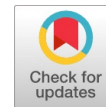


A Study on Impact of Macro-Economic Variables and Information Asymmetry on the Aum of Various Kinds of Mutual Fund Schemes in India: A Vecm and E- Garch Model Approach

Priyank kulshreshtha, K. Santi Swarup, Swami Prasad Saxena



Abstract: Macroeconomic risks can create disruptions among various asset classes globally and has potential to affect investors perception towards any investment alternative and mutual funds in India are not an exception to this. It is one of the burgeoning investment alternatives in India which has witnessed manifold growth in couple of decades with AUM of ₹10 trillion. In this study, an attempt has been made to assess the impact of macro-economic variables on the AUM of various kinds of mutual funds and to trace the existence of information asymmetry by applying Vector Error Correction Model and E- GARCH model on a 10-year monthly data from 2012 to 2022. It is found that Macro-economic variables play a significant role in explaining the variations of AUM in various types of mutual funds. Information asymmetry exists in all kinds of mutual funds except Equity and Debt oriented open-ended schemes.

Keywords: Macroeconomic, Risk, AUM, Vector Error Correction Model, E- GARCH Model

I. INTRODUCTION

It is commonly accepted that unexpected changes in macroeconomic variables have the potential to generate global financial impact and there are various channels through which macroeconomic fundamentals can have significant impact on the investment alternatives. These changes are known as macroeconomic risk and interpreted as economic uncertainty (Bali et al. (2014) [8]. It is observed that exposure to macro- economic risk is more powerful than exposure to financial risk (Bali et al. (2014) [8]. Hence a natural question arises that whether mutual funds are more exposed to macro- economic risk or not? Indian financial system comprises of various investment alternatives like shares, debentures, bonds, precious metals, real estate, fixed deposit schemes, recurring deposit schemes, post office saving schemes etc. out of which mutual funds has gained prominence in the last 20 years.

It is an investment alternative where an Asset Management Company generates a pool of money from common investors and invest that money in a diversified portfolio so that investors enjoy the high returns of stock market at a relatively low risk, and at the same time they are not required to actively involve themselves in stock market operations. The modern form of mutual fund industry came into existence after the bifurcation of Unit Trust of India into Specified Undertaking of Unit Trust of India (SUUTI) and UTI Mutual funds and since then, industry has witnessed manifold growth. At present the size of mutual fund industry is ₹39.46 Trillion in comparison to ₹ 8.14 Trillion in comparison to 10 years ago. The number of investor folios has also gone up from 6.99 crore to 14.42 crore in past five years which is the testimony of increasing investors' interest towards mutual funds. Mutual fund industry provides various types of investment alternatives like based on maturity period, mutual funds are classified as open-ended funds, closed ended funds and interval funds. Open ended funds are those kinds of funds wherein investors can buy or sell their units at any point of time and deal directly with the mutual fund company for investing and redeeming their money on the contrary closed ended funds are the schemes having a fixed maturity period and investor can only invest in these schemes at the launch period commonly known as new fund offer (NFO). Interval funds is the combination of open ended and closed ended funds. These funds can be traded on stock exchanges or may be open for sale or redemption at pre- defined intervals of time. Mutual fund schemes are further classified based on the principle of investment like equity schemes, debt schemes, hybrid schemes, solution-oriented schemes, and others. There are various other sub classifications in each of these broad categories. Due to variety of investment alternatives and various income tax advantages mutual fund industry is flourishing at a faster pace. Generally, the growth of mutual fund industry is measured by looking at Assets Under Management (AUM) and it is considered as one of the important metrics because it not only reflects the growth in mutual funds but also hints about various other aspects related to this industry.

AUM is the market values of all the assets being handled by any asset management company (AMC) on behalf of their clients. It serves as an indicator of the performance of a particular fund.

Manuscript received on 17 February 2023 | Revised Manuscript received on 10 March 2023 | Manuscript Accepted on 15 May 2023 | Manuscript published on 30 May 2023.

* Correspondence Author (s)

Priyank Kulshreshtha*, Department of Management, Dayalbagh Educational Institute Dayalbagh Agra, India. E-mail: priyankpyara@gmail.com

Prof. K. Santi Swarup, Department of Management, Dayalbagh Educational Institute Dayalbagh Agra, India. E-mail: kssdei2001@yahoo.com

Prof. Swami Prasad Saxena, Department of Applied Business Economics, Dayalbagh Educational Institute Dayalbagh Agra, India. E-mail: spsaxena@dei.ac.in

© The Authors. Published by Lattice Science Publication (LSP). This is an open access article under the CC-BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

A Study on Impact of Macro-Economic Variables and Information Asymmetry on the Aum of Various Kinds of Mutual Fund Schemes in India: A Vecm and E- Garch Model Approach

It gets affected by market forces, inflow and outflow of funds and dividends paid by the companies whose securities are being held by the AMC. AUM is important for any fund because as AUM increases, revenues of AMC in the form of managerial fees, increases. Since, changes in AUM is a function of inflow and out flow of funds so it not only indicates the performance of the funds but it also reflects the investors' preference for any type of mutual fund and can act as a proxy for investor sentiments for mutual funds (Sundaram, 2020). So, AUM is considered as one of the important metrics for both investors and fund managers, because it provides a comprehensive idea to both the parties regarding their future course of action. Prior studies hints that in case of the performance of Shariya mutual funds Inflation pertains significant positive impact and exchange rate affect negatively and significantly (Setiawan & Wati, 2019) [32] [24], however others argue that real macroeconomic variables bear no significant influence on the investments in mutual funds (K. Rao and Datta (2011) [29], Ansari and Uz-Zaman (2021) [5] suggest that GDP growth rate, interest rate and inflation has negative impact whereas exchange rate has positive impact on the AUM of mutual funds. In case of relationship between macroeconomic variables and NAV positive relation is found with inflation, CPI and negative relation found with interest rates, money supply M3 (Makau, 2014) [21]. So, we find evidence of relationship between various macroeconomic variables and performance of mutual funds but one research paper tries to establish the relationship between AUM and macroeconomic variables. So, present study endeavours to trace the impact of various macro-economic variables on the Assets Under Management of various kinds of mutual funds with an aim to understand the interplay between macro- economic variables and AUM of various types of mutual funds. Further this study attempts to explore the existence of information asymmetry in the AUM of various types of mutual funds. The research paper is further classified into 4 sections. In first section, research work of eminent researchers is mentioned, section 2 comprises of material and methods, section three deals with data analysis and interpretation and section four discusses the key findings.

II. REVIEW OF LITERATURE

A lot of studies are being undertaken by various researchers to highlight the impact of macro- economic variables on different kind of dependent variables like Lockwood (1996) [20] in his paper traced the impact of macro-economic variables on the mutual fund's betas using monthly returns of 171 mutual funds over a period commencing from 1978 to 1991 and found that, there exists a negative relationship between fund betas and inflation and between fund betas and default risk premia. Whereas, Dash and Dinesh (2008) [10][11] in their paper tried to trace the impact of macro-economic variables on the performance of mutual funds in term of their returns and volatility by applying Granger Causality test and found that the variance of 35.29% schemes of mutual funds is not sensitive to any macro- economic variable. On the contrary, Kariuki (2014) [15] in his paper tried to trace the impact of macro- economic variables on the performance of mutual funds in Kenya by applying OLS model and found that identified macro- economic variables namely money supply, interest rate, inflation rate, GDP and

exchange rate explains 70.9% fund performance of mutual funds operating in Kenya (TASSEVEN & Teker, (2009); Lobão, & Levi (2016) [18]; Qureshi et al. (2017) [28]; Asad and Siddiqui, (2019) [7]; Panigrahi (2020) [26]; Bandonio et.al. (2020); Gyimah et al. (2021) [13]; Melkani, 2023) [23]

Test of causality between AUM and of mutual funds and key economic indicator was done by Rao and Daita (2012) [30] in their paper by deploying EIC approach and found that real macroeconomic variables do not affect investments in mutual funds significantly. Whereas, Alexakis et al. (2013) [3] in their paper by applying Crouching Error Correction Model found that stock prices and mutual fund flows are cointegrated and in case of positive movement bi- directional causality takes place on the contrary if negative movement occurs the causality run from mutual fund flows to stock prices [2].

One of the novel attempts was made by Kopsch et al. (2015) [17] In their paper where they endeavoured to trace the determinants of the flow of mutual funds in equity and hybrid mutual funds by collecting the data for the period commencing 1998 to 2013. They applied VAR and Granger Causality and found that market fear, inflation expectation and exchange rate explain the variability in mutual fund flows. The impact of mutual fund fees on the return predictability was examined by Vidal et al. (2015) [34][35] in their paper and found that funds with pre fees bad performance charge higher fees from their clients.

Paul (2017) [27] in his paper tried to trace the impact of business cycle, market return on the financial performance of socially responsible investing (SRI) mutual funds by collecting data for two business cycles.

Islamic mutual funds are gaining prominence now a days in Islamic countries, so with an aim to trace the impact of macro-economic variables on the NAV of Islamic Unit Trust Fund in Malaysia, Othman et al. (2018) [25], wrote a research paper by applying Vector Error Correction model and found a strong significant equilibrium relationship between NAV of all Islamic Unit Trust Funds and Macro Economic variables in Malaysia. (Sumantyo and Savitri; (2019) [33] Ardhani et al. (2020) [6] There have been various studies in past to trace the information asymmetry in various dimensions of stock markets like Booth et al. (1997) [9] in their paper attempted to trace the volatility spill over in Scandinavian stock markets by applying E- GARCH model and found that volatility spill over is asymmetric in nature which means spill overs are more pronounced in case of bad news rather than good news. Lobo (2000) [19][22] in their paper tried to trace the asymmetric effect of interest rates changes on stock prices of USA by applying ASAR- EGARCH model and found that there exists overreaction in the presence of bad news in comparison to good news.

Kasman and Kasman (2008) [16] in their paper tried to trace the impact of futures and options trading on the stock market volatility of Istanbul Stock Exchange by applying E- GARCH model on the data collected from 2002 to 2007 and found that future trading helped in reducing volatility in ISE.



Mohanty (2009) in his paper tried to trace the asymmetric nature of volatility in Indian stock markets by applying various classes of GARCH models on the data collected from four indices viz. Sensitivity index, BSE-100, S&P CNX 500 and S&P CNX Nifty for the period commencing from 1995 to 2007 and found that E- GARCH model is most suitable in explaining asymmetric behaviour in all these indices. Abdalla and Winker (2012) [1] in their paper tried to model the stock price volatility in the stock markets of Sudan and Cairo by applying various symmetric and asymmetric GARCH models on the data over a period of 2006 to 2010 and found that there exists a positive risk premium and evidence of asymmetry in both the markets.

Kamal et al. (2012) [14] in their paper tried to model to exchange rate volatility in Pakistan by applying various GARCH models. The results of M- GARCH model indicate that previous day forex rates affect the current day forex rates, whereas results of E- GARCH model indicate that there exists a asymmetric behaviour in forex volatility. Al-Najjar (2016) [4] in her paper tried to model the volatility in the stock markets of Jordan by applying various models belonging to the family of GARCH models and found that symmetric ARCH/ GARCH models can capture the volatility in Amman Stock Exchange (ASE) and E- GARCH model does not find any leverage effect in the ASE [36].

Fakhfekh and Jeribi (2020) [12] in their paper tried to identify best suited model for explaining volatility in crypto currencies by applying 5 GARCH models with different error distributions on the 16 most popular crypto currencies and found the existence of asymmetry but unlike stock markets because in case of crypto currencies, positive shocks impact the volatility more than negative shocks. Sakarya and Ekinci (2020) [31] in their paper tried to trace the impact of flow of funds in exchange traded funds on the exchange rate volatility by applying E- GARCH model and found that large inflow in exchange traded fund increases exchange rate volatility.

After reviewing the available literature, it can be deduced that impact of macro-economic variables on the AUM of the mutual funds is not studied, however ample of research is focused on performance of mutual funds, its risk, and NAV of mutual funds. One of the research projects attempted to establish the relationship between AUM and Macro-economic variables but constrained themselves to identify the causal linkage amongst them. Similarly, the information asymmetry has also not been checked for AUM of mutual funds. So, to bridge this gap, present study attempts to identify the degree and direction of long-term and short-term relationship amongst the AUM of various types of mutual funds. Further, this study attempts to trace the existence of information asymmetry in the AUM of various mutual funds in India.

III. MATERIAL AND METHODS

Objectives of the Study: Present study aims at fulfilling two main objectives out of which one is to trace the impact of various macroeconomic factors on the assets under management of various kinds of mutual funds secondly to trace the asymmetric effect on the volatility of the various mutual fund schemes.

Data: For accomplishing the objectives 10-year monthly data is considered for a period commencing from January 2012 to December 2022 for the various mutual funds like Equity Mutual Funds Open ended, Close ended, Debt Funds open ended, closed ended, hybrid schemes open ended, Exchange Traded Funds open ended. The macroeconomic variables under considerations are Inflation, Consumer Price Index, Index of Industrial Production, Exchange Rate, M3 and Sensex. For checking the causality amongst the variables Granger causality is used, for tracing the relationship between the variables and the impact of macroeconomic variables on various kinds of mutual fund schemes, Johansson's co-integration test and Vector Error Correction Model is used and E- GARCH model is used for tracing the asymmetric impact for various kinds of mutual fund schemes.

Vector Error Correction Model: This model is an advancement over the Vector Auto Regression model because the pre-requisite of applying the VAR model is that data should be stationary at level which is generally not found in time series data whereas Vector Error Correction Model can be applied to a non-stationary data set at level. Further, this model captures the change in the dependent variable if any one of the independent variable deviates from the equilibrium popularly known as speed of adjustments. VECM is a full information maximum likelihood estimation model tests the co-integrating relationships for the whole system in one equation and it also prevents carry over of mistakes from one step to the other. The VECM takes the following form

$$\Delta x_{t-1} = \Pi x_{t-1} + \sum_{l=1}^{p-1} \Gamma_l \Delta x_{t-1} + C d_t + \varepsilon_t \quad \text{Eq. 1}$$

Where Δx is first difference of the variables in vector x , P_i is the coefficient matrix of co-integrating relationships Γ_l is coefficient matrix of lags of differenced variables of x_i , d is the vector of deterministic terms, C is corresponding coefficient matrix P is the lag order model in its VAR form ε is the error term with zero mean and variance co-variance matrix Σ . Πx_{t-1} is the error correction term which captures the effect on the growth rate of dependent variable if one of the independent variables deviates from equilibrium. The coefficient matrix Π can be written as matrix product $\Pi = \alpha\beta'$ hence error correction term becomes $\alpha\beta'x_{t-1}$, β contains information on the equilibrium relationship between the variables at the level, $\beta'x_{t-1}$ is interpreted as the distance of variable from its equilibrium values, α describes the speed at which variable converges back to its equilibrium value.

E- GARCH Model: Symmetric class of GARCH models developed by Bollerslave (1986) are capable to model the volatility of any time series but do not capture the asymmetric effect which was discovered by Black (1976) and confirmed by French, Schwert and Stambaugh (1987), Schwert(1990) and Nelson (1991). Asymmetric effect can be defined as the unexpected impact of bad news on the volatility on any time series in comparison to the good news of same magnitude. So, with an aim to capture this phenomenon E- GARCH model was developed by Nelson (1991).



A Study on Impact of Macro-Economic Variables and Information Asymmetry on the Aum of Various Kinds of Mutual Fund Schemes in India: A Vecm and E- Garch Model Approach

This model pertains various advantages over the traditional GARCH models like use of exponential formulation removes the restriction of positive constraints on the estimated coefficients in ARCH and GARCH. Secondly Unlike GARCH models, E- GARCH model captures the negative asymmetry apparent in various time series by allowing for the standardised residuals as moving average regressor in the variance equation and thirdly, it also captures the increased volatility associated with negative shocks. So, the mean equation for the E- GARCH model takes the following form

$$r_t = a + br_{t-1} + \varepsilon_t \quad \text{Eq. 2}$$

Where ε_t follows a generalised error distribution

$$\text{Log}(h_t) = \varphi + \sum_{i=1}^q \eta \left| \frac{u_{t-1}}{\sqrt{h_{t-1}}} \right| + \sum_{i=1}^q \lambda_i \frac{u_{t-i}}{\sqrt{h_{t-i}}} + \sum_{k=1}^p \theta_k \log(h_{t-k}) \quad \text{Eq.3}$$

Left hand side of the equation is conditional variance which implies that asymmetric effect is exponential and not quadratic as a result to which, the forecasts of the proposed model is guaranteed to be non-negative. φ is a constant, η represent ARCH effect, λ signifies for asymmetric effect and Θ stands for GARCH effect. So, if in an E- GARCH model if, $\lambda_1 = \lambda_2 = \dots = 0$ the model is said to be symmetric but if $\lambda_i < 0$ it implies that negative shocks generate larger volatility than good news.

IV. SECTION:4 ANALYSIS AND INTERPRETATION OF DATA:

A. Description of Data

For further calculations Log values of the various schemes as well as log values of identified macro-economic variables are considered. By looking at the table no.2 (in appendix) it can be inferred that Assets Under Management of Hybrid schemes is the highest (1.20) and of Debt Oriented Schemes Closed ended is lowest (0.14). The skewness values indicate that both the open ended and closed ended equity and debt-oriented schemes and interval schemes are negatively skewed, whereas AUM of ETFs and Hybrid schemes are positively skewed. Kurtosis values indicate that distribution of AUM of Debt Oriented Schemes open ended (3.32) and of Interval schemes (3.80) is leptokurtic since the values are greater than 3 and rest all are platykurtic in nature because their values are less than significantly less than 3. Since the probability values of Jarque- Bera Test are less than 0.05 level of significance hence all the distributions do not follow normal distribution. Table no. 3 (in appendix) provides the description of various macroeconomic variables. After looking at the table, inflation has highest standard deviation (0.48) and IIP (0.03) has lowest standard deviation. The skewness values of all the regressors indicate that all the series are negatively skewed. Kurtosis values of IIP and Inflation are 4.70 and 4.58 respectively which is greater than 3 so the distribution is leptokurtic rest all other variables are platykurtic in nature. Since the probability values of CPI, SENSECX, Interest Rates and M3 are more than 0.05 level of significance thus fails to reject the null hypothesis of normal distribution. All other variables are not normally

distributed since their probability values are less than 0.05 level of significance.

Test of Stationarity: For stationarity testing Augmented Dickey Fuller Test is used. This is test is related to the Unit Root Category of tests. Unit Root is a characteristic of time series that makes it non- stationary.

$$Y_t = \alpha Y_{t-1} + \beta X_e + \varepsilon \quad \text{Eq.4}$$

Where Y_t is the values of dependent variable at time t , α & β are constants and X_e is an exogenous variable. So, technically in the equation above if value of $\alpha=1$, unit root is said to be exist and presence of which means the series is non-stationary. The Augmented Dickey Fuller Test is an advancement over basic Dickey Fuller test which test the null hypothesis of Alpha = 1 at first lag like

$$y_t = c + \beta_t + \alpha y_{t-1} + \phi \Delta Y_{t-1} + \varepsilon_t \quad \text{Eq.5}$$

Where, y_{t-1} is lag of the time series and ΔY_{t-1} is the first difference of time series at lag 1. However, Augmented Dickey Fuller test helps in adding high order regressive process in the model to test the same null hypothesis $H_0 = \alpha=1$.

$$y_t = c + \beta t + \alpha y_{t-1} + \phi_1 \Delta Y_{t-1} + \phi_2 \Delta Y_{t-2} + \dots + \phi_p \Delta Y_{t-p} + \varepsilon_t \quad \text{Eq.6}$$

The noticeable fact is that more differencing terms are added to the equation.

B. Test of Stationarity

After looking at the table no 4 (in appendix) values of t-statistics for all the schemes at level is less than 3 and their probability values are more than 0.05 level of significance thus fail to reject the null hypothesis of presence of unit root and it can be inferred that series are non- stationary at level however, t- statistic values for all the schemes at first difference are more than |3| and their probability values are less than 0.05 level of significance thus rejects the null hypothesis of presence of unit root in the time series hence it is confirmed that AUM of all the schemes are stationery at first difference. To test the stationarity of macro- economic indicators, see table 5 (in appendix) which states that t-statistics values for all these variables are less than |3| and their probability values are more than 0.05 level of significance thus fail to reject the null hypothesis of presence of unit- root and helps in inferring that all the series are non- stationary at level (I(0)) on the contrary at first difference (I(1)), all the t-statistics values are greater than |3| and their probability values are less than 0.05 level of significance thus rejects the null hypothesis of presence of unit root in the time series and it can be said that macro- economic variables are stationary at first difference (I(1))

C. Selection of Optimal Lag Length

Optimum lag length is selected based on Akaike Information Criterion (AIC) which comes out to be 8 in all the cases.

D. Results of Vector Error Correction Model

Impact of Macroeconomic variables on the ETFs in long term: Based on the analysis, the co-integrating vectors comes out as follows



B1' = (1.00, 7.02, 12.41, -7.36, 0.25, -1.89, -18.27, 5.23)

All these values explain the long-term elasticity measuring co-efficient for the AUM of ETFs and CPI, FOREX, IIP, Inflation, Interest Rates, M3 and Sensex and can be expressed as

$$\text{ETF} = -480.90 - 7.02\text{CPI} - 12.41\text{EXT} + 7.36\text{IIP} - 0.25\text{INF} + 1.89\text{INTR} + 18.27\text{M3} - 5.23\text{SS} \quad \text{Eq. 7}$$

The equation displayed above entails that there is negative but insignificant relationship between CPI and ETF and if CPI change by 1 unit it can bring 7.02-unit change in ETF.

The relationship between ETF and FOREX is significantly

Impact of Macroeconomic Variables on the AUM of ETFs in Short Term

$$\begin{aligned} & -0.16\text{ECT} - 0.11*\text{D}(\text{ETF}(-1)) - 0.24*\text{D}(\text{ETFS}(-2)) - 0.33*\text{D}(\text{ETFS}(-3)) - 0.15*\text{D}(\text{ETFS}(-4)) + 0.02*\text{D}(\text{ETFS}(-5)) - \\ & 0.03*\text{D}(\text{ETFS}(-6)) - 0.15*\text{D}(\text{ETFS}(-7)) + 2.57*\text{D}(\text{CPI}(-1)) - 6.15*\text{D}(\text{CPI}(-2)) + 1.49*\text{D}(\text{CPI}(-3)) + 1.89*\text{D}(\text{CPI}(-4)) - \\ & 1.49*\text{D}(\text{CPI}(-5)) + 4.17*\text{D}(\text{CPI}(-6)) + 1.88*\text{D}(\text{CPI}(-7)) + 0.79*\text{D}(\text{EXT}(-1)) - 0.03*\text{D}(\text{EXT}(-2)) + 1.08*\text{D}(\text{EXT}(-3)) \\ & + 3.51*\text{D}(\text{EXT}(-4)) - 1.08*\text{D}(\text{EXT}(-5)) + 0.87*\text{D}(\text{EXT}(-6)) + 1.13*\text{D}(\text{EXT}(-7)) - 0.64*\text{D}(\text{IIP}(-1)) + 0.94*\text{D}(\text{IIP}(-2)) - \\ & 0.93*\text{D}(\text{IIP}(-3)) + 1.96*\text{D}(\text{IIP}(-4)) + 0.03*\text{D}(\text{IIP}(-5)) + 1.51*\text{D}(\text{IIP}(-6)) + 0.68*\text{D}(\text{IIP}(-7)) - 0.01*\text{D}(\text{INF}(-1)) + 0.12*\text{D}(\text{INF}(-2)) \\ & - 0.09*\text{D}(\text{INF}(-3)) + 0.02*\text{D}(\text{INF}(-4)) - 0.03*\text{D}(\text{INF}(-5)) - 0.12*\text{D}(\text{INF}(-6)) - 0.08*\text{D}(\text{INF}(-7)) - 0.98*\text{D}(\text{INTR}(-1)) \\ & + 0.32*\text{D}(\text{INTR}(-2)) - 1.54*\text{D}(\text{INTR}(-3)) - 0.18*\text{D}(\text{INTR}(-4)) + 0.35*\text{D}(\text{INTR}(-5)) - 0.75*\text{D}(\text{INTR}(-6)) - 0.16*\text{D}(\text{INTR}(-7)) - \\ & 3.84*\text{D}(\text{M3}(-1)) - 0.89*\text{D}(\text{M3}(-2)) - 2.57*\text{D}(\text{M3}(-3)) - 1.48*\text{D}(\text{M3}(-4)) + 1.38*\text{D}(\text{M3}(-5)) - 0.11*\text{D}(\text{M3}(-6)) - 1.47*\text{D}(\text{M3}(-7)) \\ & + 0.51*\text{D}(\text{SS}(-1)) + 0.36*\text{D}(\text{SS}(-2)) - 0.36*\text{D}(\text{SS}(-3)) + 0.19*\text{D}(\text{SS}(-4)) + 0.03*\text{D}(\text{SS}(-5)) - 0.80*\text{D}(\text{SS}(-6)) + 0.18*\text{D}(\text{SS}(-7)) \\ & + 0.08 \end{aligned} \quad \text{Eq. 8}$$

The equation above displays the short-term relationship between macroeconomic variables and AUM of ETFs. The results of Wald test (see table 7 in appendix) indicate that since the probability values of F- Statistics and Chi-Square test for CPI and Exchange rate is less than 0.05 level of significance (F- statistics = 0.034, 0.02, Chi-Square test = 0.02, 0.01 respectively) thus rejects the null hypothesis of no short-term relationship between AUM and CPI, and between AUM and EXT and accepts the alternate hypothesis that significant short-term relationship exist between the AUM and CPI and AUM and Exchange rate. However, the p-values of F- statistics and Chi-Square statistics is more than 0.05 level of significance (see table no. 7 in appendix) thus fail to reject the null hypothesis that no short-term relationship exists between AUM and rest of the macro-economic variables.

Long-term Impact of Macro-Economic Variables on Equity Oriented Schemes closed ended (EOSce)

$$\begin{aligned} \text{EOSce} &= -5397.62 - \\ & 610.31\text{CPI} + 237.19\text{EXT} + 10.23\text{IIP} + 13.97\text{INF} - \\ & 103.55\text{INTR} + 223.81\text{M3} - 13.27\text{SS} \end{aligned} \quad \text{Eq. 9}$$

Short-Term Impact of Macro-Economic Variables on the AUM of EOSce.

$$\begin{aligned} & 0.004\text{ECT} + 0.06*\text{D}(\text{EOSce}(-1)) - 0.10*\text{D}(\text{EOSce}(-2)) + 0.32*\text{D}(\text{EOSce}(-3)) + 0.01*\text{D}(\text{EOSce}(-4)) - 0.27 \\ & * \text{D}(\text{EOSce}(-5)) - 0.15*\text{D}(\text{EOSce}(-6)) + 0.09*\text{D}(\text{EOSce}(-7)) - 0.86*\text{D}(\text{CPI}(-1)) + 0.38*\text{D}(\text{CPI}(-2)) + \\ & 0.57*\text{D}(\text{CPI}(-3)) - 3.62*\text{D}(\text{CPI}(-4)) - 0.42*\text{D}(\text{CPI}(-5)) - 3.20*\text{D}(\text{CPI}(-6)) + 3.67*\text{D}(\text{CPI}(-7)) - 1.25*\text{D}(\text{EXT}(-1)) \\ & + 0.46*\text{D}(\text{EXT}(-2)) + 0.63*\text{D}(\text{EXT}(-3)) + 0.91*\text{D}(\text{EXT}(-4)) + 0.27*\text{D}(\text{EXT}(-5)) + 0.34*\text{D}(\text{EXT}(-6)) - 0.05 \\ & * \text{D}(\text{EXT}(-7)) + 0.47*\text{D}(\text{IIP}(-1)) + 0.40*\text{D}(\text{IIP}(-2)) - 0.94*\text{D}(\text{IIP}(-3)) + 1.07*\text{D}(\text{IIP}(-4)) - 1.21*\text{D}(\text{IIP}(-5)) + \\ & 0.61*\text{D}(\text{IIP}(-6)) - 1.56*\text{D}(\text{IIP}(-7)) + 0.04*\text{D}(\text{INF}(-1)) - 0.09*\text{D}(\text{INF}(-2)) - 0.13*\text{D}(\text{INF}(-3)) + 0.04*\text{D}(\text{INF}(-4)) - \\ & 0.11*\text{D}(\text{INF}(-5)) - 0.01*\text{D}(\text{INF}(-6)) - 0.10*\text{D}(\text{INF}(-7)) - 0.07*\text{D}(\text{INTR}(-1)) + 0.84*\text{D}(\text{INTR}(-2)) + \\ & 0.50*\text{D}(\text{INTR}(-3)) + 0.42*\text{D}(\text{INTR}(-4)) - 0.31*\text{D}(\text{INTR}(-5)) - 0.43*\text{D}(\text{INTR}(-6)) + 0.03*\text{D}(\text{INTR}(-7)) + \\ & 3.06*\text{D}(\text{M3}(-1)) + 1.18*\text{D}(\text{M3}(-2)) + 0.80*\text{D}(\text{M3}(-3)) + 1.78*\text{D}(\text{M3}(-4)) + 1.81*\text{D}(\text{M3}(-5)) + 2.25*\text{D}(\text{M3}(-6)) + \\ & 1.56*\text{D}(\text{M3}(-7)) - 0.87*\text{D}(\text{SS}(-1)) + 0.22*\text{D}(\text{SS}(-2)) - 0.13*\text{D}(\text{SS}(-3)) + 0.39*\text{D}(\text{SS}(-4)) + 0.48*\text{D}(\text{SS}(-5)) + \\ & 0.20*\text{D}(\text{SS}(-6)) + 0.42*\text{D}(\text{SS}(-7)) - 0.08 \end{aligned} \quad \text{Eq. 10}$$

The equation above displays the short-term impact of macro-economic variables on the AUM of EOSce. The results of Wald test (see table in appendix) represent that none of the variables pertains a significant impact because the probability values are more than 0.05 level of significance.

negative because the t- statistic value is greater than |1.96| (6.65). The relationship between IIP and ETF is positive and significant (-3.86 > -3). Inflation has negative but insignificant impact on the AUM of ETF whereas Interest rates has positive but insignificant relationship with ETFs. M3 impacts AUM of ETF significantly because t- statistic value of M3 is -11.28 which is greater than |1.96|. Sensex pertains significant negative relationship with the AUM of ETF. The value of Co-integrating vector is negative and significant which points out that model is robust and responsive to any structural change if introduced in the system.

After looking at the equation above it can be inferred that CPI pertains significant inverse relation with AUM of equity-oriented schemes, closed ended (EOSce) because the t-statistic value is significantly greater than cut-off rate (79.73 > 1.96). The relationship between Exchange rate and AUM is positive and significant (-6.92 > 1.96) (see table in appendix). Similarly, IIP impacts AUM of EOSce positively but the relationship is insignificant (0.30 < 1.96) however inflation has significant positive relationship with the same (-7.43 > -1.96). Interest rates and M3 pertains significantly negative and positive relationship respectively (6.06, -5.76) (see table in appendix) with AUM of EOSce, however, there is insignificant negative relationship between Sensex and AUM of EOSce, t- statistics being less than 1.96 (-1.01). The error correction term is insignificant because the t-statistic value of the error correction term is 1.25 which is less than 1.96 and the probability value is 0.22 which is more than 0.05 level of significance which express that proposed model is not robust enough to encompass any policy level change which means that if any change gets introduced in the system variables will not respond immediately and significantly.

A Study on Impact of Macro-Economic Variables and Information Asymmetry on the Aum of Various Kinds of Mutual Fund Schemes in India: A Vecm and E- Garch Model Approach

$$\begin{aligned}
 & -0.01\text{ECT}-0.14*\text{D}(\text{EOSoe}(-1)) -0.07*\text{D}(\text{EOSoe}(-2)) +0.26*\text{D}(\text{EOSoe}(-3)) + 0.22*\text{D}(\text{EOSoe}(-4)) + 0.01*\text{D}(\text{EOSoe}(-5)) \\
 & +0.05*\text{D}(\text{EOSoe}(-6)) -0.13*\text{D}(\text{EOSoe}(-7)) + 0.13*\text{D}(\text{CPI}(-1)) + 1.46*\text{D}(\text{CPI}(-2)) -1.06 *\text{D}(\text{CPI}(-3)) -0.66*\text{D}(\text{CPI}(-4)) + \\
 & 0.54*\text{D}(\text{CPI}(-5)) -1.61*\text{D}(\text{CPI}(-6)) -0.04*\text{D}(\text{CPI}(-7)) -1.25*\text{D}(\text{EXT}(-1)) + 0.46*\text{D}(\text{EXT}(-2)) + 0.63*\text{D}(\text{EXT}(-3)) + \\
 & 0.91*\text{D}(\text{EXT}(-4)) + 0.27*\text{D}(\text{EXT}(-5)) + 0.34*\text{D}(\text{EXT}(-6)) -0.05*\text{D}(\text{EXT}(-7)) +0.47*\text{D}(\text{IIP}(-1)) + 0.40*\text{D}(\text{IIP}(-2)) - \\
 & 0.94*\text{D}(\text{IIP}(-3)) + 1.07*\text{D}(\text{IIP}(-4)) -1.21*\text{D}(\text{IIP}(-5)) + 0.61*\text{D}(\text{IIP}(-6)) -1.56*\text{D}(\text{IIP}(-7)) + 0.04*\text{D}(\text{INF}(-1)) -0.09*\text{D}(\text{INF}(-2)) \\
 & -0.13*\text{D}(\text{INF}(-3)) + 0.04*\text{D}(\text{INF}(-4)) -0.11*\text{D}(\text{INF}(-5)) -0.01*\text{D}(\text{INF}(-6)) -0.10*\text{D}(\text{INF}(-7)) -0.07*\text{D}(\text{INTR}(-1)) + \\
 & 0.84*\text{D}(\text{INTR}(-2)) -0.50 *\text{D}(\text{INTR}(-3)) +0.42*\text{D}(\text{INTR}(-4)) -0.31*\text{D}(\text{INTR}(-5)) -0.43*\text{D}(\text{INTR}(-6)) + 0.03*\text{D}(\text{INTR}(-7)) + \\
 & 3.06*\text{D}(\text{M3}(-1)) + 1.18*\text{D}(\text{M3}(-2)) + 0.80*\text{D}(\text{M3}(-3)) + 1.78*\text{D}(\text{M3}(-4)) + 1.81*\text{D}(\text{M3}(-5)) + 2.25*\text{D}(\text{M3}(-6)) + 1.56*\text{D}(\text{M3}(- \\
 & 7)) -0.87*\text{D}(\text{SS}(-1)) +0.22*\text{D}(\text{SS}(-2)) -0.13*\text{D}(\text{SS}(-3)) + 0.39*\text{D}(\text{SS}(-4)) + 0.43*\text{D}(\text{SS}(-5)) + 0.20*\text{D}(\text{SS}(-6)) + 0.42*\text{D}(\text{SS}(- \\
 & 7)) -0.08
 \end{aligned}
 \tag{Eq.11}$$

The equation above expresses the short-term relationship between macro-economic variables and AUM of EOSoe. The results of Wald test (see table in appendix) indicate that the probability values of F- statistics and Chi-square test are more than 0.05 level of significance hence fail to reject the null hypothesis that there is no significant relationship between Macro- economic variables and AUM of EOSoe in short run.

Long Term Impact of Macroeconomic Variables on the AUM of Hybrid Schemes (HS)

$$\begin{aligned}
 & -1038.97 + \\
 & 102.55\text{CPI}+34.81\text{EXT}+21.81\text{IIP}+2.38\text{INF}- \\
 & 14.31\text{INTR}+38.96\text{M3}+4.08\text{SS}
 \end{aligned}
 \tag{Eq. 12}$$

The equation above talks about the impact of various macroeconomic variables on the AUM of Hybrid schemes and after looking at the equation, it can be derived that CPI

Short- Term Impact of Macroeconomic Variables on the AUM of Hybrid Schemes (HS)

$$\begin{aligned}
 & -0.03\text{ECT}-0.32*\text{D}(\text{HS}(-1)) -0.12*\text{D}(\text{HS}(-2)) + 0.01*\text{D}(\text{HS}(-3)) -0.01*\text{D}(\text{HS}(-4)) +0.23*\text{D}(\text{HS}(-5)) + 0.11*\text{D}(\text{HS}(-6)) - \\
 & 0.16*\text{D}(\text{HS}(-7)) -7.89*\text{D}(\text{CPI}(-1)) + 3.78*\text{D}(\text{CPI}(-2)) + 9.66*\text{D}(\text{CPI}(-3)) -2.04*\text{D}(\text{CPI}(-4)) -0.35*\text{D}(\text{CPI}(-5)) \\
 & +7.34*\text{D}(\text{CPI}(-6)) -15.57*\text{D}(\text{CPI}(-7)) -3.37*\text{D}(\text{EXT}(-1)) -0.72*\text{D}(\text{EXT}(-2)) + 3.09*\text{D}(\text{EXT}(-3)) -4.41*\text{D}(\text{EXT}(-4)) - \\
 & 5.72*\text{D}(\text{EXT}(-5)) + 5.42*\text{D}(\text{EXT}(-6)) -2.72*\text{D}(\text{EXT}(-7)) -3.68*\text{D}(\text{IIP}(-1)) + 1.09*\text{D}(\text{IIP}(-2)) -6.28*\text{D}(\text{IIP}(-3)) + \\
 & 1.53*\text{D}(\text{IIP}(-4)) -3.26*\text{D}(\text{IIP}(-5)) + 4.59*\text{D}(\text{IIP}(-6)) -5.28*\text{D}(\text{IIP}(-7)) + 0.01*\text{D}(\text{INF}(-1)) + 0.07*\text{D}(\text{INF}(-2)) -0.33*\text{D}(\text{INF}(- \\
 & 3)) + 0.32*\text{D}(\text{INF}(-4)) -0.32*\text{D}(\text{INF}(-5)) + 0.09*\text{D}(\text{INF}(-6)) + 0.17*\text{D}(\text{INF}(-7)) + 0.88*\text{D}(\text{INTR}(-1)) + 2.79*\text{D}(\text{INTR}(-2)) - \\
 & 1.75*\text{D}(\text{INTR}(-3)) + 2.60*\text{D}(\text{INTR}(-4)) -2.62*\text{D}(\text{INTR}(-5)) + 0.007*\text{D}(\text{INTR}(-6)) + 1.17*\text{D}(\text{INTR}(-7)) -0.94*\text{D}(\text{M3}(-1)) + \\
 & 5.62*\text{D}(\text{M3}(-2)) -3.46 *\text{D}(\text{M3}(-3)) + 2.64*\text{D}(\text{M3}(-4)) + 1.73*\text{D}(\text{M3}(-5)) -6.51*\text{D}(\text{M3}(-6)) + 0.24*\text{D}(\text{M3}(-7)) +0.73*\text{D}(\text{SS}(- \\
 & 1)) -0.15*\text{D}(\text{SS}(-2)) + 1.18*\text{D}(\text{SS}(-3)) +0.36*\text{D}(\text{SS}(-4)) -2.10*\text{D}(\text{SS}(-5)) + 0.90*\text{D}(\text{SS}(-6)) + 1.19*\text{D}(\text{SS}(-7)) + 0.08
 \end{aligned}
 \tag{Eq.13}$$

The equation above displays the short-term impact of identified macroeconomic variables on the AUM of Hybrid Schemes. Wald test is applied to check for the relationship and the results of test indicate that since probability value of the F- statistics and Chi square test is less than 0.05 level of significance for CPI and Exchange rate (see table 7 in appendix) rejects the null hypothesis and accepts the alternate hypothesis that there exist a significant relation between CPI and AUM of HS and Exchange rate and AUM of HS in short term, however the probability values of F- statistic and Chi-square test for all other macroeconomic variables are greater than 0.05 level of significance (see table in appendix), thus fail to reject the null hypothesis that there is no significant relationship between AUM and rest of the macroeconomic variables in the short-run.

Impact of Macroeconomic Variables on the Debt Oriented Schemes Closed Ended (DOSce) in the Long-Term.

$$\begin{aligned}
 & 1.52 + 2.27\text{CPI}-1.95\text{EXT}+0.45\text{IIP}- \\
 & 0.14\text{INF}+1.84\text{INTR}+0.07\text{M3}+0.02\text{SS}
 \end{aligned}
 \tag{Eq. 14}$$

The equation above displays the long-term impact of identified macroeconomic variables on the AUM of Debt oriented schemes closed ended (DOSce) in the long run. By

has significant positive impact because the t- statistic values is 8.87 which is greater 1.96 (see table no. in appendix). Similarly, Exchange rates, IIP and Inflation has significant positive impact on the AUM of Hybrid Schemes because the t-statistic values are significantly greater than |1.96| (5.94, -3.48, -7.77). However, interest rates impact the AUM of Hybrid Schemes negatively and significantly (4.94>1.96). The relationship between M3 and AUM of Hybrid Scheme is significantly positive however the relationship between AUM of HS and Sensex is positive but insignificant. The Error correction term is also found to be insignificant because the t- statistic value is less than |1.96| (-0.79) which tells that proposed model is not robust and variables will not respond immediately, if any policy level changes being introduced.

looking at the equation no and table no. (in appendix) it can be inferred that CPI, Exchange rate, Inflation and interest rates has significant impact on AUM of DOSce since their t-statistics values are significantly higher than |1.96| (-2.52,4.61,7.41,-6.03 respectively) however the impact of IIP, M3 and Sensex is insignificant as their t-statistic values are lower than |1.96| thus fail to reject the null hypothesis of no long term relation between AUM of DOSce and IIP, M3 and Sensex (see table in appendix). The error correction term of the model is insignificant (see table no. in appendix) which indicate that the proposed model is not robust and thus it is required to incorporate more variables which can improve the responsive of the model.

Impact of Macroeconomic Variables on the Debt Oriented Schemes Closed Ended (DOSce) in Short- Term

$$0.04ECT-0.11*D(DOSce(-1)) -0.11*D(DOSce(-2)) -0.08*D(DOSce(-3)) -0.13*D(DOSce(-4)) + 0.23*D(DOSce(-5)) - 0.003*D(DOSce(-6)) + 0.16*D(DOSce(-7)) -1.95*D(CPI(-1)) + 0.41*D(CPI(-2)) -1.07*D(CPI(-3)) + 1.84*D(CPI(-4)) 0.50*D(CPI(-5)) + 1.35*D(CPI(-6)) + 2.21*D(CPI(-7)) + 0.75*D(EXT(-1)) + 0.68*D(EXT(-2)) + 0.18*D(EXT(-3)) - 0.28*D(EXT(-4)) -1.30*D(EXT(-5)) + 0.18*D(EXT(-6)) -0.32*D(EXT(-7)) + 1.27*D(IIP(-1)) -1.05*D(IIP(-2)) + 1.56*D(IIP(-3)) + 0.21*D(IIP(-4)) + 0.29*D(IIP(-5)) + 0.15*D(IIP(-6)) -0.36*D(IIP(-7)) + 0.02*D(INF(-1)) -0.01*D(INF(-2)) + 0.02*D(INF(-3)) -0.03*D(INF(-4)) + 0.02*D(INF(-5)) -0.03*D(INF(-6)) + 0.02*D(INF(-7)) + 0.69*D(INTR(-1)) + 0.05*D(INTR(-2)) + 0.59*D(INTR(-3)) + 0.72*D(INTR(-4)) + 0.42*D(INTR(-5)) + 0.29*D(INTR(-6)) + 0.11*D(INTR(-7)) + -1.38*D(M3(-1)) -0.24*D(M3(-2)) + 0.01*D(M3(-3)) + 0.59*D(M3(-4)) + 0.70*D(M3(-5)) -0.80 *D(M3(-6)) + 0.90*D(M3(-7)) -0.01*D(SS(-1)) -0.26*D(SS(-2)) -0.67*D(SS(-3)) -0.44*D(SS(-4)) -0.68*D(SS(-5)) -0.10*D(SS(-6)) + 0.18*D(SS(-7)) + 0.01$$

Eq.15

The equation above exhibits the impact of macroeconomic variables on the AUM of DOSce in the short-term. To test the significance of the relationship Wald test is conducted and it is found that, since the probability values of f- statistics and Chi -square test is less than 0.05 level of significance (see table in appendix) for CPI and Exchange rate establish the fact that CPI and exchange rate significantly impacts the AUM of DOSce in the short- term and all other variables do not pertain any significant impact on the AUM of DOSce in the short-term.

Long-Term Impact of Macroeconomic Variables on the AUM of Debt Oriented Schemes Open Ended (DOSoe)

Short-Term Impact of Macroeconomic Variables on the AUM of Debt Oriented Schemes Open ended (DOSoe)

$$0.0003ECT-0.63*D(DOSoe(-1)) -0.61*D(DOSoe(-2)) -0.19*D(DOSoe(-3)) -0.25*D(DOSoe(-4)) + 0.04*D(DOSoe(-5)) + 0.16*D(DOSoe(-6)) +0.23*D(DOSoe(-7)) + 0.90*D(CPI(-1)) -2.06*D(CPI(-2)) + 3.12*D(CPI(-3)) -0.65*D(CPI(-4)) - 1.07*D(CPI(-5)) + 0.32*D(CPI(-6)) -1.99*D(CPI(-7)) -1.07*D(EXT(-1)) -0.32*D(EXT(-2)) + 0.47*D(EXT(-3)) - 0.68*D(EXT(-4)) + 1.26*D(EXT(-5)) + 0.33*D(EXT(-6)) + 0.39*D(EXT(-7)) -0.41*D(IIP(-1)) + 1.21*D(IIP(-2)) - 0.57*D(IIP(-3)) -0.92*D(IIP(-4)) + 0.31*D(IIP(-5)) -0.11*D(IIP(-6)) -0.38*D(IIP(-7)) + 0.03*D(INF(-1)) + 0.02*D(INF(-2)) - 0.19*D(INF(-3)) + 0.08*D(INF(-4)) -0.09*D(INF(-5)) -0.05*D(INF(-6)) + 0.14*D(INF(-7)) -0.39*D(INTR(-1)) + 0.23*D(INTR(-2)) + 0.03*D(INTR(-3)) -0.72*D(INTR(-4)) -0.42*D(INTR(-5)) +0.17*D(INTR(-6)) -0.91*D(INTR(-7)) - 0.44*D(M3(-1)) + 2.42*D(M3(-2)) + 1.49*D(M3(-3)) -0.79*D(M3(-4)) -0.54*D(M3(-5)) + 1.48*D(M3(-6)) -0.73*D(M3(-7)) + 0.26*D(SS(-1)) -0.40*D(SS(-2)) + 0.35*D(SS(-3)) + 0.36*D(SS(-4)) + 0.52*D(SS(-5)) -0.01*D(SS(-6)) + 0.07*D(SS(-7)) - 0.01$$

Eq. 17

The equation above displays the direction of the relationship between AUM and macroeconomic factors and for testing the significance of relationship in short-run Wald test is used. The results of Wald Test indicate that none of the variable pertain a significant relationship with AUM of DOSce in short- run (see table no. 7 in appendix)

Long Term Impact of Macro Economic Variables on the AUM of Interval Schemes (IS):

$$522.33 - 132.82CPI+161.12EXT+105.88IIP+5.12INF- 70.95INTR-32.75M3+13.03SS$$

Eq.18

Short-Term Impact of Macroeconomic Variables on the AUM of Interval Schemes

$$-0.03ECT+0.13*D(IS(-1)) + 0.18*D(IS(-2)) -0.28*D(IS(-3)) -0.23*D(IS(-4)) +0.06*D(IS(-5)) + 0.09*D(IS(-6)) - 0.19*D(IS(-7)) -12.48*D(CPI(-1)) + 17.94*D(CPI(-2)) + 7.57*D(CPI(-3)) -15.99*D(CPI(-4)) -4.47*D(CPI(-5)) + 14.17*D(CPI(-6)) -9.34*D(CPI(-7)) -0.54*D(EXT(-1)) + 4.61*D(EXT(-2)) -0.58*D(EXT(-3)) -9.86*D(EXT(-4)) - 3.54*D(EXT(-5)) + 4.69*D(EXT(-6)) + 4.73*D(EXT(-7)) -1.79*D(IIP(-1)) 0.89*D(IIP(-2)) + 1.43*D(IIP(-3)) - 1.63*D(IIP(-4)) -4.44*D(IIP(-5)) -1.93*D(IIP(-6)) -4.72*D(IIP(-7)) + 0.03*D(INF(-1)) -0.08*D(INF(-2)) + 0.24*D(INF(-3)) + 0.35*D(INF(-4)) -0.27*D(INF(-5)) + 0.11*D(INF(-6)) + 0.33*D(INF(-7)) + 0.98*D(INTR(-1)) -1.40*D(INTR(-2)) + 1.45*D(INTR(-3)) + 7.04*D(INTR(-4)) 2.64*D(INTR(-5)) -0.52*D(INTR(-6)) + 4.47*D(INTR(-7)) + 7.27*D(M3(-1)) + 2.95*D(M3(-2)) -6.94*D(M3(-3)) + 2.86*D(M3(-4)) + 0.31*D(M3(-5)) -8.08*D(M3(-6)) + 4.92*D(M3(-7)) + 2.27*D(SS(-1)) -0.90*D(SS(-2)) -0.61*D(SS(-3)) + 0.37*D(SS(-4)) -0.96*D(SS(-5)) + 1.75*D(SS(-6)) + 0.56*D(SS(-7)) + 0.001$$

Eq.19

The equation stated above displays the direction of relationship between macroeconomic variables and the AUM of Interval schemes. Wald test is applied to trace the significance of the relationship and it is found that probability values of F- statistics and Chi-square test are significantly lower than 0.05 level of significance for CPI and Exchange rate and interest rates thus rejects the null hypothesis of no

$$-161.38 - 15.02CPI+5.97EXT+5.30IIP+0.23INF- 2.87INTR+6.16M3+0.092SS$$

Eq.16

The equation above explains the impact of macroeconomic variables on the AUM of DOSoe which exhibits that AUM pertains a significant negative relation with CPI and Interest rates and significant positive relations with exchange rates, IIP, Inflation and M3 however positive but insignificant relationship with Sensex. (For t- statistics values see table no. in appendix). The Error correction term of the proposed model is also found to be insignificant (0.0037>1.96) which concludes that model is not robust.

Equation stated above exhibits the impact of Macro economic variables on the AUM of Interval schemes in long term. Equation signifies that AUM of Interval scheme has significant negative relation with CPI, Interest rates and M3 (see table no.) and significant positive relations with Exchange rates, IIP, Inflation and insignificant positive relation with Sensex. The error correction term is found to be significant (-2.28>-1.96) which implies that proposed model is robust and if any institutional change gets introduced in the system, the variables will respond instantaneously.

A Study on Impact of Macro-Economic Variables and Information Asymmetry on the Aum of Various Kinds of Mutual Fund Schemes in India: A Vecm and E- Garch Model Approach

The probability values of F-statistics and Chi-square test is less than 0.05 level of significance for rest of the variables hence they fail to reject the null hypothesis of no relationship between AUM of Interval schemes and rest of the macroeconomic variables. (See table no 7 in appendix)

V. RESULTS OF E- GARCH MODEL

E- GARCH model is applied to trace the impact of information asymmetry on the AUM of various mutual funds. The results of this model (see table 8 in appendix) indicate that in case of Debt oriented schemes closed ended (DOSce) Z- statistics is more than calculated value and probability value is less than 0.05 level of significance ($0.02 > 0.05$) hence rejects the null hypothesis and establishes the fact that asymmetrical effect exists in this case. However, the probability value of co-efficient of Debt oriented schemes open ended (DOSoe) is greater than 0.05 level of significance ($0.31 > 0.05$) hence, fail to reject the null hypothesis and states the fact that information asymmetry is not found. The probability values for all other mutual funds are significantly lower than 0.05 level of significance so it can be interpreted that information asymmetry exists in rest of the mutual funds except Equity Oriented Schemes Open Ended (EOSoe) which signifies that information asymmetry does not exist in EOSoe also.

VI. FINDINGS

After analysing the data it was found out that ETFs pertains significant positive relationship with CPI, Exchange rate, Inflation and Sensex where as significant negative relationship with IIP, Interest Rate and M3 in the long run and significant relationship with CPI, Exchange rate and Interest rates in the short term. The R^2 value of the proposed mode is 0.67 which implies that macro- economic variables explain 67% variation in the AUM of ETFs. The probability for the F- statistics is 0.05 which says that model is significant. Durbin- Watson statistics is 1.92 hence it can be implied that there is no serial auto correlation exist in the model. The Error correction term is also found to be significant which means this model is robust. In case of Equity Oriented schemes closed ended (EOSce) the AUM has significant positive relationship with CPI and Interest Rates and significant negative relationship with exchange rate, inflation and M3, insignificant positive relation with Sensex and insignificant negative relationship with IIP in the long run. In Short- run none of the macro-economic variable impacts the AUM of EOSce significantly. The R^2 value of the model is 0.54 which implies that 54% variation in the AUM of EOOSce is explained by macro-economic variables. The probability of F- statistics is 0.62 hence the model is not significant. The Durbin- Watson statistics is 2.11, so there is no serial auto correlation found in the model. The Error correction term is also not found to be significant hence, model is not robust.

The AUM of Equity Oriented Schemes open -ended (EOSoe) pertains significant positive relationship with CPI, Interest Rates and Sensex and significant negative relationship with Exchange rate, IIP, Inflation and M3 in the long run. None of the macro-economic variable impacts AUM of EOSoe in the short run. The R^2 value is 0.39 which means that macro-economic variables only explain 39% of variations in the AUM of EOSce. Probability value of F-

statistics is also greater than 0.05 level of significance so the model is not found to be significant. The Durbin- Watson statistics is 2.01, hence there is no serial auto-correlation is found in the model. The error correction term is found to be insignificant hence the model is not robust. In case of Hybrid Schemes (HS), significant positive relation of AUM is found with CPI, Inflation and Interest rates and significant negative relation is found with Exchange rate, IIP, Inflation and M3, however insignificant negative relation is found with Sensex in the long run. Only CPI and Exchange Rate significantly impacts the AUM of Hybrid Schemes in the Short run. The R^2 value is 0.70 which means that macro-economic variables explain 70% variation in the AUM of Hybrid Schemes. The probability of F- statistics is 0.02, hence the model is significant and the value of Durbin Watson test is 1.76 so the model is free from the problem of serial auto- correlation. The error correction term is found to be insignificant which implies that model is not robust. AUM of Debt Oriented Schemes closed ended (DOSce) has significant positive relationship with exchange rate and inflation and significant negative relationship with CPI and Interest rates, however insignificant negative relationship with IIP, M3 and Sensex in long term. CPI, Exchange rate and Sensex has significant relationship with AUM of DOSce in the short- term. The R^2 value of the model is 0.72 which means model explains 72% variation in the AUM of DOSce. Probability value of F- statistics is 0.011 which implies that model is significant. The value of Durbin Watson test is 2.31 so there is no serial auto-correlation is found in the model. The Error correction term is not found to be significant which mean the model is not robust. The relationship between macro-economic variables and AUM of DOSoe is significantly positive in case of CPI and Interest Rates and significantly negative in case of Exchange Rate, IIP, Inflation and M3 and insignificant negative relationship with Sensex in long run however, none of the variable pertain significant relationship with AUM of DOSoe in the short-run. The R^2 value of the proposed model is 0.83 which indicate the model can explain 83% variation in AUM of DOSoe. The probability value of F- statistics is significant which indicate that model is significant and the value of Durbin Watson test is 1.85 so there is no serial auto correlation found in the model. The error correction term is not significant hence it can be concluded that model is not robust. CPI and interest rate have significant positive relationship with AUM of Interval scheme, however insignificant positive relationship with M3 in the long run.

Significant negative relation with Exchange rate, IIP, inflation and insignificant negative relationship with Sensex in long run. CPI, Exchange rate, Interest rate and M3 significantly impact the AUM of Interval scheme in the short-run. The R^2 value is 0.67 which means macro-economic variables explain 67% variation. Probability value of F- statistics in not significant which means model is not significant. Durbin Watson statistic is 2.03 so the model is free from serial auto correlation. The Error Correction term is found to be significant it means model is robust.



The results of E- GARCH model indicate that except Equity oriented open ended and debt oriented open-ended schemes, information asymmetry is found in all other schemes.

VII. CONCLUSION

After conducting the study it was found that macro-economic variables play a significant role in explaining the variation in AUM of various funds except equity-oriented schemes open ended where R^2 value turns out to be 0.39. This research proves to be very important in because it establishes one on one long-term and short-term relationship between AUM and various macro-economic variables along with degree of sensitivity and direction of relationship. With the help of these models, students can understand the inter play between AUM of various mutual funds and Macro-economic variables. Investors can make an informed decision by considering prospective movement in AUM in response to changes in macro-economic indicators and fund managers can being more pertinent changes in their existing portfolios, introduce new investment alternatives depending on the changes in investors' preferences due to change in macro-economic variables and can also assess the prospective changes in their earnings in the form of management fees which is dependent on AUM actions by according to the investors preferences for mutual funds.

DECLARATION STATEMENT

Funding	No, I did not receive.
Conflicts of interest	No conflicts of interest to the best of our knowledge
Ethical approval and consent to participate	No, the article does not require ethical approval and consent to participate with evidence.
Availability of data and material	Not relevant
Authors Contributions	All authors have equal participation in this article.

REFERENCES

- Abdalla, S., & Winker, P. (2012). Modelling Stock Market Volatility Using Univariate GARCH Models: Evidence from Sudan and Egypt. *International Journal of Economics and Finance*, 4(8). <https://doi.org/10.5539/ijef.v4n8p161>
- Agarwal, P. K., & Pradhan, H. (2019). Mutual fund performance in changing economic conditions: Evidence from an emerging economy. *Cogent Economics & Finance*. <https://doi.org/10.1080/23322039.2019.1687072>
- Alexakis, C., Dasilas, A., & Grose, C. (2013). Asymmetric dynamic relations between stock prices and mutual fund units in Japan. An application of hidden cointegration technique. *International Review of Financial Analysis*, 28, 1–8. <https://doi.org/10.1016/j.irfa.2013.02.001>
- Al-Najjar, D. (2016). Modelling and Estimation of Volatility Using ARCH/GARCH Models in Jordan's Stock Market. *Asian Journal of Finance and Accounting*, 8(1), 152. <https://doi.org/10.5296/ajfa.v8i1.9129>
- ANSARI, W., & UZ-ZAMAN, S. (2021). Macroeconomic Factors Influencing the Growth of Mutual Fund Industry in Pakistan: A Regression Analysis of ten Years. *International Review of Management and Business Research*, 10(3), 73–81.
- Ardhani, I. A., Effendi, J., & Irfany, M. I. (2020). The effect of macroeconomics variables to Net Asset Value (NAV) growth of sharia mutual funds in Indonesia. *Jurnal Ekonomi & Keuangan Islam*, 6(2), 134–148. <https://doi.org/10.20885/jeki.vol6.iss2.art5>
- Asad, M. U., & Siddiqui, D. A. (2019). Determinants of Mutual Funds Performance in Pakistan. *International Journal of Social and Administrative Sciences*, 4(2), 85–107. <https://doi.org/10.18488/journal.136.2019.42.85.107>
- Bali, T. G., Brown, S. J., & Caglayan, M. (2014). Macroeconomic risk and hedge fund returns. *Journal of Financial Economics*, 114(1), 1–19. <https://doi.org/10.1016/j.jfineco.2014.06.008>
- Booth, G. G., Martikainen, T., & Tse, Y. (1997). Price and volatility spillovers in Scandinavian stock markets. *Journal of Banking and Finance*, 21(6), 811–823. [https://doi.org/10.1016/s0378-4266\(97\)00006-x](https://doi.org/10.1016/s0378-4266(97)00006-x)
- Dash, M., & G, D. K. (2008). A Study on the Effect of Macroeconomic Variables on Indian Mutual Funds. *Social Science Research Network*. <https://doi.org/10.2139/ssrn.1316442>
- EBSCOhost | 55795899 | Macroeconomic Determinants of Turkish Mutual Fund Prices. (n.d.). <https://web.p.ebscohost.com/abstract?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=13086588&asa=Y&AN=55795899&h=5W7C6eCth%2feNRqb%2fZtz8nBEHapmtSxXM5maQHdZ1omX1Xeci7gkO2hyWmyfgQ5h2tiwWQE5hJx%2fX6yW%2fLlgLA%3d%3d&crl=c&resultNs=AdminWebAuth&resultLocal=ErrCrlNotAuth&crlhashurl=login.aspx%3fdirect%3dtrue%26profile%3dehost%26scope%3dsite%26authtype%3dcrawler%26jrn1%3d13086588%26asa%3dY%26AN%3d55795899>
- Fakhfekh, M., & Jeribi, A. (2020). Volatility dynamics of cryptocurrencies' returns: Evidence from asymmetric and long memory GARCH models. *Research in International Business and Finance*, 51, 101075. <https://doi.org/10.1016/j.rif.2019.101075>
- Gyimah, A. G., Addai, B., & Asamoah, G. K. (2021). Macroeconomic determinants of mutual funds performance in Ghana. *Cogent Economics & Finance*, 9(1). <https://doi.org/10.1080/23322039.2021.1913876>
- Kamal, Y., Hammad-Ul-Haq, Ghani, U., & Khan, M. S. (2012). Modeling the exchange rate volatility, using generalized autoregressive conditionally heteroscedastic (GARCH) type models: Evidence from Pakistan. *African Journal of Business Management*, 6(8). <https://doi.org/10.5897/ajbm10.1657>
- Kariuki, E. C. (2014). Effect of macro economic variables on financial performance of mutual funds industry in Kenya. <http://erepository.uonbi.ac.ke/handle/11295/75068>
- Kasman, A., & Kasman, S. (2008). The impact of futures trading on volatility of the underlying asset in the Turkish stock market. *Physica D: Nonlinear Phenomena*, 387(12), 2837–2845. <https://doi.org/10.1016/j.physa.2008.01.084>
- Kopsch, F., Song, H., & Wilhelmsson, M. (2015). Determinants of mutual fund flows. *Managerial Finance*, 41(1), 10–25. <https://doi.org/10.1108/mf-06-2013-0161>
- Lobão, J., & Levi, A. (2016). The relation between mutual fund flows, stock returns and macroeconomic variables: evidence from Portugal. *Portuguese Journal of Finance, Management and Accounting*, 2(4).
- Lobo, B. J. (2000). Asymmetric Effects of Interest Rate Changes on Stock Prices. *The Financial Review*, 35(3), 125–144. <https://doi.org/10.1111/j.1540-6288.2000.tb01424.x>
- Lockwood, L. J. (1996). Macroeconomic Forces and Mutual Fund Betas. *The Financial Review*, 31(4), 747–763. <https://doi.org/10.1111/j.1540-6288.1996.tb00895.x>
- Makau, M. M. (2014). Effect of Macroeconomic Variables on Financial Performance of Unit Trusts in Kenya. *Research Journal of Finance and Accounting*, 7(14), ISSN 2222-1697.
- Maysami, R. C., & Koh, T. A. (2000). A vector error correction model of the Singapore stock market. *International Review of Economics & Finance*, 9(1), 79–96. [https://doi.org/10.1016/s1059-0560\(99\)00042-8](https://doi.org/10.1016/s1059-0560(99)00042-8)
- Melkani, B. C. (2023). Micro and Macro Economic Factors and their Association with Mutual Fund Selection by the Investors. *ijemr.vandanapublications.com*. <https://doi.org/10.31033/ijemr.13.1.7>
- Nguyen, H. L., & Nguyen, D. (2019). The impact of country-level and fund-level factors on mutual fund performance in Vietnam. *Journal of Economics and Development*, 21(1), 42–56. <https://doi.org/10.1108/jed-06-2019-0007>
- Othman, A. H. A., Aziz, H. A., & Kassim, S. (2018). Identification of macroeconomic determinants for diversification and investment strategy for Islamic unit trust funds in Malaysia. *International Journal of Emerging Markets*, 13(4), 653–675. <https://doi.org/10.1108/ijem-03-2017-0074>
- Panigrahi, A. (2020, July 16). Impact of Macroeconomic Variables on the Performance of Mutual Funds: A Selective Study. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3653076

A Study on Impact of Macro-Economic Variables and Information Asymmetry on the Aum of Various Kinds of Mutual Fund Schemes in India: A Vecm and E- Garch Model Approach

27. Paul, K. (2017). The effect of business cycle, market return and momentum on financial performance of socially responsible investing mutual funds. *Social Responsibility Journal*, 13(3), 513–528. <https://doi.org/10.1108/srj-09-2016-0154>
28. Qureshi, F., Kutan, A. M., Ismail, I., & Chan, S. (2017). Mutual funds and stock market volatility: An empirical analysis of Asian emerging markets. *Emerging Markets Review*, 31, 176–192. <https://doi.org/10.1016/j.ememar.2017.05.005>
29. Rao, K., & Datta, N. (2011). Fundamental Factors Influencing Investment in Mutual Funds - EIC Approach - A Case Study of RCAML. *THE INDIAN JOURNAL OF COMMERCE*, 64(03), 61–73.
30. Rao, K. V., & Daita, N. (2012). Fundamental Factors Influencing Investments in Mutual Funds – The EIC Approach: A Case Study of RCAML. *Indian Journal of Finance*, 6(6), 4–13.
31. Sakarya, B., & Ekinci, A. (2020). Exchange-traded funds and FX volatility: Evidence from Turkey. *Central Bank Review*, 20(4), 205–211. <https://doi.org/10.1016/j.cbrev.2020.06.002>
32. Setiawan, C. K., & Wati, N. M. N. (2019). Factors affecting the performance of Sharia equity funds in Indonesia. *Iranian Journal of Management Studies*, 12(4), 481–508. <https://doi.org/10.22059/ijms.2019.263411.673253>
33. Sumantyo, R., & Savitri, D. I. (2019). Macroeconomic variables towards net asset value of sharia mutual funds in Indonesia and Malaysia. *Jurnal Keuangan Dan Perbankan*. <https://doi.org/10.26905/jkdp.v23i2.2195>
34. *The Study of Asymmetric Volatility in Indian Equity Market: A GARCH Approach*. (2009). <https://www.indianjournals.com/ijor.aspx?target=ijor:abjfm&volume=1&issue=1&article=001>
35. Vidal, M., Vidal-García, J., Lean, H. H., & Uddin, G. S. (2015). The relation between fees and return predictability in the mutual fund industry. *Economic Modelling*, 47, 260–270. <https://doi.org/10.1016/j.econmod.2015.02.036>
36. Yadav, C. S., Sudhakar, & Kumar, S. (2016). THE IMPACT OF MACROECONOMIC FACTORS ON THE PERFORMANCE: A STUDY OF SELECTED EQUITY ORIENTED MUTUAL FUNDS IN INDIA. *Journal of Economic Policy & Research*, 11(02), 49–55.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the Lattice Science Publication (LSP)/ journal and/ or the editor(s). The Lattice Science Publication (LSP)/ journal and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.