Examining the linkage of large-cap equity mutual funds' performance with macroeconomic indicators using Panel ARDL approach

Krishna Murari

Dept. of Management Studies, Babasaheb Bhimrao Ambedkar University (A Central University) Lucknow, Uttar Pradesh, India

ABSTRACT

The main objective of this research is to examine the short- and long-term correlations between macroeconomic indicators and the performance of largesize equity mutual funds using empirical data from India. Using the panel ARDL technique, we discovered that while GVA and inflation have a varied short-term impact, the market return, policy rate, and exchange rate have a significant impact on mutual fund performance. Furthermore, exchange rates have a detrimental impact on the short-term performance of funds. Therefore, it is crucial to take into account the effects of GVA, market return, inflation, policy rate, and currency rates when assessing the short- and long-term performance of mutual funds.

Keywords: Mutual Fund Performance, Macroeconomic Indicators, Gross Value Added, Inflation, Policy rate, Exchange Rate, Panel ARDL

INTRODUCTION

Mutual fund is pooling of resources from the investors to create a corpus and investing it in the securities of the various companies. The profit so generated is distributed among the investors in proportion to their investment after deducting the asset management expenses by the asset management companies. With the SEBI's initiatives since 2012, the Indian mutual fund industry has seen a steady increase in the AUM as well as the number of investor accounts. The ability of the mutual fund to generate the returns depends on several factors such as fund managers' skills, choices of securities, size of the corpus etc. The consistency in mutual fund performance largely depends upon the macroeconomic variables (Gyamfi Gyimah et al., 2021). Because of the complex nature of interconnections of micro and macroeconomic indicators and mutual funds' performance, the performance assessment of mutual fund has been a key concern for the AMCs and the investors as well. But, there has not been any single approach found suitable across the globe to comment upon the key drivers of the mutual fund

performance. Among the various approaches used by the researchers in the field of finance to evaluate the mutual fund performance, Data Envelopment Analysis (Basso & Funari, 2017; Chen et al., 2011; Chen & Lin, 2006; do Castelo Gouveia et al., 2018; Khedmatgozar et al., 2013; Tsolas, 2020; Tuzcu & Ertugay, 2020; Zhao et al., 2011); risk adjusted performance evaluation measures i.e. Sharpe, Treynor and Jenson' ratios (Ali et al., 2021; Altınırmak et al., 2018; Arora, 2015; Iraj & Ali, 2019; Kiymaz, 2015; Krishnaprabha, 2016; Kumar et al., 2020; Leković, 2017; Moreno & Rodríguez, 2009; Pangestuti et al., 2017; Patel, 2020; Shah & Hijazi, 2005; Tiwari et al., 2020); and Value at risk models (Chen & Lin, 2006; Tehrani et al., 2014) are extensively used in the extant literature. Among other approaches used for performance evaluation include single and multifactor models (Hunter et al., 2014; Iraj & Ali, 2019; Mateus et al., 2019); panel methods with both fund and time effects (Blake et al., 2014; Murhadi, 2011); neural networks (Kong et al., 2019; Wang & Huang, 2010); regression (Bangash et al., 2018; Gabriel et al., 2015; Tuzcu & Ertugay, 2020) as an extension of DEA; and vector auto regression (Kavita & Pasripcha, 2017) to name a few.

Financial theory claims that the mutual fund investments are prone to market (systematic) risks that may arise on account of fluctuations in inflation, exchange rate, GDP, Consumer price Index, Gross Domestic Savings, interest rate, monetary policy rates and other macroeconomic variables (Angelidis et al., 2013; Gyamfi Gyimah et al., 2021; Kavita & Pasripcha, 2017; Murhadi, 2011). Price ratio, default spread, relative T-Bill rate, and consumption-wealth ratio are related to fund flows in the United States and can explain the correlation between flows and market returns (Jank, 2012). Kotishwar (2017) examined the impact of economic variables on the amount of money invested in mutual funds in India; Gusni et al., (2018) examined both macro and micro variables when analysing the factors influencing Indonesia's equity mutual fund performance; and Asad & Siddiqui (2019) evaluated Pakistani mutual funds and found a negative relationship between fund returns and macroeconomic factors (interest rate and GDP) and risk adjusted return.

It is worthy to note that very few studies such as (Gyamfi Gyimah et al., 2021; Kavita & Pasripcha, 2017; Verma & Bansal, 2021) in the field of financial econometrics have applied the panel ARDL approach to evaluate the linkage of macroeconomic indicators with the mutual fund performance. Besides, most of the studies focused on stock market data for assessing mutual fund performance with reference to benchmark index as a proxy for market returns. Understanding

the relationship between macroeconomic factors and mutual fund performance empirically in India is our main driving force in this paper. This study thoroughly assesses the impact of a few chosen macroeconomic factors on the short- and long-term performance of mutual funds in India.

The remainder to the paper is presented as: section 2 reviews the relevant existing literature. Section 3 sheds light on the data, sample & research methodology. Section 4 presents the results & discussion, and finally, section 5 concludes the study.

REVIEW OF LITERATURE

Stock market investments through individual securities or portfolios and their relationship with the other investor specific, market centered, and macro level variables has been a focal point among the researchers during the past many decades. The renowned market portfolio theory (MPT) by Markowitz (1952) provides the foundation to all the investment related models in the field of finance. Portfolio returns including the mutual funds are largely influenced by the risk and return tradeoffs considered by the investors according to the theory. The MPT is a helpful foundational theory because it clarifies why mutual funds are predominantly used as an investment option and why, even in recessionary times, they may perform better than undiversified single investment vehicles. According to Ross (1976), the expected returns of a portfolio are influenced by macroeconomic variables that increase systematic risk. He asserted that a number of macroeconomic factors, including GDP, inflation, interest rates, and policy rates, have an impact on equity returns. Each equity stock's risk premium is influenced by the risk premium of risk variables. With these two theories, the researchers (Gyamfi Gyimah et al., 2021; Krishnaprabha, 2016; Leković, 2017; Mateus et al., 2019; Murhadi, 2012; Pangestuti et al., 2017; Verma & Bansal, 2021) believe that changes in macroeconomic variables can be used to explain the performance of mutual fund investments.

Literature available on impact of macroeconomic variables on mutual fund performance (Agarwal & Pradhan, 2019; Asad & Siddiqui, 2019; Gyamfi Gyimah et al., 2021; Kavita & Pasripcha, 2017; Titi et al., 2021) and stock market performance (Ayuba et al., 2018; Jank, 2012; Khan et al., 2021; Qureshi et al., 2019; Tangjitprom, 2012; Verma & Bansal, 2021) suggests that the stock market investments are significantly related to various macroeconomic indicators. Verma & Bansal (2021) discovered that while the price of gold has a negative impact on the stock market of both emerging and developed nations, GDP, FDI,

and FII have favourable effects. With the exception of a few developing nations, interest rates had a negative effect on both economies. For nations that export oil, the link with oil prices was favourable; for nations that import oil, it was negative. The money supply, exchange rate, and inflation all have an impact on broad market indices and, consequently, the performance of stock market investments.

We review the extant literature based on the macroeconomic indicators of mutual fund performance considered in this study viz. market returns, economic growth, inflation, policy rate and exchange rate. These macroeconomic variables were chosen based on the consistency, availability, and trustworthiness of the data. Furthermore, it has been demonstrated both theoretically and empirically that the chosen factors have a significant influence on both stock market and mutual fund performance.

Market Return

The corpus of mutual funds is primarily allocated to equity or debt securities in the stock market depending upon their purpose and risk profile. There is ample evidence in the extant literature that stock market returns are directly linked with the market composite index movements. Besides, stock market index returns exhibit the effect of uncontrollable factors through systematic risk and thereby leading to the volatility in the market (Murari, 2013). Stock selection and market timing are the two key talents that fund managers rely on to beat the market, despite their best efforts (Sehgal and Babbar 2017). Jensen (1968) created a onefactor model based on a capital asset pricing model (CAPM) that took the market as the sole risk factor influencing portfolio returns in order to reflect the stock selection abilities of mutual funds. According to a study by Coffie & Chukwulobelu (2012), market beta plays a role in the volatility in equity returns in Ghana, however it is not always as large as the CAPM projected. However, Hili, Pace, and Grima (2016) concluded that fund managers exposed to emerging markets (EM) do not outperform the market as a whole when analyzing the stock portfolios of the US, Europe, and EM. All things considered, these managers build their portfolios conservatively, and they are more comfortable investing in large-cap equity funds. In contrast, Rao, et. al (2017) observed that fund managers have positive market timing skills and Chinese equities funds are successful in generating returns that are higher than the market. We view the return of the market benchmark index as one of the macroeconomic variables

affecting the performance of mutual funds since it is unclear how market returns relate to portfolio returns.

Economic Growth

The literature suggest that the researchers have used different proxies for assessing the economic growth such as Industrial production index, employment rate, gross domestic savings and GDP. The GDP (the total market value of goods and services produced in the economy over a specific period of time) is the most commonly used comprehensive indicator of overall economic performance. Several studies have used GDP as a proxy of economic growth (Asad & Siddiqui, 2019; Gyamfi Gyimah et al., 2021; Shastri & Shastri, 2016; Verma & Bansal, 2021). In order to analyze economic growth, policymakers have recently begun to look at gross value added, or GVA. While GDP offers data from the consumers' or demand side, GVA gives a summary of economic activity from the producers' or supply side. GVA is thought to be a more precise measure of the economy. Since a rapid increase in output could be the result of higher tax receipts—which could be the consequence of improved compliance or coverage—rather than the actual output situation, GDP cannot accurately reflect the genuine state of the economy. When evaluating a nation's economic performance from the perspective of international data standards and uniformity, GVA is a vital and necessary indicator. Therefore, we use GVA as a proxy for the economic growth. However, the previous studies that used GDP as a proxy for economic growth found a tumbling GDP as a negative signal for investors to avoid investments such as mutual funds while a rising GDP achieves the opposite effect. Evidently, the use of GVA as a proxy of economic growth and its association with mutual fund performance may be a significant contribution to literature.

Policy Rates

RBI announces the monetary policy rates on quarterly basis to influence the interest rates, aggregate demand and inflation in the country. The policy rate can affect the cost of financing, national lending and borrowing patterns, and the performance of mutual funds. Due to the policy rate increase, which tends to cause interest rates to automatically rise, investors will anticipate a better return on their investment. People and businesses would therefore have less money to invest if the policy rate increased. As policy rates rise, interest rates may rise as well, making mutual funds as well as other assets less appealing. With a few exceptions, the majority of comparable studies in the body of existing literature do not include the policy rate as an explanatory variable (Ayuba et al., 2018;

Bandono et al., 2020; Gyamfi Gyimah et al., 2021; Tangjitprom, 2012). AliAhmadi & Soroushyar (2022) found that the interest rate has a negative and significant impact on Islamic mutual fund flows. However, as a significant influence rate, the impact of interest rates may be very different from that of the monetary policy rate. Therefore, the monetary policy rate is taken into account in this study as an independent variable that could have an impact on the performance of mutual funds both in the short and long term.

Inflation

Inflation has been used as an independent variable in several studies to examine its impact on stock returns or stock market performance (Amtiran et al., 2017; Ayuba et al., 2018; Khan et al., 2021; Tangjitprom, 2012; Verma & Bansal, 2021) and even for bank performance (Chowdhury & Rasid, 2016). The findings of these studies suggest that inflation has a significant negative impact on stock return. Bandono et al. (2020) concluded that inflation proxied by CPI has a negative effect on infrastructure oriented mutual fund performance. Another study found that the rate of inflation significantly and negatively affected the flows of Islamic mutual funds (AliAhmadi & Soroushyar, 2022). On the other hand, some studies suggest an opposite relationship of inflation with mutual fund performance (AliAhmadi & Soroushyar, 2022; Gusni et al., 2018; Gyamfi Gyimah et al., 2021; Panigrahi et al., 2020). According to Panigrahi et al. (2020), long-term equity mutual fund performance tends to improve even when risk rises as inflation rates rise. According to Gusni et al. (2018), the performance of equities mutual funds is positively impacted by inflation. Another study by Ray & Vina (2004) concluded that inflation rate has considerable influence in the net asset value movement of mutual fund. Adam & Tweneboah (2008) found that inflation rate plays more significant roles in the long period. Since there is no consensus among the researchers about the relationship of inflation with investment related asset returns, we consider inflation as one of the independent variables in our study.

Exchange rate

It is possible to trace the relationship between exchange rates and stock prices to the causal relationship between currency rates and stock prices. It is predicated on the idea that the market value of companies can be significantly impacted by the status of the home currency. It suggests that when a country's currency depreciates, its exported goods become more affordable outside, which can spur economic growth and potentially boost profits for companies that rely on exports

for their revenue. On the other hand, when fund managers invest in the stocks of foreign companies, a rise in rate of exchange is considered as a restrictive, but when it declines, it is well received by the fund managers. When international goods and services become more expensive due to an increase in exchange rates, local investors are encouraged to make investments in the domestic stock market assets. As a result, the flow to the Mutual fund will increase and thereby the returns. Katechos (2011) revealed a substantial correlation between exchange rates and returns on the global stock market. Global equity returns are positively correlated with the value of currencies with higher rates of interest, whereas they are adversely correlated with the value of currencies with lower interest rates. Adams & Hartsfield (2010) and Murari (2015) stated that both the short- and long-term cash flow of funds are positively and significantly correlated with higher exchange rate volatility. (Gyamfi Gyimah et al., 2021) found a homogenous long-run significant positive influence of exchange rate on mutual fund performance in Ghana. Mohammad, Hussain, Anwar Jalil, & Ali (2009) also concluded that influence of exchange rate significantly affects the stock prices. Khan et al. (2021) revealed a positive impact of exchange rate on stock return. Titi et al. (2021) found the weak the effect of the exchange rate on fund performances for equity and money market funds when moderated by interest rate. According to Panigrahi et al. (2020), currency rates are important when dealing with international investments, although they often have a relatively small impact on mutual funds. From a study in Ghana, Adam & Tweneboah (2008) claimed that exchange rates matter for share price movements in short run only. Kariuki (2014) came to the conclusion that mutual funds doing business in Kenya are significantly impacted negatively by exchange rates. The foreign exchange rate and the stock return of medium- and large-sized Taiwanese portfolios were found to be negatively correlated by Singh, Mehta, and Varsha (2011). Research on the correlation between exchange rates and stock or mutual fund returns has produced conflicting findings.

DATA & METHODOLOGY

We have selected tope five large cap equity mutual funds based on the net assets as on Feb 2022 and the launch date prior to 2011 (Table 1). Mutual funds which invest mostly in the top 100 Indian companies based on market capitalization are known as large cap funds. Large-cap funds are required by law to allocate a minimum of 80% of their funds to these 100 businesses. The quarterly data for selected mutual fund's net asset value (NAV) is obtained from AMFI for a period

of 10 years (2012-2021) and mutual fund return (MFR) is calculated in percentage as natural log of the ratio of two consecutive quarters i.e. $ln(NAV_t/NAV_{t-1}) \ge 100$. MFR is used as a proxy for the performance of mutual fund in this study. Other variables in the study include market return (MR) proxied by Nifty benchmark index, monetary policy rate (PR), inflation (INF), gross value added (GVA) and exchange rate (ER). The data for the independent variable (MR, IR, INF, GVA and ER) is obtained from the EPW research foundation time series database for the same period.

Mutual fund	Fund Size (in Rs. Crores)	Launch date
Axis Blue chip	32,322	Jan 2010
Mirae Asset fund	31,292	April 2008
SBI Blue chip	31,029	Feb 2006
ICICI Prudential Blue chip	30,956	May 2008
ABSL Frontline	20, 706	Aug 2002

 Table 1: Selected Mutual funds, fund size and their launch dates

Source: etmoney <u>https://www.etmoney.com/mutual-funds/equity/large-cap/32</u> accessed on 18th Feb 2022

Table 2 provides a description and the data source for the variables considered in this research.

Varia	Label	Description	Source of
ble			data
MFR	Mutual fund	Calculated in percentage as natural log of the	Association
	Return	ratio of two consecutive quarters i.e. ln(NAVt	of Mutual
		/ NAV $_{t-1}$). MFR is used as a proxy for the	Funds in
		mutual fund performance	India
			(AMFI)
MR	Market	NSE nifty benchmark index is used as a	NSE
	Return	proxy of market return. It is calculated in	
		percentage as natural log of the ratio of nifty	
		value for two consecutive quarters	
PR	Policy Rate	It is taken as benchmark Repo rate (lending	EPWRF
		rate) announced by RBI on quarterly basis	
INF	Inflation	Measured as change in the Consumer price	EPWRF
		index with base year 2012	
GVA	Gross Value	used as a stand-in for the total value of	EPWRF
	Added	products and services generated by an	
		economy's various sectors. It is Calculated in	
		percentage as natural log of the ratio of GVA	
		for two consecutive quarters	
ER	Exchange	Measured as the value of Indian rupee	EPWRF
	Rate	against US dollar. It is Calculated in	
		percentage as natural log of the ratio of	
		exchange rate for two consecutive quarters.	

Table 2: Variables in the study & their description

Source: Author's compilation

ISSN No.2349-7165 METHODOLOGY

Unit root test

We verify the stationarity condition in the data series prior to executing the panel ARDL technique. The stationarity of the variables was examined using IPS test suggested by Im, Pesaran, and Shin (2003) and the LLC test proposed by Levin, Lin, & Chu (2002). The LLC test uses serial correlation to examine the cross-section unit heterogeneity, but because of the limited sample size and residual serial correlation, the power of the test is poor. Therefore, this study also used the IPS test to address this flaw because it is appropriate for small sample sizes and effectively eliminates serial correlation.

		Level				
Variables	Unit root test	With intercept		With trend and intercept		
		Statistics	p-value	Statistics	p-value	
MED	LLC	-6.836	0.000***	-6.073	0.000***	
MIL!K	IPS	-5.786	0.000***	-4.335	0.000***	
MD	LLC	-7.712	0.000***	-6.985	0.000***	
MIK	IPS	-6.212	0.000***	-4.842	0.000***	
CVA	LLC	-3.755	0.000***	-2.856	0.000***	
UVA	IPS	-4.486	0.000***	-3.428	0.000***	
INF	LLC	-1.229	0.110	1.319	0.906	
	IPS	-1.024	0.153	1.998	0.977	
מס	LLC	0.606	0.728	-0.281	0.390	
PK	IPS	2.701	0.997	-0.718	0.237	
ER	LLC	-5.665	0.000***	-5.239	0.000***	
	IPS	-7.633	0.000***	-6.789	0.000***	
		First Di	fference			
INIE	LLC	-4.862	0.000***	-4.061	0.000***	
INF	IPS	-8.226	0.000***	-7.948	0.000***	
DD	LLC	-7.481	0.000***	-6.860	0.000***	
PK	IPS	-5.635	0.000***	-4.162	0.000***	
Levin, Lin & Chun (LLC) assumes common unit root process.						

Table 3:	Panel	unit root	test	results

Levin, Lin & Chun (LLC) assumes common unit root process. Im, Pesaran and Shin (IPS) assume individual unit root process. *** represent significance at 1 percent level of significance.

Source: Author's Calculations

Table 3 displays the outcomes of the panel unit root testing. The findings show that while the policy rate and inflation are non-stationary at the level, they are stationary at the first difference, meaning that both variables have an order of integration of I(1), whereas the other variables have an order of integration of I(0). The unit root test is used in the panel ARDL approach to rule out the existence of I (2) variables (Pesaran et al., 2001). The variables are not of order I (2). Therefore, in the current situation, Panel ARDL seems to be a more appropriate technique for estimation.

This study is aimed at examining the macroeconomic factors of large cap mutual fund performance using econometric approach for panel data as adopted by (Chowdhury & Rasid, 2016; Murari, 2017) in similar studies. The following equation shows the details of the basic panel model for macroeconomic factors influencing mutual fund performance:

 $MFR_{it} = \beta_0 + \beta_1 MR_{it} + \beta_2 GVA_{it} + \beta_3 INF_{it} + \beta_4 PR_{it} + \beta_5 ER_{it} + e_{it}$ Where MFR_{it} is the return for ith mutual fund at t time and is used as a proxy for mutual fund performance. MR is market return, GVA is the percentage change in the gross value added in the economy during the quarter, INF is inflation, PR is the policy rate and ER as the percentage change in the exchange rate. e_{it} is the error term in the model

Autoregressive Distributed Lag (ARDL) Framework

As the data is easily accessible, panel data analysis models may include both large and small cross sections (i) and time spans (t) for analytical purposes. Panel estimation for short time periods (t) uses the Generalized Method of Moments (GMM), which was introduced by Arrelano & Bond (1991), or fixed and random effect estimators. Individual cross sections are pooled in these estimators, and only the constant term is permitted to change between cross sections. The assumption of homogeneity of slope coefficients is often inappropriate, according to the primary conclusions derived from the large cross sections with large time periods (t) (Im et al., 2003; Pesaran et al., 2001, 1999; Pesaran & Smith, 1995). The fixed effect estimate approach allows the intercept terms to differ between cross sections and pools the time series data for each cross section. The fixed effect may yield deceptive findings if the slope coefficients vary. On the other hand, by constructing the model independently for every cross section, the arithmetic mean of the coefficients can be obtained. Pesaran and Smith (1995) created the Mean Group (MG) estimator, which allows for cross-sectional variation in intercepts, slope coefficients, and error variances.

As time periods in dynamic panels rise, non-stationarity becomes a significant concern. To investigate the short- and long-term correlations between independent and dependent variables, Pesaran et al. (1999) developed the Pooled Mean Group (PMG) estimation for nonstationary dynamic panels. The PMG estimator is based on a combination of coefficient averaging and amalgamation. Similar to the MG estimator, this estimator allows short run parameters, intercepts terms, and error variance to differ between groups. The Autoregressive Distributed Lag (ARDL) cointegration method was refined by Pesaran et al.

(2001) and is applicable to variables with different integration orders, namely I (0) and I (1).

Two significant econometric issues arise in dynamic panel data model estimation in practice. In models with fixed effects and lagged dependent variables, parameter estimates are known to be biased. In addition, the homogeneity assumptions that are frequently placed on the coefficients of the lagged dependent variable can result in significant biases when the dynamics are heterogeneous across the cross-sections. Weinhold, (1999) proposed a dynamic fixed effects (DFE) panel data model which reduces both problems.

Therefore, based on the characteristics of the data, the researcher can select one of three models for panel ARDL: Mean Group (MG), Pooled Mean Group (PMG), or Dynamic Fixed Effect (DFE). Our Hausman tests, which are summarised in Table 6, demonstrate that the PMG performs more consistently and effectively than the MG and the DFE estimations. The PMG is also used in this study because it allows the long-run slope coefficients to be homogeneous across entities, but allows the short-run coefficients, such as the intercepts, the rate of adjustment to the long-run equilibrium values, and error variances, to be heterogeneous across entities. The following is the specification for the panel ARDL (p,q) model:

$$Y_{it} = \sum_{j=1}^{p} \quad \gamma_{ij}.\, y_{i,t-j} + \sum_{j=0}^{q} \quad \delta_{ij}.\, X_{i,t-j} + \mu_i + \varepsilon_{it}$$

Where $X_{i,t-j}$ is the vector $(k \times I)$ of the explanatory variables for group *i* and μ_i denotes the mutual fund fixed effect. Theoretically, p and q might vary among mutual funds. The following specifications can be used to reparametrize the ARDL model into a vector error correction model (VECM):

$$\Delta Y_{it} = \phi_i (y_{i,t-1} - \beta_i (X_{i,t-1}) + \sum_{j=1}^p \gamma_{ij} \cdot \Delta y_{i,t-j} + \sum_{j=0}^q \delta_{ij} \cdot \Delta X_{i,t-j} + \mu_i + \varepsilon_{it}$$

where β_i signifies the long-run parameters and ϕ_i means the group-specific speed of adjustment coefficient or the (error) correction parameters and it is expected that $\phi_i < 0$. In this case, the PMG constraint is that all mutual funds share members of β . By substituting the mutual fund performance proxied by mutual fund return (MFR), the model can be rewritten as:

$$\Delta MFR_{it} = \phi_i(y_{i,t-1} - \beta_i(X_{i,t-1}) + \sum_{j=1}^p \gamma_{ij} \cdot \Delta MFR_{i,t-j} + \sum_{j=0}^q \delta_{ij} \cdot \Delta X_{i,t-j} + \mu_i + \varepsilon_{it}$$

Where, MFR is the measure of performance of large cap equity mutual fund, X is a group of explanatory variables, market returns, gross value added, policy rate, inflation, and exchange rate. Additionally, β stands for the long-run coefficients, \emptyset for the coefficient of speed of adjustment to equilibrium, *i* and *t* for the mutual fund and time, respectively, and δ and γ for the short-run coefficients of the independent and dependent variables.

RESULTS & DISCUSSION

The descriptive statistics in Table 4 portrays that the average value of mutual fund returns (MFR) for the selected mutual funds for the study period is 3.67%, the average market return (MR) is 3.03%, the average policy repo rate (PR) is 6.26%, the average inflation rate is 5.8%, the average gross value added (GVA) is 5.45% while the average percentage change in exchange rate of the Indian rupee against US dollar is 0.998. Examining the medians from the study variables' summary statistics in more detail reveals that they are quite close to the means, suggesting that outliers have little effect on the data. The study variables' standard deviations also show that the data values vary fairly and do not deviate significantly from the variables' means. In particular, the INF and GVA standard deviations demonstrate that there is relatively little variation in the data around the means.

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
MFR	3.671	4.210	23.250	-34.380	8.329	200
GVA	5.451	6.225	18.150	-21.410	5.344	200
MR	3.034	3.184	22.663	-33.642	8.249	200
PR	6.261	6.375	8.000	4.000	1.397	200
INF	5.884	5.459	10.904	1.540	2.476	200
ER	0.998	0.662	8.798	-4.886	3.111	200

 Table 4: Descriptive Statistics of Selected Variables

Source: Author's Calculations

Trend of Mutual Fund Returns with Macroeconomic Indicators

An annual trend analysis of a few chosen covariates, including the exchange rate, inflation rate, monetary policy rate, and the performance of mutual funds in India, is shown in Figures 1 to 2. Figure 1 shows the trends of inflation, policy rates and exchange rate and along with mutual fund returns. The maximum inflation during the study period was observed in the Q2 of the year 2013 with 10.9%

whereas the minimum was recorded as 1.54% in the first quarter of the year 2017. There has been a fluctuating trend of the inflation within a range of 9.36% during the study period. India emphasized on making the cost of borrowing cheaper, hence there has been a steady decline in policy rates has from 8% in 2012 to 4% in 2021. The quarterly percentage change in the exchange rate has shown a fluctuating trend with maximum 8.79% and minimum of -4.88%.



Figure 1: Trend of mutual fund returns with macroeconomic indicators Figure 2 shows that mutual fund returns have almost followed the market trend, therefore an overlapping trend between MFR and MR has been seen during the study period. Besides, the trend in the economic growth proxied by GVA has also been fluctuating around its mean. There has been a sharp decline in GVA in the year 2020 due to unforeseen covid-19 impact on the economy.



Figure 2: Trend of Mutual fund return with GVA and MR

Correlations and Multicollinearity among Macroeconomic Indicators

To determine whether the variables in our study, especially the independent variables, have a strong correlation with one another, we use Pearson's correlation. In general, a multi-collinearity issue is indicated if the coefficients' values increase by more than 0.8 (Gujrati & Porter, 2013, p.338).

	MR	PR	INF	GVA	ER
MR	1.000				
PR	-0.121*	1.000			
INF	0.031	0.330***	1.000		
GVA	-0.215***	0.312***	-0.060	1	
ER	-0.377***	0.115	0.251***	0.116	1
*, **, and *** indicate significant coefficients at 10%, 5%, and 1%,					
respectively.					

Table 5: Correlation matrix for checking the multicollinearity issue in panel IVs

Table 5 demonstrates the outcome of the Pearson correlations among the independent variables. All the correlation coefficients among regressors are less than 0.8 which indicates that there is no serious issue of multi-collinearity. It can also be observed that market return has relatively higher negative correlation with policy rate, GVA and exchange rate. Policy rate is highly positively correlated with the GVA and inflation. The reserve bank of India exerts influence over inflation by manipulating the monetary policy rates which in turn have impact on GVA and other macroeconomic indicators.

Panel ARDL Estimation for Performance of Mutual Fund

The estimation outcomes of the Mean Group (MG), Pooled Mean Group (PMG), and Dynamic Fixed Effect (DFE) models are presented in Table 6. The short- and long-term dynamics of the chosen macroeconomic variables on the mutual fund industry's financial performance are illustrated by the model findings. Although the results of the MG and DFE models are provided for comparison, the PMG estimates' consistent and effective performance over the MG and DFE models is confirmed by the Hausman tests (also shown in Table 6). The dependent variable, MFR, and the independent variables, GVA, INF, MR, PR, and ER, are represented by the lag structure, ARDL (1, 1, 1, 1, 1, 1).

The results of the PMG Panel ARDL estimations, which are displayed in Table 6, demonstrate that policy rates and market return have a strong positive and significant short-term impact on mutual fund performance. However, the performance of mutual funds is significantly impacted negatively by the exchange rate. Since this study examines the relative contributions of each variable to mutual fund financial performance, our findings indicate that only MR, IR, and ER have a short-term effect on mutual fund performance, whereas gross value added (GVA) and inflation (INF) have a negligible short-term impact.

Table 6: Panel ARDL estimation for mutual fund performance linkage with
macroeconomic indicators

Variables	Pooled Mean Group		Mean Group		Dynamic Fixed Effect	
	Short run	Long run	Short run	Long run	Short run	Long run
Error Correction	0.966***		0.975***		1.085***	
D(GVA)	0.106		0.094		0.106**	
D(INF)	0.004		-0.014		-0.028	
D(MR)	0.987***		0.987***		1.002***	
D(PR)	2.532***		2.383***		2.634***	
D(ER)	-0.248***		-0.233***		-0.215***	
Constant	3.008***		2.829***		3.326***	

GVA	0.126***	0.111***	0.099**
INF	0.259***	0.210***	0.185**
MR	0.985***	0.977***	1.006***
PR	0.293**	0.325***	0.359**
ER	-0.486***	-0.492***	-0.408***
¹ Hausman χ^2 (p-		2.01	
value)		(0.847)	
² Hausman χ^2 (p-			0.18
value)			(0.999)

*, **, and *** indicate that coefficients are significant at 10%, 5%, and 1%, respectively. ¹Hausman χ^2 : PMG is efficient estimation than MG under null Hypothesis. ²Hausman χ^2 (p-value): PMG is efficient estimation than DFE under null Hypothesis.

On the other hand, the PMG's long-run results show a better outcome than its short-term outcomes. Surprisingly, it was found that GVA and INF had a significant and favourable long-term impact on mutual fund performance. The findings indicate that every independent variable taken into account in our model has an impact on the performance of mutual funds over the long term. The error correction coefficient, which is large and positive for all three short-run models, supports the validity of the outcomes in our model.

It's possible that the majority of Indian mutual funds invest in equity shares of companies with overseas activities, which exposes them to currency rate risk, which explains the long-term negative link between mutual fund returns and exchange rates. As a result, changes in the value of the rupee have an effect on the earnings potential of Indian companies, which is reflected in their dividends and stock prices, which in turn influences returns. Exchange rate fluctuations can also boost domestic companies' profits, and as the majority of mutual fund companies buy shares from these companies, they can boost their returns. This implies that even if mutual funds exclusively hold domestic investments, the exchange rate might have a significant impact on their results. Our data supports the significant negative impact of exchange rate and is consistent with finding of others (Kariuki, 2014; Kim & Wu, 1987) claiming the significant negative impact of exchange rate on stock returns.

The result of our model in Table 6 shows that effect of inflation on mutual fund returns is insignificant in short run but significant in the long-run. This may be attributed to the fact that the people prefer to invest in mutual funds to beat the inflation as the value of money decreases with rise in prices of the goods. As a result, even if an investment displays increases, it is crucial for investors that the returns are at least equal to inflation; if they are lower, the investment is losing money. In order to counteract the impact of inflation on returns, certain mutual funds in India diversify their holdings by keeping a combination of bonds and stocks. Higher inflation results in higher market volatility in the short term; however, it leads to a huge opportunity for investors in the long term and equity investments are considered best for the long term. Literature also supports our findings of positive relationship of inflation with mutual fund performance (Chiang et al., 1996; Gyamfi Gyimah et al., 2021; Kavita & Pasripcha, 2017)

The findings suggest that the policy rate significantly affects the long-term returns of large-cap equities mutual funds. Mutual funds and other investments become less appealing as policy rates rise because borrowing becomes more expensive and people and corporations have less money to invest in their portfolios. It is therefore more difficult for mutual funds to produce strong returns because they have less capital to deal with. Furthermore, when policy rates rise, the stock market typically declines, which is bad news for investors in mutual funds as well as individual equities. Therefore, when a declining trend in the policy rates is observed, equity mutual fund returns are higher. In India, the policy rates have declined from 8% in 2012 to 4% in 2021. We observe a positive effect of policy rates on the performance of the large cap equity mutual funds. This may be because the large cap equity mutual funds.

We used gross value added (GVA) as a proxy measure of economic growth for the study period. The observed relationship between GVA and mutual fund returns is found insignificant in short run, but its impact is significant in long run. This positive significant impact of GVA is attributed to the fact that a rise in economic growth brings in expansion and profitability to the businesses and thereby generating a higher stock return. This finding contrasts with Kavita & Pasripcha (2017) while is consistent with the findings of Gyamfi Gyimah et al. (2021) and Singh et al., (2011).

Stock market return proxied by NSE Nifty benchmark index return is associated with factors such as a change in policy rate, fluctuation in currency, and other factors (such as crude oil prices, geopolitics, etc.). Our findings suggest that mutual fund returns are positively and significantly associated with market returns. This indicates that in India, increase in stock market activities attracts the flow to the mutual funds through capital market and hence generating higher mutual fund returns. Besides, the relationship between mutual fund flows and excess stock market returns also depends upon the openness of the economy (Yangbo et al., 2010). Our finding is also supported by Yangbo et al. (2010) and

Qureshi et al., (2019) who concluded that mutual fund flows positively affect excess stock market returns and vice versa.

CONCLUSION

We aimed at examining the short run and long run effect of macroeconomic indicators on the large cap equity mutual fund returns in India. Our study finds that market return, policy rate and exchange rate have significant effect on the mutual fund performance in short run whereas GVA and inflation do not influence the mutual fund performance in short run. However, GVA has heterogenous effect in short run. Exchange rate has significant negative impact on fund performance in short run. The study reveals the homogenous long-run significant positive impacts of GVA, market return, policy rate and inflation on the performance of mutual funds, and a homogeneous long-run negative significant impact of exchange rate on mutual funds' return. The effect of Inflation can be offset by wise monetary policy rate decisions taken by the RBI. Therefore, it is advised that the Reserve Bank of India attempt to establish a favorable atmosphere by setting its monetary policy rate at a level that will eventually improve the performance of mutual funds. A lower monetary policy rate will result in lower borrowing costs, which will facilitate corporate operations. A lower monetary policy rate will also result in reduced interest rates and inflation, which will have the knock-on effect of increasing consumer and business spending on goods and services in the community. This implies that companies will turn a profit, which will allow the majority of these businesses and individuals to invest more in mutual funds. The study employed a unique proxy of economic growth i.e. GVA and it shows a significant positive impact on large cap equity mutual fund's performance in India. This finding is in line with the findings of others that state that economic growth and stock markets are closely linked with each other. However, this study has been limited to examining the effect of only five macroeconomic indicators on the fund returns with only tope five large cap equity mutual funds India. Therefore, further studies may be extended to inclusion of other macroeconomic indicators and with medium and small cap equity mutual funds to fully explore the mutual fund panel dynamics with various macroeconomic indicators.

This research adds to the body of literature in the following ways: First, in contrast to many earlier research that primarily employed stock data to analyze mutual fund performance, the mutual funds used for this analysis are large cap equity funds. We also include monetary policy rates and gross value added

(GVA) as study variables because these macroeconomic indicators were not included in the majority of previous studies. Lastly, our study's findings add to our understanding of how macroeconomic indicators affect mutual fund performance over the short and long terms from the viewpoint of a developing nation.

REFERENCES

- Adam, A. M., & Tweneboah, G. (2008). Macroeconomic factors and stock market movement: Evidence from Ghana. *MPRA Paper*, 11256. <u>https://doi.org/10.2139/ssrn.1289842</u>
- Adams, J. C., & Hartsfield, F. R. (2010). Foreign currency exchange rates and mutual fund cash flows. *Journal of Asset Management*, *11*(5), 314–320. <u>https://doi.org/10.1057/jam.2009.37</u>
- Agarwal, P. K., & Pradhan, H. K. (2019). Mutual fund performance in changing economic conditions: Evidence from an emerging economy. *Cogent Economics* & *Finance*, 7(1), 1–24. https://doi.org/10.1080/23322039.2019.1687072
- Ali, M. A., Aqil, M., Alam Kazmi, S. H., & Zaman, S. I. (2021). Evaluation of risk-adjusted performance of mutual funds in an emerging market. *International Journal of Finance & Economics*, 1–14. <u>https://doi.org/10.1002/ijfe.2486</u>
- AliAhmadi, S., & Soroushyar, A. (2022). Monetary policies and Islamic mutual fund flows: Evidence from the Islamic Republic of Iran. *Journal of Islamic Accounting and Business Research*, 13(8), 1253–1267. <u>https://doi.org/10.1108/JIABR-03-2022-0073</u>
- Altınırmak, S., Gül, Y., Oluch Okoth, B., & Karamaşa, Ç. (2018). Performance evaluation of mutual funds via single-valued neutrosophic set (SVNS) perspective: A case study in Turkey. *Neutrosophic Sets and Systems*, 23(1), 110–125. <u>https://doi.org/10.5281/zenodo.2156689</u>
- Amtiran, P. Y., Indiastuti, R., Nidar, S. R., & Masyita, D. (2017). Macroeconomic factors and stock returns in APT framework. *International Journal of Economics and Management*, 11(Special Issue 1), 197–206.
- Angelidis, T., Giamouridis, D., & Tessaromatis, N. (2013). Revisiting mutual fund performance evaluation. *Journal of Banking and Finance*, *37*(5), 1759– 1776. <u>https://doi.org/10.1016/j.jbankfin.2013.01.006</u>

- Arora, K. (2015). Risk-adjusted performance evaluation of Indian mutual fund schemes. *Paradigm*, 19(1), 79–94. <u>https://doi.org/10.1177/0971890715585203</u>
- Asad, M., & Siddiqui, D. A. (2019). Determinants of mutual funds performance in Pakistan. *International Journal of Social and Administrative Sciences*, 4(2), 85–107. <u>https://doi.org/10.18488/journal.136.2019.42.85.107</u>
- Ayuba, J. A., Balago, G. S., & Dagwom, D. Y. (2018). Effects of macroeconomic factors on stock returns in Nigeria. *International Journal of Finance and Accounting*, 3(1), 66. <u>https://doi.org/10.47604/ijfa.711</u>
- Bandono, B., Hidayat Pasaribu, S., Nuryartono, N., Fariyanti, A., Yusdianto, S., Anggraenie, T., Rifai, M. A., Tarmizi, M., & Ardiyanti, H. (2020). The impacts of general mutual funds and macroeconomic factors on the performance of an infrastructure-oriented mutual fund in Indonesia. *Otoritas Jasa Keuangan (OJK), WP/20/05.*
- Bangash, R., Hussain, A., & Azhar, M. H. (2018). Performance evaluation of mutual funds: A data envelopment analysis. *Global Social Sciences Review*, 3(2), 212–236. <u>https://doi.org/10.31703/gssr.2018(iii-ii).14</u>
- Basso, A., & Funari, S. (2017). The role of fund size in the performance of mutual funds assessed with DEA models. *European Journal of Finance*, 23(6), 457–473. <u>https://doi.org/10.1080/1351847X.2016.1164209</u>
- Basso, A., & Funari, S. (2018). Introducing weights restrictions in data envelopment analysis models for mutual funds. *Mathematics*, 6(9). <u>https://doi.org/10.3390/MATH6090164</u>
- Blake, D., Caulfield, T., Ioannidis, C., & Tonks, I. (2014). Improved inference in the evaluation of mutual fund performance using panel bootstrap methods. *Journal of Econometrics*, 183(2), 202–210. https://doi.org/10.1016/j.jeconom.2014.05.010
- Chen, Y. C., Chiu, Y. H., & Li, M. C. (2011). Mutual fund performance evaluation: Application of system BCC model. *South African Journal of Economics*, 79(1), 1–16. <u>https://doi.org/10.1111/j.1813-6982.2011.01263.x</u>
- Chen, Z., & Lin, R. (2006). Mutual fund performance evaluation using data envelopment analysis with new risk measures. *OR Spectrum*, 28(3), 375–398. <u>https://doi.org/10.1007/s00291-005-0032-1</u>
- Chiang, W.-C., Urban, T. L., & Baldridge, G. W. (1996). A neural network approach to mutual fund net asset value forecasting. *Omega*, 24(2), 205–215.

https://doi.org/10.1016/0305-0483(95)00059-3

- Chowdhury, M. A. F., & Rasid, M. E. S. M. (2016). Determinants of performance of Islamic banks in GCC countries: Dynamic GMM approach. In Advances in Islamic Finance, Marketing, and Management (pp. 49–80). https://doi.org/10.1108/978-1-78635-899-820161005
- Do Castelo Gouveia, M., Duarte Neves, E., Cândido Dias, L., & Henggeler Antunes, C. (2018). Performance evaluation of Portuguese mutual fund portfolios using the value-based DEA method. *Journal of the Operational Research Society, 69*(10), 1628–1639. <u>https://doi.org/10.1057/s41274-017-0259-7</u>
- Gabriel, T. F., Nicolescu, L., & Lupu, R. (2015). Evolution of mutual funds in Romania: Performance and risks. *Romanian Journal of Economic Forecasting*, 18(4), 180–197.
- Gujrati, D. N., & Porter, D. C. (2013). Basic econometrics. McGraw-Hill.
- Gusni, Silviana, & Hamdani, F. (2018). Factors affecting equity mutual fund performance: Evidence from Indonesia. *Investment Management and Financial Innovations*, 15(1), 1–9. <u>https://doi.org/10.21511/imfi.15(1).2018.01</u>
- Gyamfi Gyimah, A., Addai, B., & Asamoah, G. K. (2021). Macroeconomic determinants of mutual funds performance in Ghana. *Cogent Economics and Finance*, 9(1), 1–20. <u>https://doi.org/10.1080/23322039.2021.1913876</u>
- Hunter, D., Kandel, E., Kandel, S., & Wermers, R. (2014). Mutual fund performance evaluation with active peer benchmarks. *Journal of Financial Economics*, 112(1), 1–29. <u>https://doi.org/10.1016/j.jfineco.2013.12.006</u>
- Iraj, A., & Ali, S. M. (2019). Performance evaluation of Pakistan's mutual fund industry. *Abasyn Journal of Social Sciences*, 12(2), 290–297. <u>https://doi.org/10.34091/AJSS.12.2.07</u>
- Jank, S. (2012). Mutual fund flows, expected returns, and the real economy. *Journal of Banking and Finance*, 36(11), 3060–3070. <u>https://doi.org/10.1016/j.jbankfin.2012.07.004</u>
- Kariuki, E. C. (2014). Effect of macroeconomic variables on financial performance of mutual funds industry in Kenya. (Doctoral dissertation, University of Nairobi).
- Kavita, & Pasripcha, J. S. (2017). Influence of macroeconomic indicators on mutual funds market in India. *Research in Humanities and Social Sciences*,

5(3), 2347–5404. http://www.raijmr.com

- Khan, M. T., Khan, A., Ahmad, A., & Bashir, O. (2021). Impact of macroeconomic factors on stock returns of KSE 100 Index. *Journal of Business & Tourism, 4*(1), 133–145. <u>https://doi.org/10.34260/jbt.v4i1.95</u>
- Khedmatgozar, H. R., Kazemi, A., & Hanafizadeh, P. (2013). Mutual fund performance evaluation: A value efficiency analysis approach. *International Journal of Electronic Finance*, 7(3–4), 263–280. <u>https://doi.org/10.1504/IJEF.2013.058599</u>
- Kim, M. K., & Wu, C. (1987). Macro-economic factors and stock returns. Journal of Financial Research, 10(2), 87–98. <u>https://doi.org/10.1111/j.1475-6803.1987.tb00481.x</u>
- Kiymaz, H. (2015). A performance evaluation of Chinese mutual funds. *International Journal of Emerging Markets*, 10(4), 820–836. <u>https://doi.org/10.1108/IJoEM-09-2014-0136</u>
- Kong, Y., Owusu-Akomeah, M., Antwi, H. A., Hu, X., & Acheampong, P. (2019). Evaluation of the robusticity of mutual fund performance in Ghana using enhanced resilient backpropagation neural network (ERBPNN) and fast adaptive neural network classifier (FANNC). *Financial Innovation*, 5(1). https://doi.org/10.1186/s40854-019-0125-5
- Krishnaprabha, S. (2016). Performance evaluation of selected mutual funds in India. Asian Journal of Research in Social Sciences and Humanities, 6(7), 1225–1237. <u>https://doi.org/10.5958/2249-7315.2016.00507.4</u>
- Kumar, V., Bhayo, M. U. R., Kumar, S., Kumar, R., & Dakhan, S. A. (2020). Faysal Asset Management mutual funds performance evaluation. *Emerald Emerging Markets Case Studies*, 10(4), 1–33. <u>https://doi.org/10.1108/EEMCS-05-2020-0137</u>
- Leković, M. (2017). Mutual funds portfolio performance evaluation models: Sharpe, Treynor and Jensen index. *Bankarstvo*, 46(4), 108–133. <u>https://doi.org/10.5937/bankarstvo17041081</u>
- Markowitz, H. (2009). Portfolio selection. In *Harry Markowitz: Selected Works* (Vol. 7, pp. 15–30). <u>https://doi.org/10.2307/2975974</u>
- Mateus, I. B., Mateus, C., & Todorovic, N. (2019). Review of new trends in the literature on factor models and mutual fund performance. *International Review of Financial Analysis*, 63, 344–354. <u>https://doi.org/10.1016/j.irfa.2018.12.012</u>

- Mohammad, S. D., Hussain, A., Jalil, M. A., & Ali, A. (2009). Impact of macroeconomics variables on stock prices: Empirical evidence in the case of KSE (Karachi Stock Exchange). *European Journal of Scientific Research*, 38(1), 96–103.
- Moreno, D., & Rodríguez, R. (2009). The value of coskewness in mutual fund performance evaluation. *Journal of Banking and Finance*, *33*(9), 1664–1676. <u>https://doi.org/10.1016/j.jbankfin.2009.03.015</u>
- Murari, K. (2013). Volatility modeling and forecasting for banking stock returns. *International Journal of Banking, Risk and Insurance, 1*(2), 17–27.
- Murari, K. (2015). Exchange rate volatility estimation using GARCH models, with special reference to Indian Rupee against world currencies. *IUP Journal of Applied Finance*, *21*(1), 22–37.
- Murari, K. (2017). Financial development–economic growth nexus: Evidence from South Asian middle-income countries. *Global Business Review*, 18(4), 924–935. <u>https://doi.org/10.1177/0972150917692245</u>
- Murhadi, W. R. (2011). Mutual funds performance evaluation based on selectivity and market timing. *IQTISHODUNA: Jurnal Ekonomi Dan Bisnis Islam*, 7(2), 1–12. <u>https://doi.org/10.18860/iq.v0i0.1737</u>
- Pangestuti, I. R. D., Wahyudi, S., & Robiyanto, R. (2017). Performance evaluation of equity mutual funds in Indonesia. *Journal of Finance and Banking*, 21(4), 527–542. <u>https://doi.org/10.26905/jkdp.v21i4.1503</u>
- Panigrahi, A., Karwa, P., & Joshi, P. (2020). Impact of macroeconomic variables on the performance of mutual funds: A selective study. *Journal of Economic Policy & Research*, 15(1), 29–43.
- Patel, J. (2020). A study on performance evaluation of selected mutual funds in India. *Gap Gyan - A Global Journal of Social Sciences*, 3(4), 80–85. <u>https://doi.org/10.47968/gapgyan.340012</u>
- Qureshi, F., Kutan, A. M., Ghafoor, A., Hussain Khan, H., & Qureshi, Z. (2019). Dynamics of mutual funds and stock markets in Asian developing economies. *Journal of Asian Economics*, 65, 101–135. https://doi.org/10.1016/j.asieco.2019.101135
- Ray, P., & Vina, V. (2011). Neural network models for forecasting mutual fund net asset value. SSRN Electronic Journal. <u>https://doi.org/10.2139/ssrn.872269</u>
- Shah, S. M. A., & Hijazi, S. T. (2005). Performance evaluation of mutual

funds in Pakistan. *The Pakistan Development Review*, 44(4II), 863–876. https://doi.org/10.30541/v44i4IIpp.863-876

- Shastri, S., & Shastri, S. (2016). Exchange rate interest rate linkages in India: An empirical investigation. *Journal of Financial Economic Policy*, 8(4), 443– 457. <u>https://doi.org/10.1108/JFEP-06-2015-0038</u>
- Tangjitprom, N. (2012). The review of macroeconomic factors and stock returns. *International Business Research*, 5(8), 107–115. <u>https://doi.org/10.5539/ibr.v5n8p107</u>
- Tehrani, R., Mohammadi, S. M., & Nejadolhosseini, N. S. (2014). Value at risk as a tool for mutual funds performance evaluation. *International Business Research*, 7(10), 16–21. <u>https://doi.org/10.5539/ibr.v7n10p16</u>
- Titi, M., Salim, U., Sumiati, & Wijayanti, R. (2021). Indonesian mutual funds: Performance determinants and interaction of macroeconomic factors. *International Journal of Revenue Management*, 12(1–2), 83–103. <u>https://doi.org/10.1504/IJRM.2021.114967</u>
- Tiwari, S., Sharma, A. P., Gupta, D., & Gupta, M. (2020). Performance evaluation of mutual funds using Sharpe, Treynor, and Jensen ratios. *Finance India*, 34(2), 743–752.
- Tsolas, I. E. (2020). Precious metal mutual fund performance evaluation: A series two-stage DEA modeling approach. *Journal of Risk and Financial Management*, 13(5), 87. <u>https://doi.org/10.3390/jrfm13050087</u>
- Tuzcu, S. E., & Ertugay, E. (2020). Is size an input in the mutual fund performance evaluation with DEA? *Eurasian Economic Review*, 10(4), 635– 659. <u>https://doi.org/10.1007/s40822-020-00141-6</u>
- Verma, R. K., & Bansal, R. (2021). Impact of macroeconomic variables on the performance of stock exchange: A systematic review. *International Journal of Emerging Markets*, 16(7), 1291–1329. <u>https://doi.org/10.1108/IJOEM-11-2019-0993</u>
- Vidal-García, J., & Vidal, M. (2022). Benchmark versus index in mutual fund performance evaluation. SSRN Electronic Journal. <u>https://doi.org/10.2139/ssrn.4011422</u>
- Wang, K., & Huang, S. (2010). Using fast adaptive neural network classifier for mutual fund performance evaluation. *Expert Systems with Applications*, 37(8), 6007–6011. <u>https://doi.org/10.1016/j.eswa.2010.02.003</u>
- Weinhold, D. (1999). A dynamic fixed effects model for heterogeneous panel

data. Mimeo: London School of Economics.

- Yangbo, B., Wickramanayake, J., Watson, J. R., & Tsigos, S. (2010). The relationship between mutual fund flows and stock market returns: A comparative empirical analysis. *Corporate Ownership and Control*, 8(1), 785–799. <u>https://doi.org/10.22495/cocv8i1c8p4</u>
- Zhao, X., Wang, S., & Lai, K. K. (2011). Mutual funds performance evaluation based on endogenous benchmarks. *Expert Systems with Applications*, 38(4), 3663–3670. <u>https://doi.org/10.1016/j.eswa.2010.09.022</u>