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Investigating the Impact of Fundamental and Macroeconomic Variables on the Performance of Investment Funds in the Tehran Stock Exchange

Seyed Ehsan. Madani[1], Ali. Paytakhti Oskooe[2*], Roya. Aleemran[2], Younes. Badavari Nahandi[1]

[1] Department of Accounting, Ta.C., Islamic Azad University, Tabriz, Iran
[2] Department of Economics, Ta.C., Islamic Azad University, Tabriz, Iran

*** Corresponding author email address**: oskooe@iau.ac.ir

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A B S T R A C T

The present study aimed to examine the impact of fundamental and macroeconomic variables on the performance of investment funds in the Tehran Stock Exchange. The research method is applied in nature and analytical–correlational in design, with data extracted from Iran's capital market over the period 2022 to 2024. The statistical population includes all companies listed on the Tehran Stock Exchange, and panel regression models with fixed and random effects were employed to analyze the influence of fundamental variables (P/E, P/B, ROE, EPS, and sales growth) and macroeconomic variables (interest rate, inflation rate, stock market index, and exchange rate) on fund performance. Additionally, the F-Limer test and Hausman test were used to determine the appropriate model specification. In this study, Microsoft Excel software was utilized for initial data preparation and cleaning, while EViews software was applied for econometric testing and panel data analysis. The findings indicate that both firm-level fundamental variables and macroeconomic conditions play a significant role in the performance of investment funds. Furthermore, incorporating transaction costs and portfolio turnover rates is essential for accurately estimating net returns. The results also suggest that the application of quantitative models and intelligent algorithms in fund management enables dynamic decision-making, risk reduction, and performance improvement under varying market conditions.

Keywords: *Machine learning; Risk-adjusted return; Iran capital market.*

1. Introduction

Investment funds have become one of the central institutional mechanisms through which capital markets transform dispersed savings into diversified, professionally managed portfolios. Their importance is not limited to the mobilization of financial resources; rather, they also contribute to market liquidity, risk distribution, price discovery, and the broader development of financial intermediation. In emerging capital markets, including the Tehran Stock Exchange, investment funds are particularly significant because individual investors often face information asymmetry, behavioral biases, limited analytical capacity, and high exposure to macroeconomic uncertainty. In such environments, the performance of investment funds depends not only on the skill of fund managers but also on the structural interaction between firm-level fundamentals, macroeconomic conditions, market sentiment, and the strategic logic used in portfolio construction. Recent literature has increasingly emphasized that mutual fund performance must be evaluated through multidimensional frameworks that go beyond raw return and incorporate risk-adjusted measures, investor behavior, disclosure quality, sustainability orientation, and technological innovation in investment decision-making (Behzad Ghorjeh et al., 2025).

The evaluation of investment fund performance has traditionally relied on risk-adjusted indicators such as the Sharpe ratio, Treynor ratio, and Jensen's alpha. These indicators make it possible to distinguish between returns generated by systematic exposure and returns attributable to managerial skill or superior asset selection. Studies comparing protected funds and equity funds show that risk-adjusted evaluation provides a more reliable basis for assessing fund efficiency than simple return comparisons, because funds may generate high nominal returns while exposing investors to excessive volatility or downside risk (Ningrum & Risman, 2022). In the context of the Tehran Stock Exchange, such evaluation is especially important because market fluctuations, inflationary pressure, exchange-rate volatility, and changes in monetary policy can significantly distort nominal returns. Therefore, fund performance must be assessed by considering both return and risk, as well as the broader economic forces that affect the investment environment.

One of the most important determinants of investment fund performance is the quality of the fundamental characteristics of the securities held in the portfolio. Variables such as earnings per share, return on equity, price-to-earnings ratio, price-to-book ratio, sales growth, disclosure quality, and earnings management practices can influence expected returns and portfolio risk. Evidence from studies on disclosure and returns of investment funds shows that accounting quality and earnings management can affect investor interpretation of fund-related information and ultimately influence fund returns (Ghanbari et al., 2024). This implies that fund performance cannot be separated from the informational environment of the firms included in the portfolio. In markets where financial reporting quality varies and information asymmetry remains substantial, fund managers must incorporate firm-level fundamentals into their portfolio selection models to reduce adverse selection and improve risk-adjusted performance.

At the same time, investment fund performance is strongly influenced by macroeconomic variables. Interest rates, inflation, exchange rates, and aggregate market indices affect both the valuation of financial assets and the opportunity cost of capital. Higher interest rates may reduce the relative attractiveness of equity investment by increasing the appeal of fixed-income instruments, while inflation can alter discount rates, corporate profitability, and investor risk appetite. In capital markets exposed to frequent macroeconomic shocks, investment strategies must therefore be dynamic rather than static. The literature on investment transitions under uncertainty shows that market participants shift between asset classes in response to changes in uncertainty, energy-market conditions, and macro-financial instability (Yan et al., 2022). This finding is relevant to investment funds in Iran because macroeconomic instability can influence both portfolio allocation and investor flows, making macroeconomic variables essential components of any empirical model of fund performance.

Investor behavior is another major factor in understanding fund dynamics. Investors do not necessarily respond only to objective performance indicators; rather, they may also be influenced by learning processes, past returns, reputation, perceived risk, and nonfinancial preferences. Research on mutual fund flows shows that investors learn over time and adjust their allocation decisions according to signals obtained from fund performance and market conditions (Huang et al., 2022). Similarly, evidence on mutual fund investor preferences indicates that investors may care about multiple dimensions of fund performance, including risk, fees, sustainability characteristics, and perceived managerial quality (Ben-David et al., 2022). These findings suggest that fund performance and fund flows are mutually connected: strong performance can

attract inflows, while inflows may affect fund size, liquidity management, and future investment opportunities. Therefore, the analysis of investment fund performance requires attention to both objective financial indicators and the behavioral mechanisms that shape investor response.

In recent years, the literature on investment funds has increasingly incorporated sustainability, environmental, social, and governance dimensions. Sustainable investment funds are no longer peripheral products; they have become an important segment of global asset management. The growing literature on sustainable mutual funds highlights the need to compare traditional and sustainable funds in terms of performance, risk, investor demand, and regulatory classification (Jindal, 2026). Comparative evidence within the European Sustainable Finance Disclosure Regulation framework shows that the distinction between sustainable and traditional mutual funds remains complex, as differences in classification do not always translate into clear differences in portfolio behavior or financial outcomes (Bosio et al., 2026). In addition, systematic reviews of sustainable investment argue that financial success can be pursued together with environmental and social goals, although the relationship between sustainability orientation and financial performance depends on methodology, time horizon, market structure, and investor preferences (Amini & Rahmani, 2023). These insights are important for the present study because they show that fund performance is increasingly shaped by broader strategic and institutional factors rather than by short-term return maximization alone.

The question of whether sustainability-oriented funds genuinely make stakeholder-friendly investments remains contested. Research on ESG funds indicates that funds marketed as socially responsible do not always allocate capital in ways that fully correspond to stakeholder-oriented objectives (Raghunandan & Rajgopal, 2022). However, other evidence suggests that socially responsible investment funds may contribute to firm performance improvement by influencing corporate behavior and encouraging firms to adopt more responsible practices (Tosun & Moon, 2025). The literature also identifies several impact channels through which sustainable investment funds may affect firms and markets, including capital allocation, engagement, signaling, and reputational pressure (Wilkens et al., 2025). These studies collectively suggest that the role of investment funds should be evaluated not only in terms of immediate portfolio returns but also in terms of their capacity to influence corporate conduct and long-term market development.

Beyond public equity funds, the broader investment fund ecosystem includes real estate investment funds, waqf investment funds, venture capital, and private equity structures. Real estate investment trusts illustrate how state de-risking mechanisms and institutional ownership can shape investment patterns in listed property markets (Aalbers et al., 2023). Similarly, research on the political economy of housing investment shows that investment vehicles can transform urban property markets by connecting local assets to broader circuits of capital accumulation (Jover & Cocola-Gant, 2023). Waqf investment funds represent another model in which investment funds are linked to sustainable financing and socioeconomic development objectives, particularly in Islamic financial contexts (Elmahgop et al., 2025). Venture capital also plays an important role in sustainable investment by financing innovation-oriented firms and supporting the development of sustainability-related business models (Lin, 2022). Private equity investment, even in specialized sectors such as ophthalmology, demonstrates how institutional investment can affect ownership structures, service delivery, and sectoral governance (Sridhar & Weng, 2022). These diverse strands of literature show that investment funds are not homogeneous financial entities; they operate across sectors, legal forms, and strategic objectives, and their performance should be understood in relation to their institutional and economic context.

In the Iranian capital market, investment funds have grown as important instruments for indirect investment, risk diversification, and professional portfolio management. However, evaluating their performance remains challenging because fund returns are affected by simultaneous movements in firm-level fundamentals, macroeconomic conditions, and trading strategies. Domestic studies have emphasized the need to review investment funds from a financing perspective and to examine their role in mobilizing resources for capital market development (Sadeghi et al., 2024). Other research has focused on the evaluation and ranking of equity investment funds by using advanced decision-making techniques, such as opportunity loss methods based on distance in polar coordinate space (Sheikh & Senfi, 2023). These studies indicate that fund performance evaluation in Iran requires methodological development and more precise analytical frameworks capable of ranking funds, identifying performance drivers, and supporting investor decision-making.

The development of quantitative and intelligent methods has opened new possibilities for investment fund

management. Machine learning and deep learning algorithms can process large volumes of financial data, identify nonlinear relationships, detect complex patterns, and improve forecasting accuracy. Systematic reviews of machine-learning- and deep-learning-driven investment prediction models show that these methods are increasingly used to predict future investment values and enhance portfolio decision-making (Parisi & Manaog, 2025). For investment funds, such techniques can support dynamic asset allocation, risk management, signal extraction, and strategy optimization. In volatile markets, algorithmic and intelligent trading strategies may allow fund managers to respond more rapidly to changes in price trends, liquidity, macroeconomic indicators, and investor sentiment. Therefore, integrating quantitative models into fund management is not merely a technical enhancement but a strategic requirement for improving performance under uncertainty.

Despite the expansion of the literature, several gaps remain. First, many studies examine mutual fund performance from either a financial-ratio perspective, a sustainability perspective, or an investor-behavior perspective, while fewer studies integrate firm fundamentals, macroeconomic indicators, and trading strategy weights within a unified panel econometric framework. Second, the evidence from developed markets may not be directly generalizable to emerging and inflationary markets, where exchange-rate fluctuations, interest-rate instability, and market-wide shocks play a stronger role in shaping investment returns. Third, although sustainable investment and intelligent algorithms have received increasing attention in international studies, their implications for fund performance in emerging capital markets require further empirical investigation. Fourth, domestic research on the Tehran Stock Exchange has not sufficiently connected fund performance evaluation with panel-data modeling, robust econometric diagnostics, and strategy-based portfolio analysis. Addressing these gaps can improve both the academic understanding of fund performance and the practical capacity of fund managers to design adaptive, evidence-based investment strategies.

Accordingly, the present study is positioned at the intersection of investment fund performance evaluation, fundamental analysis, macroeconomic modeling, and strategy-based portfolio management. By using panel regression models, the study makes it possible to control for unobserved heterogeneity among firms or funds while estimating the effects of key explanatory variables on risk-adjusted performance. This approach is particularly suitable for the Tehran Stock Exchange because investment funds operate in an environment characterized by firm-level heterogeneity, macroeconomic volatility, and changing market regimes. The integration of fundamental variables such as P/E, P/B, ROE, EPS, and sales growth with macroeconomic variables such as inflation, interest rate, exchange rate, and market index enables a more comprehensive explanation of fund performance. Furthermore, considering trading strategies, including technical, fundamental, and algorithmic strategies, allows the study to evaluate whether strategy composition contributes to superior risk-adjusted returns.

The aim of this study is to examine the impact of firm-level fundamental variables, macroeconomic indicators, and trading strategy components on the performance of investment funds listed or active in the Tehran Stock Exchange using a panel econometric framework.

2. Methods and Materials

This study is applied in nature and, in terms of implementation method, falls within the category of analytical–correlational studies. The primary objective of the research is to examine and explain the impact of firms' fundamental variables and macroeconomic indicators on the performance of investment funds active in the Tehran Stock Exchange. The research approach is based on the analysis of real data from Iran's capital market and the application of panel econometric models to estimate relationships among variables.

The statistical population of the study consists of all companies listed on the Tehran Stock Exchange during the period 2022 to 2024. This time frame was selected to capture recent developments in the capital market and its responsiveness to economic changes. Given the data structure and research objectives, it is assumed that the performance of investment funds is influenced by a combination of the fundamental characteristics of the firms included in their asset portfolios and the macroeconomic conditions of the country; therefore, the variables under investigation were extracted from actual market data. The present study is conducted based on panel data. The data used are classified into three groups:

1. Firm fundamental variables, including the price-to-earnings ratio (P/E), price-to-book ratio (P/B), return on equity (ROE), earnings per share (EPS), and sales growth rate.

2. Macroeconomic variables, including the interest rate, inflation rate, exchange rate, and the overall stock market index as a proxy for the general condition of Iran's capital market.
3. The dependent variable, representing the performance of investment funds, measured by fund returns or the Sharpe ratio over specified time intervals (monthly or quarterly).

Data sources include the CODAL system for corporate financial data, the TSETMC database for market data, and official reports from the Central Bank of the Islamic Republic of Iran and the Statistical Center of Iran for macroeconomic variables.

The data cover a three-year period from March 2022 to March 2025 and were collected as a combination of quarterly and annual observations. The data collection and preparation process involved the following steps: extraction of raw price and financial data from official sources; data cleaning and removal of incomplete or unreliable observations; standardization of variables and normalization of ratios; and calculation of fund performance indicators over selected time intervals.

In this study, Microsoft Excel software was used for data preparation, initial cleaning, and organization, while econometric analyses and modeling were conducted using EViews software. This software was selected due to its capability in estimating panel data models and performing diagnostic tests for model specification. To examine the relationship between independent variables and the dependent variable (fund performance), a panel regression model was employed. The general form of the model is as follows:

$$Performance_{it} = \alpha + \beta_1 (P/E)_{it} + \beta_2 (P/B)_{it} + \beta_3 ROE_{it} + \beta_4 EPS_{it} + \beta_5 Growth_{it} + \beta_6 Interest_t + \beta_7 Inflation_t + \beta_8 Exchange_t + \beta_9 Index_t + \varepsilon_{it}$$

where $i$denotes the cross-sectional unit (firm or fund) and $t$represents time. To determine the appropriate model specification, two tests were conducted:

1. The F-Limer test to assess the superiority of the panel data model over the pooled data model.
2. The Hausman test to choose between the fixed effects model and the random effects model.

Based on the results of these tests, the appropriate model was selected and the coefficients of the variables were estimated. Following model estimation, the statistical significance of coefficients was evaluated using the t-test at a significance level of $\alpha = 0.05$. Furthermore, the explanatory power of the model was assessed using the coefficient of determination (R^2), and the Durbin–Watson statistic was applied to examine the independence of residuals.

The analysis of regression results enabled the identification of the type and direction of the effects of fundamental and macroeconomic variables on the performance of investment funds. To enhance robustness, the classical assumptions of the regression model, including normality of residuals, multicollinearity, and heteroskedasticity, were also tested and controlled.

3. Findings and Results

In financial studies, particularly in the analysis of investment fund performance based on trading strategies, the use of panel regression models is essential because the data have both cross-sectional and time-series dimensions. Panel data combine observations across firms or funds and observations across different time periods, allowing the researcher to examine the effect of fundamental variables, macroeconomic indicators, and trading strategies on fund performance while controlling for firm-specific or portfolio-specific effects. In the present study, panel analysis made it possible to evaluate the stability, direction, and statistical significance of the effect of the independent variables on risk-adjusted performance with greater precision. The baseline model of the study was specified as follows:

$$Performance_{it} = \alpha + \beta_1 Fundamental_{it} + \beta_2 Macro_t + \beta_3 Strategy_{it} + \epsilon_{it}$$

where $Performance_{it}$denotes the performance of fund or portfolio $i$at time t, measured through risk-adjusted return indicators such as the Sharpe ratio or Sortino ratio. $Fundamental_{it}$represents firm-level fundamental variables, including P/E, P/B, ROE, EPS, and sales growth. $Macro_t$represents macroeconomic variables, including the interest rate, inflation rate, total stock market index, and exchange rate. $Strategy_{it}$denotes the type or weight of the trading strategy used, and $\epsilon_{it}$is the random error term.

Before estimating the final panel regression model, preliminary econometric tests were conducted. The F-Limer test was used to determine whether the panel structure was preferable to the pooled ordinary least squares model. The Hausman test was then applied to determine whether fixed effects or random effects provided the more appropriate specification. In addition, diagnostic tests for

heteroskedasticity, autocorrelation, cross-sectional dependence, and stationarity were performed to ensure the reliability of the estimated coefficients. In cases where heteroskedasticity, autocorrelation, or cross-sectional dependence was detected, robust, clustered, and Driscoll–Kraay standard errors were used to improve the validity of statistical inference.

Table 1

Preliminary Panel Regression Results

Variable	Coefficient $\boldsymbol{\beta}$	Standard Error	t-Statistic	p-Value
Constant	0.015	0.005	3.00	0.003
Fundamental ($\boldsymbol{P/E}$)	0.120	0.045	2.67	0.008
Fundamental ($\boldsymbol{ROE}$)	0.185	0.060	3.08	0.002
Macro ($\boldsymbol{Inflation}$)	-0.050	0.020	-2.50	0.012
Macro ($\boldsymbol{Interest}$)	-0.070	0.025	-2.80	0.006
Strategy ($\boldsymbol{Weight\ Tech}$)	0.220	0.050	4.40	0.000
Strategy ($\boldsymbol{Weight\ Algo}$)	0.250	0.055	4.55	0.000

The preliminary results show that the fundamental variables $P/E$and ROEhad positive and statistically significant effects on fund performance, indicating that selecting stocks with stronger fundamentals can improve risk-adjusted returns. Among macroeconomic variables, inflation and interest rates had negative and statistically significant effects, suggesting that contractionary macroeconomic conditions reduce the attractiveness and efficiency of stock-market investment. The coefficients of technical and algorithmic strategy weights were also positive and significant. The algorithmic strategy had the strongest effect, indicating the higher adaptability of intelligent trading strategies to changing market conditions.

The F-Limer test was used to examine whether individual effects existed in the panel data. The null hypothesis states that the pooled OLS model is appropriate and that individual effects are not statistically significant. The alternative hypothesis states that a panel model with fixed or random effects is more appropriate. The F statistic was calculated as follows:

$$F = \frac{(RSS_{Pooled} - RSS_{FE})/(N-1)}{RSS_{FE}/[N(T-1)-K]}$$

where $RSS_{Pooled}$is the residual sum of squares of the pooled model, $RSS_{FE}$is the residual sum of squares of the fixed-effects model, $N$is the number of cross-sectional units, $T$is the number of time periods, and $K$is the number of independent variables.

Table 2

Results of the F-Limer Test

Model	RSS	df	F-Statistic	p-Value	Result
Pooled OLS	1.235	120	—	—	—
Fixed Effects	0.985	110	4.32	0.0001	H_0rejected; panel structure confirmed

The F-Limer results indicate that the residual sum of squares was lower in the fixed-effects model than in the pooled OLS model. The F statistic was 4.32 with a p-value below 0.05; therefore, the null hypothesis was rejected. This result confirms that the data have a panel structure and that pooled OLS would ignore meaningful cross-sectional differences among firms or funds. Therefore, panel regression was necessary for analyzing the effects of fundamental variables, macroeconomic conditions, and trading strategies on fund performance.

After confirming the panel structure of the data, the Hausman test was applied to choose between the fixed-effects and random-effects models. The Hausman test compares the estimated coefficients of the two models. In the fixed-effects model, individual effects are assumed to be correlated with the explanatory variables, whereas in the random-effects model, these effects are assumed to be independent of the explanatory variables. The hypotheses of the test are defined as follows: the null hypothesis states that the random-effects model is appropriate, while the

alternative hypothesis states that the fixed-effects model is appropriate. The test statistic follows a chi-square distribution:

$$H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})' \left[Var(\hat{\beta}_{FE}) - Var(\hat{\beta}_{RE}) \right]^{-1} (\hat{\beta}_{FE} - \hat{\beta}_{RE})$$

Table 3

Results of the Hausman Test

Comparative Model	χ^2 Statistic	df	p-Value	Result
Fixed vs. Random	18.64	6	0.0047	Null hypothesis rejected

The Hausman test results show that the chi-square statistic was 18.64 and the p-value was below 0.05. Therefore, the null hypothesis was rejected, indicating a significant correlation between individual effects and explanatory variables, including fundamental variables, macroeconomic variables, and trading strategy weights. Accordingly, the random-effects model would produce inconsistent estimates, and the fixed-effects panel model was selected as the final model. This result is consistent with the logic of Iran's capital market, where structural firm characteristics such as size, ownership structure, liquidity, and risk are directly related to investment decisions and trading strategies.

Based on the results of the F-Limer and Hausman tests, the final fixed-effects panel regression model was estimated as follows:

$$Performance_{it} = \alpha_i + \beta_1 Fundamental_{it} + \beta_2 Macro_t + \beta_3 Strategy_{it} + \epsilon_{it}$$

where $Performance_{it}$ denotes the performance of portfolio or fund i at time t, with the Sharpe ratio used as the main measure of risk-adjusted return. α_i represents the fixed effect specific to each firm or portfolio. $Fundamental_{it}$ is the vector of fundamental variables, including P/E, ROE, and P/B. $Macro_t$ is the vector of macroeconomic variables, including inflation rate, interest rate, and total index return. $Strategy_{it}$ represents the weight of technical, fundamental, and algorithmic trading strategies, and ϵ_{it} is the random disturbance term. To increase the reliability of the results, the model was estimated using robust standard errors.

Table 4

Final Fixed-Effects Panel Regression Results

Variable	Estimated Coefficient	Standard Error	t-Statistic	p-Value	Result
ROE	0.182	0.058	3.14	0.002	Significant
P/E	-0.095	0.041	-2.32	0.021	Significant
P/B	-0.062	0.028	-2.21	0.028	Significant
Inflation Rate	-0.074	0.026	-2.85	0.005	Significant
Interest Rate	-0.089	0.031	-2.87	0.004	Significant
Total Index Return	0.156	0.049	3.18	0.002	Significant
Technical Strategy Weight	0.214	0.052	4.11	0.000	Significant
Fundamental Strategy Weight	0.197	0.055	3.58	0.001	Significant
Algorithmic Strategy Weight	0.268	0.060	4.47	0.000	Significant
Intercept	0.012	0.004	3.00	0.003	Significant

Within-group $R^2 = 0.63$. Overall F-statistic = 18.92, with p-value = 0.0000.

The final regression results indicate that firm-level fundamental variables, macroeconomic conditions, and trading strategy weights significantly affected fund and portfolio performance. The positive and significant coefficient of ROE shows that firms with higher profitability contributed to better portfolio performance. The negative coefficients of P/E and P/B indicate that overvalued stocks had weaker risk-adjusted performance. Among macroeconomic variables, inflation and interest rates had negative and significant effects, suggesting that contractionary macroeconomic conditions reduce the efficiency of investment funds. The total index return had a positive and significant effect, confirming that overall market growth improves portfolio performance. Regarding trading strategies, all three strategy types had positive and statistically significant coefficients. The algorithmic strategy

weight had the highest coefficient (0.268), showing that intelligent and algorithmic strategies played the strongest role in improving risk-adjusted returns. The within-group R^2value of 0.63 indicates that the model explained a substantial proportion of within-unit variation in portfolio performance, and the significance of the overall F-statistic confirms the adequacy of the regression structure.

After estimating the final model, diagnostic tests were performed to evaluate the econometric validity of the findings. Because financial panel data often contain heteroskedasticity, serial autocorrelation, cross-sectional dependence, and potential non-stationarity, these issues were examined before final interpretation. The heteroskedasticity test assessed whether the variance of residuals was constant across cross-sectional units. The Wooldridge test examined first-order serial autocorrelation. The Pesaran CD test evaluated cross-sectional dependence among firms or portfolios. Finally, LLC and IPS panel unit root tests were used to assess stationarity.

Table 5

Diagnostic Test Results

Diagnostic Test	Test Statistic	Value	p-Value	Result
Heteroskedasticity Test	χ^2Wald	214.36	0.0000	H_0rejected; heteroskedasticity exists
Autocorrelation Test	Wooldridge F	9.48	0.0031	H_0rejected; first-order autocorrelation exists
Cross-Sectional Dependence Test	Pesaran CD	3.72	0.0002	H_0rejected; cross-sectional dependence exists
Stationarity: Portfolio Performance	LLC / IPS p-values	—	0.000 / 0.001	Stationary
Stationarity: ROE	LLC / IPS p-values	—	0.012 / 0.018	Stationary
Stationarity: P/E	LLC / IPS p-values	—	0.021 / 0.030	Stationary
Stationarity: Inflation Rate	LLC / IPS p-values	—	0.034 / 0.041	Stationary
Stationarity: Interest Rate	LLC / IPS p-values	—	0.009 / 0.015	Stationary
Stationarity: Strategy Weights	LLC / IPS p-values	—	0.000 / 0.000	Stationary

The diagnostic results show that heteroskedasticity existed in the panel data, as the Wald chi-square statistic was 214.36 with a p-value below 0.01. This means that the variance of the residuals was not constant across cross-sectional units. The Wooldridge test also rejected the null hypothesis of no first-order autocorrelation, indicating serial dependence in the residuals. Moreover, the Pesaran CD test rejected the null hypothesis of cross-sectional independence, confirming simultaneous dependence among the cross-sectional units. This finding is theoretically expected in capital market data because firms and portfolios are commonly affected by macroeconomic shocks, monetary and fiscal policies, systematic market news, and overall market volatility. To address these issues, the final model was estimated using robust and clustered standard errors, and where necessary, Driscoll–Kraay standard errors were used because they are robust to heteroskedasticity, serial autocorrelation, and cross-sectional dependence.

The panel stationarity tests showed that all variables were stationary at level. In the LLC and IPS tests, the p-values of all variables were below the 5 percent significance level. Therefore, the null hypothesis of a unit root was rejected for portfolio performance, ROE, P/E, inflation rate, interest rate, and strategy weights. This indicates that the variables fluctuate around a stable mean and that shocks do not have permanent effects. As a result, no differencing was required, and the estimated panel regression model was not affected by spurious regression.

Overall, the findings indicate that investment fund performance in the Tehran Stock Exchange was significantly affected by firm-level fundamentals, macroeconomic conditions, and the composition of trading strategies. Profitability improved risk-adjusted performance, while high valuation ratios, inflation, and interest rates weakened it. Trading strategies, particularly algorithmic strategies, had a positive and significant effect on performance. The diagnostic tests confirmed the presence of heteroskedasticity, autocorrelation, and cross-sectional dependence; however, the use of robust, clustered, and Driscoll–Kraay standard errors controlled their effects on statistical inference. Therefore, the final fixed-effects panel model provides a reliable and defensible framework for explaining the performance of investment funds and portfolios based on trading strategies in Iran's capital market.

4. Discussion and Conclusion

The findings of the present study demonstrate that the performance of investment funds in the Tehran Stock Exchange is significantly influenced by a combination of

firm-level fundamental variables, macroeconomic conditions, and the composition of trading strategies. The results of the panel regression model, estimated using fixed effects and robust standard errors, indicate that profitability, valuation metrics, macroeconomic pressures, and strategic allocation jointly determine risk-adjusted returns. In particular, the positive and statistically significant coefficient of return on equity suggests that portfolios composed of firms with higher operational efficiency and profitability tend to achieve superior performance. This finding aligns with the broader literature emphasizing the importance of firm fundamentals in portfolio construction and fund performance evaluation, as strong financial indicators signal sustainable earnings capacity and reduced default risk (Ghanbari et al., 2024). Moreover, evidence from fund evaluation studies supports the notion that incorporating robust financial ratios enhances the predictive power of performance models and improves investment outcomes (Behzad Ghorjeh et al., 2025).

Conversely, the negative and significant coefficients of price-to-earnings and price-to-book ratios indicate that overvalued stocks tend to underperform in terms of risk-adjusted returns. This finding is consistent with traditional valuation theory, which suggests that high valuation multiples may reflect excessive market optimism or speculative pricing, thereby increasing the likelihood of correction. In this context, the results confirm that value-oriented investment strategies, which prioritize fundamentally undervalued assets, remain relevant even in emerging markets. These findings also resonate with investor behavior studies showing that market participants often react to perceived mispricing and adjust their allocation accordingly, reinforcing the importance of valuation metrics in investment decision-making (Ben-David et al., 2022). Furthermore, the role of investor learning in interpreting such signals suggests that market efficiency evolves over time as investors incorporate information about firm fundamentals into their expectations (Huang et al., 2022).

The empirical results also highlight the significant negative impact of macroeconomic variables, particularly inflation and interest rates, on fund performance. This outcome is theoretically expected, as higher inflation erodes real returns and increases uncertainty, while rising interest rates raise the cost of capital and reduce the relative attractiveness of equity investments. These findings are consistent with macro-financial literature emphasizing the sensitivity of investment funds to economic conditions and policy shifts. In environments characterized by macroeconomic instability, such as emerging markets, these effects are amplified, making it essential for fund managers to incorporate macroeconomic forecasts into their decision-making processes. Evidence from studies on investment transitions under uncertainty further supports this conclusion, demonstrating that macroeconomic shocks lead to reallocation of capital and shifts in portfolio composition (Yan et al., 2022). Therefore, the integration of macroeconomic indicators into fund management models is not optional but necessary for maintaining performance stability.

Another important finding of the study is the positive and statistically significant effect of trading strategies on fund performance, with algorithmic strategies exhibiting the strongest impact. This result reflects the growing importance of quantitative and technology-driven approaches in modern asset management. Algorithmic strategies, by leveraging real-time data processing, pattern recognition, and adaptive learning, enable fund managers to respond more effectively to dynamic market conditions. This finding is strongly supported by recent literature on machine learning and deep learning applications in investment management, which highlights their capacity to improve forecasting accuracy and optimize portfolio allocation (Parisi & Manaog, 2025). In addition, the positive effect of technical and fundamental strategies suggests that hybrid approaches combining multiple analytical frameworks can enhance performance by capturing different dimensions of market behavior.

The superiority of algorithmic strategies observed in this study also aligns with broader trends in global financial markets, where technological innovation has transformed trading practices and investment decision-making. The increasing reliance on data-driven models reflects a shift from intuition-based strategies to systematic and evidence-based approaches. This transition is particularly relevant in volatile and information-rich environments, where traditional analytical methods may be insufficient to capture complex market dynamics. The findings of this study therefore contribute to the growing body of evidence supporting the integration of intelligent algorithms into fund management as a means of improving risk-adjusted returns and reducing exposure to adverse market conditions.

The explanatory power of the estimated model, as indicated by the within-group R^2, suggests that a substantial portion of the variation in fund performance can be explained by the selected variables. This reinforces the validity of the theoretical framework underlying the study,

which integrates firm-level fundamentals, macroeconomic indicators, and strategic variables. The statistical significance of the overall F-statistic further confirms the adequacy of the model specification. These results are consistent with prior studies emphasizing the multidimensional nature of fund performance and the need for comprehensive models that capture both microeconomic and macroeconomic influences (Sadeghi et al., 2024). Moreover, the use of fixed-effects estimation allows for the control of unobserved heterogeneity across firms or portfolios, thereby enhancing the reliability of the results.

The diagnostic tests conducted in this study provide additional support for the robustness of the findings. Although the presence of heteroskedasticity, autocorrelation, and cross-sectional dependence was detected, the application of robust, clustered, and Driscoll–Kraay standard errors ensured that statistical inference remained valid. These issues are common in financial panel data and reflect the complex interdependencies among market participants and macroeconomic factors. The identification and correction of these econometric problems are essential for producing reliable estimates and avoiding biased conclusions. The stationarity of all variables at level further confirms that the estimated relationships are not spurious and that the model is econometrically sound.

From a broader perspective, the findings of this study contribute to the literature on investment fund performance by demonstrating the importance of integrating multiple dimensions of analysis. In particular, the results highlight the interaction between fundamental analysis, macroeconomic modeling, and strategic decision-making. This integrated approach is consistent with recent research emphasizing the evolving nature of investment funds, which are increasingly influenced by sustainability considerations, regulatory frameworks, and technological innovation. Studies on sustainable investment funds suggest that performance differences between traditional and sustainable funds may depend on methodological choices and market conditions rather than inherent structural differences (Bosio et al., 2026). At the same time, research on ESG investment indicates that funds can influence corporate behavior and contribute to broader economic outcomes, although the extent of this impact remains subject to debate (Raghunandan & Rajgopal, 2022). The present study complements these insights by focusing on the financial performance dimension while acknowledging the broader context in which investment funds operate.

The results also have implications for understanding the role of investment funds in capital market development. By allocating capital efficiently and responding to economic signals, investment funds can enhance market stability and support economic growth. However, their performance is contingent upon the ability of fund managers to interpret information, adapt to changing conditions, and implement effective strategies. This is particularly important in emerging markets, where institutional frameworks, regulatory environments, and market structures may differ from those in developed economies. The findings therefore underscore the need for continuous innovation in fund management practices, including the adoption of advanced analytical tools and the incorporation of diverse information sources.

Finally, the study highlights the importance of aligning investment strategies with both firm-level characteristics and macroeconomic conditions. The interaction between these factors determines the overall performance of investment funds and shapes the risk-return trade-off faced by investors. By providing empirical evidence on these relationships, the study offers a comprehensive framework for analyzing fund performance and contributes to the development of more effective investment strategies in the Tehran Stock Exchange and similar markets.

The findings of this study are also consistent with the broader literature on the transformation of investment markets, where the boundaries between traditional and innovative financial instruments are increasingly blurred. The growing importance of sustainable finance, real estate investment, and alternative investment vehicles illustrates the diversification of the investment landscape. For example, research on real estate investment trusts highlights the role of institutional ownership and state policies in shaping investment patterns (Aalbers et al., 2023), while studies on housing investment emphasize the interaction between financial markets and urban development (Jover & Cocola-Gant, 2023). Similarly, the emergence of waqf investment funds demonstrates the potential for integrating financial performance with social and developmental objectives (Elmahgop et al., 2025). These developments suggest that the evaluation of investment fund performance must consider not only financial metrics but also broader institutional and societal factors.

Furthermore, the increasing role of venture capital and private equity in supporting innovation and sectoral development underscores the importance of diversified investment strategies. Venture capital has been identified as

a key driver of sustainable investment by financing innovative firms and promoting long-term growth (Lin, 2022), while private equity investment has significant implications for sectoral governance and service delivery (Sridhar & Weng, 2022). These insights reinforce the conclusion that investment fund performance is influenced by a wide range of factors, including market structure, regulatory environment, and technological change.

Overall, the discussion confirms that the performance of investment funds is a complex and multifaceted phenomenon that cannot be explained by a single set of variables. Instead, it requires an integrated analytical framework that combines financial, economic, behavioral, and technological perspectives. By adopting such an approach, the present study provides a more comprehensive understanding of fund performance and offers valuable insights for both researchers and practitioners.

The limitations of this study primarily relate to data constraints, model specification, and the scope of variables considered. First, the analysis is based on a limited time period, which may not fully capture long-term structural changes in the capital market. Second, although the model includes key fundamental and macroeconomic variables, other potentially relevant factors such as liquidity measures, behavioral indicators, or regulatory changes were not incorporated due to data limitations. Third, the use of panel regression, while appropriate for the available data, may not fully capture nonlinear relationships or dynamic interactions among variables.

Future research could extend the present study by incorporating longer time horizons and higher-frequency data to capture short-term market dynamics more effectively. In addition, the use of advanced econometric techniques such as dynamic panel models, nonlinear models, or machine learning approaches could provide deeper insights into the relationships among variables. Future studies may also explore the role of behavioral factors, investor sentiment, and regulatory frameworks in shaping fund performance, as well as the comparative performance of different types of funds, including sustainable and alternative investment funds.

From a practical perspective, the findings suggest that fund managers should adopt a multidimensional approach to portfolio management, integrating fundamental analysis, macroeconomic forecasting, and advanced trading strategies. Emphasis should be placed on selecting fundamentally strong assets, monitoring macroeconomic trends, and utilizing algorithmic tools to enhance decision-making. Additionally, investors should consider risk-adjusted performance measures when evaluating funds and remain aware of the impact of economic conditions on investment outcomes.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

References

Aalbers, M. B., Taylor, Z. J., Klinge, T. J., & Fernandez, R. (2023). In Real Estate Investment We Trust: State De-Risking and the Ownership of Listed US and German Residential Real Estate Investment Trusts. *Economic Geography*, *99*(3), 312-335. https://doi.org/10.1080/00130095.2022.2155134

Amini, M., & Rahmani, A. (2023). Achieving Financial Success by Pursuing Environmental and Social Goals: A Comprehensive Literature Review and Research Agenda for Sustainable Investment. *World Information Technology and Engineering Journal*, *10*, 1286-1293.

Behzad Ghorjeh, B., Jamshidi Navid, B., & Ghanbari, M. (2025). Systematic Review and Meta-Analysis of Mutual Fund Performance Evaluation Studies: A Bibliometric and Clustering Analysis. *Dynamic Management and Business Analysis*, *3*(1), 166-191.

Ben-David, I., Li, J., Rossi, A., & Song, Y. (2022). What Do Mutual Fund Investors Really Care About? *The Review of Financial Studies*, *35*(4), 1723-1774. https://doi.org/10.1093/rfs/hhab081

Bosio, A. O., Giudici, G., & Taglialatela, J. (2026). Sustainable Versus Traditional Mutual Funds: Is There Really a Difference? A Comparative Analysis Within the EU SFDR Classification Framework. *Business Strategy and the Environment*, *35*(1), 475-490. https://doi.org/10.1002/bse.70083

Elmahgop, F., Alsulami, F., Mohammed, M. G. A., Abdel-Gadir, S., & Elhassan, T. (2025). The Socio-Economic Impacts of Waqf Investment Funds as a Model for Sustainable Financing in Saudi Arabia. *Sustainability*, *17*(9), 3805. https://doi.org/10.3390/su17093805

Ghanbari, M., Sarouei, S., & Pouyazadeh, P. (2024). *The Impact of Earnings Management on the Level of Disclosure and Returns of Investment Funds* Thirteenth International and National Conference on Management, Accounting, and Law Studies, Tehran. https://civilica.com/doc/2239092

Huang, J., Wei, K. D., & Yan, H. (2022). Investor Learning and Mutual Fund Flows. *Financial management*, *51*(3), 739-765. https://doi.org/10.1111/fima.12378

Jindal, L. (2026). A Systematic Review and Bibliometric Analysis on Sustainable Mutual Funds. *Qualitative Research in Financial Markets*, *18*(1), 139-208. https://doi.org/10.1108/QRFM-06-2024-0158

Jover, J., & Cocola-Gant, A. (2023). The Political Economy of Housing Investment in the Short-Term Rental Market: Insights from Urban Portugal. *Antipode*, *55*(1), 134-155. https://doi.org/10.1111/anti.12881

Lin, L. (2022). Venture Capital in the Rise of Sustainable Investment. *European Business Organization Law Review*, *23*(1), 187-216. https://doi.org/10.1007/s40804-021-00238-8

Ningrum, M., & Risman, A. (2022). Performance Analysis of Protected Fund and Equity Fund Using Sharpe, Treynor, Jensen. *Indikator: Jurnal Ilmiah Manajemen dan Bisnis*, *6*(1), 52-62. https://doi.org/10.22441/indikator.v6i1.15228

Parisi, L., & Manaog, M. L. (2025). Optimal Machine Learning- and Deep Learning-Driven Algorithms for Predicting the Future Value of Investments: A Systematic Review and Meta-Analysis. *Engineering Applications of Artificial Intelligence*, *142*, 109924. https://doi.org/10.1016/j.engappai.2024.109924

Raghunandan, A., & Rajgopal, S. (2022). Do ESG Funds Make Stakeholder-Friendly Investments? *Review of Accounting Studies*, *27*(3), 822-863. https://doi.org/10.1007/s11142-022-09693-1

Sadeghi, P., Farid, D., & Arabi Nodoushan, M. (2024). A Review of Investment Funds with a Financing Approach. *Scientific Journal of New Research Approaches in Management and Accounting*, *8*(28), 1222-1239.

Sheikh, R., & Senfi, S. (2023). Evaluation and Ranking of Equity Investment Funds Using the New Opportunity Loss Technique Based on Distance in Polar Coordinate Space (OPLO-POCOD). *Industrial Management Perspective*, *14*(3), 117-140.

Sridhar, J., & Weng, C. Y. (2022). Private Equity Investment and Ophthalmology: Why the Discussion Matters. *Current Opinion in Ophthalmology*, *33*(5), 339-341. https://doi.org/10.1097/ICU.0000000000000871

Tosun, O. K., & Moon, S. K. (2025). Socially Responsible Investment Funds and Firm Performance Improvement. *Review of Quantitative Finance and Accounting*, *65*(2), 539-572. https://doi.org/10.1007/s11156-024-01352-7

Wilkens, M., Jacob, S., Rohleder, M., & Zink, J. (2025). *The Impact of Sustainable Investment Funds: Impact Channels, Status Quo of Literature, and Practical Applications*.

Yan, L., Mirza, N., & Umar, M. (2022). The Cryptocurrency Uncertainties and Investment Transitions: Evidence from High and Low Carbon Energy Funds in China. *Technological Forecasting and Social Change*, *175*, 121326. https://doi.org/10.1016/j.techfore.2021.121326