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## Article

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Journal of Derivatives and Quantitative Studies: Seonmul yeon'gu (JDQS)

## Provided in Cooperation with:

Korea Derivatives Association (KDA)

*Suggested Citation:* Yi, Kayoun; Kim, Noolee (2025) : Predictive power of mutual fund holdings on stock returns: Evidence from the Korean market, Journal of Derivatives and Quantitative Studies: Seonmul yeon'gu (JDQS), ISSN 2713-6647, Emerald, Leeds, Vol. 33, Iss. 4, pp. 262-281, <https://doi.org/10.1108/JDQS-09-2025-0061>

This Version is available at:

<https://hdl.handle.net/10419/337299>

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# Predictive power of mutual fund holdings on stock returns: evidence from the Korean market

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Received 15 September 2025  
Revised 27 September 2025  
29 September 2025  
Accepted 30 September 2025

## Abstract

The question of whether mutual funds have a superior prediction ability for future stock returns as professional investors has been an important research topic in the theory of investments. We examine the predictive power of mutual funds' stock holdings on stock returns in the Korean market. Specifically, we conduct empirical analyses using data on the stock holdings of Korean stock mutual funds to examine whether the levels and changes of mutual funds' stock holdings have predictive power for individual stock returns, and whether the information asymmetry of individual stocks affects the prediction ability of mutual fund holdings. The analysis results are as follows: First, the levels and changes of mutual fund holdings have statistically significant explanatory power for future stock returns. Second, the predictive power of mutual fund holdings is higher in the stocks of large firms, firms with higher foreign ownership, firms with higher return volatility and firms included in the KOSPI200 index. Third, the prediction ability of mutual fund holdings is higher during the period of positive market momentum. Fourth, the stocks where mutual funds have larger holdings or have increased their holdings exhibit higher returns.

**Keywords** Mutual funds, Stock returns, Return predictability, Stock funds

**Paper type** Research article

## 1. Introduction

A mutual fund is an investment vehicle that pools and invests the funds of individual investors in securities such as stocks, bonds and money market instruments or other assets. A mutual fund is managed by a fund manager specialized in asset management, and the profit is distributed to individual investors. Mutual funds provide asset access to financial markets for ordinary individual investors who do not have enough expertise in investments and information on market conditions, and enable individual investors to achieve efficient diversification at low transaction costs. Due to these advantages of mutual funds, investors' interests in indirect investments through mutual funds continue to increase, and the size of the market continues to grow.

Mutual funds in the US market have grown significantly since the 1980s, with the total assets increasing from \$70 billion in 1980 to \$6.6 trillion in 2008. Korea's mutual fund market has grown significantly since 2005, when the sales of dollar cost averaging investment funds

Journal of Derivatives and Quantitative  
Studies: 선물연구  
Vol. 33 No. 4, 2025  
pp. 262-281  
Emerald Publishing Limited  
e-ISSN: 2713-6647  
p-ISSN: 1229-988X  
DOI 10.1108/JDQS-09-2025-0061

## JEL Classification — G14, G23, G2

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**Funding:** This work was supported by the IREC, The Institute of Finance and Banking, Seoul National University.

became active (Ko, 2011) [1]. Although the market's growth stagnated once due to the aftermath of the Global Financial Crisis in the late 2000s, it had recovered the growth momentum again since 2011. According to data from the Korea Financial Investment Association, the net assets and total number of funds in the Korean fund market increased significantly from 241 trillion Korean won and 8,125 funds at the end of 2006 to 424 trillion Korean won and 12,617 funds at the end of August 2015. In the case of the US market, as the proportion of mutual funds in the capital market increases, many related studies have been conducted, actively accumulating ample empirical evidence for the area of mutual funds, and many studies are still in progress. On the other hand, in the case of the Korean market, where the history of the mutual fund market is relatively short, research on mutual funds has been scarce compared to the US market. However, the current growth trend of the Korean mutual fund market significantly increases the need for mutual fund research in the Korean market.

Among the various research topics on mutual funds, the question of whether mutual funds as professional investors have a superior prediction ability for future returns of individual stocks has been treated as one of the important research topics in investment theory with relation to the Efficient Market Hypothesis. One approach in this area of study is to examine whether funds' stock holdings and trades representing the funds' investing behaviors have predictive ability for future stock returns. This approach is novel compared to existing studies, which mainly examine the funds' excess returns. Currently, however, there is virtually no research on the predictive power of Korean mutual funds on future stock returns, which necessitates related studies. In the Korean market, where the mutual funds have shown significant growth since the 2000s, this topic of mutual funds' prediction ability has many practical implications as well as academic importance, especially from the perspective of ordinary investors.

In this study, we examine the predictive power of mutual funds' stock holdings on stock returns in the Korean market. Specifically, using data on the stock holdings of Korean stock mutual funds, we examine whether the stock holding levels and changes of stock mutual funds have predictive power for individual stock returns, and whether the degree of information asymmetry of individual stocks affects the prediction ability of mutual fund holdings. In the empirical analyses, index funds are excluded in consideration of the significantly different management styles between active funds and passive index funds.

The results of our empirical analyses are as follows. First, the levels and changes of mutual fund holdings have statistically significant explanatory power for future stock returns. Second, the predictive power of mutual fund holdings is higher in the stocks of large firms, firms with higher foreign ownership, firms with higher return volatility and firms included in the KOSPI200 index. Third, the prediction ability of mutual fund holdings is higher during the period of positive market momentum. Fourth, the stocks where mutual funds have larger holdings or have increased their holdings exhibit higher returns. To the best of our knowledge, this study is the first attempt to analyze the predictive power of mutual fund holdings in the Korean market, where empirical research on the subject has not been conducted yet. The results of this study are expected to enhance our understanding of the Korean mutual fund market and contribute to the accumulation of empirical evidence in the related mutual fund studies. Also, this study is expected to provide considerable implications in both practical and policy aspects. Whether mutual funds have a superior prediction ability for future stock returns might be valuable information in investors' investment decisions and might have a significant impact on investors' utilities from indirect investments through mutual funds.

The remainder of the paper is organized as follows. Section 2 reviews related literature and presents research hypotheses. In Section 3, the data and research methodologies are described, and descriptive statistics are provided. Section 4 presents the results of empirical analyses on the predictive power of mutual fund stock holdings on future stock returns. Section 5 summarizes and concludes the paper.

## 2. Related literature and research hypotheses

### 2.1 Related literature

One of the important research topics related to the Efficient Market Hypothesis in the field of investment theory is whether mutual fund managers who are professional investors and experts in asset management have a superior prediction ability on future stock returns over ordinary individual investors. For investors, the issue of market efficiency boils down to whether skilled investors such as mutual fund managers can make consistent abnormal trading profits (Bodie *et al.*, 2009), which has motivated many studies on the performance of mutual funds as part of empirical tests of the Efficient Market Hypothesis [2].

Since Grinblatt and Titman (1989), the main research trend in related studies has been to examine how much excess returns are realized in mutual fund returns (Grinblatt and Titman, 1993; Daniel *et al.*, 1997; Wermers, 2000). In the meantime, as an alternative approach, studies examining whether mutual fund stock holdings have a return predictability for stocks have emerged as a new trend in related research. In this line of research, starting from Chen *et al.* (2000), it is examined whether the stock holdings of mutual funds and, furthermore, other institutional investors have the predictability or explanatory power for future stock returns in the US market.

Chen *et al.* (2000) examined the stockholdings and trades of mutual funds, showing that the stocks bought by mutual funds exhibited significantly higher returns than those sold. Based on this result, they argued that mutual funds have superior stock selection abilities. Meanwhile, Gompers and Metrick (2001) showed that there is a positive relation between institutional investors' stock holdings and future stock returns, and Yan and Zhang (2009) presented empirical results that institutional investors' stock holdings and trading activities have predictive power for future stock returns and argued that institutional investors have informational advantages and employ active investment strategies to exploit their advantages. Baik *et al.* (2010) provided empirical evidence showing that institutional investors' stock holdings and trades have more predictive power on the returns of geographically close-range stocks, and Bae *et al.* (2012) presented empirical results that hedge funds have a superior prediction ability than mutual funds using data on funds' stock holdings and trading activities.

In the case of the Korean market, there has been no serious study that properly examines the issue of mutual fund holdings' prediction ability, but related studies include Kho and Kim (2010), and Park and Kim (2012). Kho and Kim (2010), in their empirical analyses of the Korean mutual fund market, provided supporting evidence for the price pressure hypothesis, stating that the mutual funds' trading activities affect the stock returns, and showed that this price pressure effect is concentrated on stocks with higher mutual fund holdings. Also, Park and Kim (2012) present empirical results that asset management companies belonging to large business groups increase their holdings of affiliate firms' stocks in the same group in order to prevent the expected stock price declines.

### 2.2 Research hypotheses

The purpose of this study is to examine whether mutual funds have predictive power on the returns of the stocks they invest in. This is one of the most basic questions related to the ability of mutual funds as professional investors. If mutual funds do not have a meaningful prediction ability on stock returns, this means that active management strategies based on security selection and market timing have no advantage over passive management strategies holding efficiently diversified portfolios. In this study, our sample for the empirical analyses is limited to stock mutual funds because we examine mutual funds' predictive power on stock returns. We expect that stock mutual funds' prediction ability on future returns of stocks, if any, will be reflected in the investing behaviors of the funds, such as stock holdings and trades. Therefore, two research hypotheses are established as below.

- H1.* The stock holdings of stock mutual funds have predictive power on future individual stock returns.

- H2. The stock trades of stock mutual funds have predictive power on future individual stock returns.

Meanwhile, if stock funds have predictive power on the returns of individual stocks, this predictive power is likely to be related to the degree of information asymmetry of individual stocks. If the predictive power of mutual fund holdings is stronger in stocks with a higher degree of information asymmetry, this might suggest that the superior prediction ability of mutual funds is mainly based on their informational advantages. Therefore, two research hypotheses are established as below.

- H3. The predictive power of stock mutual funds' stock holdings on individual stock returns is stronger in stocks with a high degree of information asymmetry.
- H4. The predictive power of stock mutual funds' stock trades on individual stock returns is stronger in stocks with a high degree of information asymmetry.

### 3. Data and research methodologies

#### 3.1 Description of the sample

We use the list of stock funds in the Korean market provided by KG Zeroin, which is a Korean investment research company offering mutual fund analyses and data, for the period from November 2001 to May 2014 [3] [4]. The list includes stock mutual funds satisfying the following criteria: (1) the fund should be publicly offered and private equity funds are excluded from the sample, (2) the fund should be open-end fund and closed-end funds are excluded, (3) in the case of multi-class funds, the fund should be a class fund and operation funds are excluded to avoid duplications, and (4) in the case of master-feeder fund, the fund should be a feeder fund and master funds are excluded to avoid duplications [5].

From the list, funds that are not considered as appropriate for the purpose of this study are excluded from the sample. First, funds with missing data in their stock holdings over the sample period are excluded. Also, funds with an average net asset value of less than 100 million Korean won are excluded from the sample. This threshold is significantly lower than those of existing Korean mutual fund studies [6]. The rationale behind this lower threshold is the consideration that this study focuses upon the stock holdings and stock trading activities of stock funds rather than the funds' performance, which has been the main interest in previous studies. Furthermore, funds with any single daily net asset value less than 100 million Korean won during the sample period are excluded from the sample. This additional exclusion criterion is because when the size of the fund's assets decreases to an abnormally low level and bounces back again, abnormal figures are frequently observed in the daily return data, which causes problems with the reliability of the data. Meanwhile, the predictive power of the funds' stock holdings on future stock returns examined in this study is related to the active management strategy, not to the passive management strategy. Therefore, we exclude index funds from our mutual fund sample. Even though index funds belong to stock funds, they are expected to have significantly different investment behaviors than ordinary active stock funds because they aim to track specific indices.

The data on mutual fund characteristics such as monthly stock holdings, daily total net asset value, and daily returns of each individual fund in the sample are obtained from KG Zeroin. The data of individual stocks held by the funds, such as stock returns and the firm characteristics of issuing firms, such as financial information, are obtained from DataGuide of FnGuide, KOCOInfo of Korea Listed Companies Association and KIS-Value of Korea Investors Service.

Table 1 reports descriptive statistics by year on the monthly returns and the fund ownership shares of stocks held by our sample funds [7]. There is an overall upward trend during the sample period in the number of stocks held by our sample funds. On the other hand, the average

**Table 1.** Mutual fund stock holdings: Returns and fund ownership shares

Year	Number of stocks	Stock returns		Fund ownership shares	
		Mean	Median	Mean	Median
2001	300	4.649%	2.509%	1.13%	0.08%
2002	2,815	0.794%	0.000%	1.29%	0.33%
2003	2,413	3.316%	1.383%	1.23%	0.34%
2004	2,186	1.652%	0.590%	0.60%	0.23%
2005	2,521	6.664%	4.348%	0.60%	0.31%
2006	2,834	0.866%	0.205%	0.65%	0.38%
2007	3,141	3.764%	1.646%	0.64%	0.29%
2008	3,435	-3.535%	-3.106%	0.81%	0.24%
2009	3,414	4.333%	1.892%	0.67%	0.24%
2010	3,454	1.901%	0.833%	0.60%	0.20%
2011	3,473	-0.195%	-0.893%	0.47%	0.13%
2012	3,568	1.013%	0.348%	0.69%	0.14%
2013	3,730	1.108%	0.375%	0.58%	0.15%
2014	1,333	1.627%	0.605%	0.50%	0.13%

**Note(s):** This table presents descriptive statistics by year on the monthly returns and the fund ownership shares of stocks held by our sample funds. For the fund stockholdings, only stocks listed in the KOSPI market are considered and the KOSDAQ listed stocks are excluded

**Source(s):** Authors' own work

fund ownership number has not changed significantly since its drastic fall in 2004, and the median number has not changed significantly over the entire sample period.

### 3.2 Research methodologies and description of variables

This study follows the methodologies of [Chen et al. \(2000\)](#), [Yan and Zhang \(2009\)](#), [Baik et al. \(2010\)](#), and [Bae et al. \(2012\)](#) to examine whether mutual funds' stock holdings and trades have predictive or explanatory power on future stock returns. KG Zeroin's mutual fund data includes monthly data on the stocks held by each individual fund, through which we construct the main variables in the empirical analyses, the stock holdings and trades. The trades of funds are estimated as the changes in the stock holdings [8].

Regression specifications in previous studies differ slightly across studies, but they are common in that individual stock returns are used as the dependent variable, variables representing the investment behaviors of funds (stock holding levels and changes) as the explanatory variables, and variables of individual stock characteristics, such as return volatility and firm size, as the control variables. Based on the regression specifications of these related studies, we specify our baseline regression equation as below.

$$\begin{aligned}
 Return_{t+1} = & \beta_1 + \beta_2 Fund\ Ownership + \beta_3 \Delta Fund\ Ownership + \beta_4 Size + \beta_5 RND + \beta_6 MTB \\
 & + \beta_7 Cum(-3, -1) + \beta_8 Cum(-6, -3) + \beta_9 logprice + \beta_{10} Volatility \\
 & + \beta_{11} Turnover + \beta_{12} Dvyield + \beta_{13} Fown + \beta_{14} KOSPI200 + \varepsilon
 \end{aligned}$$

Return = Monthly return of individual stock

Fund Ownership = Total number of stocks held by stock mutual funds/Number of shares outstanding

Size = Natural logarithm of total asset numbers

RND = R&D expenses/total assets

MTB = Market capitalization/book value of equity capital

Cum(-3,-1) = The cumulative stock return deducted by the cumulative market return (KOSPI returns) over the period from three months ago to one month ago

Cum(-6,-3) = The cumulative stock return deducted by the cumulative market return (KOSPI returns) over the period from six months ago to three months ago

logprice = Natural logarithm of individual stock price

Volatility = Standard deviation of weekly stock returns over the preceding one-year period

Turnover = Cumulative trading volume for one month/Number of shares outstanding

Dvyield = Cash dividend/stock price

Fown = Foreign shareholders' ownership ratio

KOSPI200 = A dummy variable which receives a value of one if a stock is included in the KOSPI200 index, zero otherwise.

Individual stock returns are used as the dependent variable of this regression equation. The explanatory variable is Fund Ownership, capturing funds' investment behaviors, which is calculated as the ratio of the funds' stock holdings among the total number of shares outstanding. As control variables, return volatility and R&D activities are included following Bae *et al.* (2012). Also, market-to-book ratio of equity capital representing growth opportunities, and foreign ownerships are included as control variables. The regression equation is estimated using the Fama-MacBeth regression method, where the time-series average of the coefficient estimates from cross-sectional regressions for each month's data is calculated. If mutual funds have predictive power on future stock returns, the coefficient estimates of the fund's investment behavior variables will have statistical significance.

### 3.3 Descriptive statistics

Table 2 presents descriptive statistics for each variable included in our baseline regression equation explained above. Also, it provides the results of the test of difference in mean for each variable when we divide the whole sample based on the median value of the fund ownership variable. The median value is calculated for each month. The results show that the difference in mean is statistically significant for most of the variables.

The monthly stock returns are significantly higher in firms with higher fund ownership. Also, size, return momentum (Cum(-3,-1) and Cum(-6,-3)), price, foreign ownership and KOSPI200 inclusion variables have statistically higher values in firms with higher fund ownerships. On the other hand, R&D, return volatility and dividend yield variables exhibited significantly lower values in firms with higher fund ownership. Turnover variable is also lower in firms with higher fund ownerships, but the difference is only marginally significant at the 10% level. These results can be interpreted as evidence of higher propensities of mutual funds to invest in firms with larger size, more positive return momentum, higher price, higher foreign ownership and firms included in the KOSPI200 index. Also, these results suggest that firms with higher mutual fund investments realize higher stock returns.

## 4. Results of empirical analyses

### 4.1 Predictive power of mutual fund stock holdings

In this section, we examine whether stock funds' stockholding levels and changes have predictive power on future stock returns and present the results. Table 3 provides the estimation results of the baseline regression equation described above through the Fama-MacBeth method for our sample of stock funds excluding index funds. In Model (1), the funds' stock holdings level (Fund Ownership) is used as the explanatory variable representing the

**Table 2.** Descriptive statistics

Variables	Mean	Median	Fund ownership		Test of difference (A)–(B)
			Lower group mean (A)	Higher group mean (B)	
Return	0.0168	0.0049	0.01310	0.02040	–5.53***
Fund Ownership	0.0072	0.0022	0.0006	0.0137	–85.81***
Size (in billion won)	542.25	445.72	378.05	776.61	–43.56***
RND	0.5399	0.0000	0.6274	0.4527	2.70***
MTB	1.8002	1.0500	1.8432	1.7574	0.50
Volatility	44.35	41.65	44.56	44.14	2.46**
Cum(–3,–1)	0.0286	–0.0009	0.0139	0.0433	–13.30***
Cum(–6,–3)	0.0299	–0.0014	0.0165	0.0432	–10.93***
Price	22,540	21,100	17,487	29,025	–37.09***
Turnover	0.1647	0.0909	0.1686	0.1608	1.69*
Dvyield	3.1819	1.8300	4.0451	2.3447	13.20***
Fown	17.25	12.09	15.78	18.72	–17.46***
Kospi200	0.5807	1.0000	0.5331	0.6281	–19.00***

**Note(s):** This table presents descriptive statistics for the variables employed in the empirical analyses. Return is the monthly returns of individual stocks. Fund Ownership is measured as the total number of stocks held by stock mutual funds divided by the number of shares outstanding. Size is the natural logarithm of total asset numbers. RND is measured as R&D expenses divided by total assets. MTB is measured as market capitalization divided by the book value of equity capital. Cum(–3,–1) is the cumulative stock return deducted by the cumulative market return (KOSPI returns) over the period from three months ago to one month ago. Cum(–6,–3) is the cumulative stock return deducted by the cumulative market return (KOSPI returns) over the period from six months ago to three months ago. Logprice is the natural logarithm of individual stock price. Volatility is measured as the standard deviation of weekly stock returns over the preceding one-year period. Turnover is measured as the cumulative trading volume for one month divided by the number of shares outstanding. Dvyield is measured as cash dividend divided by stock price. Fown is foreign shareholders' ownership ratio. KOSPI200 is a dummy variable which receives value of one if a stock is included in the KOSPI200 index, zero otherwise. Test of difference is for the mean values, and the reported numbers are t-statistics. \*\*\*, \*\*, \* denote significance level at the 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

funds' investment behaviors, and Model (2) employs the funds' stock holding changes ( $\Delta$ Fund Ownership) as the investment behavior variable. In model (3), two variables are used at the same time.

In the case of the funds' investment behavior variable, which is the main variable of interests, the estimated coefficient of the Fund Ownership variable in Model (1) shows a statistically significant and positive value of 0.1951. The coefficient estimate of the  $\Delta$ Fund Ownership variable in Model (2) is also positive and statistically significant, but the size and significance of the estimate appear much greater than those in Model (1). In the model (3), where both variables are included at the same time, the significance of the  $\Delta$ Fund Ownership variable is maintained as in model (2), but the significance of the Fund Ownership variable disappears. These results indicate that the level and change of stock holdings variables representing the funds' investment behaviors have statistically significant explanatory power for stock returns over the following one-month period, which shows that stock funds have a meaningful prediction ability for future stock returns.

In the case of control variables, the recent momentum (Cum(-3,-1)), growth opportunity (MTB) and KOSPI200 inclusion (KOSPI200) variables exhibit significantly negative coefficient estimates in all regression specifications, and the size, stock price, turnover and dividend yield variables have statistically significant and positive estimates in all specifications. Meanwhile, the R&D variable shows a positive coefficient estimate, but it is only marginally significant at the 10% level.

**Table 3.** Predictive power of mutual fund stock holdings on future stock returns

Dependent = return	(1)	(2)	(3)
Constant	-0.1591 <sup>***</sup> (-6.38)	-0.1614 <sup>***</sup> (-6.5)	-0.1584 <sup>***</sup> (-6.37)
Fund Ownership	0.1951 <sup>**</sup> (2.33)		-0.0059 (-0.07)
△Fund Ownership		6.2273 <sup>***</sup> (13.33)	6.4689 <sup>***</sup> (13.62)
Cum(-3,-1)	-0.0124 <sup>*</sup> (-1.78)	-0.0138 <sup>**</sup> (-1.99)	-0.0140 <sup>**</sup> (-2.02)
Cum(-6,-3)	-0.0005 (-0.08)	-0.0001 (-0.02)	-0.0004 (-0.08)
Size	0.0035 <sup>***</sup> (3.56)	0.0035 <sup>***</sup> (3.64)	0.0034 <sup>***</sup> (3.59)
Ln(Price)	0.0091 <sup>***</sup> (8.9)	0.0093 <sup>***</sup> (9.27)	0.0092 <sup>***</sup> (9.1)
MTB	-0.0081 <sup>***</sup> (-8.38)	-0.0076 <sup>***</sup> (-8.34)	-0.0076 <sup>***</sup> (-8.37)
Volatility	-0.0001 (-1.13)	-0.0001 (-1.32)	-0.0001 (-1.35)
Turnover	0.0962 <sup>***</sup> (9.59)	0.0976 <sup>***</sup> (9.99)	0.0969 <sup>***</sup> (9.91)
Dvyield	0.0017 <sup>***</sup> (5.36)	0.0016 <sup>***</sup> (5.34)	0.0016 <sup>***</sup> (5.31)
KOSPI200	-0.0134 <sup>***</sup> (-5.78)	-0.0125 <sup>***</sup> (-5.4)	-0.0126 <sup>***</sup> (-5.52)
RND	0.0013 <sup>*</sup> (1.78)	0.0013 <sup>*</sup> (1.85)	0.0013 <sup>*</sup> (1.82)
Fown	-0.0001 (-1.21)	-0.0001 (-1.26)	-0.0001 (-1.22)
F-value	207.37	207.37	206.37
Adjusted R <sup>2</sup>	0.1443	0.1647	0.1682

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

#### 4.2 Sub-sample results based on firm characteristics

The stock funds' predictive power on individual stock returns might vary depending on the characteristics of individual stocks they hold. Especially, if the superior prediction ability of mutual funds comes from the superior information of fund managers over ordinary individual investors, the degree of prediction ability of the mutual funds will be related to the degree of information asymmetry of the individual stocks they invest in, and the predictive power of mutual funds will be stronger in stocks with a higher degree of information asymmetry. In this section, we divide the entire sample of mutual fund stock holdings into sub-samples based on various stock characteristics and conduct regression analyses separately for each of the sub-samples to examine the cross-sectional variations of the predictive power of mutual fund stock holdings. To construct sub-samples, we sort the whole sample of mutual fund stock holdings based on a stock characteristic variable for each month and divide the sample into two sub-samples using the median value of the characteristic variable. The stock characteristic variables employed in the sub-sample analyses include size, foreign ownership, return volatility, R&D activities and KOSPI200 index inclusion.

4.2.1 *Firm size.* Table 4 shows the results of sub-sample analyses where the sample is divided based on the size of the firms. In an analogous manner as in Table 3, the baseline regression equation is estimated using the Fama-MacBeth method, and the regression specifications are exactly the same as in Table 3. Looking at the coefficient estimates of the funds' investment behavior variable, the main variable of interest, the estimated coefficient of the stock holding changes is much larger and more significant than the estimate of stock holding levels, as in the full sample results in Table 3. Also, in all specifications, the estimated coefficients of stock holding variables are much larger and more significant in the sub-sample of stocks with larger firm size than the sub-sample of smaller firm size. These results show that mutual fund stock holdings have a highly stronger explanatory power on stock returns in larger firms.

4.2.2 *Foreign ownership.* Table 5 presents the results on the sub-sample based on the foreign ownership. Overall, the results are consistent with the results on the whole sample in Table 3. Also, similar to the sub-sample results based on the size in Table 4, the estimated coefficients of stock holding variables are larger and more significant in the sub-sample of higher foreign ownership than the sub-sample of lower foreign ownership in all regression specifications. These results suggest that fund stock holdings have better predictive power on stock returns in firms with higher foreign ownership.

4.2.3 *Return volatility.* The results of sub-sample analyses based on the return volatility are reported in Table 6. The overall pattern observed for the main variable of interest, the stock holdings of funds, is highly similar to that of previous sub-sample analyses based on the foreign ownership in Table 5 described above. The coefficient estimates of fund ownership variables are larger and more significant in the firms with higher return volatility than firms with lower volatility. These results imply that the prediction ability of mutual funds' stock holdings is higher in firms with more return volatility.

4.2.4 *R&D activities.* Table 7 presents the results on sub-samples based on the R&D activities. The overall results are generally consistent with the results on the whole sample in Table 3. The coefficients of fund stock holding changes are larger in the firms with more R&D activities than in firms with less R&D activities, suggesting that for firms with more R&D activities, the mutual funds' stock holdings can better explain the future stock returns.

4.2.5 *KOSPI200 inclusion.* The results of sub-sample analyses using the Fama-MacBeth method based on whether the stock is included in the KOSPI200 index are provided in Table 8. The coefficients of the stock holding changes are much larger and more significant than those of stock holding levels, as in the full sample results in Table 3. The estimated coefficients show that the explanatory power of stock holdings on future stock returns is much stronger in firms included in the KOSPI200 index. Specifically, the coefficient of the stock holding levels and changes is much larger and more significant in the sub-sample of stocks in the KOSPI200 index.

In sum, our results of sub-sample analyses suggest that the predictive power of the stock holdings of mutual funds on future stock returns is affected by the characteristics of the individual stocks held by the mutual funds. However, it is not likely that the meaningful explanatory power of the mutual funds' stock holdings comes from the superior information of the mutual funds. The results show that the prediction ability of stock holdings is stronger in firms with larger size, higher foreign ownership, higher R&D activities and included in the KOSPI200 index, where the degree of information asymmetry is lower than in other firms [9]. In general, our results suggest that the predictive power of the stock holdings of mutual funds is stronger in firms with a lower degree of information asymmetry.

#### 4.3 Predictive power of stock holdings and market conditions

In this section, we examine whether the mutual funds' prediction ability on future stock returns is affected by market conditions. Specifically, we divide our sample period according to criteria representing specific market conditions and conduct sub-period analyses. First, we

**Table 4.** Predictive power of mutual fund stock holdings: Sub-sample results based on firm size

Dependent = return	(1)		(2)		(3)	
	Small	Large	Small	Large	Small	Large
Constant	-0.3949*** (-8.91)	-0.1193*** (-3.6)	-0.40095*** (-9.17)	-0.1115*** (-3.49)	-0.3973*** (-8.92)	-0.1132*** (-3.57)
<i>Fund Ownership</i>	0.1118 (1.24)	0.5538*** (2.85)			-0.0374 (-0.38)	0.1504 (0.76)
$\Delta$ <i>Fund Ownership</i>			3.6951*** (5.95)	9.6738*** (14.06)	3.7637*** (5.75)	9.7996*** (14.29)
Cum(-3,-1)	-0.0221*** (-2.78)	-0.0145* (-1.66)	-0.0234*** (-3.03)	-0.0135 (-1.5)	-0.0226*** (-2.86)	-0.0152* (-1.72)
Cum(-6,-3)	-0.0039 (-0.57)	-0.0006 (-0.09)	-0.0049 (-0.7)	0.0029 (0.4)	-0.0050 (-0.72)	0.0019 (0.27)
Size	0.0138*** (7.46)	0.0010 (0.84)	0.0141*** (7.7)	0.0007 (0.6)	0.0140*** (7.50)	0.0007 (0.63)
Ln(Price)	0.0085*** (6.39)	0.0092*** (7.67)	0.0084*** (6.45)	0.0098*** (8.18)	0.0084*** (6.40)	0.0096*** (7.95)
MTB	-0.0225*** (-9.34)	-0.0051*** (-5.69)	-0.0208*** (-8.71)	-0.0048*** (-5.69)	-0.0208*** (-8.94)	-0.0048*** (-5.62)
Volatility	-0.0006*** (-4.75)	0.0003** (2.11)	-0.0006*** (-4.89)	0.0003* (1.93)	-0.0006*** (-5.01)	0.0003** (2.08)
Turnover	0.1597*** (12.31)	0.0648*** (3.82)	0.1574*** (12.38)	0.0771*** (4.62)	0.1570*** (12.29)	0.0752*** (4.53)
Dvyield	0.0012*** (3.22)	0.0029*** (4.13)	0.0011*** (3.13)	0.0026*** (3.7)	0.0012*** (3.13)	0.0027*** (3.83)
KOSPI200	-0.0183*** (-7.48)	-0.0122*** (-3.4)	-0.0178*** (-7.38)	-0.0116*** (-3.35)	-0.0178*** (-7.36)	-0.0111*** (-3.19)
RND	0.0029*** (3.21)	0.0011 (1.11)	0.0026*** (2.89)	0.0009 (1.00)	0.0026*** (2.87)	0.0009 (0.95)
Fown	0.0000 (-0.23)	0.0000 (-0.32)	0.0000 (-0.13)	-0.0001 (-0.80)	0.0000 (-0.20)	0.0000 (-0.47)
F-value	98.1141	96.2550	98.1141	96.2550	97.1141	95.2550
Adj. R <sup>2</sup>	0.1705	0.1612	0.1830	0.1949	0.1844	0.2036

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings when the sample is divided based on firm size. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

**Table 5.** Predictive power of mutual fund stock holdings: Sub-sample results based on foreign ownership

Dependent = return	(1)		(2)		(3)	
	Lower	Higher	Lower	Higher	Lower	Higher
Constant	-0.2602*** (-8.59)	-0.1393*** (-4.82)	-0.25785*** (-8.61)	-0.14926*** (-5.26)	-0.2534*** (-8.42)	-0.1427*** (-4.97)
<i>Fund Ownership</i>	0.1592 (1.52)	0.4585** (2.99)			-0.0126 (-0.12)	0.2001 (1.29)
$\Delta$ <i>Fund Ownership</i>			5.4047*** (8.82)	7.8731*** (11.34)	5.5603*** (8.81)	8.1064*** (11.84)
Cum(-3,-1)	-0.0130 (-1.53)	-0.0139* (-1.77)	-0.0141* (-1.72)	-0.0141* (-1.80)	-0.0146* (-1.77)	-0.0146* (-1.86)
Cum(-6,-3)	-0.0082 (-1.23)	0.0081 (1.35)	-0.0077 (-1.08)	0.0086 (1.4)	-0.0080 (-1.13)	0.0086 (1.42)
Size	0.0079*** (6.23)	0.0022** (2.07)	0.0077*** (6.29)	0.0025** (2.46)	0.0075*** (6.19)	0.0023** (2.19)
Ln(Price)	0.0100*** (8.13)	0.0084*** (7.5)	0.0102*** (8.48)	0.0088*** (8.00)	0.0101*** (8.31)	0.0087*** (7.84)
MTB	-0.0172*** (-7.1)	-0.0067*** (-6.62)	-0.0160*** (-7.13)	-0.0061*** (-6.35)	-0.0159*** (-7.21)	-0.0061*** (-6.36)
Volatility	-0.0005*** (-4.01)	0.0001 (1.03)	-0.0006*** (-4.48)	0.0002 (1.10)	-0.0006*** (-4.45)	0.0002 (1.10)
Turnover	0.1360*** (11.43)	0.0891*** (5.48)	0.1388*** (11.56)	0.0953*** (5.86)	0.1372*** (11.38)	0.0935*** (5.82)
Dvyield	0.0017*** (4.01)	0.0015*** (2.88)	0.0018*** (4.19)	0.0016*** (2.99)	0.0018*** (4.04)	0.0016*** (2.94)
KOSPI200	-0.0161*** (-5.58)	-0.0101*** (-3.62)	-0.0151*** (-5.18)	-0.0093*** (-3.44)	-0.0152*** (-5.22)	-0.0093*** (-3.44)
RND	0.0032*** (3.04)	0.0013 (1.18)	0.0029*** (2.86)	0.0014 (1.31)	0.0029*** (2.88)	0.0014 (1.24)
Fown	-0.0006** (-2.07)	0.0001* (1.81)	-0.0006* (-1.90)	0.0000 (0.79)	-0.0006** (-1.81)	0.0001 (1.29)
F-value	91.6443	102.7315	91.6443	102.7315	90.6443	101.7315
Adj. R <sup>2</sup>	0.1693	0.1550	0.1879	0.1797	0.1904	0.1852

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings when the sample is divided based on foreign ownership. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

**Table 6.** Predictive power of mutual fund stock holdings: Sub-sample results based on return volatility

Dependent = return	(1)		(2)		(3)	
	Lower	Higher	Lower	Higher	Lower	Higher
Constant	-0.1058*** (-4.61)	-0.2995*** (-6.51)	-0.08118*** (-3.51)	-0.27571*** (-6.24)	-0.0773*** (-3.39)	-0.2693*** (-6.04)
<i>Fund Ownership</i>	0.0836 (0.98)	0.2981** (2.03)			0.0109 (0.12)	-0.1685 (-1.17)
$\Delta$ <i>Fund Ownership</i>			5.1555*** (9.6)	7.6417*** (11.56)	5.4755*** (9.83)	7.8745*** (11.86)
Cum(-3,-1)	-0.0142* (-1.87)	-0.0165* (-1.95)	-0.0142* (-1.85)	-0.0156* (-1.84)	-0.0142* (-1.86)	-0.0152* (-1.8)
Cum(-6,-3)	-0.0029 (-0.46)	-0.0027 (-0.44)	-0.0014 (-0.21)	-0.0006 (-0.09)	-0.0011 (-0.17)	-0.0007 (-0.11)
Size	0.0008 (0.89)	0.0070*** (4.19)	0.0006 (0.72)	0.0078*** (4.69)	0.0005 (0.62)	0.0077*** (4.62)
Ln(Price)	0.0079*** (8.33)	0.0141*** (8.31)	0.0079*** (8.32)	0.0140*** (8.32)	0.0078*** (8.16)	0.0138*** (8.15)
MTB	-0.0050*** (-5.45)	-0.0134*** (-8.07)	-0.0043*** (-4.91)	-0.0120*** (-7.97)	-0.0043*** (-4.95)	-0.0119*** (-8.01)
Volatility	0.0003 (1.8)	0.0002 (0.75)	-0.0003** (-2.14)	-0.0007*** (-3.81)	-0.0003** (-2.2)	-0.0007*** (-3.89)
Turnover	0.1498*** (7.59)	0.0867*** (8.23)	0.1670*** (8.3)	0.0931*** (9.16)	0.1649*** (8.06)	0.0927*** (9.16)
Dvyield	0.0020*** (4.99)	0.0031*** (4.41)	0.0017*** (4.14)	0.0028*** (4.09)	0.0016*** (4.14)	0.0028*** (4.09)
KOSPI200	-0.0077*** (-2.95)	-0.0237*** (-7.13)	-0.0061** (-2.37)	-0.0252*** (-7.65)	-0.0062** (-2.42)	-0.0251*** (-7.72)
RND	-0.0001 (-0.09)	0.0024** (2.15)	0.0002 (0.11)	0.0021* (1.87)	0.0002 (0.1)	0.0020* (1.84)
Fown	-0.0001 (-1.45)	-0.0002 (-1.49)	0.0000 (-1.00)	-0.0002 (-1.90)	-0.0001 (-1.11)	-0.0002* (-1.82)
F-value	105.2282	89.1409	105.2282	89.1409	104.2282	88.1409
Adj. R <sup>2</sup>	0.1322	0.1463	0.1432	0.1764	0.1465	0.1777

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings when the sample is divided based on return volatility. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

**Table 7.** Predictive power of mutual fund stock holdings: Sub-sample results based on R&D activities

Dependent = return	(1)		(2)		(3)	
	Lower	Higher	Lower	Higher	Lower	Higher
Constant	-0.1440*** (-5.23)	-0.3051*** (-6.27)	-0.15048*** (-5.61)	-0.3057*** (-6.77)	-0.1480*** (-5.42)	-0.2793*** (-5.76)
<i>Fund Ownership</i>	0.2191** (2.08)	0.1039 (0.60)			0.0153 (0.13)	0.0241 (0.13)
$\Delta$ <i>Fund Ownership</i>			6.2527*** (11.85)	8.3536*** (5.21)	6.5901*** (12.19)	8.2936*** (4.85)
Cum(-3,-1)	-0.0112 (-1.52)	-0.0094 (-0.70)	-0.0121 (-1.63)	-0.0090 (-0.70)	-0.0131* (-1.79)	-0.0150 (-1.14)
Cum(-6,-3)	-0.0026 (-0.43)	0.0050 (0.45)	-0.0036 (-0.59)	-0.0001 (-0.01)	-0.0038 (-0.62)	0.0053 (0.48)
Size	0.0027*** (2.68)	0.0092*** (4.48)	0.0029*** (2.94)	0.0092*** (4.86)	0.0028*** (2.85)	0.0085*** (4.16)
Ln(Price)	0.0093*** (9.00)	0.0088*** (4.29)	0.0096*** (9.5)	0.0089*** (4.49)	0.0094*** (9.28)	0.0085*** (4.25)
MTB	-0.0082*** (-6.95)	-0.0106*** (-5.1)	-0.0080*** (-7.24)	-0.0092*** (-4.81)	-0.0078*** (-6.94)	-0.0091*** (-4.58)
Volatility	-0.0001 (-0.81)	-0.0001 (-0.59)	-0.0001 (-0.86)	-0.0002 (-0.95)	-0.0001 (-0.82)	-0.0004* (-1.75)
Turnover	0.0878*** (7.71)	0.1200*** (5.36)	0.0889*** (8.11)	0.1223*** (5.53)	0.0884*** (8.03)	0.1422*** (5.46)
Dvyield	0.0017*** (4.96)	0.0056*** (3.46)	0.0017*** (4.99)	0.0058*** (3.89)	0.0017*** (4.99)	0.0054*** (3.65)
KOSPI200	-0.0117*** (-4.5)	-0.0236*** (-4.92)	-0.0106*** (-3.97)	-0.0214*** (-4.3)	-0.0110*** (-4.29)	-0.0226*** (-4.58)
RND	0.0240*** (3.36)	0.0017 (1.75)	0.0225*** (3.10)	0.0013 (1.54)	0.0242*** (3.41)	0.0017* (1.85)
Fown	0.0000 (-0.10)	-0.0002 (-1.47)	0.0000 (-0.37)	-0.0001 (-0.89)	0.0000 (-0.27)	-0.0001 (-0.65)
F-value	154.1141	41.0872	154.1141	41.0872	153.1141	40.0872
Adj. R <sup>2</sup>	0.1506	0.2088	0.1674	0.2482	0.1725	0.2458

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings when the sample is divided based on R&D activities. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

**Table 8.** Predictive power of mutual fund stock holdings: Sub-sample results based on KOSPI200 inclusion

Dependent = return	(1)		(2)		(3)	
	Not included	Included	Not included	Included	Not included	Included
Constant	-0.2419*** (-6.02)	-0.1506*** (-5.64)	-0.2578*** (-6.53)	-0.15123*** (-5.65)	-0.2467*** (-6.19)	-0.1464*** (-5.53)
<i>Fund Ownership</i>	0.0564 (0.42)	0.5808*** (3.49)			-0.0989 (-0.70)	0.2685* (1.65)
$\Delta$ <i>Fund Ownership</i>			4.2120*** (6.28)	8.9676*** (13.78)	4.4478*** (6.37)	9.0205*** (14.13)
Cum(-3,-1)	-0.0096 (-1.12)	-0.0177** (-2.03)	-0.0118 (-1.36)	-0.0186** (-2.13)	-0.0113 (-1.30)	-0.0192** (-2.23)
Cum(-6,-3)	-0.0024 (-0.33)	-0.0002 (-0.03)	-0.00312 (-0.42)	0.002655 (0.39)	-0.0025 (-0.33)	0.0016 (0.23)
Size	0.0069** (4.25)	0.0025*** (2.60)	0.0074*** (4.69)	0.0026*** (2.65)	0.0071*** (4.46)	0.0024** (2.49)
Ln(Price)	0.0090*** (5.70)	0.0091*** (8.47)	0.00918*** (5.90)	0.009411*** (8.98)	0.0090*** (5.78)	0.0093*** (8.67)
MTB	-0.0116*** (-5.34)	-0.0069*** (-6.94)	-0.01093*** (-5.27)	-0.00647*** (-6.88)	-0.0113*** (-5.36)	-0.0063*** (-6.72)
Volatility	-0.0002** (-2.03)	-0.0001 (-0.72)	-0.00025** (-2.07)	-0.00016 (-1.02)	-0.0003** (-2.23)	-0.0001 (-0.85)
Turnover	0.1288*** (9.69)	0.0857*** (5.75)	0.128656*** (9.52)	0.09604*** (6.68)	0.1258*** (9.41)	0.0930*** (6.48)
Dvyield	0.0017*** (4.43)	0.0018** (2.43)	0.001704*** (4.31)	0.001877** (2.56)	0.0017*** (4.19)	0.0018** (2.51)
RND	0.0032 (1.10)	0.0004 (0.39)	0.004461 (1.09)	0.000336 (0.37)	0.0046 (1.07)	0.0003 (0.30)
Fown	-0.0001 (-0.94)	0.0000 (-0.07)	-0.0001 (-0.92)	-0.0000 (-0.18)	-0.0001 (-0.88)	0.0000 (0.04)
F-value	78.5503	117.8188	78.55034	117.8188	77.5503	116.8188
Adj. R <sup>2</sup>	0.1543	0.1603	0.165491	0.190916	0.1675	0.1966

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings when the sample is divided based on KOSPI200 inclusion. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

divide the sample based on the momentum of the KOSPI index into a period of rising trend and falling trend and conduct separate Fama-MacBeth regression analysis for each sub-period. In this division of the sample, the period before April 29, 2011, is classified as a sub-period with rising momentum and the period after April 29, 2011, is labeled as a sub-period with falling momentum. In addition, the whole sample period is divided into the bullish market period and the bearish market period, where the market returns are positive and negative, respectively, and separate regression analyses are conducted for each sub-period.

*4.3.1 Rising and falling momentum periods.* The results of sub-period analyses based on the market momentum are reported in Table 9. The estimated coefficients of the stock holding changes are much larger and more significant than those of stock holding levels, as in the full sample results presented in Table 3. The coefficients of the stock holding levels and changes are much larger and more significant in the sub-period of rising momentum. These results show that the predictive power of stock holdings on the stock returns is much stronger in the period of rising momentum.

*4.3.2 Bullish market and bearish market periods.* Table 10 provides the results sub-period of analyses base on the sign of market returns. As in the whole sample results, the coefficients of  $\Delta$ Fund Ownership variable are much larger and more significant than those of Fund Ownership variable. In the case of  $\Delta$ Fund Ownership variable, coefficient estimates exhibit no significant difference between the bearish market period and the bullish market period. Combining these results with the previous results of market momentum presented in Table 9 suggests that the prediction ability of mutual funds' stock holdings is stronger when there is positive market momentum over a prolonged period rather than short term increases such as monthly increases.

#### *4.4 The performance of stocks and mutual fund ownerships*

Until now, it has been examined whether the levels and changes of stock mutual funds' stock holdings have meaningful predictive power on future stock returns. This section examines whether such predictive power on stock returns is realized as a superior investment performance of the mutual funds. To this end, we sort the individual stocks held by the stock mutual funds according to the levels and changes of fund ownerships and divide the whole sample into five quintile portfolios. Then the average market adjusted returns are calculated by subtracting the monthly market returns from the monthly portfolio returns. These results are presented in Table 11. Panel A of the table shows the results of portfolios sorted by the stock holding levels, and the lowest quintile portfolio (Q1) exhibits a negative market adjusted return, which is not statistically significant. However, the highest quintile portfolio (Q5) shows a statistically significant and positive return. In particular, the arbitrage portfolio constructed by purchasing the highest quintile (Q5) and selling the lowers quintile (Q1) exhibits a statistically significant and positive market adjusted return. Also, panel B provides the results of portfolios sorted by the stock holding changes, which are consistent with and stronger than the results in Panel A. The Q1 portfolio has a statistically significant and negative market adjusted return, while the Q5 portfolio shows a statistically significant and positive return. Also, the market adjusted return of the arbitrage portfolio exhibits a statistically significant and positive return. Furthermore, the arbitrage return based on the stock holding changes is larger than that based on the stock holding levels. These results show that stocks with higher mutual fund ownership levels or changes realize significantly higher returns than stocks with lower mutual fund ownership levels or changes. Therefore, this is indirect evidence that the prediction ability of stock mutual funds on stock returns is realized as a higher fund performance.

## **5. Summary and conclusion**

In this paper, using Korean stock mutual fund data, we analyze the prediction ability of the stock holdings of stock mutual funds on future stock returns. In our empirical tests, index funds

**Table 9.** Predictive power of mutual fund stock holdings: Sub-period results based on market momentum

Dependent = return	(1) Rising Momentum	Falling momentum	(2) Rising Momentum	Falling Momentum	(3) Rising Momentum	Falling momentum
Constant	-0.2063*** (-7.13)	-0.0160 (-0.39)	-0.2080*** (-7.16)	-0.0203 (-0.51)	-0.2056*** (-7.13)	-0.0158 (-0.38)
<i>Fund Ownership</i>	0.2698*** (2.67)	-0.0309 (-0.23)			0.0221 (0.20)	-0.0907 (-0.66)
$\Delta$ <i>Fund Ownership</i>			7.1616*** (15.00)	3.3991*** (3.12)	7.4175*** (15.20)	3.5974*** (3.27)
Cum(-3,-1)	-0.0187** (-2.38)	0.0067 (0.47)	-0.0206*** (-2.65)	0.0070 (0.48)	-0.0208*** (-2.69)	0.0069 (0.47)
Cum(-6,-3)	-0.0009 (-0.13)	0.0008 (0.08)	-0.0006 (-0.09)	0.0014 (0.14)	-0.0009 (-0.13)	0.0010 (0.10)
Size	0.0051*** (4.51)	-0.0015 (-0.87)	0.0051*** (4.55)	-0.0013 (-0.82)	0.0050*** (4.57)	-0.0014 (-0.85)
Ln(Price)	0.0097*** (7.62)	0.0070*** (5.28)	0.0101*** (8.01)	0.0070*** (5.29)	0.0100*** (7.86)	0.0069*** (5.25)
MTB	-0.0103*** (-8.64)	-0.0017* (-1.76)	-0.0095*** (-8.55)	-0.0018* (-1.85)	-0.0095*** (-8.60)	-0.0018* (-1.81)
Volatility	-0.0001 (-0.47)	-0.0003** (-2.02)	-0.0001 (-0.71)	-0.0003* (-1.92)	-0.0001 (-0.72)	-0.0003** (-2.01)
Turnover	0.0922*** (8.08)	0.1081*** (5.12)	0.0942*** (8.43)	0.1082*** (5.31)	0.0934*** (8.37)	0.1076*** (5.28)
Dvyield	0.0016*** (4.77)	0.0020*** (2.57)	0.0016*** (4.79)	0.0019** (2.51)	0.0016*** (4.85)	0.0019** (2.40)
KOSPI200	-0.0119*** (-4.26)	-0.0182*** (-4.51)	-0.0106*** (-3.86)	-0.0180*** (-4.44)	-0.0108*** (-3.97)	-0.0181*** (-4.46)
RND	0.0017* (1.90)	0.0001 (0.06)	0.0017** (2.01)	0.0000 (0.03)	0.0017** (1.98)	0.0000 (0.00)
Fown	-0.0001 (-1.63)	0.0001 (0.76)	-0.0001* (-1.70)	0.0001 (0.79)	-0.0001* (-1.65)	0.0001 (0.77)
F-value	195.2411	244.0811	195.2411	244.0811	194.2411	243.0811
Adj. R <sup>2</sup>	0.1466	0.1372	0.1721	0.1424	0.1763	0.1436

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings when the sample period is divided based on market momentum. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

**Table 10.** Predictive power of mutual fund stock holdings: Sub-period results based on market return signs

Dependent = return	(1)		(2)		(3)	
	Negative	Positive	Negative	Positive	Negative	Positive
Constant	-0.1216*** (-3.59)	-0.1865*** (-5.29)	-0.1191*** (-3.52)	-0.1924*** (-5.50)	-0.1206*** (-3.50)	-0.1862*** (-5.34)
<i>Fund Ownership</i>	0.0892 (0.69)	0.2728** (2.49)			-0.0812 (-0.61)	0.0492 (0.40)
$\Delta$ <i>Fund Ownership</i>			6.2423*** (8.26)	6.2163*** (10.46)	6.4371*** (8.33)	6.4922*** (10.79)
Cum(-3,-1)	-0.0039 (-0.37)	-0.0186** (-2.00)	-0.0068 (-0.66)	-0.0189** (-2.03)	-0.0067 (-0.65)	-0.0193** (-2.09)
Cum(-6,-3)	0.0038 (0.57)	-0.0036 (-0.44)	0.0036 (0.55)	-0.0028 (-0.33)	0.0040 (0.60)	-0.0037 (-0.43)
Size	0.0007 (0.52)	0.0055*** (4.03)	0.0006 (0.45)	0.0056*** (4.22)	0.0007 (0.53)	0.0054*** (4.11)
Ln(Price)	0.0110*** (7.39)	0.0076*** (5.56)	0.0109*** (7.37)	0.0082*** (6.01)	0.0109*** (7.30)	0.0079*** (5.85)
MTB	-0.0053*** (-4.06)	-0.0102*** (-7.58)	-0.0052*** (-4.07)	-0.0093*** (-7.53)	-0.0050*** (-4.03)	-0.0095*** (-7.6)
Volatility	-0.0009*** (-6.18)	0.0004 (3.36)	-0.0009*** (-6.17)	0.0004*** (3.18)	-0.0009*** (-6.23)	0.0004*** (3.20)
Turnover	0.0538*** (3.52)	0.1272*** (10.33)	0.0584*** (4.02)	0.1264*** (10.24)	0.0570*** (3.91)	0.1262*** (10.28)
Dvyield	0.0013*** (3.43)	0.0020*** (4.23)	0.0012*** (3.25)	0.0020*** (4.30)	0.0012*** (3.29)	0.0020*** (4.24)
KOSPI200	-0.0177*** (-5.34)	-0.0103*** (-3.24)	-0.0172*** (-5.31)	-0.0090*** (-2.82)	-0.0169*** (-5.15)	-0.0095*** (-3.03)
RND	0.0010 (1.10)	0.0015 (1.41)	0.0011 (1.25)	0.0014 (1.40)	0.0011 (1.25)	0.0014 (1.36)
Fown	0.0002** (2.48)	-0.0002*** (-3.35)	0.0002** (2.55)	-0.0002*** (-3.50)	0.0002** (2.37)	-0.0002*** (-3.34)
F-value	209.1111	206.0930	209.1111	206.0930	208.1111	205.0930
Adj. R <sup>2</sup>	0.1343	0.1516	0.1534	0.1730	0.1567	0.1766

**Note(s):** This table presents the Fama-MacBeth regression results of stock returns on mutual fund stock holdings when the sample period is divided based on market return signs. Dependent variable is Return which is the monthly returns of individual stocks. Variables are as defined in Table 2. Reported numbers are the average of estimates by Fama-MacBeth regression method for the baseline regression equation. Numbers in parenthesis are t-statistics. \*\*\*, \*\*, and \* denote significance of the parameter estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

**Table 11.** The performance of stock portfolios based on the mutual fund ownership

Panel A	
Levels of fund ownership	Market adjusted return
Low (Q1)	-0.001 (-0.340)
High (Q5)	0.014*** (4.485)
High - Low	0.015*** (4.975)
Panel B	
Changes of fund ownership	Market adjusted return
Low (Q1)	-0.012*** (-4.587)
High (Q5)	0.045*** (11.839)
High - Low	0.057*** (17.464)

**Note(s):** This table presents the performance of stock portfolios sorted by the mutual fund ownership levels and changes. Reported numbers are the average monthly market adjusted returns of the stock portfolios constructed based on the level and change of fund ownership of stocks. Numbers in parenthesis are the t-statistics of the estimates. \*\*\*, \*\*, and \* denote the significance of the estimates at 1%, 5%, and 10% levels, respectively

**Source(s):** Authors' own work

using passive management strategies are excluded from the sample in order to analyze only ordinary active stock funds using active management strategies.

We find that the levels and changes of mutual fund holdings have statistically significant explanatory power for future stock returns, and the predictive power of mutual fund holdings is higher in the stocks of large firms, firms with higher foreign ownership, firms with higher return volatility, and firms included in the KOSPI200 index. These findings of the higher prediction ability of the mutual fund holdings with the lower degree of information asymmetry suggest that the prediction ability of the mutual funds' stock holdings does not come from the superior information or informational advantages of the mutual funds. Also, the prediction ability of mutual fund holdings is higher during the period of positive market momentum. Furthermore, the stocks where mutual funds have larger holdings or increased their holdings exhibit higher returns.

This study is expected to enhance our understanding of the Korean mutual fund market, contribute to the existing literature through the accumulation of related empirical evidence, and provide meaningful practical implications. Also, this study is expected to be a baseline study for many related future studies. One possible direction of future studies is the issues of the cross-sectional variation of the prediction ability across individual mutual funds. Whether such variations exist and, if any, what would be the determinants of such variations might be interesting research topics.

Meanwhile, one limitation of this study is the lack of robustness tests for empirical results. There is a possibility that the investments and trading behaviors of mutual funds might affect the supply and demand of the stocks, and therefore the stock returns, which could lead to misleading results even when mutual funds have no real predictive power over future stock returns. [Kho and Kim \(2010\)](#) provided empirical evidence supporting the price pressure hypothesis that the trades of mutual funds affect the stock returns and argued that this price pressure effect is concentrated on the stocks with higher mutual fund holdings. Therefore, to examine this possibility, additional analyses are necessary where individual stocks are divided into groups with high and low fund holdings, and the prediction ability of stock holdings are examined for each group. Such a robustness test should be covered through additional future studies. Another limitation of this study is the lack of data on recent periods. Even though we have employed as much data as possible based on our accessibility to the data, we have failed to extend our sample period to recent years because we do not have any access to the data on the

period after 2014. The analyses using data on recent period which is missing in this study should be covered through future studies. We believe this kind of further analyses in future research will enhance our understandings on the issues examined in this study.

### Notes

1. There are two types of mutual funds in the Korean market: Investment trust and investment company. Economically, they are identical in that they perform the same function as an indirect investment vehicle pooling the funds of individual investors. Technically, however, they are different in that investment trust takes the form of a trust contract and investment company takes the form of a corporation. Most of the mutual funds in the Korean market are investment trusts, and mutual funds of investment company type account for an extremely low proportion.
2. Another approach of this line of research is to examine the performance of security analysts' investment recommendations.
3. KG Zeroin has been the most popular source of Korean mutual fund data in the related studies. Alternative data sources include Korea Fund Ratings (KFR). For the information about the mutual fund data from KFR, please refer to [Lee and Lee \(2023\)](#) and [Kim et al. \(2024\)](#).
4. The classification of stock funds follows the classification criteria of KG Zeroin. KG Zeroin classifies mutual funds into fifteen major types, and this study use mutual funds classified as stock types by KG Zeroin. Stock hybrid funds and bond hybrid funds which invest considerable amounts in bonds are excluded from our sample even if they invest part of their assets in stocks. Also, foreign investment funds such as foreign stock funds are excluded from the sample.
5. KG Zeroin's mutual fund data distinguish between operation funds and class funds in the case of multi-class funds, and master funds and feeder funds in the case of master-feeder funds. In a multi-class fund, multiple class funds with different fee structures derived from a single operation fund are sold to investors. In a master-feeder fund, multiple feeder funds are sold to investors, and a master fund integrates the investments into a single fund.
6. Many existing studies require the minimum amount standard for the average fund net assets of 1 billion or 5 billion Korean won to be included in the sample. This is to consider the characteristics of the Korean fund market where there are many small funds that are not being managed properly. [Ban and Choe \(2013\)](#) examined the relation between fund size and performance in the Korean mutual fund market and argued that fund managers tend to put much less efforts into the management of small funds with assets of less than 5 billion Korean won.
7. In the empirical analyses, only stocks listed in the KOSPI market are employed and the KOSDAQ listed stocks are excluded.
8. This estimation method has a limitation in that detailed transactions between the monthly reporting dates of stock holdings cannot be fully captured. However, this is commonly used method in the related studies and furthermore, the monthly holdings data of this study would provide more finer description of the trading activities of funds than the quarterly or semi-annual holdings data employed in related mutual fund studies in the U.S. market.
9. The relation between return volatility and information asymmetry is not straightforward and therefore, it is unclear whether firms with higher return volatility have stronger information asymmetry.

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