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Relationship Between Fund Attributes and Timing Abilities: Empirical Evidence from Mutual Funds Industry of Pakistan

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Abstract

The timing abilities of fund managers are difficult to observe, therefore, identifying fund attributes explaining fund returns through timing abilities would be helpful to investors in selecting a particular fund. This study is an addition to the scarce literature covering the relationship of fund attributes on timing abilities of the mutual fund industry for an emerging economy, Pakistan, over the period 1999 to 2019. The study has employed a regression approach comprised of two stages. The findings of the study reveal that funds having more exposure to market movements show better market timing abilities and volatility timing abilities but poor selectivity timing abilities. Among all the variables, fund size has the largest impact on selectivity timing ability, depicting the efficiency of managers in selecting the right set of securities. Furthermore, the study concludes that the expense ratio and turnover ratio have a significant positive relationship with market timing abilities. However, the study reports a negative relationship between fund size and market timing ability. For volatility timing ability, the turnover ratio has the strongest effect, followed by market risk and turnover ratio respectively. For other fund attributes, the results report a weak relationship. These results provide valuable insight into the industry to focus more on the quality of the fund attributes resulting in improved timing abilities of fund managers.

Keywords: Market Timing, Selectivity Timing, Volatility Timing, Fund attributes, Pakistan Mutual Fund.

JEL Classification: G11, E120

1. Introduction

A vast strand of literature (Jensen 1968; Shah et al 2005; Afza & Rauf 2009; Ammann et al 2012) investigating the performance of mutual funds and the factors contributing to that performance is available. A pervasive finding in previous literature highlights that the relationship between fund flows and performance is convex-shape, a heavy influx of funds inflows is observed for good past

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performance but funds outflows are not sensitive to past bad performance. Researchers debating the origins and consequences of this area include (Sirri & Tufano 1998; Lynch & Musto 2003; Huang et al 2007). Others focus on comparing the performance across different types of funds (Bauer et al. 2007; Munoz et al. 2014; Leite & Cortez 2015). However, in recent years, researchers have shifted their focus to other dimensions, i.e. whether mutual fund managers are adding any value to the portfolios under their cap, a phenomenon termed as 'timing abilities". The fund manager acts as an insulating layer between the individual investor and the painful fluctuations of market place (Deb et al. 2007). The literature identifies various categories of timing abilities, including market timing, selectivity timing, volatility timing, style timing, liquidity timing, etc.

Ferson & Mo (2016) argue that not only the market timing ability and volatility timing ability of the fund manager determines the investment performance of portfolio managers but selectivity timing ability also plays a vital role in this regard. The literature reports determinants of fund performance, however, very few studies report the factors contributing to the timing abilities of fund managers. As timing abilities of fund managers are difficult to observe, hence information on fund attributes contributing to timing abilities would allow the manager to better manage their timing abilities (Low 2012). Therefore, this paper is an addition to the scarce literature of he relationship between timing abilities and fund attributes. The study explores the extent to which the manager's ability to select securities and timing the market movements and market volatility are connected to fund attributes, such as market beta, size, growth, age, turnover ratio, and expense ratio.

This study triggers the idea of investigating the relationship between timing abilities and fund characteristics for the mutual fund industry of Pakistan. This study is targeting Pakistan mutual fund industry as Romacho & Cortez (2006) and Engstrom (2003) conclude that managers investing in local markets possess a strong information advantage hence leading to better performance of funds. Pakistan, an emerging market differs from developed markets in terms of market characteristics, such as market integrity, market liquidity, size, information symmetry, and government regulations (Kiymaz & Simsek 2017), therefore, the models applicable to developed countries have major limitations when applied to emerging countries. Mutual funds in emerging markets are facing several problems that tend to impede their growth. Klapper & Vittas (2004) argue that the mutual fund industry requires market integrity and market liquidity to grow. Market integrity refers to the phenomenon of information asymmetry and hence difficult for investors to reap the advantages of the information available to them. Market

liquidity is a situation characterized with low transaction costs, therefore investors are not subject to loss caused by large movements in prices. Emerging markets such as that of Pakistan offer an outstanding opportunity to investigate whether the previous results of the short coming of mutual funds to perform in developed markets hold for emerging markets. However, the weak legal framework and underdeveloped financial markets in emerging markets could lead to under-performance. Additionally, to some extent, market inefficiency might also lead the managers towards effective security selection and hence, outclass the market (Bialkowski & Otten 2011).

The history of Mutual funds in Pakistan can be traced back to the 1960s when the first open-ended mutual fund NIT (National Investment Trust) was formed. The launch of the Investment Corporation of Pakistan (ICP) in 1966 makes this fund pioneer for closed-ended mutual funds. The industry after tremendous growth stands at 242 funds with Rs.601 Billion (Net Assets) by November 2018[4]. These figures stimulate the idea to investigate the reasons behind this rapid growth of the fund market.

For Pakistan mutual fund industry, few researchers investigate the selectivity timing abilities, market timing abilities (Shah et al. 2020; Bhatti et al. 2015; Ahmad & Sattar 2016; Nafees et al. 2018). Furthermore, the authors find few studies investigating the volatility timing ability for Pakistan mutual fund market. Maroof & Javid (2016) find the existence of volatility timing ability among funds at an aggregate level. Maroof et al. (2019) find strong evidence for volatility timing ability in a bear market for the Pakistan mutual fund market. However, the authors do not investigate the attributes that could affect the timing abilities of the fund managers.

The literature reports one study investigating the relationship between fund attributes and volatility timing ability by Chen & Liang (2007) for the hedge fund industry. In the context of the mutual fund industry, Low (2012) explores the fund characteristics that help determine a manager's stock-picking ability and market timing ability. To the best of the authors' knowledge, the literature is silent for investigating the relationship between fund attributes and volatility timing for the mutual fund industry. Hence, this study is the first attempt to investigate the relationship between fund attributes and volatility timing ability for the mutual fund industry. Secondly, to the best of our knowledge, there is no previous study investigating the relationship between fund attributes and timing abilities, i.e.

[4] As per Mutual Funds Association Pakistan's website http://www.mufap.com.pk

selectivity timing ability and market timing ability of fund managers for the mutual fund industry of Pakistan.

The current study is contributing to the additional literature in the following ways. This study highlights whether the timing abilities of fund managers could be improved by developing fund attributes in a better way. Therefore, this current study is helpful for practitioners and fund managers as it guides them to improve their timing abilities by paying more attention to fund attributes. Henceforth, this study uses daily returns of 82 mutual funds of Pakistan for the period 2009 to 2019 to estimate the relationship between fund attributes and timing abilities, i.e. selectivity timing ability, market timing ability, and volatility timing abilities. The rest of the paper is structured as follows. Section 2 reviews the relevant literature, followed by section 3 covering methodology for empirical analysis. Section 4 discusses the results followed by Section 5 giving the conclusions, limitations, future research, and policy implications.

2. Literature Review

The literature investigating the relationship between fund attributes and fund performance reports mixed results. Researchers claim that an increase in fund size offers cost advantages as expenses are not directly proportional to size (Tufano & Sevick 1997; Elton et al. 2012,). Margaritis et al. (2007) argue that larger funds outperform smaller funds due to economies of scale. Fund performance increases with growth in fund size (Belgacem & Hellara 2011) as managerial compensation is proportional to fund size (Sirri and Tufano 1998), however, economies of scale can lead to a higher risk of agency problem (Babalos et al. 2012). Nguyen et al. (2018) find a negative effect of fund size on performance and claim that smaller funds have high operating efficiency. Many other researchers document a negative relationship between fund size and fund performance (Becker & Vaughan 2001; Chen et al. 2004; Berk & Green 2004). Graham et al. (2020) find that large size funds lead to high performance both for US and European funds.

Regarding fund age, researchers conclude that fund age is a strong determinant of fund performance. Ferreira et al. (2013) document a positive relationship between fund age and performance. This positive relationship is also reported by (Otten & Bams 2002; Afza & Rauf 2009; Sawicki & Finn 2002). Kiymaz (2017) reports the positive impact of fund age on the performance of SRI funds. On the contrary, literature also reports an inverse relationship between fund age and fund performance. With an increase in fund age, performance decreases attributable to high trading costs (Berk & Green 2004) and diminishing returns (Berk and Green 2004; Pástor et al. 2015). However, others fail to report a

significant relationship between fund age and fund performance (Peterson et al. 2001; Low 2010; Bialkowski and Otten 2011).

Regarding the relationship between turnover ratio and fund performance, the literature presents ambiguous results. Pástor et al. (2017) report a positive relationship between turnover ratio and fund performance and identify portfolio liquidity to be the reason for strengthening this relationship. This result is also reported by researchers (Dahlquist *et al.* 2000; Fortin and Michelson 2005). However, studies (Carhart 1997; Chen et al. 2004, Maftukhah 2020) find statistically a negative relationship between turnover ratio and fund performance. On the contrary, few researchers fail to report any significant relationship between turnover ratio and fund performance (Ippolito 1989; Droms and Walker 1996). Nguyen et al. (2018) find an inverse relationship between turnover ratio and fund performance arguing it is an indication of a reflexive strategy adopted by fund managers.

The literature investigates the relationship between expense ratio and fund performance and reports an inverse relationship between the two variables (Carhart 1997; Gil-Bazo & Ruiz-Verdu 2009; Otten & Bams 2002, Maftukhah 2020). Investigating mutual funds of Polland, Bialkowski & Otten (2011) fail to report any significant impact of expense ratio on fund performance. Regarding fund growth, some suggest that funds experiencing net inflows greater than net outflows subsequently perform better (Gruber 1996; Zheng 1999, Champagne et al. 2018; Nguyen et al. 2018). On the other hand, Dichev (2007) find that funds having fewer cash holdings are a better survivor. Ferreira et al. (2013) fail to report any significant relationship between funds growth and fund performance. Harjono et al. (2017) also fail to find a significant relationship between expense ratio and fund performance.

The rapid growth of the mutual fund industry has highlighted the role and the timing abilities of a fund manager in the overall scenario. Based on the theory of market efficiency, considerable work has been done in measuring managers' performance in terms of timing skills. The first type of skills refers to the intra-asset class selection of the securities i.e. selecting better-performing securities within the same asset class. The second type of skill refers to the ability to select the asset classes that would outclass the benchmark. The former skill is categorized as 'stock-selection' and later as 'market timing'. Stock selection ability has been targeted by many researchers. Selectivity timing is the ability of a fund manager to select stocks that anticipate favorable price movements relative to some benchmark. However, the ability of a fund manager to choose a set of portfolios

based upon market movements is termed as market timing (In et al. 2014). Giambona & Golec (2009) defines the ability of a fund manager to select a portfolio in anticipation of market volatility.

Researchers report the presence of selectivity timing ability (e.g. Romacho & Cortez 2006; Ang & Lean 2013; Munoz et al. 2014; Goo et al. 2015), market timing ability (Tschanz 2010; Elton et al. 2011; In et al. 2014), and volatility timing ability abilities (Busse 1999; Chunhachinda & Tangprasert 2004; Giambona & Golec 2009; Liao et al 2017). However, these studies do not investigate the factors contributing to these timing abilities. The literature reports a few studies investigating the relationship between fund attributes and timing abilities. In this regard, Chen & Liang (2007) investigate how various fund attributes of hedge funds affect various timing skills. i.e. return timing, volatility timing, and joint timing. The authors conclude that smaller funds and onshore funds have a significant relationship between return timing and joint timing. Overall, the study finds a weak relationship between the fund characteristics and timing abilities. They investigate the relationship for hedge funds and this motivates us to investigate the relationship between fund attributes and timing abilities for the mutual fund industry. Low (2012) explores the fund characteristics that help determine a manager's stock-picking ability and market timing ability. The study uses 65 Malaysian unit trust funds for a period from January 2000 to December 2004 and reports a significant relationship between timing coefficients and few fund characteristics. They report a significant negative relationship between selectivity timing and size and market beta, while positive relationship towards growth. On the contrary, size and market beta have a positive relationship with market timing at 5% and the expense ratio has a positive relationship at 10%. Above mentioned studies either find the relationship between fund attributes and performance of mutual funds or investigate the timing ability of mutual funds manager, however, very few studies in the literature explore the relationship between fund attributes and timing abilities. As timing abilities determine the performance of mutual funds (Ferson & Mo 2016), hence, it is also important to identify the fund attributes that could improve the timing abilities of fund managers that would ultimately help mutual funds to perform better.

The current study is making an addition by taking the latest data set till 2019. The study measures the relationship between fund attributes and volatility timing. Henceforth, this is the first attempt to investigate the relationship between fund attributes and volatility timing ability for the mutual fund industry. Secondly, to the best of the authors' knowledge, there is no previous study investigating the

relationship between fund attributes and timing abilities, i.e. selectivity timing ability and market timing ability of fund managers for the mutual fund industry of Pakistan.

3. Methodology

3.1. Data

The purpose of the study is to investigate the relationship between mutual fund attributes and the timing abilities of the Pakistan mutual fund industry. Researchers claim that high-frequency data, i.e daily, captures the time variation in systematic risk in a more efficient way than the low-frequency data. Therefore, daily data of 82 open-end mutual funds for the period of December 2009 to February 2019 is used for this current study. The study accounts only for the companies that remain in existence throughout the study period (Javid & Ahmad 2008). For risk-free asset, the KSE-100 index is used. Then the study regresses the funds' return against a set of fund attributes to investigate their impact on the timing abilities of fund managers. The data of fund attributes (market risk, fund size, growth, fund age, minimum investment, turnover ratio, and expense ratio) has been obtained from the annual reports of the funds. The variables and data sources have been mentioned in Table 1.

Table 1: Variables and Definitions

Variables	Symbols	Definitions	Data Sources
Mutual Fund Returns	R_f	Excess fund return over and above the risk-free asset	MUFAP website
Market Return	R_m	PSX -100 index	PSX website
Selectivity timing ability	α_i	The ability of fund manager to select stock	Treynor & Muzoy (1966) model
Market timing ability	η_i	The ability of fund manager to time market	Treynor & Muzoy (1966) model
Volatility timing ability	λ_i	The ability of fund manager to time volatility	Busse (1999) model
Fund Size	$Size_i$	The natural logarithm of the year-end total net asset value of the fund	Annual reports
Fund Growth	$Growth_i$	The percentage change in fund assets over the previous year	Annual reports
Fund Age	$\beta_4 Age_i$	Age is the natural logarithm of a fund's age	Annual reports
Turnover Ratio	$\beta_5 TUO_i$	measures the aggressiveness of the fund manager	Annual reports
Expense Ratio	$\beta_6 Exp_i$	Expenses incurred by a fund for its operation	Annual reports

3.2. Model Specification

To investigate the relationship between timing abilities and fund attributes, the study computes Ordinary Least Square (OLS) regression analysis comprising of two-stage estimation. The regression objective of the first stage is point-estimation aims at getting the coefficient of timing abilities (selectivity timing,

market timing, and volatility timing) estimated by time series analysis. To calculate the coefficients of selectivity timing ability, market timing ability, and volatility timing ability, first, the returns of the mutual funds are calculated. The mutual funds' prices (Net Asset Values, NAV) are gathered from the MUFAP website. For mutual fund returns, the following formula is used:

$$R_{it} - R_{ft} = \frac{NAV_t - NAV_{t-1}}{NAV_t} \quad (1)$$

In the above equation, R_{it} measures the fund excess return over the risk-free rate (R_{ft}). For risk-free assets, the treasury bills rate is selected. The difference between fund returns and market returns generate the fund excess returns. NAV_t represents the Net asset value of fund 'i' at month t. However, NAV_{t-1} measures the Net asset value of fund 'i' for the previous month (t-1).

Fama (1972) distinguishes the forecasting skills of managers into two separate components: selectivity timing skills and market timing skills. The selectivity timing ability and market timing ability of the funds are measured by Treynor & Muzay (1966) model (Equation 2), however, the volatility timing coefficient is measured by using Busse (1999) model (Equation 3).

The selection of the benchmark affects the results of the performance tests (Grinblatt & Titman 1989). Goetzmann et al. (2000) claim that the Fama-French 3-factor model provides better and less biased coefficients of timing abilities. Therefore, following the Fama-French (1992) and Carhart (1997) model, size (SMB), book-to-market value (HML), and momentum (MOM) factors are added to the model, hence controlling the influence of particular investment strategies adopted by fund managers.

$$R_{pt} - R_{ft} = \alpha_p + \beta_{1p}(R_{mt} - R_{ft}) + \beta_{2p}SMB_t + \beta_{3p}HML_t + \beta_{4p}MOM_t + \eta_p(R_{mt} - R_{ft})^2 + \varepsilon_t \quad (2)$$

α_p measures the selectivity skill and η_p measures the market timing skill respectively.

Then volatility timing coefficient is measured using Busse (1999) model, given in equation

$$R_{pt} - R_{ft} = \alpha_p + \beta_{1p}(R_{mt} - R_{ft}) + \beta_{2p}SMB_t + \beta_{3p}HML_t + \beta_{4p}MOM_t + \gamma_p(\sigma_{mt} - \bar{\sigma}_{mt}) + \varepsilon_t \quad (3)$$

In the above equation, λ_p measures the volatility timing ability of fund managers.

Then in the second-stage conducting cross-sectional estimation, these coefficients of selectivity timing ability, market timing ability, and volatility timing coefficient from equations (2) and (3) are taken as dependent variables/ data points. The second-stage regression aims at point estimation and hypothesis testing too. Hence, in the second stage, the estimated coefficients (obtained from the first stage) are regressed against a set of explanatory variables. After calculating selectivity timing, market timing, and volatility timing coefficients, the relationship between timing abilities and fund attributes is investigated. The relationship between selectivity timing abilities and fund attributes is measured by following the Low model (2012), given in equation (4)

$$\alpha_i = \beta_{0+}\beta_1 Risk_i + \beta_2 Size_i + \beta_3 Growth_i + \beta_4 Age_i + \beta_5 TUO_i + \beta_6 Exp_i + \varepsilon_t \quad (4)$$

β_1 captures the risk value *(Risk)* of a fund and the risk value is calculated using the daily returns of the fund. Size measures the size of the fund and it is calculated by taking the natural logarithm of the year-end total net asset value of the fund and is measured by β_2. β_3 measures the growth in fund assets in 2019 and growth of fund calculated as a percentage change in fund assets over the previous year, i.e.2018. Age is the natural logarithm of the fund's age (in months) since inception till February 2019 and captured by β_4. B_5 represents the turnover ratio of a fund measuring the aggressiveness of the fund manager. β_6, the expense ratio captures the expenses incurred by a fund for its operation.

To measure the relationship between market timing 'η' and fund attributes, equation (5) is used;

$$\eta_i = \beta_0 + \beta_1 Risk_i + \beta_2 Size_i + \beta_3 Growth_i + \beta_4 Age_i + \beta_5 TUO_i + \beta_6 Exp_i + \varepsilon_t \quad (5)$$

Equation (6) is used to explore the relationship between volatility timing 'λ' and fund attributes

$$\lambda_i = \beta_0 + \beta_1 Risk_i + \beta_2 Size_i + \beta_3 Growth_i + \beta_4 Age_i + \beta_5 TUO_i + \beta_6 Exp_i + \varepsilon_t \quad (6)$$

where α_i, η_i, and λ_i represent the selectivity timing, market timing, and volatility timing coefficients measured from the first-stage estimation. Then these coefficients are used as dependents variables in the second stage to explore the relationship between timing abilities and fund attributes.

4. Empirical Results and Discussion

Before discussing the results of this study, it is appropriate to discuss the validity of the estimation technique. The coefficients of the selectivity timing ability, market timing ability, and volatility timing ability are estimated using the four-index model to increase the explanatory power of the model (Kader & Qing 2007; Elton et al 2011).

Table 2: Descriptive Statistics

(Daily Sample for the Period from December 2009 to February 2019)

Variables	Definitions	Mean	Max	Min	Std. Dev	Skewness	Kurtosis
Ri	Return of funds	-0.001	0.028	-0.028	0.016	-5.945	7.734
R_m	Return of Market	0.012	0.042	-0.045	0.008	-0.789	6.467
SMB	Size Portfolio	0.005	0.022	-0.022	0.006	0.043	3.672
HML	Book-Market Portfolio	0.004	0.034	-0.036	0.008	0.068	4.543
MOM	Momentum Portfolio	1.095	0.038	0.075	0.012	20.886	6.428

Note: Table 2 presents the descriptive statistics of the variables used in this study, based on the daily sample of mutual funds of Pakistan for the period December 2009 to February 2019.

Table 2 presents the descriptive statistics of the variables used. The negative value of mutual fund returns depicts that the funds are offering loss to the investors. However, the systematic risk is 1.1%, represented by R_m. The funds return R_i, with a high value of standard deviation appears to be riskier.

Table 3: Unit Root Test

Null Hypothesis *Returns series has a unit root*

	t-Statistic	**Probability**
Augmented Dickey-Fuller test statistic	-60.667	0.0000

The null hypothesis of the Unit-root test assumes that the return series has a common unit root process, with an alternative hypothesis of no common unit root test. We reject the null hypothesis as the probability value is less than 0.01, confirming that the return series data is stationary.

Table A-1 (Appendix) shows the correlation matrix for the timing abilities and different fund attributes. Table A-1 shows a highly significant negative correlation exists between selectivity timing ability and market timing ability suggesting a trade-off between these timing abilities. The negative correlation of -0.804 implies that a manager cannot possess both timing abilities simultaneously. The weak correlation among the variables is confirmed as the coefficient value is less than 0.4, obvious from the values of table 3.

To cater to the potential issue of multi-collinearity among the fund attributes, the variance inflation factor (VIF) test is performed to investigate if multicollinearity exists in a regression analysis or not. Variance inflation factor (VIF) value greater than 10 indicates the presence of multi-collinearity. In our study, the VIF value for every regressor is less than 10, confirming that no multicollinearity exists among the fund variables (reported in the second column of Table 1).

The objective of the second stage analysis is to test the hypothesis regarding the impact of fund attributes on selectivity timing, market timing, and volatility timing of the fund managers. This analysis involves cross-sectional analysis, therefore, the assumption of white-noise is important to have a valid interpretation of the regression equation. Hence statistical tests are performed on equation (4), (5), and (5) to confirm that the regression assumptions are not violated. In this regard, the White test (1980) is performed to identify the presence of heteroscedasticity. The results of the White test are reported in Table A-2 (Appendix). The null hypothesis of the White Test is that errors are homoscedastic, i.e. variance for the errors are constant. The Chi-square (p) value obtained for selectivity timing, market timing, volatility timing is 0.906, 0.924, and 0.300 respectively. We reject the null hypothesis and accept the alternative hypothesis if the probability value lies under a significant level, i.e. 1%, 5%, and 10%. As evident from Table A-2, the chi-square (p) is greater than the cut-off value, therefore, we accept the null hypothesis of homoscedastic errors, i.e. variance of errors is equal. To check the autocorrelation, the Durbin-Watson statistics is used. The Durbin-Watson values for selectivity timing ability, market timing, ability, and volatility timing ability reported are 1.654, 1.759, and 1.772 confirming that no autocorrelation exists in the data.

4.1. Discussions

To investigate the relationship between timing coefficients and fund attributes the selectivity timing, market timing, and volatility timing coefficients are regressed against the fund attributes (market risk, fund size, growth, fund age, turnover ratio, and expense ratio).

4.1.1. Selectivity Timing and Fund Attributes

Table 4 summarizes the cross-sectional results of selectivity timing ability and fund attributes as expressed by equation (4). The dependent variable is the selectivity timing coefficients of funds estimated from the four-index model, given in equation (2). The adjusted R^2 value is 0.379 suggesting that fund attributes seem

to explain 38% of cross-sectional variations in the selectivity timing ability of managers. The study finds a significant negative relationship between market risk and the dependent variable. The market risk being measured by 'β' captures fund sensitivity to market movements. The negative significant relationship between market risk and selectivity timing ability suggests that risky funds with high exposure to market movements are poor selectivity timers or poor stock pickers. As it is difficult to predict market movements, it is more challenging for managers of risky funds to select stocks that would maximize the returns of the funds. Therefore, managers with specialization in stock-selection seem to display poor selectivity performance when funds are highly exposed to market movements. This finding is in line with Low (2012) who finds a significant negative relationship between market risk and selectivity timing coefficient. He argues that such funds should be better managed by managers having market timing abilities who can better predict market fluctuations. On the other hand, a significant positive relationship is reported for fund size, fund growth, and turnover ratio, and selectivity timing ability. The results indicate that increase in fund size is positively related to selectivity timing ability at a 5% significance level. Among all the variables, fund size has the largest impact on selectivity timing ability. With one unit of increase in size, selectivity timing ability increases by 0.067 unit. After fund size, a one-unit increase in turnover ratio and fund growth increases the selectivity timing ability by 0.284 and 0.003 units respectively. However, the results confirm a weak relationship between growth in funds and selectivity timing ability. Additionally, a weak relationship is observed for turnover ratio and, selectivity timing ability. The results for fund growth are incongruent with Low (2012). However, for fund size and turnover ratio, the reported results are in disagreement with Low (2012). He reports a negative significant relationship between fund size and selectivity timing ability and an insignificant relationship between turnover ratio and selectivity timing ability. It is important to note that this study considers the sample of an emerging market where the mutual fund industry is not very developed. Furthermore, this study is considering a different period.

These findings show that other attributes including fund age and expense ratio depict no significant role in explaining the variation of selectivity timing ability.

Considering all the attributes, fund size has the strongest positive impact on selectivity timing ability, followed by turnover ratio and then fund growth

respectively. On the contrary, market risk has a negative effect on the selectivity timing ability, significant at 5%.

Table 4: Relationship Between Selectivity Timing Ability and Fund Attributes

Variables	Coefficient	VIF
Constant	-0.200	
	(-1.267)	
Risk	-0.05**	1.883
	(-2.154)	
Size	0.067***	1.129
	(2.847)	
Growth	0.003*	1.116
	(1.655)	
Age	0.02	1.050
	(1.066)	
Expense ratio	-0.01	1.894
	(-0.581)	
Turnover ratio	0.284*	1.469
	(1.764)	
R^2 value	0.379	
Durbin-Watson	1.654	

Note: Table 4 shows the relationship between selectivity timing abilities (estimated from the four-index model) and the fund attributes for Data ranges from December 2009-February 2019. The results in the parenthesis report t-values. The ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively. The last column shows the value of the Variance Inflation Factor (VIF) for multi-collinearity. Errors are Hetro-adjusted. The value of Durbin-Watson is reported in the last row

4.1.2. Market Timing and Fund Attributes

Table 5 presents the results of the market timing ability and fund attributes, as expressed by equation (5). Here, the dependent variable is the market timing coefficients of funds estimated from the four-index model. The adjusted R^2 value is 0.429 suggesting that fund attributes seem to explain 43 percent of cross-sectional variations in the market timing ability of managers. An interesting fact is reported that market risk behaves in the opposite direction as recorded in the case of selectivity timing ability. The study finds that market risk has a significant positive relationship (0.255) with market timing ability at 5%, whereas selectivity timing ability has a negative relationship with market risk at 5%. This is in line with previous literature, that selectivity timing and market timing ability cannot exist simultaneously. Rather, a tradeoff exists between these two timing abilities. A significant positive coefficient depicts that funds having more exposure to market movements show better market timing abilities as compared to funds with less exposure to market movements. The reason is that managers with market timing skills can anticipate market movements and thus make changes in their portfolios accordingly. The study concludes that the expense ratio and turnover ratio have a significant positive relationship with market timing abilities. These results are in

line with Yi & He (2016). The coefficients reported for expense ratio and turnover ratio are 0.165 and 0.005 respectively, significant at 10% confirming a weak relationship. With a 1% increase in expense ratio and turnover ratio, market timing ability increases by 16.5 and 5% respectively.

Table 5: Relationship Between Market Timing Ability and Fund Attributes

Variables	Coefficient
Constant	-3.692 (-0.650)
Risk	0.255*** (2.580)
Size	-0.154*** (-2.761)
Growth	-0.093 (-0.311)
Age	0.451 (0.469)
Expense ratio	0.165* (1.783)
Turnover ratio	0.005* (1.655)
R^2 value	**0.429**
Durbin-Watson	**1.759**

Note: Table 5 shows the relationship between market timing abilities (estimated from the four-index model) and the fund attributes for Data ranges from December 2009-February 2019. The results in the parenthesis report (t-values). The *** indicates significance at 1%, ** at 5% and * at 10% levels. The value of Durbin-Watson is reported in the last row.

However, fund size has a negative significant relationship with market timing ability, evident by the coefficient value of -0.154, significant at 1%. A one-unit increase in fund size decreases the market timing ability by 0.154 units. However, fund size has a negative significant relationship with market timing ability, evident by the coefficient value of -0.154, significant at 1%. One-unit increase in fund size decreases the market timing ability by 0.154 units.

The negative relationship suggests that an increase in fund size diminishes timing abilities owing to liquidity impact (Chen et al 2004). The fund attributes of growth and age have insignificant coefficients, suggesting that these attributes have no impact on market timing ability.

Out of all the attributes, market risk positively affects the market timing ability, followed by expense ratio and turnover ratio respectively. Fund size also has a significant negative impact on market timing ability.

4.1.3. Volatility Timing and Fund Attributes

Table 6 displays the results of volatility timing ability and fund attributes, as expressed by equation (6). Here, the dependent variable is the volatility timing coefficients of funds estimated from the four-index model. The adjusted R^2 value is 0.521 suggesting that fund attributes seem to explain 52 percent of cross-sectional variations in the volatility timing ability of managers.

Table 6: Relationship Between Volatility Timing Ability and Fund Attributes

Variables	Coefficient
Constant	-0.941 (-0.786)
Risk	0.626*** (3.007)
Size	-1.219 (-0.229)
Growth	0.053 (0.008)
Age	1.588 (0.078)
Expense Ratio	0.455*** (2.490)
Turnover Ratio	0.911*** (2.536)
R^2 value	0.521
Durbin-Watson	1.772

Note: Table 6 shows the relationship between volatility timing abilities (estimated from the four-index model) and the fund attributes for Data ranges from December 2009-February 2019. The results in the parenthesis report (t-values). The *** indicates significance at 1%, ** at 5% and * at 10% levels. The last column shows the value of the Variance Inflation Factor (VIF) for multi-collinearity. The value of Durbin-Watson is reported in the last row

The coefficient of volatility timing is multiplied by -1 (Chen & Liang 2007) to get the same results. The results document a positive relationship between market risk and volatility timing ability at a significant level of 5 percent. It shows that when market risk is high, managers decrease the proportion of their portfolio. Thus the fund managers compensate the investors by altering their portfolio during high volatile periods. Among all the attributes, turnover ratio significantly positively affects the volatility ability, followed by market risk and turnover ratio respectively. The results confirm a positive relationship between turnover ratio and volatility timing ability. When the turnover ratio increases by 1 unit, volatility timing ability increases by 0.911 units. A one-unit increase in market risk and expense ratio

induces volatility timing ability to increase by 0.626 and 0.455 units respectively. 0.455 units respectively.

For other variables including fund size, fund growth, and fund age, the study fails to find any significant relationship thus leading to a conclusion that there exists a weak relationship between fund attributes and timing abilities of mutual funds.

Among the fund attributes, the results show that fund age is the weakest attribute as it remains insignificant for selectivity timing ability, market timing ability, and volatility timing ability. However, the fund risk measured by beta remains the most powerful attribute, as it is statistically significant at 5%. As far as other fund attributes are concerned, i.e. growth, expense ratio, and turnover ratio have relatively a weak relationship with selectivity timing ability, market timing ability, and volatility timing ability.

The other positive relationship is being observed for investment at a significant level of 5%. It depicts that when investment into fund increases, the managers' market timing ability increases as it increases the cash in hand.

5. Conclusions

The performance of mutual funds is dependent on selectivity timing ability, market timing ability, and volatility timing ability. It is difficult to observe the timing abilities of fund managers, hence, identifying fund attributes explaining fund returns through timing abilities would be helpful to investors while making investment decisions. This study examines the fund attributes that could lead towards the identification of funds having superior selectivity timing ability, market timing ability, and volatility timing abilities of the Pakistan mutual fund industry for the period 2009 to 2019. As the industry is still in its infancy age, therefore, this study is limited to a total of 82 open-end funds.

To serve this purpose, first, the selectivity timing ability, market timing ability, and volatility timing ability coefficients for each fund are estimated. This study employs Treynor & Mazuy (1966) model and Busse (1999) models to examine selectivity timing, market timing, and volatility timing skill respectively. Then the obtained timing coefficients are regressed against a set of fund attributes. These fund attributes include market risk, fund size, fund growth, fund age, turnover ratio, and expense ratio. Among all the fund attributes, the findings of the study suggest that only market risk and fund size have a significant relationship with all the timing abilities of the managers. Other fund attributes have a weak relationship with the timing abilities of the fund manager.

The findings of this study are beneficial to the investors and the academicians. The investors are not directly involved in the management of funds hence, these findings on what fund attributes can lead to more polished timing abilities of the managers can help the investors regarding their investment decisions. These findings can also help the researchers to come forward and identify more fund attributes that could affect the timing abilities of fund managers. The current study has some limitations, thus offers many new areas for the researchers to explore. The Pakistan mutual fund industry is still in the growth phase; hence this study is restricted to a few numbers of mutual funds. The constraints of a limited number of funds and a short study time horizon limit the generalizability of our results to the entire industry. The scope of the current study is limited only to investigate the impact of fund attributes on the timing abilities, hence, does not investigate the relationship between attributes of the fund manager and the timing abilities. The researchers can investigate the differential impact of manager personal attributes, e.g. manager age, gender, educational qualification, manager experience, etc. on selectivity timing, market timing, and volatility timing ability of the fund managers. Additionally, the impact of fund attributes can be investigated on different fund categories, i.e. a comparison can be based on Shariah-compliant funds and conventional funds.

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Appendix

Table A-1: Correlation Matrix

Variables	Definitions	STIM	MTIM	VTIM	BETA	AGE	SIZE	GROW	INV	TUO	EXP
STIM	Selectivity timing	1									
MTIM	Market timing	-0.804***	1								
VTIM	Volatility timing	-0.429**	0.353**	1							
BETA	Fund risk	-0.220	0.131	0.451**	1						
AGE	Fund age	0.056	-0.137	-0.057	0.108	1					
SIZE	Fund size	0.297*	-0.211	-0.348*	-0.071	0.140	1				
GROW	Growth	-0.058	0.117	0.005	-0.020	0.236	-0.362**	1			
INV	Minimum investment	-0.148	0.116	0.263	-0.058	0.004	-0.116	0.122	1		
TUO	Turnover ratio	-0.188	0.101	0.435**	0.109	0.108	-0.094	-0.202	-0.043	1	
EXP	Expense ratio	-0.245	0.323*	0.346**	0.456**	0.069	-0.189	0.285	0.124	-0.096	1

Note: Table A-1 shows the correlation matrix of the timing abilities and the fund attributes used in the study. *** shows significant correlation at a 1 percent level of significance. Data ranges from December 2009-February 2019

Table A-2: Results of Heteroskedasticity Test using White Test (1980)

	F-value	Chi-square prob	Adjusted R^2	No. of obs
Selectivity Timing	0.556	0.906	0.224	80
Market Timing	0.531	0.924	0.216	80
Volatility Timing	1.175	0.300	0.379	80

Note: Table A-2 reports the results of a White test to identify Heteroscedasticity of variance errors.