Liquidity Timing Ability of Fund Managers under Changing Market Dynamics*

Hale YALÇIN**, Sema DUBE***

Abstract

We examine the liquidity timing ability of Turkish variable fund managers during 2011-2018, and how this ability is affected by the environmental factors such as the technological advancement level, the presence of derivatives market, the growth in the overall economy, the level of market openness, and the performance of portfolios for bond, gold, real estate, foreign exchange, emerging markets. We use interaction variables within a panel data framework. We find strong evidence of the liquidity timing ability of mutual fund managers even after controlling for environmental factors. The nature of the interactions for most of the control factors with liquidity timing ability is strongly significant and differs based on the factor.

Keywords: *Mutual Funds, Liquidity Timing, Amihud Ratio, Economic Growth, Technology, Openness, Derivatives Market, Bond, Currency, Gold, Real Estate, Emerging Market, Panel Data, Interaction Variables.*

JEL Classification Codes: *G11, O33, C14, C23*

1. Introduction

'Timing' is a tactical asset allocation strategy that sets a fund for certain assets while analyzing the market conditions in the near future. Liquidity timing strategy involves fund managers' allocating away from bonds to stocks during the periods of high stock market liquidity, and from stocks to bonds during the periods of low stock market liquidity. This study searches for evidence for fund managers' liquidity timing ability and factors that interact with this ability. Our sample includes monthly data on the Turkish variable mutual funds from 2011 - 2018. We examine the effects of technological advancement level, market openness, economic growth, currency, commodity, real estate, bond, and emerging market performance on the fund

Original Research Article
Received: 15.01.2021
Accepted: 22.03.2021

* a) This research is a part of the first author's Ph. D. dissertation work titled as ''Essays in Financial Economics: Timing Ability of Mutual Fund Managers'' accepted 2020, at Yeditepe University, Institute of Social Sciences, Doctoral Program in Financial Economics under the supervision of Assoc. Prof. Dr. Sema Dube.
b) An earlier version of this paper was presented at the 4th International Conference on Economics and Finance, Istanbul Gelisim University-University of the West of England, U.K., October 22-23, 2020, Istanbul, TURKEY.
c) Authors would like to thank the Editor, anonymous referees and the participants at the "Gelisim-UWE: 4th International Conference on Economics and Finance" for their insightful comments which improved this work.

** Corresponding author, Dr., Yeditepe University, Institute of Social Sciences, Istanbul, TURKEY.
E-mail: hale.yalcin@yahoo.com https://orcid.org/0000-0003-0807-0102
*** Assoc. Prof. Dr., Yeditepe University, Department of International Finance, Istanbul, TURKEY.
E-mail: sdube@yeditepe.edu.tr https://orcid.org/0000-0003-2092-7308

manager's liquidity timing ability for Turkish variable funds.

Prior research on timing mainly focuses on market timing, that is, the ability of fund managers to time market return (e.g., Treynor and Mazuy, 1966; Henriksson and Merton, 1981; Jagannathan and Korajczyk, 1986; Jiang, 2003), market volatility (e.g., Busse, 1999) or style returns (e.g., Swinkels and Tjong-A-Tjoe, 2007; Chen, Adams and Taffler, 2013). The number of studies on the liquidity timing ability of mutual fund managers is much less compared to the market timing literature. While some studies show that there is weak or no evidence of liquidity timing (e.g., Wang, 2008 p.67; Foran & O'Sullivan, 2017 p: 20) other studies show strong evidence for the fund managers' liquidity timing (e.g., Pukki, 2012; Cao, Simin & Wang, 2013; Cao, Chen, Liang & Lo, 2013; Bazgour, Bodson & Sougne, 2017; Wattanatorn, Padungsaksawasdi, Chunhachinda, & Nathaphan, 2020).

Our results indicate very strong evidence for the Turkish variable fund managers' liquidity timing capability, which increases with growing derivative market size relative to spot markets, increasing economic growth, as well as bond and gold portfolio returns and decreases with real estate and emerging market returns. We also show that the technological advancement level and the market openness affect the mutual fund performance, but it does not interact with the liquidity timing ability of fund managers during our sample period. Our results indicate that liquidity timing is the performance-enhancing strategy for the fund managers and certain environmental factors may increase or decrease the extent to which this strategy improves the performance. We have not seen any other liquidity timing research studying similar issues using the same set of factors and interaction terms within a panel data set, especially for Turkish mutual funds. Our study adds to the literature on the importance of liquidity in investment performance, the evidence for fund managers' liquidity timing ability, and its interacting factors. Liquidity is an important dimension for the markets (e.g., Amihud, 2002; Pastor & Stambaugh, 2002; Acharya & Pedersen, 2005; Yeşildag, 2008) and it will be important to understand how its relation to investment performance changes under changing market conditions.

The remainder of the paper is organized as follows: Section 2 describes the sample data and the methodology. Section 3 reports the results while Section 4 concludes.

2. Data and Methodology

Using a sample of 96 Turkish Variable mutual funds during 2011 – 2018, we search for evidence of liquidity timing-ability for the fund managers.

Greene (2003) defines the panel data analysis as a method that attempts to predict the relationships between the variables using the cross-sectional data with time dimension where it is not adequate to study only with time-series data or cross-sectional data separately.

In order to evaluate fund managers liquidity-timing ability, the following liquidity timing model is adopted from prior literature (for instance, see Pukki, 2012; Cao, Chen, Liang and Lo, 2013; Foran and O'Sullivan, 2017; Bazgour, Bodson and Sougne,2017; Wattanatorn,

Padungsaksawasdi, Chunhachinda and Nathaphan, 2020):

$$\left(\mathrm{R_{p,t}} - \mathrm{R_{f,t}}\right) = \alpha_{\mathrm{p}} + \mathrm{b_{1,p}}\left(\mathrm{R_{m,t}} - \mathrm{R_{f,t}}\right) + \mathrm{c_{1,p}}\left(L_{m,t} - \bar{L}_{m,T}\right)\left(\mathrm{R_{m,t}} - \mathrm{R_{f,t}}\right) + \mathrm{e_{p,t}} \quad [1]$$

where

$R_{f,t}$=Month t rate of return on the risk-free asset (proxied by the one-year Treasury bill),

$R_{p,t}$=Month t rate of return of Turkish Variable Fund P,

$R_{m,t}$=Month t rate of return of the market portfolio (proxied by the BIST-30 Index),

$L_{m,t}$ = Amihud (2002) illiquidity measure for the market in Month t:

$$L_{m,t} = |\mathrm{R_{m,t}}| \,/\, VOLM_{\mathrm{t}}$$

$VOLM_{\mathrm{t}}$ = Natural logarithm of the Market (proxied by the BIST-30 Index) TL transaction volume in Month t,

$\bar{L}_{m,T}$ = Average Amihud (2002) illiquidity measure for the Market (proxied by the BIST-30 Index) in year T, estimated as a moving average of the last 12 months' monthly illiquidity measure:

$$\bar{L}_{m,T} = \frac{1}{\mathrm{M_T}} \sum_{t=1}^{M_{\mathrm{T}}} \boldsymbol{L_{m,t}}$$

and

$\mathrm{M_T}$ = number of months with available data in Year T f our sample period, 2011-2018.

In order to estimate the Market Illiquidity measure, $L_{mt,}$ we follow the Amihud (2002) procedure: First, we determine the firms listed in the BIST 30 Index every period during our sample period, then, for every month, we estimate the daily illiquidity measure of each BIST 30 Index firm using the L_{mt} formula above. After that, we estimate the monthly illiquidity measure for each index firm by taking the average of that firm's daily illiquidity values during that month. Monthly market illiquidity, $L_{mt,}$ is the average of monthly illiquidity measures of all firms listed in the market index that month.

The coefficient $\boldsymbol{c_{1,p}}$ in Equation 1 measures the liquidity timing ability of a mutual fund manager. A significant, positive liquidity-timing coefficient $\mathrm{c_{1.p}}$implies that a fund has higher (lower) market exposure when aggregate market liquidity is higher (lower). In other words, the mutual fund manager is able to increase (reduce) exposure prior to increases (decreases) in liquidity. We expect the sign of the coefficient to be negative since the Amihud illiquidity measure should be inversely related to the fund's premium in the presence of liquidity timing (Amihud & Mendelson, 1986; Amihud, 2002; Cao e al., 2013).

We also examine how changes in certain market conditions affect the fund managers' ability to time the liquidity using:

$$\left(\mathrm{R_{p,t}} - \mathrm{R_{f,t}}\right) = \alpha_{\mathrm{p}} + \mathrm{b_{1,p}}\left(\mathrm{R}_{m,t} - \mathrm{R_{f,t}}\right) + \mathrm{c_{1,p}}\left(L_{m,t} - \bar{L}_{m.T}\right)\left(\mathrm{R}_{m,t} - \mathrm{R_{f,t}}\right) + \mathrm{c_{2,}}\boldsymbol{_p}\, \boldsymbol{Ft} + \mathrm{c_{3,p}}\left[\boldsymbol{Ft}\left(\mathrm{R}_{m,t} - \mathrm{R_{f,t}}\right)\left(L_{m,t} - \bar{L}_{m.T}\right)\right] + \mathrm{e_{p,t}} \quad [2]$$

where F_t is one of DGDP, DT, DOOR, DDMS, DCB, DGLDTR, DFBIST, DXGMYO or DMSCI, each of which represents the percentage monthly change in a controlling factor. We examine the interactions of these control factors with the mutual fund performance and liquidity timing ability of fund managers. These factors are

- Gross Domestic Product (GDP). The monthly Gross Domestic Product values are extrapolated from the quarterly values obtained from the Turkish Statistical Institute database. The economic growth level of the country is represented by the monthly change in the Gross Domestic Product. DGDP denotes the monthly percentage change in GDP.
- Technological Advancement Level (T) is measured by the number of active customers of digital, internet, and mobile banks in the country. The data is obtained by the Banks Association of Turkey. DT denotes the monthly percentage change in T.
- Outward Openness Ratio (OOR) is the ratio of the total of imports and exports to the Gros Domestic Product of the country. The data is obtained from the Turkish Statistical Institute database. DOOR denotes the monthly percentage change in OOR.
- Derivative Market Size (DMS) is the monthly TL transaction volume of the Turkish Derivatives Exchange as a percentage of the monthly TL transaction volume of Borsa Istanbul obtained from Borsa Istanbul. DDMS denotes the monthly percentage change in DMS.
- Currency Basket (CB) monthly closing value. Currency Basket is an equally weighted portfolio of EURO/TL and US Dollar/TL exchange rates. The monthly closing values are obtained from the Foreks FX plus financial platform. DCB denotes the monthly percentage change in CB.
- Istanbul Gold Exchange Traded Fund monthly closing value (GLDTR) obtained from investing.com. DGLDTR denotes the monthly percentage change in GLDTR.
- Finansbank FTSE Istanbul Bond Exchange Traded Fund monthly closing value (FBIST). FBIST is a portfolio of Turkish Government Debt Securities. The data is obtained from investing.com. DFBIST denotes the monthly percentage change in FBIST.
- Borsa Istanbul Real Estate Investment Trust monthly closing value (XGMYO). It is composed of National Market listed companies in the real estate industry. The monthly data is obtained from investing.com. DXGMYO denotes the monthly percentage change in XGMYO.
- MSCI Emerging Markets Index monthly closing value (MSCI). The Morgan Stanley Capital International Emerging Markets Index covers 24 developing and 23 emerging markets

in the world. The data is obtained from investing.com. DMSCI denotes the monthly percentage change in MSCI.

Table 1 presents the descriptive statistics for the variables used in the study. The Capital Markets Board reports 131 variable mutual funds during our sample period. However, we could determine only 96 Turkish variable funds with complete and continuous monthly data for our sample period, 2011-2018.

	Mean	Median	Maximum	Minimum	Standard Deviation
R_P	-0.0126	-0.0024	0.5043	-1.0154	0.107
R_M	-0.0022	-0.0032	0.1433	-0.1396	0.0653
DGDP	0.0124	0.0252	0.0523	-0.05	0.0333
DT	0.019	0.0173	0.1166	-0.0038	0.0164
DOOR	0.0063	-0.0083	0.4543	-0.284	0.1139
DDMS	0.0386	0.025	0.7431	-0.3743	0.2364
DGLDTR	0.0111	0.0021	0.3143	-0.1051	0.0574
DCB	0.0117	0.0092	0.3278	-0.0881	0.0408
DFBIST	0.0052	0.0054	0.1125	-0.0984	0.0237
DXGMYO	0.0014	0.0015	0.2192	-0.1676	0.0676
DMSCI	-0.001	-0.0006	0.1303	-0.1478	0.049
L_M	0.115	0.1056	0.3517	0.0244	0.0653
$\bar{L}_m$	0.1247	0.1191	0.2229	0.0316	0.0544

Notes: This table presents the mean, median, maximum, minimum, standard deviation and number of observations for the variables RP, RM, DGDP, DT, DOOR, DDMS, DGLDTR, DCB, DFBIST, DXGMYO, DMSCI, LM, $\bar{L}_m$ during our sample period, January 2011 - December 2018. Number of observations is 96. RP is the monthly return on the variable type of Turkish Securities Mutual Funds. RM is the monthly market Index returns. The market index is proxied by Borsa Istanbul 30 Index. DGDP is the monthly percentage change in the Gross Domestic Product. DT is the monthly percentage change in the Technological Advancement Level measured by the number of Digital, Internet, and Mobil Banks Users in the country. DOOR is the monthly percentage change in the market outward openness, which is calculated as the sum of import and export value changes as a percentage of GDP. DDMS is the monthly percentage change in the Turkish Derivatives market's monthly TL transaction volume relative to Borsa Istanbul monthly TL transaction volume. DCB is the monthly percentage change in the Currency Basket closing value. The currency basket is an equally weighted portfolio of EURO/TL and US Dollar/TL exchange rates. DGLDTR is the monthly percentage change in the Istanbul Gold Exchange Traded Fund closing value. DFBIST is the monthly percentage change in FTSE Istanbul Bond Exchange Traded Fund closing value. DXGMYO is the monthly percentage change in the Borsa Istanbul Real Estate Investment Trust closing value. DMSCI is the monthly percentage change in the Morgan Stanley Capital International Emerging Markets Index monthly closing value. Lm is the monthly Amihud (2002) market illiquidity measure while $\bar{L}_m$ is the annual Amihud (2002) market illiquidity measure, which is the moving average of the last 12 months' monthly illiquidity measures. In order to estimate the monthly Amihud (2002) market Illiquididty measure, Lm, we first estimate the daily illiquidity measure of each BIST 30 Index firm using the Amihud (2002) illiquidity ratio. After that, we estimate the monthly illiquidity measure for each index firm by taking the average of that firm's daily illiquidity values for each month in our sample period. Lm is the average of monthly illiquidity measures of all firms listed in the market index that month. The data for mutual funds is from the historical statistics section of the Turkish Capital Markets Board website. The data for DGDP and DOOR are from the Turkish Statistical Institute website. The data for DIT is from the Banking Regulation and Supervision Agency website. The data for RM and DDMS are provided by Borsa Istanbul. The data for DGLDTR, DFBIST, DXGMYO, and DMSCI are from the investing.com website while the data for DCB is from the Foreks financial trading platform.

Table 1. Descriptive Statistics, Turkish Variable Mutual Funds, 01/2011 – 12/2018

Table 2 present the cross-correlations for the variables of the study. As Table 2 shows, all correlations among independent variables are small and not economically meaningful, with the exception of the negative correlation of (-0.4932) between economic growth and internet usage. A decrease in economic growth may increase the intensity and duration of financial management and search for funds by individuals as well as institutions, which, in turn, may lead to the increased use of internet banking.

	R_P	R_M	DGDP	DT	DOOR	DDMS	DDCB	DGLDTR	DFBIST	DXGMYO	DMSCI
R_P	1.0000										
R_M	0.0856	1.0000									
DGDP	-0.0095	-0.1368	1.0000								
DT	0.0360	0.07488	-0.4932	1.0000							
DOOR	0.0781	0.1739	-0.385	0.1816	1.0000						
DDMS	-0.0253	-0.1840	-0.0005	0.0480	0.0109	1.0000					
DCB	-0.0208	-0.3618	0.2057	-0.07545	-0.2379	0.09575	1.0000				
DGLDTR	-0.0651	-0.2372	0.1401	-0.06486	-0.3007	0.02633	0.6027	1.0000			
DFBIST	0.0112	0.4833	-0.1069	0.01255	0.1576	-0.07674	**-0.7253**	-0.3168	1.0000		
DXGMYO	0.0758	0.7076	-0.2124	0.1381	0.06252	-0.01081	-0.2745	-0.2046	0.3779	1.0000	
DMSCI	0.0481	0.4660	-0.2035	0.1217	0.1384	-0.0003238	-0.3289	-0.06873	0.2632	0.4401	1.0000

Notes: Cross-correlations for the variables of the study are reported. The sample period is January 2011 to December 2018. The variable definitions are provided in Table 1.

Table 2. Correlation Matrix

We use Variance Inflation Factor (VIF) (Belsley et al., 1980) to verify lack of multicollinearity for the independent variables in our models, and test for stationarity of our variables using the Augmented Dickey-Fuller-Fisher (ADF) (Dickey & Fuller, 1979 and Fisher, 1932) unit root tests. Our unit root test results, omitted here for space sake, show all variables used in regressions to be stationary.

To ascertain the use of panel data analysis and decide on random effects vs fixed effects approach, we conduct the Breusch-Pagan tests and Hausman tests, which compare Swamy-Arora random-effects estimates of coefficients with the related fixed effects estimators (Baltagi, 2008). The fixed effect and random effect model result was shaped and determined using the Hausman Test structure, which was previously made.

As Table 3 shows the Breusch-Pagan Lagrange Multiplier p-values are smaller than zero for all regressions, which support the validity of panel estimation, and the redundant fixed effect tests produce insignificant statistics. The Hausman tests fail to reject the choice of random effects model over the fixed effects model for all equations except the one that uses the Currency Basket (CB) as a control factor.

	Cross-section F Statistics	Cross-section χ^2 Statistics	Hausman Test (χ^2 Statistics)		Breusch-Pagan Test Langrage Multiplier p-value
R_P	0.5716	54.8229	1.2870	*	< 0.000
DGDP	0.5721	54.8876	4.5665	*	< 0.000
DT	0.5805	55.6931	6.2855	*	< 0.000
DOOR	0.5746	55.1243	5.7790	*	< 0.000
DDMS	0.5741	55.0766	6.4981	*	< 0.000
DCB	0.5706	54.7492	9.9329	***	< 0.000
DGLDTR	0.5713	54.8151	3.4016	*	< 0.000
DFBIST	0.5749	55.1584	3.2156	*	< 0.000
DXGMYO	0.5689	54.5862	1.7130	*	< 0.000
DMSCI	0.5719	54.6555	2.6059	*	< 0.000

Notes: The results from the redundant fixed effects, Hausman and Breusch-Pagan tests are reported. This table shows cross-section F and Chi-square (χ^2) statistics for redundant fixed effects, Chi-square statistics for Hausman tests, and the Lagrange Multiplier (LM) probability (p) values for Breusch-Pagan tests. The sample includes 96 mutual funds. The sample period is from January 2011 to December 2018. Models studied:

$$(R_{p,t} - R_{f,t}) = \alpha_p + b_{1,p}(R_{m,t} - R_{f,t}) + c_{1,p}(L_{m,t} - \bar{L}_{m,T})(R_{m,t} - R_{f,t}) + e_{p,t} \text{ [1]}$$

$$(R_{p,t} - R_{f,t}) = \alpha_p + b_{1,p}(R_{m,t} - R_{f,t}) + c_{1,p}(L_{m,t} - \bar{L}_{m.T})(R_{m,t} - R_{f,t}) + c_{2,\boldsymbol{p}}\, F\boldsymbol{t} + c_{3,p}\, F\boldsymbol{t}\,(R_{m,t} - R_{f,t})(L_{m,t} - \bar{L}_{m.T}) + e_{p,t} \text{ [2]}$$

*where (Rm-Rf) is the monthly rate of return on the market portfolio (proxied by the BIST 30 Index return) in excess of the monthly rate of return on the risk-free asset (proxied by the one-year Treasury Bill). F_t is the monthly percentage change in one of the control factors, which are DGDP, DIT, DOOR, DDMS, DCB, DGLDTR, DFBIST, DXGMYO, or DMSCI. These variables are as described in Table 1. ***, **, and * indicate significance at 1%, 5%, and 10%, respectively.*

Table 3. Redundant Fixed Effects, Hausman and Breusch-Pagan Tests

All analyses use panel corrected standard error covariance estimators, which correct for heteroscedasticity and serial correlation problems in panel data (White & Domowitz, 1984; Beck & Katz,1995; Liang & Zeger, 1986; Hansen, 2007b).

3. Empirical Results

In a panel data analysis, a statistically significant coefficient on an independent variable from a regression generally indicates how that independent variable impacts the dependent variable, when the value of the independent variable changes across time and between different funds by one unit. Tables 4 and 5 present the results of our panel data analyses to determine the liquidity timing ability of fund managers using Turkish variable mutual funds and the impact of selected control factors on this ability during January 2011 and December 2018.

Dependent Variable: $(R_{p,t} - R_{f,t})$	
Independent Variables	Coefficients
α_p	-0.0139 ***
$(R_{BIST30,t} - R_{f,t})$	0.1466 ***
$(R_{BIST30,t} - R_{f,t}) * (L_{m,t} - \bar{L}_{m,T})$	-1.3767 ***
R-squared	0.0090
Adjusted R-squared	0.0087
F-statistics	33.4550 ***
Number of Mutual Funds	96
No. of Months per Fund	96

Notes: This table reports the empirical results from the panel data analyses of Model 1:

$$(R_{p,t} - R_{f,t}) = \alpha_p + b_{1,p}(R_{m,t} - R_{f,t}) + c_{1,p}(L_{m,t} - \bar{L}_{m,T})(R_{m,t} - R_{f,t}) + e_{p,t} \quad [1]$$

R_P is the monthly return of each of the 96 Turkish Variable Mutual Funds. (Rm-Rf) is the monthly rate of return on the market portfolio (proxied by the BIST 30 Index return) in excess of the monthly rate of return on the risk-free asset (proxied by the one-year Treasury Bill). All other variables are as described in Table 1. The period of estimation is January 2011 to December 2018. All analyses use panel corrected standard errors (PCSE) covariance estimators, which correct for heteroscedasticity or serial correlation. R-squared, adjusted R-squared, and F statistics are reported.
****, **, and * denote significance at 1%, 5% and 10%, respectively.*

Table 4. Empirical Results: Liquidity Timing Ability of Fund Managers, Turkish Variable Funds, 2011-2018

We use the Amihud (2002) illiquidity measure, which is expected to be positive and larger when the market is more illiquid. A negative coefficient for the Amihud (2002) measure implies that fund managers effectively use liquidity timing when they make investment decisions for their funds; Since we use the ILLIQ proxy, we will be interpreting the sign of $(c_{1,p})$ in reverse.

Table 4 shows that the illiquidity timing coefficient is negative and significant at 1% significance level (-1.3767 ***) indicating that the fund managers' effectiveness in liquidity timing decisions. The Amihud illiquidity measure is significantly and negatively correlated with market returns which means that high (low) level of market liquidity is associated with high (low) market returns.

We also examined how environmental factors interact with the liquidity timing ability of fund managers. Environmental factors; we examined include Economic Growth (DGDP), and changes in the Outward Openness Ratio (DOOR), Technological Advancement level (DT) the Derivative Market Size (DDMS), Currency Basket (DCB); Istanbul Gold Exchange Traded Fund (DGLDTR), Finansbank FTSE Istanbul Treasury Securities Exchange Traded Fund (DFBIST), Borsa Istanbul Real Estate Investment Trust (DXGMYO) and MSCI Emerging Market Index (DMSCI).

Table 5 presents the results from these analyses.

Dependent Variable: $(R_{p,t} - R_{f,t})$					
Panel A	**Control Factor: DGDP**	**Control Factor: DT**	**Control Factor: DOOR**	**Control Factor: DDMS**	**Control Factor: DCB**
α_p	- 0.0134 ***	-0.0175 ***	-0.0145 ***	-0.0128 ***	-0.0140 ***
$(R_{BIST30,t} - R_{f,t})$	0.1569 ***	0.1419 ***	0.1278 ***	0.1556 ***	0.1576 ***
$(R_{BIST30,t} - R_{f,t}) * (L_{m,t} - \bar{L}_{m,T})$	-0.7659 ***	-0.7647	- 1.5207 ***	-0.6285 *	- 1.0321 ***
F_t	-0.0239	0.1928 ***	0.0621 ***	- 0.0077 *	0.0225
$F_t * (R_{BIST30,t} - R_{f,t}) * (L_{m,t} - \bar{L}_{m,T})$	- 29.7595 ***	-34.4850	- 1.6361	- 4.5250 ***	-13.4044 *
R-squared	0.0095	0.0100	0.0134	0.0102	0.0164
Adjusted R-squared	0.0090	0.0095	0.0129	0.0097	0.0031
F-statistics	0.1066	0.1065	0.1064	0.1065	1.2359 *
Number of Mutual Funds	96	96	96	96	96
No. of Monthly Observations per Fund	96	96	96	96	96
Panel B	**Control Factor: DGLDTR**	**Control Factor: DFBIST**	**Control Factor: DXGMYO**	**Control Factor: DMSCI**	
α_p	-0.0128 ***	-0.0127 ***	-0.0145 ***	-0.0134 ***	
$(R_{BIST30,t} - R_{f,t})$	0.1283 ***	0.1757 ***	0.1148 ***	0.1538 ***	
$(R_{BIST30,t} - R_{f,t}) * (L_{m,t} - \bar{L}_{m,T})$	-1.2477 ***	-1.1959 ***	-1.2452 ***	-0.8478 ***	
F_t	-0.1298 ***	-0.2246 ***	0.0797 ***	0.0372 ***	
$F_t * (R_{BIST30,t} - R_{f,t}) * (L_{m,t} - \bar{L}_{m,T}$	-13.7474 ***	-46. 3252 ***	10.8926 ***	18.6238 ***	
R-squared	0.0126	0.0110	0.0111	0.0100	
Adjusted R-squared	0.0120	0.0104	0.0106	0.0094	
F-statistics	23.5762 ***	20.5594 ***	20.7907 ***	18.6871 ***	
Number of Mutual Funds	96	96	96	96	
No. of Monthly Observations per Fund	96	96	96	96	

Notes: This table reports the empirical results from the panel data analyses of Model 2:
$(R_{p,t} - R_{f,t}) = \alpha_p + b_{1,p}(R_{m,t} - R_{f,t}) + c_{1,p}(L_{m,t} - \bar{L}_{m.T})(R_{m,t} - R_{f,t}) + c_{2,\boldsymbol{p}}\, F\boldsymbol{t}\, + c_{3,p}\, F\boldsymbol{t}\,(R_{m,t} - R_{f,t})(L_{m,t} - \bar{L}_{m.T}) + e_{p,t}$ *[2]*

*Where R_P is the monthly return on the variable type of Turkish Securities Mutual Fund; (Rm-Rf) is the monthly rate of return on the market portfolio (proxied by the BIST 30 Index return) in excess of the monthly rate of return on the risk-free asset (proxied by the one year Treasury Bill); F_t is the monthly percentage change in one of the control factors, which are DGDP, DT, DOOR, DDMS, DCB, DGLDTR, DFBIST, DXGMYO, or DMSCI. L_m is the monthly Amihud (2002) market illiquidity measure while $\bar{\boldsymbol{L}}_{\boldsymbol{m}}$ is the annual Amihud (2002) market illiquidity measure. These variables are as described in Table 1. The period of estimation is January 2011 to December 2018. All analyses use panel corrected standard errors (PCSE) covariance estimators, which correct for heteroscedasticity or serial correlation. R-squared, adjusted R-squared, and F statistics are reported. ***, **, and * denote significance at 1%, 5% and 10%, respectively.*

Table 5. Empirical Results: Liquidity Timing Ability of Fund Managers in the Presence of Macro Control Factors, Turkish Variable Mutual Funds, 2011-2018

Table 5 presents that controlling for macroeconomic factors such as economic growth, technology advancement level, market openness, or alternative investments such as gold market, real estate market, similar emerging markets do not change the results obtained in Table 4: There is strong evidence of liquidity timing ability for Turkish variable fund managers during our sample period 2011-2018.

As seen in Table 5, increases in the technology advancement level, market openness, real estate, and emerging markets' returns have significant positive effects while increasing returns in the gold and bond portfolios have significant negative effects on Turkish variable fund returns in our sample during 2011-2018.

For a factor, if the coefficient $(c_{3,p})$ for the interaction term $(F_t * (R_{BIST30,t} - R_{f,t}) * (L_{m,t} - \bar{L}_{m,T})$ is negative and statistically significant, it shows that a raise in any of these control factors enhances the market liquidity timing ability.

The coefficients of the interaction terms for DGDP, DDMS, DGLDTR, and DFBIST are negative and significant at 1%. Increases in economic growth, derivatives market size growth relative to spot market size, gold market returns, and bond portfolio returns increases the liquidity timing ability.

Similarly, the coefficients of the interaction terms for real estate investment trust (DXGMYO) and similar emerging market returns (DMSCI) are positive and significant at 1%. This implies that decreases in the real estate market and similar international market returns increase the liquidity timing ability of fund managers in the domestic market.

Interestingly, the coefficients of the interaction terms for the changes in the technology advancement level (DT), market openness (DOOR) for the country and average foreign exchange rate represented by the currency basket (DCB) are not statistically different from zero implying theses variables does not increase or decrease the liquidity timing ability.

4. Conclusions

We examine the liquidity timing ability of Turkish variable fund managers during 2011-2018 using panel data analyses and state-of-the-art timing methodologies. Our results show strong evidence of liquidity

timing ability for Turkish fund managers during our sample period.

We also examine how environmental factors such as economic growth, changes in the technological advancement level, market openness of the country, foreign exchange rate, and the relative size of the derivatives market, and the returns on bond, gold, real estate portfolios and emerging markets interact with liquidity timing ability of mutual fund managers.

Turkish variable fund managers still exhibit significant liquidity timing ability even after controlling for these market factors. We find that liquidity timing ability of fund managers gets stronger when we observe increases in economic growth, derivatives market size relative to the spot market, gold, and bond market returns. Our findings also show that liquidity timing ability increases when there is a decrease in the real estate market and similar international market returns. Even though the mutual fund returns are positively related to the technology advancement and market openness levels of the country, our results do not show any evidence of interaction between liquidity timing ability and changes in the technological advancement level, the market openness, and the foreign exchange rate during our sample period. Our findings imply that liquidity timing is the performance-enhancing strategy for the fund managers and certain environmental factors may increase or decrease the extent to which this strategy improves the performance. Our results add to the literature on the importance of liquidity in investment performance; To our knowledge, there is no other study that examines the interaction of our environmental factors with the liquidity timing ability of fund managers using panel data analyses and interaction terms.

In the economy and finance literature and over time; as economies developed, as the financial quantities increased, as technology and business volumes progressed, the liquidity timing increased and the values giving positive signals were observed in more academic studies and the empirical results show significant evidence for the application of liquidity timing strategies by mutual fund managers in Turkey and so, our results show that investment fund managers do fulfill the predictions of the liquidity introduction for the future.

REFERENCES

ACHARYA, V. V., & PEDERSEN, L. H. (2005). Asset pricing with Liquidity Risk. *Journal of Financial Economics*, 77(2), 375-410.

AMIHUD, Y. (2002). Illiquidity and Stock Returns: Cross-Section and Time-Series Effects. *Journal of Financial Markets*, 5(1), 31-56.

BALTAGI, B. (2008). Econometric Analysis of Panel Data, 4th Ed. John Wiley & Sons: England.

BALTAGI, B. H., BRESSON, G., & PIROTTE, A. (2007). Panel Unit Root Tests and Spatial Dependence. *Journal of Applied Econometrics*, 22(2), 339-360.

BAZGOUR, T., BODSON, L., & SOUGN, D. (2017). What Style Liquidity Timing Skills Do Mutual Fund Managers Possess? *Financial Review*, 52(4), 597-626.

BECK, N., & KATZ, J. N. (1995). What to Do (and Not to Do) with Time-Series Cross-Section Data. *American Political Science Review*, 89(3), 634-647.

BELSLEY, D. A., KUH, E., & WELSH, R. E. (1980). Regression Diagnostics: Identifying Influential Data and Sources of Collinearity. *John Wiley & Sons: New Jersey*.

BRSA. (2016). *Banking Regulation and Supervision Agency*. Accessed online at: http://www.bddk.org.tr/Data-Category/Banking-Sector-Data/13

BUSSE, J. A. (1999). Volatility Timing in Mutual Funds: Evidence from Daily Returns. *The Review of Financial Studies*, 12(5), 1009-1041.

CAO, C., CHEN, Y., LIANG, B., & LO, A. W. (2013). Can Hedge Funds Time Market Liquidity? *Journal of Financial Economics*, 109(2), 493-516.

CAO, C., SIMIN, T. T., & WANG, Y. (2013). Do Mutual Fund Managers Time Market Liquidity? *Journal of Financial Markets*, 16(2), 279-307.

CHEN, L.-W., ADAMS, A., & TAFFLER, R. (2013). What Style-Timing Skills Do Mutual Fund "Stars" Possess? *Journal of Empirical Finance*, 21, 156-173.

CBRT. (2019, September 19). *Central Bank Republic of Turkey*. Accessed online at: https://www.tcmb.gov.tr

CMB. (2018). *Capital Markets Board Report: Monthly Statistics of Capital Markets Board of Turkey*. Accessed online at: http://www.spk.gov.tr/SiteApps/Yayin/AylikIstatistikBultenleri

DICKEY, D. A., & FULLER, W. A. (1979). Distribution of The Estimators for Autoregressive Time Series with A Unit Root. *Journal of the American Statistical Association*, 74(366a), 427-431.

FAMA, E. F., & FRENCH, K. R. (1993). Common Risk Factors in The Returns on Stocks and Bonds. *Journal of Financial Economics*, 33(1), 3-56.

FISHER, R. (1932). Statistical Methods for Research Workers. Edinburgh: Oliver and Boyd, 1925

FONG, K. Y., HOLDEN, C. W., & TRZCINKA, C. A. (2017). What are The Best Liquidity Proxies for Global Research? *Review of Finance*, 21(4), 1355-1401.

FORAN, J., & O'SULLIVAN, N. (2017). Mutual Fund Skill in Timing Market Volatility and Liquidity. *International Journal of Finance & Economics*, 22(4), 257-273.

GREENE, W. H. (2003). Econometric Analysis. *Pearson Education India*.

HANSEN, C. B. (2007B). Generalized Least Squares Inference in Panel and Multilevel Models with Serial Correlation and Fixed Effects. *Journal of Econometrics*, 140(2), 670-694.

HENRIKSSON, R. D., & MERTON, R. C. (1981). On Market Timing and Investment Performance. II. Statistical Procedures for Evaluating Forecasting Skills. *Journal of Business*, 513-533.

HO, T., & STOLL, H. R. (1981). Optimal Dealer Pricing Under Transactions and Return Uncertainty. *Journal of Financial Economics*, 9(1), 47-73.

HSIAO, C. (2007). Panel Data Analysis-Advantages and Challenges. *Test. 16(1)*, 1-22. *University of Southern California*

HUBERMAN, G., & HALKA, D. (2001). Systematic Liquidity. *Journal of Financial Research*, 24(2), 161-178.

JAGANNATHAN, R., & KORAJCZYK, R. A. (1986). Assessing The Market Timing Performance of Managed Portfolios. *Journal of Business*, 217-235.

JIANG, W. (2003). A Nonparametric Test of Market Timing. *Journal of Empirical Finance*, 10(4), 399-425.

LIANG, K.-Y., & ZEGER, S. L. (1986). Longitudinal Data Analysis Using Generalized Linear Models. *Biometrika*, 73(1), 13-22.

LIPPMAN, S. A., & MCCALL, J. J. (1986). An Operational Measure of Liquidity. *The American Economic Review*, 76(1), 43-55.

LO, A. W., & WANG, J. (2000). Trading Volume:Definitions, Data Analysis, and Implications of Portfolio Theory. *The Review of Financial Studies*, 13(2), 257-300.

MENDELSON, H. (1982). Market Behavior in A Clearing House. *Econometrica: Journal of The Econometric Society*, 1505-1524.

MENDELSON, H. (1985). Random Competitive Exchange: Price Distributions and Gains from Trade. *Journal of Economic Theory*, 37(2), 254-280.

MENDELSON, H. (1986). Liquidity and Stock Returns. *Financial Analyst Journal*, (42).

MILNE, F., & SMITH, C. W. (1980). Capital Asset Pricing with Proportional Transaction Costs. *Journal of Financial and Quantitative Analysis*, 15(2), 253-266.

ØDEGAARD, B. A. (2018). Liquidity–The Amihud Illiquidity Estimator.

PASTOR, L., & STAMBAUGH, R. F. (2002). Liquidity Risk and Expected Stock Returns" Forthcoming in The Journal of Political Economy. *Journal of Political Economy*.

PUKKI, M. (2012). Do Mutual Funds Time Market Liquidity? A Study on US Mutual Fund Performance. *Aalto University*

REINGANUM, M. R. (1981). Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings' Yields and Market Values. *Journal of Financial Economics*, 9(1), 19-46.

RÖTTGER, D., & MELENBERG, B. (2013). The Pricing of Liquidity Risk Around The World.

SWINKELS, L., & TJONG-A-TJOE, L. (2007). Can Mutual Funds Time Investment Styles? *Journal of Asset Management*, 8(2), 123-132.

TREYNOR, J. L. (1980). If You Can Forecast The Market, You Don't Need Anything Else. Editor's Comment. *Financial Analysis Journal*, January-February, 2.

TREYNOR, J., & MAZUY, K. (1966). Can Mutual Funds Outguess The Market? *Harward Business Review*, 44 (4), 131-136.

WALL, L. D. (2018). Financial Stability Implications of New Technology-Federal Reserve Bank of Atlanta.

WANG, Y. (2008). Essays on Mutual Funds, Ph.D. Thesis, *The Pennsylvania State University*

WATTANATORN, W., PADUNGSAKSAWASDI, C., CHUNHACHINDA, P., & NATHAPHAN, S. (2020). Mutual Fund Liquidity Timing Ability in the Higher

Moment Framework. *Research in International Business and Finance*, 51, 101105.

WHITE, H., & DOMOWITZ, I. (1984). Nonlinear Regression With Dependent Observations. Econometrica. *Journal of the Econometric Society*, 143-161.

YEŞILDAĞ, E. (2008). Measurement of The Relationship Between Liquidity and Stock Returns: ISE Application (Master's Thesis, Adnan Menderes University). *Social Sciences Institute*.