PressAcademia

Journal of Business, Economics and Finance
Year: 2014 Volume: 3 Issue: 2

THE EFFECTS OF WEATHER ON INVESTOR BEHAVIOR: A STUDY ON INDIVIDUAL TURKISH STOCK MARKET INVESTORS

Süleyman IC[1], M. Burak KAHYAOGLU[2], Devlet ODABAS[3]

[1]Ondokuz Mayıs University, Faculty of Economics and Administrative Sciences. E-mail: suleyman.ic@omu.edu.tr
[2]Ondokuz Mayıs University, Faculty of Economics and Administrative Sciences.
E-mail: burak.kahyaoglu@omu.edu.tr
[3]Basari University, Faculty of Economics and Administrative Sciences. E-mail: devletodabas@basari.edu.tr

Keywords:

Behavioral finance,
decision making under uncertainty,
risk perception,
weather effect,
investor behavior

ABSTRACT

This study aimed at revealing the effects of weather on the investment behaviors of individual investors transacting at BIST (Borsa Istanbul) in the 2009-2011 period, and determining whether the socio-economic and demographic characteristics of investors created any significant difference in those effects. Unlike other studies conducted on this subject, the present study employed real stock purchase and sales data belonging to investors. The analyses conducted demonstrated that the level of cloudiness and temperature were influential on investor behaviors, and the socio-economic and demographic characteristics of investors created certain differences in those effects. The number of sunny days, the number of overcast days, and sunshine duration were seen to have no effect on investor behaviors.

1. INTRODUCTION

The traditional finance literature suggests that financial markets operate rationally and completely based on economic fundamentals. However, many recent popular studies have argued that psychological factors have an effect on investment decisions. Examining investment decisions from a broader perspective and through an interdisciplinary approach, these studies make an attempt to explain the dynamic financial markets of the present time. Thanks to such broad perspective, many variables that are deemed "non-economic" variables by the traditional finance literature are not ignored anymore. As a result, the number of studies investigating the probable effects of these variables on investment decisions is increasing rapidly. The behavioral financiers investigating the psychological factors influential on investment decisions suggest that the mood of people significantly affects the decisions they make (Saunders, 1993; Hirshleifer and Shumway, 2003).

The mood of people and the factors influential on their mood affect investment assessments in the "investment decision making process", which starts with information gathering, continues with the analysis of the obtained information, and ends with making a decision based on such analysis. Shwarz (1990) and Loewenstein et al. (2001) developed the first theories that associated the mood and feelings with the general decision making process.

According to Cao and Wei (2005), the mood, emotions, and feelings play essential roles in the decisions made by people. Watson (2000) argues that the mood is affected by situational and environmental factors. The only environmental factor that has a potential to have a simultaneous impact on all investors in general is weather conditions. According to psychologists, the weather conditions affect the mood and emotional states of individuals, thereby disrupting optimal decision-making process (Min Yoon and Kang, 2009). The literature contains many studies examining the relationships between the weather variables and human behaviors (Wyndham, 1969; Bell and Baron, 1976; Allen and Fisher, 1978; Bell, 1981; Howarth and Hoffman, 1984; Watson, 2000). Howarth and Hoffman (1984) argued that, humidity rate, temperature, and sunshine amount are the weather variables having the highest influence on the mood of people.

Saunders (1993) was the first person to investigate the relationship between weather and investment behaviors. In his pioneering study conducted on New York Stock Exchange, Saunders obtained hard evidences implying the existence of a negative relationship between the level of cloudiness and stock returns. Later on, similar studies were carried out based on a greater variety of weather variables. Different periods of time were covered in the studies conducted at the stock exchanges of various countries.

The phenomena of globalization and financialization have broadened the profile of investors transacting in financial markets, and have increased their number. At the present time, millions of women and men from every age group, every income group, and every educational level make investments in various markets across the world. Given the potential effect of such a specific variable as weather on investment decisions, important information may be obtained for interpreting financial markets if such effect is revealed.

This study aimed at revealing the effects of weather on the investment decisions of 100 individual investors transacting at Borsa Istanbul (BIST) in the 2009-2011 period. Moreover, considering the expansion in the profile of investors in financial markets, it was investigated what sorts of differences were created by socio-economic and demographic factors in such effects, which was a first in the literature. Real data belonging to 100 individual investors were used in the present study. Such data were extracted from the intermediary. The results of T-tests showed that certain weather variables were influential on investment decisions, and the level of such influence varied by the socio-economic and demographic characteristics of investors.

2. ENVIRONMENTAL PSYCHOLOGY: WEATHER, MOOD, AND DECISION MAKING

Studying the relationship between environment and human behavior, environmental psychology explains many phenomena on this subject. Environment contains many factors including weather, sound, color, buildings, crowd, etc. (Chang et al., 2006, p. 344).

At decision making stage, people are affected by the environmental conditions they face, which disrupts optimal decision making mechanisms. From this perspective, it can be argued that the weather has a large influence area as an environmental factor.

According to Cao and Wei (2000), mood is affected by situational and environmental factors. Hirshleifer and Shumway (2003) state that the mood bears valuable information about the environment. All in all, from a psychological perspective, weather is not regarded as a neutral variable in terms of human behavior, and any changes in this variable have important effect on the mood of people (Dowling and Lucey, 2005, p. 338). Similarly, Min Yoon and Hoon Kang (2009) say that weather conditions are influential on the emotional states/mood of individuals, which disrupts optimal decision making process by affecting behaviors.

Loewenstein (2000) argues that the emotions and feelings experienced at decision making stage generally direct people to display behaviors different from those set through the evaluation of long-term benefits and costs. In 2001, Loewenstein analyzed how making decisions under the influence of feelings diverged from rational decision making process, and argued that one of the significant factors for such divergence was mood. Positive aspects are more apparent than negative aspects in individuals who are in a good mood. The general behavioral effects of good mood can be summarized as follows (Hirshleifer and Shumway, 2003; Chang et al., 2006; Wright and Bower, 1992):

- Optimistic thoughts prevail.
- People are driven to establish unusual relations (innovativeness).
- It improves problem solving performance.
- It makes people to make more positive evaluations on many subjects including life satisfaction, past events, people and products.
- It brings mental flexibility.
- It increases the use of simplifying heuristics at decision making stage.

On the other hand, bad mood causes people to make negative evaluations and attempt to make detailed analytical analyses.

The weather variables found to be influential on the mood of people are sunshine/cloudiness, wind speed, rainfall, humidity rate, temperature, and barometric pressure (Dowling and Lucey, 2005; Pardo and Valor, 2003). According to Bell et al. (2003), people display different behaviors in very hot or very cold weathers. It is argued that violence increases in community in very hot weathers, which is referred to as “long and hot summer effect” by psychologists. As showed by evidences, while low temperature leads to aggression, high temperature causes both slackness and aggression (Cao and Wei, 2005, p. 1559).

While aggression causes people to take more risks, slackness prevents taking the risks. According to Bell (2003), when temperature is over 84.20 F, people feel themselves more impatient and nervous. Similarly, he states that feeling cold also makes people impatient and unhappy. Sunshine is another weather variable influential on human behavior. In his study titled "Environmental Psychology", McAndrew (1993) claims that lack of sunshine makes people melancholic and unhappy, thus people generally feel themselves melancholic in autumn and winter months, and radiotherapy is conducted as a treatment for seasonal depression. As showed by many evidences, when people are exposed to sunshine a lot, they feel themselves better. For example, they become more generous for giving tips (Cunningham, 1979; Rind, 1996), answer research questions more willingly (Cunningham, 1979), and become more voluntary for supporting those people who are in need (Lockard et al., 1976).

2.1. Weather and Investor Behavior

Being the first researcher investigating the relationship between weather and investor behaviors, Saunders (1993) states that weather is influential on stock returns because weather affects the mood of investors. Examining the relationship between the weather of New York and stock returns, Saunders determined a negative relationship between stock returns at New York Stock Exchange and the level of cloudiness. Hırshleifer and Shumway (2003) conducted a study by using stock index returns for 26 stock exchanges belonging to the 1982-1997 period, and obtained findings supporting those of Saunders (1993). Kamstra et al. (2003) investigated the effect of seasonal depression on stock returns. Based on the clinical and psychological evidences showing that longer nights lead to depression, the authors put forward that longer nights are associated with lower stock returns. This relationship has also proven to be true in many international markets.

Pardo and Valor (2003) examined the relationship between the weather and Madrid Stock Exchange Index (MSEI) for the 1981-2000 period, but did not find any relationship between the number of sunny days and humidity rate and index returns. Dowling and Lucey (2005) investigated the relationships between the Irish Stock Exchange index and rainfall, the level of cloudiness, and humidity rate for the 1988-2000 period, and found out that those variables had an effect on returns. In their study on Istanbul Stock Exchange (BIST), Tufan and Hamarat (2004) argued that the number of cloudy days did not have any effect on BIST 100 index.

Cao and Wei (2005) investigated the relationships between temperature and nine international stock index returns of eight countries for the 1962-2001 period. Through analyses, they found out a significant negative correlation between temperature and stock returns in general. Chang et al. (2006) examined the relationships between the Taiwan Stock Exchange index and temperature, cloudiness, and humidity rate for the 1997-2003 period. Based on analyses, they determined that temperature and cloudiness were two important weather variables for the Taiwan Stock Exchange returns (i.e. returns fell when either the temperature became too high or the cloudiness increased).

Keef and Roush (2007) investigated the relationships between daily weather variables and the Australian Securities Exchange stock returns. They found out that stock index returns were not affected by wind speed and the level of cloudiness, but were in a negative relationship with temperature level. Chi Chang et al. (2008) examined the relationships between the weather of New York and New York Stock Exchange daily returns and transactional behaviors for the 1994-2004 period. They determined that stock returns were lower on cloudy days in general, and most of transactions were sales transactions on those days. In addition, they argued that cloudy sky led to high volatility and low transaction volume throughout the day.

In their study on Korea Stock Exchange covering the 1990-2006 period, Min Yoon and Kang (2009) found out that extreme weather conditions had a higher impact on rates of return. Moreover, they stated that extreme low temperature levels had a positive effect on returns in the pre-crisis period, but extreme humidity rates and the level of cloudiness had a negative effect on returns. They stated that weather effect disappeared in the post-1997 crisis period, and told that this might be due to the abolishment of the restrictions imposed on foreign investors and the improvement of electronic purchase and sales systems.

3. THE EFFECTS OF WEATHER ON INVESTOR BEHAVIORS AND THE DIFFERENCES CREATED BY SOCIO-ECONOMIC FACTORS IN THOSE EFFECTS: A STUDY ON INDIVIDUAL BIST INVESTORS

3.1. The Purpose of Study and the Hypotheses Used

This study aimed at revealing the effects of weather on the investment behaviors of 100 individual investors transacting at BIST (Borsa Istanbul) in the 2009-2011 period, and determining whether the socio-economic and demographic characteristics of investors created any significant difference in those effects. The hypotheses tested in the study are as follows:

H_1= There is a significant difference between the months in which the number of sunny days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of fixed income securities in the portfolios of investors.

H_2= There is a significant difference between the months in which the number of sunny days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of purchase transaction.

H_3= There is a significant difference between the months in which the number of sunny days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of sales transaction.

H_4= There is a significant difference between the months in which the number of overcast days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of fixed income securities in the portfolios of investors.

H_5= There is a significant difference between the months in which the number of overcast days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of purchase transaction.

H_6= There is a significant difference between the months in which the number of overcast days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of sales transaction.

H_7= There is a significant difference between the months in which the number of cloudy days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of fixed income securities in the portfolios of investors.

H_8= There is a significant difference between the months in which the number of cloudy days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of purchase transaction.

H_9= There is a significant difference between the months in which the number of cloudy days is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of sales transaction.

H_{10}= There is a significant difference between the months in which the number of monthly sunshine duration is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of fixed income securities in the portfolios of investors.

H_{11}= There is a significant difference between the months in which the number of monthly sunshine duration is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of purchase transaction.

H_{12}= There is a significant difference between the months in which the number of monthly sunshine duration is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of sales transaction.

H_{13}= There is a significant difference between the months in which the number of average temperature is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of fixed income securities in the portfolios of investors.

H_{14}= There is a significant difference between the months in which the number of average temperature is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of purchase transaction.

H_{15}= There is a significant difference between the months in which the number of average temperature is above the seasonal average and the months in which the number of sunny days is below the seasonal average in terms of the ratios of sales transaction.

In addition to these basic hypotheses, the study also investigated whether the socio-economic and demographic characteristics of investors created any difference in the effects of weather on investor behaviors. Therefore, the above-mentioned hypotheses were repeated for each socio-economic and demographic group.

3.2. Research Method and Data

T-test analyses were conducted in order to test the above-mentioned hypotheses. The study employed real data concerning stock purchase and sales transactions carried out by 100 individual investors at BIST between the 4th of January 2009 and the 31st of December 2011. Since the effect of weather was to be investigated, it was deemed suitable to use real data. The data extracted from the intermediary of a bank contained the residential city, gender, age, educational status, and monthly income of any investor as well as such details as date, hour, price, day, amount, and session concerning stock purchase and sales transactions carried out by him/her.

Random sampling method was used for determining the investors whose data would be included in the present study. Those investors whose data were included within the scope of the study resided in different regions of Turkey.

Table 1 presents frequency and percentage distribution concerning the research sample. The review of the frequency and percentage distribution of the research sample shows that it is consistent with the findings of Ede (2007), Dom (2003), and Dogukanli and Onal (2000) on this subject. In other words, the research sample strongly represents the BIST investors.

Based on the data concerning stock purchase and sales transactions extracted from the intermediary, the data about the ratios of fixed income securities in the portfolios of investors, the ratios of purchase transactions, and the ratios of sales transactions were calculated and derived on a monthly basis. Data about the number of sunny days, the number of overcast days, the number of cloudy days, monthly sunshine duration, and average temperature belonging to the cities where investors resided were obtained from the General Directorate of Meteorology (GDM) of Turkey. The reason for the arrangement of data on a monthly basis was that GDM had made out weather data on a monthly basis.

Table 1. Sampling Frequency and Percentage Distributions

Age	**Frequency**	**%**
18-25	1	0,01
26-39	27	0,27
40-55	55	0,55
55-	17	0,17
Total	100	100
Education	**Frequency**	**%**
Primary Education	9	0,09
Senior High School	21	0,21
Undergraduate	43	0,43
Post Graduate	3	0,03
Unknown	24	0,24
Total	100	100
Monthly Income	**Frequency**	**%**
0-999 TL	28	0,28
1.000 TL-2.499 TL	30	0,3
2.500 TL-3999 TL	26	0,26
4.000 TL-	14	0,14
Total	100	100
Gender	**Frequency**	**%**
Female	16	0,16
Male	84	0,84
Total	100	100
Living Region	**Frequency**	**%**
Marmara	35	0,35
Aegean	18	0,18
Mediterranean	13	0,13
Black Sea	10	0,10
Central Anatolia	16	0,16
East Anatolia	6	0,04
S. East Anatolia	4	0,02
Total	100	100

The average monthly ratio of fixed income securities (RFIS) in the portfolio of an investor refers to the part of the portfolio of the investor that consists of fixed income securities (e.g. bonds and bills) on a monthly basis. As is known, investors head for fixed income securities to reduce the portfolio risk when their risk perceptions increase. In this respect, investors may be more pessimistic in months when the number of cloudy days is above the seasonal average and this pessimism may lead to an increase in the ratios of fixed income securities in their portfolios. SGMKO was formulated as follows:

$$RFIS_{it} = \frac{FIS_{it}}{FIS_{it}+VS_{it}}$$

RFISit = the ratio of fixed income securities in the portfolio of the investor number i at t time.

FIS it = the total amount of the fixed income securities held by the investor number i at t time

The total amount of the fixed income securities held by the investor (FISit) and the total values of securities (VSit) were calculated as follows:

$$FIS_{it} = \sum_{h=1}^{n} FIST_{th}$$

FISTth = total amount invested in the fixed income securities h of the investor number i at t time.

$$VS_{it} = \sum_{h=1}^{n} CA_{iht} * WAP_{iht}$$

CAİht = the amount held in the securities h by the investor number i at t time

WAPİht = the weighted average price of the securities h of the investor number i at t time

Since investors purchased the same securities at different prices at different periods, weighted average price (WAP) was used for calculating the value of relevant securities. For example, let's assume that the investor purchased five A securities at t time for TL 4. Then, the investor purchased five more A securities at t+1 time for TL 8. In this case, the weighted average price is calculated as follows:

$$\left(\frac{5}{10} * 4\right) + \left(\frac{5}{10} * 8\right) = 6 \text{ TL}.$$

The ratio of purchase/sales transactions refers to the purchase/sales transactions-related part of total transactional volume achieved by an investor in one-month time period. When weather is fine and sunny, investors can purchase more as a result of the optimism emerging. On the contrary, pessimism emerging on cloudy and overcast days may drive investors to get a sales oriented position.

3.3. Findings and Discussion

Within the scope of the present study, t-tests were carried out in order to determine the differences created by weather in the behaviors of investors. Since seven different geographical regions of Turkey had unique weather conditions, the differences among geographical regions for each weather variable were determined through t-tests in the first place. Table 2 shows the differences found out. It was seen that there were quite significant differences among regions in terms of the weather variables included in the study.

Table 2. Geographical Regions Differ in Terms Of Weather

	Lower	Medium	Upper
Sunny Days	4	1-5	2-3-7
Overcast Days	2-3	1-5-6	4
Cloudy Days	1	2-7-5	3-4
Monthly Sunshine Duration	1-4	6	2-3-5-7
Average Temperature	5-6	1-4-7-2	3

1: Marmara Region, 2: Aegean Region, 3:Mediterranean Region, 4: Black sea Region, 5: Central Anatolia Region, 6: East Anatolia Region, 7: Southeastern Anatolia Region.

Another issue about the effect of weather on human behaviors is seasonality. As is known, weather variables in Turkey considerably differ by seasons. Therefore, seasonal average values were calculated for each weather variable.

These values are indicated in appendix 1. People evaluate any weather condition based on their habits. For instance, while average temperature is 28.08 degrees in summer months in the Mediterranean Region, it is 24.2 degrees in the Marmara region. While a temperature of 24.2 degrees may be perceived to be low for people living in the Mediterranean Region, a temperature of 28.08 degrees may be perceived to be high for people living in the Marmara Region.

Groups related to weather variables were formed according to those average values. When the value of relevant weather variable was lower than the average value indicated in the appendix 1, it was given the group number 1. However, when such value was higher than the average value indicated in the appendix 1, it was given the group number 2. Here, the assumption was that since people were familiar with the weather of the region they lived in, only those values which were above the average could have behavioral impacts. In this way, the reactions of investors living in different geographical regions to seasonal weather changes could be interpreted more soundly.

Table 4 shows the differences in the ratios of fixed income securities in the portfolios of investors, the ratios of purchase transactions, and the ratios of sales transactions by the number of sunny days, the number of overcast days, the number of cloudy days, sunshine duration, and average temperature. The table shows only statistically significant differences.

Based on the examination of table 3, it can be argued that the ratios of fixed income securities in the portfolios of investors increased because investors evaluated the data related to market from a pessimistic perspective in months when the number of cloudy days was above the seasonal average. These findings support the findings of Saunders (1993), Cao and Wei (2005), Chang et al. (2006), Keff and Roush (2007), and Min Yoon and Kang (2009) obtained on this subject. In addition, it is seen that investors carried out fewer purchase transactions, and more sales transactions in months when the monthly average temperature was above the seasonal average. These findings support the findings of Chang et al. (2006) and Chi Chang et al. (2008). At the end of analyses, the hypotheses of H_7, H_{14} and H_{15} were accepted, while the hypotheses of H_1, H_2, H_3, H_4, H_5, H_6, H_8, H_9, H_{10}, H_{11}, H_{12}, and H_{13} were rejected.

Table 3. Differences In Investors Behavior According to The Weather

Group (Cloudy Days)		**N**	**Mean**	**Std. Dev.**	**Std. Err. Mean.**	**F**	**Sig.**	**Sig. (2tail)**
RFIS	1*	572	0,0078	0,031	0,001	24,556	0,00	0,00
	2*	583	0,0181	0,082	0,003			
Group (Average Temperature)		**N**	**Mean**	**Std. Dev.**	**Std. Err. Mean.**	**F**	**Sig.**	**Sig. (2tail)**
Ratio of Purchase	1*	585	0,5844	0,203	0,008	13,912	0,00	0,01
	2*	546	0,5550	0,182	0,007			
Ratio of Sales	1*	585	0,4156	0,203	0,008	13,912	0,00	0,01
	2*	546	0,4450	0,182	0,007			

* No. 1 group, the average and below-average weather of conditions.

* No. 2 group, on-average (extreme) weather of conditions.

Then, data were filtered by gender, age, monthly income level, and educational status. As a result, 8 different data sets were obtained. T-test analyses were repeated, and the effects of socio-economic and demographic factors were investigated. Table 4 contains only the differences found to be statistically significant at the confidence interval of %10.

Table 4. Differences In Investors Behavior According to The Weather (Female Investors)

Group (Cloudy Days)		N	Mean	Std. Dev.	Std. Err. Mean.	F	Sig.	Sig. (2tail)
RFIS	1*	716	0,0119	0,552	0,002	22,005	0,00	0,00
	2*	684	0,0227	0,936	0,003			
Group (Average Temperature)		**N**	**Mean**	**Std. Dev.**	**Std. Err. Mean.**	**F**	**Sig.**	**Sig. (2tail)**
Ratio of Purchase	1*	712	0,5479	0,248	0,009	6,000	0,01	0,06
	2*	740	0,5239	0,236	0,008			
Ratio of Sales	1*	712	0,4521	0,248	0,009	6,000	0,01	0,06
	2*	740	0,4761	0,236	0,008			

* No. 1 group, the average and below-average weather of conditions.

* No. 2 group, on-average (extreme) weather of conditions.

As is seen in table 4, the ratios of fixed income securities in the portfolios of male investors increased in the months when the number of cloudy days was above the average. In addition, the ratios of purchase transactions decreased among male investors in the months when temperature was above the average. Among female investors, no statistically significant difference was found in any investment behavior according to any weather variable. Based on the above-mentioned findings, it can be argued that gender is a significant demographic variable in the context of the effect of weather on investor behaviors.

According to the behavioral finance literature, another socio-economic parameter influential on investment behaviors is income status. Table 5 and Table 6 demonstrate the differences occurring in the investment behaviors of low income group and high income group due to the changes in weather conditions.

Table 5: Differences In Low-income Investors Behavior According to The Weather

Group (Cloudy Days)		N	Mean	Std. Dev.	Std. Err. Mean.	F	Sig.	Sig. (2tail)
RFIS	1*	292	0,0061	0,028	0,001	15,614	0,00	0,03
	2*	286	0,0163	0,075	0,004			
Group (Average Temperature)		**N**	**Mean**	**Std. Dev.**	**Std. Err. Mean.**	**F**	**Sig.**	**Sig. (2tail)**
Ratio of Purchase	1*	282	0,5641	0,186	0,011	6,153	0,01	0,09
	2*	259	0,5387	0,167	0,010			
Ratio of Sales	1*	282	0,4359	0,186	0,011	6,153	0,01	0,09
	2*	259	0,4613	0,167	0,010			

* No. 1 group, the average and below-average weather of conditions.

* No. 2 group, on-average (extreme) weather of conditions.

* Low-income investors, which includes the monthly income of less than 2,499 TL.

Table 6: Differences In High-income Investors Behavior According to The Weather

Group (Cloudy Days)		N	Mean	Std. Dev.	Std. Err. Mean.	F	Sig.	Sig. (2tail)
RFIS	1*	282	0,0096	0,034	0,002	12,539	0,0	0,04
	2*	298	0,0215	0,093	0,005		0	

* No. 1 group, the average and below-average weather of conditions.
* No. 2 group, on-average (extreme) weather of conditions.
* High-income investors, which includes the monthly income of more than 2,500 TL.

According to Table 5 and Table 6, the ratios of fixed income securities in the portfolios of both low income group investors and high income group investors increased in the months when the number of cloudy days was above the average. On the other hand, while the ratios of purchasing transactions increased among low income group investors in the months when temperature was above the average, no change was seen in the investment behaviors of high income group investors in those months when the temperature was above the average. This may be attributed to the fact it is very probable that the areas where high income group investors transacted had ventilation systems (e.g. air-conditioner). In such a case, suffocating weather effect would not influence the investors in that group. The level of cloudiness and temperature affect human behaviors through different channels. While high level of cloudiness leads to pessimistic feelings by preventing being exposed to sunlight, high temperature level has physiological effects including sweating, etc.

Therefore, while ventilation systems alleviate the effect of temperature for high income group investments, they cannot prevent the effect of cloudiness. Age is another important demographic variable argued to be influential on investor behaviors. Table 7 and Table 8 demonstrate the differences occurring in investor behaviors of low age group and high age group due to the changes in weather conditions. According to Table 7 and Table 8, the ratios of fixed income securities in the portfolios of both low age group investors and high age group investors increased in the months when the number of cloudy days was above the average. On the other hand, while the ratios of purchasing transactions increased among high age group investors in the months when temperature was above the average, no change was seen in the investment behaviors of low age group investors in those months when the temperature was above the average. This may be attributed to the fact that as age increases, sensitivity to air temperature rises. Finally, no statistically significant difference was found out in the investment behaviors of low educational level (middle school-high school) group and high educational level group undergraduate-postgraduate) group in the months when the number of sunny days, the number of overcast days, the number of cloudy days, sunshine duration, and average temperature were above the seasonal averages.

Table 7: Differences In Investors Behavior According to The Weather (low-age)

Group (Cloudy Days)		N	Mean	Std. Dev.	Std. Err. Mean.	F	Sig.	Sig. (2tail)
RFIS	1*	180	0,0090	0,033	0,002	16,050	0,00	0,02
	2*	159	0,0263	0,099	0,007			

* No. 1 group, the average and below-average weather of conditions.
* No. 2 group, on-average (extreme) weather of conditions.
* Low age group, which includes the 18-40 years of age.

Table 8: Differences In Investors Behavior According to The Weather (high-age)

Group (Cloudy Days)		N	Mean	Std. Dev.	Std. Err. Mean.	F	Sig.	Sig. (2tail)
RFIS	1	619	0,0124	0,058	0,002	11,595	0,01	0,04
	2	654	0,0206	0,088	0,003			
Group (Average Temperature)		**N**	**Mean**	**Std. Dev.**	**Std. Err. Mean.**	**F**	**Sig.**	**Sig. (2tail)**
Ratio of Purchase	1	632	0,5470	0,249	0,009	6,758	0,00	0,07
	2	681	0,5228	0,232	0,008			
Ratio of Sales	1	199	0,4530	0,249	0,009	6,758	0,00	0,07
	2	164	0,4772	0,232	0,008			

* No. 1 group, the average and below-average weather of conditions.
* No. 2 group, on-average (extreme) weather of conditions.
* High-age group, includes the at the age of 41 and above.

4. CONCLUSION

In recent years, the number of multi-discipline studies on investment decision making process has increased rapidly. Behavioral finance is one of the important fields on this subject. An attempt is made to understand the abnormalities in the financial markets through these studies where the effects of such variables as feelings, weather, psychological factors and personality characteristics, which are regarded as non-economic variables by the traditional finance theory, on investment decisions are investigated. This study aimed at revealing the effects of weather on the investment behaviors of 100 individual investors transacting at BIST in the 2009-2011 period, and determining whether the socio-economic and demographic characteristics of investors created any significant difference in the potential effects of the weather. To this end, real data belonging to investors were used. In this study, a negative relationship was found out between the level of cloudiness and the ratio of fixed income securities in the portfolio of an investor – which represented the risk level perceived by the investor. Likewise, a negative relationship was determined between average temperature level and the ratio of purchase transactions while a positive relationship was found out between average temperature level and the ratio of sales transactions. Furthermore, the socio-economic and demographic characteristics of the investors were found to be influential on the level of being affected by weather.

REFERENCES

- Allen, A. M. and Fisher, G. J. (1978), Ambient Temperature Effects on Paired Associate Learning, Ergonomics *21, 2,* pp. 95-101.

- Bell, P. A. (1981), Physiological Comfort, Performance And Social Effects Oh Heat Stress, Journal of Social Issues*, 37,* pp. 71-94.

- Bell, P. A. and Baron, R. A. (1976), Aggression And Heat: The Mediating Role of Negative Affect, Journal of Applied Social Psychology*, 6,* pp. 18-30.

- Bell, P. A., Greene, T. C., Fisher, J. D. & Baum, A. (2003), Environmental psychology, Publisher Belmont*,* Wadsworth.

- Cao, M. and Wei, J. (2005), Stock Market Returns: A Note on Temperature Anomaly, Journal of Banking and Finance*, 29,* pp. 1559-73.

- Chang, S. C., Chen, S. S., Chou, R. K. & Lin, Y. H. (2008), Weather and Intraday Patterns in Stock Returns and Trading Activity, Journal of Banking and Finance*, 32,* pp. 1754-1766.

- Chang, T., Nieh, C.C., Yang, M. J. & Yang, T. (2006), Are Stock Market Returns Related to the Weather Effects? Empirical Evidence From Taiwan, Physica *A, 364,* pp. 343-354.

- Cunningham, M. R. (1979), Weather, Mood, And Helping Behavior: Quasi Experiments With The Sunshine Samaritan, Journal of Personality and Social Behavior, *37,* pp. 1947-56.

- Dowling, M. and Lucey, B. M. (2005), Weather, Biorhythms, Beliefs and Stock Returns: Some Preliminary Irish Evidence, International Review of Financial Analysis*, 14,* pp. 337-355.

- Hirshleifer, D. and Shumway, T. (2003), Good Day Sunshine: Stock Returns and The Weather, Journal of Finance, *58,* pp. 1009-32,

- Howarth, E. and Hoffman, M. S. (1984), A Multidimensional Approach to the Relationship Between Mood and Weather, British Journal of Psychology, *75*, pp. 15-23.

- Kamstra, M. J., Kramer, L. A. & Levi, M. D. (2003), Winter Blues: A Sad Stock Market Cycle, American Economic Review*, 93***,** pp. 324-343.

- Keef, P. and Roush, M. L. (2007), Daily Weather Effects on the Returns of Australian Stock Indices, Applied Financial Economics*, 17***,** pp. 173-184.

- Lockard, J. S., McDonald, L. L., Clifford, D. A. & Martinez, R. (1976), Panhandling: Sharing of Resources, Science*, 191*, pp. 406-408.

- Loewenstein, G. (2000), Emotions in Economic Theory and Economic Behavior, American Economic Review*, 65*, pp. 426-432.

- Loewenstein, G., Weber, E. U., Hsee, C. K., & Welch, N. (2001), Risk As Feelings, Psychological Bulletin*, 127*, pp. 267-286.

- McAndrew, F. T. (1993), Environmental Psychology, A Division of International Thompson Publishing Inc*,* Brooks/Cole.

- Pardo, A. and Valor, E. (2003), Spanish Stock Returns: Where is the Weather Effect, European Financial Management*, 9*, pp. 117-126.

- Rind, B. (1996), Effects of Beliefs About Weather Conditions on Tipping, Journal of Applied Social Psychology, 26, pp. 137-147.

- Saunders, E. M. (1993), Stock Prices and Wall Street Weather, American Economic Review, *83*, pp. 1337-45.

- Schwarz, N. (1990), Feelings as information. Informational and motivational functions of affective states, in R. Sorentino, and E. T. Higgins, eds.: Handbook of Motivation and Cognition (Guilford Press, New York).

- Tufan, E. and Hamarat, B. (2004), Do Cloudy Days Affect Stock Exchange Returns: Evidence From The Istanbul Stock Exchange, Journal of Naval Science and Engineering*, 2*, pp. 117-126.

- Watson, D. (200), Situational and environmental influence on mood. In: Mood and Temperament. (Guilford Press, New York).

- Wright, W. F. and Bower, G. H. (1992), Mood Effects on Subjective Probability Assessment, Organizational Behavior and Human Decision Process*, 52*, pp. 276-291.

- Wyndham, H. C. (1969), Adaptation to Heat And Cold, Environmental Research*, 2*, pp. 442-469.

- Yoon, M. S. and Kang, S. H. (2009), Weather Effects On Returns: Evidence From The Korean Stock Market., Physica A*, 388*, pp. 682-690.

Appendix 1. Seasonal Averages of Weather Variables by Geographic Region

	SD	OD	CD	MSD	AT
1(F. S.)	7,38	4,96	18,2	115,4	12,6
1(S.)	15,6	3,4	13,4	232,8	24,2
1(L. S.)	10,17	3,68	16,6	112	15,8
1(W.)	5,51	6,94	18,54	54,7	7,8
2(F. S.)	9,74	3,33	18,6	211,2	15,08
2(S.)	23,9	1	7,6	328	27,6
2(L. S.)	16,8	1,58	12,4	218,5	18,3
2(W.)	6,36	4,58	19,3	105,1	9,05
3(F. S.)	7,68	1,79	21,9	231,9	17,2
3(S.)	18,6	1	12,2	319	28,08
3(L. S.)	16,02	2,84	13,5	231,4	21,6
3(W.)	6,47	4,59	19,4	128,4	11,7
4(F. S.)	4,86	7,95	17,9	138,4	11,6
4(S.)	8,8	3,47	19,6	241,8	23,4
4(L. S.)	7,2	6,61	17,1	137,3	16,04
4(W.)	4,11	9,9	16,6	57,7	7,8
5(F. S.)	6,71	3,28	19,9	209,3	15,1
5(S.)	16,7	1,26	13,4	327,9	19,6
5(L. S.)	14,3	4,3	13,6	211,8	10,1
5(W.)	4,22	7,96	17,5	101,3	5,87
6(F. S.)	6,9	5	20,8	180	5,1
6(S.)	17,7	1	13,3	300,4	17,5
6(L. S.)	15,1	2,6	13,6	153,2	7,31
6(W.)	7,2	5,8	15,9	66,7	-5,77
7(F. S.)	7,7	3,8	19,6	205	15,6
7(S.)	23,5	1	7,47	336	31,2
7(L. S.)	17	2,85	12,1	212	19,5
7(W.)	8,52	7	14,2	122,7	6,56

1: Marmara Region, 2: Aegean Region, 3:Mediterranean Region, 4: Blacksea Region, 5: Central Anatolia Region, 6: East Anatolia Region, 7: Southeastern Anatolia Region; SD: sunny days, OD: overcast days, CD: cloudy days, MSD: monthly sunshine duration, AT: average temperature, F.S.:first spring, S.: summer, L.S.: last spring, W.: winter.