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Trading Puzzle, Puzzling Trade *,**,***

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Abstract.
We explore the return performance of individual investors with respect to various factors such as portfolio size, turnover, holding period and also demographic factors: gender and age. We examine the daily trades in Borsa İstanbul (formerly Istanbul Stock Exchange) of 20,000 individual investors over the two year period 2011-2012. Utilizing a weekly data set, we bring new evidence to the current debates on individual investors' trading patterns. Our findings can be summarized as follows: There is a positive relationship between holding period and return up to a certain level. The return of the individual portfolio is positively correlated with the portfolio size. Almost 70% of all individual investors cannot beat the market. Investors who have high turnover underperform compared to those who have lower turnover. Male investors trade more and lose more vis-à-vis the female and older investors have higher returns.
Keywords: *Individual Investor, Turnover, Portfolio Size, Stock Returns, Holding Period.*
JEL Classification: *G02, G12, G14.*

Özet. Alım-Satım Bilmecesi

Bu çalışmada bireysel yatırımcıların getiri performansı; portföy büyüklüğü, işlem hacmi, elde tutma süresi ve bunlara ek olarak demografik faktörler (yaş ve cinsiyet) açılarından incelenmiştir. 20.000 yatırımcının iki yıllık dönem (2011-2012) için Borsa İstanbul pay piyasasındaki işlemlerini içeren haftalık veri seti ile, bireysel yatırımcıların alım-satım davranışları üzerinde yapılan tartışmalara ilişkin yeni bulgular elde edilmiştir. Çalışmanın bulguları şu şekilde özetlenebilir: Elde tutma süresi ile getiri arasında belirli bir seviyeye kadar pozitif bir ilişki bulunmaktadır. Getiri ile porftöy büyüklüğü arasında pozitif bir ilişki bulunmaktadır. Yatırımcıların yaklaşık %70'i piyasayı yenememektedir. Daha yüksek işlem hacmine sahip yatırımcılar, daha düşük işlem hacmine sahip yatırımcılardan daha düşük bir performans göstermektedir. Erkek yatırımcılar kadın yatırımcılara gore daha fazla alım-satım yapar ve daha çok kaybederken, daha yaşlı yatırımcılar daha yüksek getirilere sahiptir.
Anahtar Kelimeler: *Bireysel Yatırımcılar, İşlem Hacmi, Portföy Büyüklüğü, Pay Getirileri, Elde Tutma Süresi.*
JEL Sınıflaması: *G02, G12, G14.*

* This paper's findings, interpretations, and conclusions are entirely those of the authors and do not necessarily represent the views of Borsa İstanbul.
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1. Introduction and Literature Review

Stock market movements are consequences of human judgment, interactions and behavior. Many studies provide extensive evidence that individual traders are imperfectly rational and prone to psychological biases that lead to costly investment mistakes[1]. For example the high trading level of the stock market was claimed to be inconsistent with the rational expectation models (Shiller (1981)). Glaser and Weber (2007) concluded that the rational motives for trade were not sufficient to explain the high trading volume in the stock markets. Even though there are a few contrary results (see Ivkovic and Weisbenner (2005) as an example), many studies showed also that individuals underperform the market.

Several studies attributed individual investors' performance to demographic factors. Goetzmann and Kumar (2008) found that individual investors who are younger and poorer tend to hold more under-diversified portfolios, suggesting that they may exhibit stronger cognitive biases due to their demographic characteristics. Investors might also be less prone to behavioral biases as they grow older and become more experienced (e.g. Feng and Seasholes (2005)[2]). Contrarily, Korniotis and Kumar (2011) argued that cognitive abilities decline with age and they have found evidence to support the notion that investment performance declines with age. Another line of study investigates the gender differences on the return performance and trading behavior. Barber and Odean (2001) showed that men underperform women in stock trading with higher tendency to trade more and significantly inferior return performance. Grinblatt et al. (1997) found that home bias, culture and demographic characteristics may have combined effect on the return performance. Bloomfield et al. (2009) noted the informational aspects on the return performance. However, Felton et al. (2003) and Feng and Seasholes (2008) found no significant evidence for the effect of gender characteristics on the return performance. From another point of view, Tütek et al. (2010) document that female financial advisors give more importance to the probability of gain or loss from financial investments as well as the reliability of financial information than their male counterparts.

This study contributes to the understanding of investor behavior in three ways. First, concerning the scarcity of individual trading data, we add a new market data to the existing field of research which is supposed to contribute to the comparison of investors from different cultures. Huang et al. (2011) noted that Asian markets differ in significant dimensions to the Western markets

1 For abnormal returns: Banz (1981); return pattern related to past performance, Bondt and Thaler (1985), momentum and disposition effect; Jegadeesh and Titman (1993), Barberis and Shleifer (2003), Grinblatt et al. (1997) etc. See Barber et al. (2009, 2012) and Statman (2014) for excellent discussions on the market anomalies that rooted in the individual actions, and Olsen (2010) on conceptual argument.

2 The previous findings convey that the age increases investor's performance due to several reasons such as experience, accumulated information and becoming more risk averse.

especially for the cultural pattern as individuals are more prone to cognitive biases. Also, individual investors dominate the market for the small size stocks. Their study concludes that the fundamental differences in culture can spur the overtrading in the stock market. Gao and Lin (2011) analyzed the individual investors in Taiwan, Feng and Seasholes (2005, 2008) studied the individual investors in China; both studies have found supporting evidence for the cultural characteristics on the return performance. For the Turkish market, based on price and aggregate volume data, Korkmaz and Çevik (2007) find that overconfident investors tend to increase trading activity after getting market return and they are more active in the bull markets. Our study is unique with its regional data of individual investor trade activities from a high turnover MENA region.

Second, this paper contributes to the literature with the weekly performance analysis of individual investors. The portfolio returns of the individuals are calculated weekly contrary to the most of the literature which use monthly aggregated data. We also differ from most of the studies utilizing a sample from the official depository agency of the country, not a single securities firm.

Third, we aim to focus on several features of the potential factors of individual investors that are expected to be correlated with their return performance. We explore the correlation of return performance of individual investors with respect to several factors such as portfolio size, turnover, holding period, gender and age. Aiming at reaching comprehensive picture of individual investors' trading patterns, we handle our unique data set from different approaches. We provide both separate analyses of the possible individual-related factors counted above and cross-sectional combined analyses including all variables together.

Specifically, we add evidence on the effect of portfolio size on which there are opposite findings and no clear consensus in the literature. Also, to the best of our knowledge, this study is one of the first studies that present the effects of holding period on the stock returns. We aim to see if individual investors suffer from inadequate decision for holding stocks in a way that selling them earlier or later than possible optimal holding time. Moreover, our findings indicate that return performance increases with portfolio holding time which can be inferred as evidence that individuals hold shorter than optimal holding period.

Before starting the main findings and discussions, we present that investors, on the average, underperform the market. Our results support the previous papers arguing that the return performances of individual investors are inferior to the market index returns, ceteris paribus. We further demonstrate that, on the average, female investors have higher average weekly returns and lower turnovers than male investors.

We then focus on the relationship between turnover, portfolio size and return performance of the individual investors. As a high turnover stock market, analysis of the turnover of individual investors in Borsa İstanbul may give important insights about the investment practices. Even though only 37% of market capitalization belongs to domestic investors, 83% of all trades are executed by these investors. Our results indicate that as the turnover of individual investors' portfolio increases, the return of the portfolio decreases. On the other hand, as the portfolio size gets bigger, the return increases.

We then explore whether age and gender characteristics of individuals together with turnover have an effect on their return performance. Here, we find that on average women has better performance than men. Likewise, age has a positive effect on the portfolio performance of individual investors. Finally, women earn less compared to men when they get older.

Last, we extend our analysis to the average stock holding periods. Individuals generally hold stocks for a very short period of time compared to the institutional investors[3]. We find that return performance increases with portfolio holding period, which can be inferred as that individual investors could perform better if they held their stocks for longer periods. The rest of the paper is organized as follows. We explain the data and methodology in Section 2. Section 3 gives the empirical results and Section 4 concludes.

2. Data and Methodology

Our dataset, provided by the central securities depository of Turkey (MKK), covers the transactions and holdings in Borsa İstanbul Equity Market. Borsa İstanbul, one of the most advanced emerging markets, is the largest and the most liquid equity market in the Eastern Europe and MENA region together with Moscow Exchange. Equity market has 405 listed companies with $347 billion annual traded value and $301 billion market capitalization as of December, 2012. Even though only 37% of market capitalization belongs to domestic investors, their traded value is quite high, making 83% of the whole trade.

There are 1,090,059 domestic individual investors at Borsa İstanbul Equity Market. For this study, individuals who traded at least once in the two-year period and held portfolios more than 1,000 TRY (approx. $560) as of the end of 2012 are selected which amounts to 250,827 investors. We randomly select 20,000 investors from these investors and used weekly aggregated daily trades for them[4]. Selection of the data is preserved under stratified

3 See Lai et. al. (2013), Kaniel et al. (2008) and Chordia et al. (2011) for individual vs. institutional investors analysis.

4 The data consists of approximately 11 million records (See also Barber and Odean (2001) and Statman et al. (2006) for data selection criteria).

random data characteristics such as the age and portfolio size distribution of the sample is the same as of the population.

The portfolio returns of the individuals are calculated weekly contrary to the most of the literature which uses monthly aggregated data. Higher frequency is preferred with aim of having clearer picture for the performance of individuals since the turnover of the Borsa İstanbul is higher than most other markets (4th highest turnover in the world[5]). When monthly data is used, as returns are calculated monthly using end-of-month portfolio balances, intra-month returns are ignored, e.g. buying a stock in the first week of a month and selling in the second week. Though Barber and Odean (2001) suggests that this does not affect the results significantly, using higher frequency strengthens the reliability of the results. In this direction, as our main measure, turnover, is calculated by aggregated traded value divided by end-of-period portfolio balance; calculating this measure as frequent as possible gives more accurate values.

The representative power of our data compared to other studies also stems from the fact that it is sampled from the depository agency (MKK) rather than a single securities firm. The data is also very reliable due to the fact that equities traded in Borsa Istanbul are fully dematerialized at MKK; therefore the data reflects the official records of the investors' portfolios.

The descriptive statistics of the sample is reported in Table 1. 83.1% of the individual investors are male (Percentage dominance of men was similar in Lease et al. (1974) as 80%, Barber and Odean (2001) as 78.7%). The average age of our sample individuals is 43.4 and average age of women is higher than that of men. Panel B shows that women have higher average portfolio size than men. Descriptive statistics indicate that distributions of the portfolio sizes are clearly positively skewed: the median portfolio size is $8,922, whereas the average portfolio size is $71,943. Although the averages of the portfolio sizes greatly differ for different genders, the median of the portfolio sizes are close to each other for males and females.

5 According to the WFE Statistics as of 2012. http://world-exchanges.org/statistics.

Table 1

Descriptive Statistics by gender of individual investors in Borsa İstanbul. *This table reports the descriptive statistics of age, portfolio size and turnover by investors' gender. The values are as of the end of 2012. Portfolio size values are in US dollars (USD). Portfolio sizes are taken from MKK in Turkish Lira (TRY) and converted to USD by Central Bank of Turkey (CBRT) effective average exchange rate. The source of the raw data is MKK. Average Turnover (weekly average) is calculated as in equation (5). *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Tests for differences in medians are based on Wilcoxon signed rank and Wilcoxon/Mann-Whitney test statistics.*

	All individuals	Women	Men
Number of individuals	20,000	3,390	16,610
PANEL A: Age			
mean	43.4	44.8	43.1
median	42.0	43.0	41.0
standard deviation	11.5	12.6	11.3
PANEL B: Portfolio size			
mean	$71,943	$90,810	$68,092
median	$8,922	$8,036	$9,083
standard deviation	$2,192,690	$3,003,394	$1,987,095

Panel C: Turnover				
	All individuals	Women	Men	Gender Difference
Number of individuals	20,000	3,390	16,610	-
Panel A: Average Turnover				
Mean (%)	113.0	73.3	121.2	-47.9*
Median (%)	38.4	31.2	39.9	-8.7***

To begin the analysis, we first define the turnover as follows[6] :

$$Turnover_{jt} = \frac{1}{2}\left(\frac{TradedValue_{jt}}{\overline{PSize_j}}\right) \quad (1)$$

where TradedValue is calculated as the average of weekly total trades in terms of market value for the each investor j, and $\overline{PSize_j}$ represents the average of end-of week portfolio holdings in terms of market value for the each investor. Hence, $\overline{PSize_j}$ is constant for each investor j in the sample period. Weekly aggregated trade data includes number of shares and values whereas the position data includes only number of shares. Therefore, prices

6 Our calculation methodology is similar to Barber and Odean (2000).

are calculated from trade data and these prices are used to obtain end-of-week portfolio values. Then, we calculate weekly turnovers as 0.5 times the market value of stocks traded in each week divided by the $PSize_j$. The second step is to estimate weekly returns of the investors using the portfolio data and adjusted stock prices, which are obtained from Bloomberg. We first calculate weekly returns of each stock and then calculate weighted weekly raw returns of portfolios:

$$r_{jt}^{raw} = \sum_{i=1}^{s_{jt}} p_{ijt} r_{it} \tag{2}$$

where r_{it} is the weekly return for stock i in week t, p_{ijt} represents the weight that was calculated by dividing the end-of-week market value for stock i to the end-of-week market value of portfolio held by investor j, and s_{jt} is the number of stocks held by investor j. Market adjusted returns are calculated weekly as follows:

$$r_{jt} = r_{jt}^{raw} - r_t^m \tag{3}$$

where r_t^m denotes corresponding weekly rate of return on BIST 100 Index (formerly IMKB 100 Index), main broad value-weighted index of Borsa Istanbul's equity market. Having calculated market adjusted weekly returns in (3) and turnover in (1) for each investor, we calculate the average return $\bar{r}_j$ and average turnover $\overline{Turnover}_j$ for each individual j over T=104 weeks from January 2011 to December 2012 as:

$$\bar{r}_j = \frac{1}{T}\sum_{t=1}^{T} r_{jt} \tag{4}$$

$$\overline{Turnover}_j = \frac{1}{T}\sum_{i=1}^{T} Turnover_{jt} \tag{5}$$

Note that the "average return" is market adjusted by subtracting the market index from raw returns as in (3). Next, to analyze return differences between investors with respect to turnover, investors are sorted into quintiles based on weekly turnover. Also, investors are sorted on the basis of portfolio size. To extend the analysis on the effect of portfolio size, we employ Capital Asset Pricing Model (CAPM) in addition to market adjusted returns:

$$\bar{r}_t - r_t^f = \alpha + \beta\left(r_t^m - r_t^f\right) \tag{6}$$

where $\bar{r}_t$ denotes the average raw return of investors for each week and r_t^f denotes the corresponding risk free rate calculated from the term structure of interest rates of Turkish Treasury bonds. We further analyze the effects of turnover and portfolio size as well as gender and age on average return for each investor in the following cross sectional OLS regression:

$$\bar{r}_j = \beta_0 + \beta_1 \overline{Turnover}_j + \beta_2 Gender_j + \beta_3 Age_j + \beta_4 GenderXAge_j + \beta_5 \overline{PSizeh}_j \quad (7)$$

We did some adjustments to solve non-normality problem in the turnover and portfolio size variables, which have number of extreme observations. The variable "Turnover" which is defined in equation (5) is adjusted in a way that values higher than 100% are taken to be 100%. This restriction affects only 0.2% of the investors in the sample (31 investors among 20,000). $\overline{PSizeh}_j$ is calculated as a dummy variable indicating that the investor has a portfolio higher than the median. The gender is also a dummy variable which equals to 1 if the investor is female. The variable "Age" is the value of investor's age divided by 10.

Last, we repeat the cross-sectional analysis adding the holding periods of investors in each of stocks. Determinants of holding period has been analysed by Shum and Faig (2006), Chung and Wei (2005) but the effect of holding period length on stock return is not presented in the literature, to the best of our knowledge. We aim to see if individual investors suffer from inadequate decision for holding stocks such as trading the stocks earlier or later than potential optimal holding time. We calculate $hold_{ij}$, which is number of consecutive weeks in which the investor holds a stock same amount. We then calculate market value-weighted average of $hold_{ij}$ for each investor. We exclude the stocks number of which is 1 and amount of which is less than TRY 100,- in the portfolios. Then we estimate the following regression in which we add the average holding period and square of the average holding period to the equation 7. The rationale behind adding the square of the holding period is that a possible change in the sign of the coefficient may imply that there is an upper limit for the benefit of holding a stock longer, i.e., some level of optimum holding period exists.

$$\bar{r}_j = \beta_0 + \beta_1 \overline{Turnover}_j + \beta_2 \overline{Holdingperiod}_j + \beta_3 \overline{Holdingperiod^2}_j + \beta_4 Gender_j + \beta_5 Age_j + \beta_6 GenderXAge_j + \beta_7 \overline{PSizeh}_j \quad (8)$$

3. Results

First, we present our results by giving the return performance of individual investors. As Panel B of Table 2 indicates, the average market adjusted return is negative ($\bar{r}_j$ = - 0.28%) which shows that in this high-turnover market, on average the individuals cannot beat the market. 71.1 percent of individuals' average market adjusted returns are negative. The Capital Asset Pricing Model (CAPM) regression given in Table 3 also yields negative (-0.24%, with p-value of 0.13) intercept which infers that the individuals' excess return is less than the market's excess return. Therefore, the average performance

of individuals is worse than the market average. This is consistent with the literature in the sense that Kramer (2012) and Coval and Shumway (2005) showed that only informed individuals can beat the market.

When we divide the data across genders, women significantly outperform men in terms of average market adjusted returns (-0.16% compared to -0.31%). The fifth and the last column show that equality of mean/median adjusted returns of both genders is rejected at 1% level. The results are consistent with the findings of Barber and Odean (2001), Choi et al. (2002) and Charness and Gneezy (2012).

As Panel A of Table 2 shows, turnover for the whole sample is 113%. This result is significantly higher than 8.8% reported by Barber and Odean (2000), 2.52% reported by Kaniel et al. (2008) and 4.7% reported by Foucault et al. (2011)[7]. On the other hand, the median turnover is 38.4%. In some of the other studies, e.g. Barber and Odean (2001), values above 100% is taken as 100%, which decreases the mean, regarding the highly skewed nature of the variable. At this step we do not use such a cap and extreme values have an effect on the high level of mean.

Moreover, the results indicate that both the mean and the median turnover are significantly lower for women than men on the average. In other words, women trade less than men. The results support the previous evidence that men are more likely to be overconfident than women.

Table 2

Turnover and Return Performance of Individual Investors. *Average Turnover is calculated as in equation (5), average return is calculated as in equation (4). Average turnover and return are weekly averages. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Tests for differences in medians are based on Wilcoxon signed rank and Wilcoxon/Mann-Whitney test statistics.*

	All individuals	Women	Men	Gender Difference
Number of individuals	20,000	3,390	16,610	-
Panel A: Average Turnover				
Mean (%)	113.0	73.3	121.2	-47.9*
Median (%)	38.4	31.2	39.9	-8.7***
Panel B: Average Return				
Mean (%)	-0.281***	-0.163***	-0.311***	0.148***
Median (%)	-0.221***	-0.109***	-0.247***	0.138***

7 Concerning that the mentioned studies use monthly data, our weekly calculated result would have been even higher if monthly data had been used.

We further analyze the relationship between return and turnover in more detail. In order to highlight the effect of turnover on the return performance, we sort the individuals according to their turnovers and divide them into quintiles. As Figure 1 clearly indicates, there is an inverse relationship between turnover and average return (Appendix provides detailed results). That is, average return decreases as turnover increases. Consistent with Barber and Odean (2000, 2001), Kramer (2012) and Statman et al. (2006); higher trading activity leads to inferior return performance for individual investors. Note that, highest turnover quintile has almost four times higher turnover than the average individual investor and sixty times higher than the lowest quintile (Panel A of Table 5 in Appendix). This high turnover has mainly been attributed to overconfidence by many studies (Barber and Odean (2000, 2001), Statman et al. (2006), Grossman and Owens (2012), and Lai et. al. (2013)).

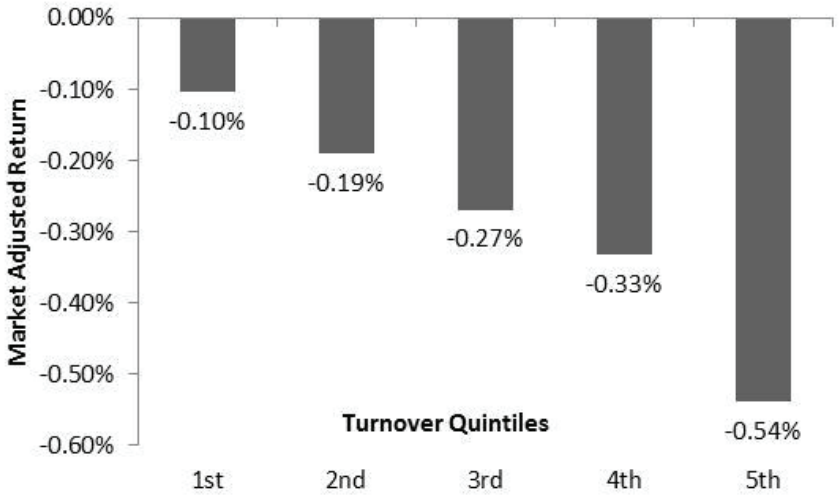

Figure 1. Relationship between Turnover and Return

We then find that there is a positive relationship between average return and portfolio size. Figure 2 shows that, as portfolio size increases, the average return of the investors increases (see Panel B of Table 5 in Appendix for details).

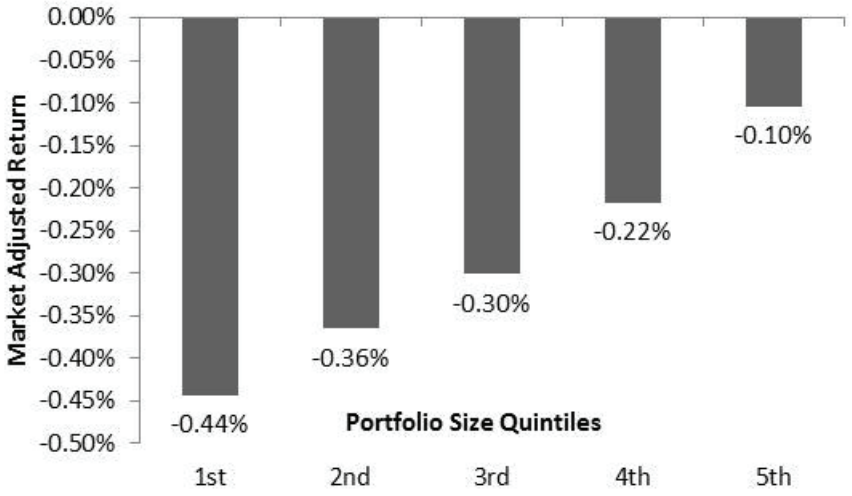

Figure 2. Relationship between Portfolio Size and Return

CAPM analysis across the quintiles of portfolio size provided in Table 3 confirms the positive relationship. The excess return (α), negative in all quintiles, is significant in the lowest three quintiles and increases consistently as portfolio increases. The value of alpha which is -0.24% per week seems excessive; however, it seems consistent with the general market figures. Borsa İstanbul benchmark index (BIST 100) has annual returns of -22.3% and 52.5% in 2011 and 2012 (our sampling period), respectively.

Table 3

Relationship between Portfolio Size and Return: CAPM Results. *This table presents the results of the time series regression analysis performed in equation (6). Alfa is the CAPM intercept and beta is the coefficient on* $(r_t^m - r_t^f)$. All variables are calculated weekly. *t-statistics are in parentheses and *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.*

		Quintile (portfolio size)				
	All investors	1 (low)	2	3	4	5 (high)
Alfa (%)	-0.24	-0.33	-0.32	-0.27	-0.12	-0.09
	(-1.51)	(-2.05)**	(-1.92)*	(-1.64)*	(-1.22)	(-0.66)
Beta (%)	95.34	95.36	95.67	95.61	95.42	94.80
	(20.87)	(20.26)***	(19.89)***	(20.06)***	(20.62)***	(23.27)***

Our results related to the return performance across different portfolio sizes contradict some studies in the previous literature. Barber and Odean (2000) have found that, small portfolios perform better (in terms of market adjusted returns) though the return performance difference is not significantly different than zero. They argue that this difference is likely attributable to the fact that small portfolios tilt more heavily toward small value stocks (see also Kumar (2007) for portfolio diversification and small value stock relationship), which performed well during the sample period. In a similar paper, Shu et al. (2004) sorted the investors in the top turnover quintile by portfolio size and find that, in the highest-turnover quintile; investors with large portfolio values have higher returns. They argue that active investors with large portfolio values tend to be informed traders. However, their analysis is limited with the highest-turnover quintile and they do not report the relationship for the full sample. Hence, small number of investors with extremely high turnover may lead to their result. These investors are very likely to be professional traders and naturally may earn higher returns.

On the other hand, Anderson (2013) documented that portfolio size positively affects returns. He attributed this fact to fees because when fees are excluded from returns, the effect of portfolio size disappears. He found that, overall wealth had a positive influence on performance even after fees. Another explanation is related to investors' cognitive skills. Grinblatt et al. (2011, 2012) found that high-IQ investors are wealthier and have superior trading performance in two separate studies. High-IQ investors may possibly have larger portfolios and perform better.

We clearly document that, even if not including the effect of small-size stock returns mentioned in Barber and Odean (2000), as portfolio size increases market adjusted return increases. This positive relationship can be consequence of the fact that high returns for bigger portfolios may be attributed to lower liquidity constraints for wealthy investors, e.g., they may not have to liquidate their stocks in hard times. The fact that decreasing turnovers as portfolio size increases (Table 5 in Appendix) except the highest-turnover quintile also supports our view. Small investors may try to gain by trading impatiently in the short term with their limited money which may not be allocated solely and comfortably for the equity investment. This behavioral pattern may be an explanation for the combined analysis of return, turnover and portfolio size.

Second, wealthier investors may also benefit more from professional investment services of the industry. As Kramer (2012) and Chang et al. (2009) noted that the individual investors who are superior informed or have better financial advice earn higher returns compared to uninformed

high turnover traders. Our findings also extend the evidence suggesting that irrational investor behaviors are weaker for wealthy investors for several other behavioral biases.

Next analysis is performed via a cross section regression of the returns on the before mentioned variables: turnover, portfolio size, gender together with age. This regression is done in order to control other variables' effect on returns. Results of the equation (7) are given in Table 4, which indicates that all coefficients of the independent variables considered in this study are significant at 1% level. Our finding related to the portfolio size is confirmed here: Portfolio size has a positive and significant coefficient, implying that wealthier investors have better earnings. This may be due to two main reasons as it is discussed above: First, wealthier investor may have lower liquidity constraints to sell their stocks especially in hard times. Second, wealthier investors may be benefiting more from professional services. As Kramer (2012) pointed, "advised portfolios perform much better than self-directed portfolios, thus reducing avoidable risk."

The other variables have the expected signs and significance levels consistent with the literature: Turnover has a negative effect on returns consistent with our previous findings and literature (Barber and Odean (2000, 2001), Statman et al. (2006)). The gender dummy indicates that women have higher returns than men, which confirms our previous findings and the results given by Barber and Odean (2001) and Agnew et al. (2003).[8] Regression results also indicate that the age has a positive impact on investors' performance. Previous literature on learning suggests that, older investors might accumulate greater investment knowledge and exhibit greater awareness of the fundamental principles of investing. Their accumulated investing wisdom could help them make better investment decisions and they might also be less prone to behavioral biases as they grow older and become more experienced (Korniotis and Kumar (2011) and Nicolosi et al. (2009)). On the other hand, the coefficient of genderxage is negative, which suggests that women earn less than compared to men as they get older. According to Korniotis and Kumar (2011), the age-related decline in cognitive abilities is steeper among older women.

8 We also added interaction variable of genderxturnover to the model, results of which are not reported here, to further check whether the better performance of women is due to a gender effect or a consequence of low turnover among women. We find that the coefficient of genderxturnover is positive but insignificant (p-value=0.42), which may support that turnover negatively affects the returns regardless of gender.

Table 4

Cross Sectional Regression of Return. *This table presents the results of the cross-sectional OLS regression analysis performed in equation (7). Market adjusted return and turnover are weekly average values for each investor.*

*Reported are the estimated coefficients with their t-statistics in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Standard errors are corrected for heteroskedasticity.*

Dependent variable	Market adjusted return (%)
Intercept	-0.655
	(-37.88)***
Turnover	-0.009
	(-5.00)***
Gender dummy	0.297
	(7.85)***
Age/10	0.068
	(18.67)***
Gender X Age	-0.037
	(-4.84)***
Portfolio size high	0.149
	(18.69)***
R^2	6.0%
Adjusted R^2	6.0%
F-value	254.16

When we repeat the regression analysis adding the holding period and its square, the findings of the equation 7 are confirmed. All coefficients of the independent variables are significant at 1% level. Our newly added variable, holding period, has a positive significant coefficient, i.e., as the average holding period for a stock gets longer, the average return rises. Interestingly, square of holding period has a negative significant coefficient, which may imply that some level of optimum holding period exists. Simply taking first derivative of the return with respect to the holding period, we calculate the level of holding period maximizing return as 55.4 weeks. Only 456 investors -2.3% of our sample- has an average holding period above this level.

Table 5

Cross Sectional Regression of Return. *This table presents the results of the cross-sectional OLS regression analysis performed in equation (8). Market adjusted return and turnover are weekly average values for each investor.*

*Reported are the estimated coefficients with their t-statistics in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Standard errors are corrected for heteroskedasticity.*

Dependent variable	Market adjusted return (%)
Intercept	-0.722
	(-39.45)***
Turnover	-0.006
	(-3.21)***
Holding period	0.011
	(16.30)***
Holding period^2	-0.0001
	(-11.00)***
Gender dummy	0.254
	(6.73)***
Age/10	0.058
	(16.18)***
Gender X Age	-0.034
	(-4.47)***
Portfolio size high	0.151
	(19.18)***
R^2	7.6%
Adjusted R^2	7.6%
F-value	234.35

4. Conclusion

Concerning the high volume of trade in stock markets, one can ask whether these trades generate high returns or not. As Glaser and Weber (2007) suggested, the rational motives for trade are not sufficient to explain the high trading volume in financial markets. Here, we investigated the individual investors in Borsa İstanbul from a behavioral perspective. We use weekly –higher frequency than most of the studies in the literature- aggregated daily trades of 20.000 individual investors from January 2011 to December 2012. Regarding the limited number of individual data sets utilized in the literature, we expand the data covered in this line of research to a new market, which has one of the highest turnovers throughout the world. This study first documents turnover and return performances of individual investors in Turkey and analyzes the relationship between the two. This analysis is repeated for the return and portfolio size. A regression analysis is carried out to find the effects of several variables such as turnover, holding period, portfolio size, age and gender on the portfolio returns of the individuals. Our analysis provides six important results:

- First, the individual investors underperform the market.
- Second, there is a reverse relationship between turnover and returns.
- Third, there is a positive relationship between holding period and returns. Moreover, there exists an optimum level of holding period.
- Fourth, men trade more than women, and hence they underperform the women.
- Fifth, there is a positive relationship between portfolio size and returns. That is the bigger the portfolio size, the higher the returns.
- Sixth, age has a positive effect on the portfolio returns.

These results are consistent with the behavioral finance literature which suggests that individuals (mainly due to their overconfidence) that trade aggressively have lower returns compared to the average investor. We contribute to the literature by bringing new evidence to the current debates on individual investors' behavioral patterns and give concluding evidence that individual investor trading pattern could be harmful to portfolio performance.

We present important evidence from an emerging market which may have some different behavioral patterns compared to the most of the studies in the literature. We find that there is a positive relationship between portfolio size and returns, on which there is no clear consensus in the previous studies. We also find evidence that as the holding period lengthens, the return increases, up to some level. Our study finds evidence that individual investors hold portfolios less than potential optimal holding period level. Any further studies that elaborate more on the levels of optimal holding period and the dynamics behind the trading patterns related to the individual behavioral biases will add up to the literature. With the accumulating empirical evidence from different countries, cross-cultural or cross-regional insights may more easily be reached in the further studies.

Appendix

Table 5

Returns for Investor Quintiles Based on Mean Turnover and Portfolio Size. *Records of 20,000 investors are sorted into quintiles based on weekly turnover. Quintile 1 contains investors with the lowest turnover; quintile 5 contains investors with the highest. Raw return is the average weekly return for the average investor. Market adjusted return is calculated as subtracting benchmark market index from raw return. Market adjusted return and turnover are weekly average values for each investor. The values are as of the end of 2012. Mean Portfolio size values are in USD dollars. Portfolio sizes are taken from MKK in Turkish Lira (TRY and converted to USD dollar by CBRT effective average exchange rate for 2011 to 2012). The source of the data is MKK.*

		Quintile				
	All investors	1 (low)	2	3	4	5 (high)
Panel A: by turnover						
Mean turnover	113.0%	7.3%	20.8%	38.8%	71.5%	427.8%
Raw return	-0.051%	0.089%	0.020%	-0.038%	-0.077%	-0.251%
Market adj. return	-0.281%	-0.103%	-0.190%	-0.269%	-0.332%	-0.538%
Panel B: by portfolio size						
Mean portfolio size	$71,943	$1,653	$4,647	$9,644	$21,651	$298,316
Mean turnover	113.0%	197.6%	94.5%	92.8%	81.5%	98.9%
Raw return	-0.051%	-0.138%	-0.121%	-0.080%	-0.011%	0.093%
Market adj. return	-0.281%	-0.444%	-0.365%	-0.301%	-0.217%	-0.104%

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