Impact Of Short Selling Activity On Market Dynamics: Evidence From An Emerging Market

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Abstract

With unique daily short sale data of Borsa Istanbul (stock exchange of Turkey), we investigate the dynamic relationship between short selling activity, volatility, liquidity and market returns from January 2005 to December 2012 using a VAR(\(p\))-cDCC-FIEGARCH(1,\(d\),1) approach. Our findings suggest that short sellers are contrarian traders and contribute to efficient stock market in Turkey. We also show that increased short selling activity is associated with higher liquidity and decreased volatility. However this relation weakens during the financial turmoil of 2008. Our results indicate that any ban on short sales may be detrimental for financial stability and market quality of Turkey.

Keywords: short selling, contrarian trading, financial stability, market quality, dynamic conditional correlation

JEL: C51, G11, G14, G18

\textsuperscript{∗}The views expressed in this work are those of the authors and do not necessarily reflect those of the Borsa Istanbul or their members.

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1. Introduction

Short selling has once again attracted the attention of academicians, regulators and general public during the recent global financial crisis as it was the case in similar stock market collapses. While short sellers were blamed for massive declines and panic selling, regulators imposed bans on short sales and introduced new regulations in order to end the downturn in the markets at the peak of the crisis. However, existing finance literature mostly suggests that short selling is a necessary tool to correct the mis-pricing as the prices drift away from fundamental value and that short sales contribute to efficient stock markets. Furthermore, much of the research concludes that constraints on short sales lead to decreased liquidity and higher volatility and thus worsen market quality.

Our study analyzes the relationship between short selling and three variables, namely market return, liquidity and volatility in Turkish stock market. Using stocks included in BIST100; the benchmark index; we calculate aggregate short sales ratio to examine the short selling activity at Borsa Istanbul.\(^1\) Construction of such measure allows us to focus on variation over time in short sales to which previous work has not paid much attention. Using also BIST100 market return and measures of liquidity and volatility, we investigate how short sales co-move with stock prices and study the association between short selling and market quality. BIST100 stocks are highly liquid and trading in those stocks accounts for 86% of total traded value as of end of 2012. Similarly, total market value of BIST100 companies is equal to 83% of total market capitalization at the end

\(^1\)Although short sale characteristics may differ from one stock to another, as far as the stock market is concerned, the important thing is the overall quality thus the aggregate behavior.
of same year. Accordingly, any evidence to support the role of short sellers in enhancing BIST100 market quality will have important policy implications for the whole market as well.

The history of short sellers in Turkey goes back to 1995 when regulators permitted investors to sell stocks short. However, short selling activity in Turkey showed signs of a pick up only after global financial crisis started to affect stock markets around the world. As our research demonstrates, aggregate short sales ratio for BIST100 market, which has never broken 4% level until early 2006 reached as much as 15% in late 2008 and has remained significantly high on average compared to pre-crisis levels. Such statistics point to the presence of an active group of short sellers that appeared with some sort of “wake-up call” and makes Turkish experience an interesting case study.

The fact that, contrary to their international peers, Turkish regulators did not impose any bans on short selling during the crisis is also noteworthy. Many financial economists have examined how market returns, liquidity and volatility were influenced by introduction of such restrictive measures on short selling mostly for developed markets. At this point, it seems legitimate to ask how short selling and its relationship with those variables evolve in a market where no bans were put into effect during these turbulent times.

We believe that our research differs from earlier studies and contributes to current literature in several aspects. Firstly, unlike most of previous studies, we focus on aggregate short selling in the market rather than examine short selling activity at individual stock level. We construct a value-weighted short sales ratio based on the daily short sales of constituent stocks of BIST100. By doing so, we create an easy-to-interpret short selling measure and may follow the evolution of short sales in Turkish market in a straightforward way.\(^2\)

\(^2\)Another advantage of this approach is that it may help us to see if aggregate short selling
Secondly, availability of short sales data at high frequency is limited. For example, in USA the short sale activity per stock is disclosed only on monthly basis. As reported by Diether (2008), short sellers focus on short-term strategies. Consistently, Reed (2007) reports that the median duration of a position in equity lending market is three days and the mode is only one day. As a result, any conclusion derived from studies using low-frequency data will be incomplete. In our study, we employ daily short sales data covering a period of eight years.

Thirdly, the method we apply makes significant contribution to our study: dynamic conditional correlation (DCC) model; which has never been applied in the short selling context; gives us the chance to observe precisely how the level of short selling and its time-varying correlation with other variables change from one day to another.\(^3\)

Lastly, to our best knowledge, this is the first study which investigates short selling activity and its relationship with the stock market in Turkey. While most of the previous research looks at developed markets, our study will present new evidence from a leading emerging market.

Our results show that the global financial crisis has been a trigger for short selling activity in Turkey and aggregate short sales ratio has never come back to pre-crisis levels. Despite the fact that short sellers are blamed for major declines in any financial turmoil, our results point out to the stabilizing role of activity can be considered as a market sentiment measure or not. This is not the scope of this paper however, it will be considered in the forthcoming studies.

\(^3\)Moreover, it has major advantages over its alternative method of rolling window Pearson correlation as the latter is heavily autocorrelated due to the overlapping windows and the choice of the window length and the rolling step can be controversial. Besides, there is a heteroskedasticity problem when measuring correlations, caused by volatility increases during the crisis. DCC is not affected by this problem as it estimates correlation coefficients of the standardized residuals and thus accounts for heteroskedasticity directly.
short sellers in whole sample period including 2008 financial crisis. Moreover, in contradiction with popular view, we demonstrate that increased short sales are associated with higher liquidity and less volatility, thus improving market quality of Turkey.

The remainder of the article is organized as follows: Section 2 provides background on the relationship between short selling and the stock market. Section 3 describes the data and the methodology. Section 4 presents the empirical results and finally, Section 5 concludes.
2. Review

The impact of short selling on stock market is highly controversial and has been much debated especially since recent financial crisis. The popular view that short sellers trigger or exaggerate market declines is shared by governments, regulators and media. However, financial economists approach the issue differently and argue that short sales contribute to efficient markets. In his seminal work, Miller (1977) predicts that short selling constraints lead to overpricing in the stocks. He suggests that if short sellers are restricted from participating in the market, negative information is not impounded into the stock prices and valuations reflect only the opinion of optimist investors. Accordingly, stocks become overvalued. Diamond and Verrecchia (1987), in a rational expectations setting, demonstrate that prices adjust slowly to private information, especially to bad news in the presence of short selling constraints.

Inspired by the predictions of above-mentioned models, many studies focus on the informational role of short selling and how short sale constraints affect stock returns. Using stock loan rates, a direct measure of cost of shorting, Jones and Lamont (2002) find that stocks expensive to short are overpriced and have low subsequent returns. Chang et al. (2007) examine the price effects following the addition of individual stocks to a “shortable stocks” list and conclude that short sale constraints cause over-valuation. Boehmer and Wu (2013) demonstrate that while greater shorting flow enhances intra-day informational efficiency, it also speeds up the incorporation of public information into stock prices at longer horizons. As a result, prices are more accurate when short sellers trade more actively. Consistently, Chen and Rhee (2010), using data from Hong Kong market, provide evidence that short sales quicken the price adjustment not only to private/public firm specific information but also market-wide information. For the same market, similar results come from Easton et al. (2013)
where authors find direct evidence that the removal of short-sale constraints generates trading activity in favor of the correct pricing.

Other studies focus on whether short sellers are informed traders. Desai et al. (2002) report that those who sell stocks short target liquid firms whose prices are high relative to their fundamentals. Diether et al. (2009) find that short sellers are contrarians and trade on short-term overreaction of stock prices as evidenced by their increased trading activity after rising returns in last five days. Boehmer et al. (2010) reveal that short sellers are successful in identifying overvalued and undervalued stocks. Bailey and Zheng (2012), employing daily short sales data for 175 financial companies, analyze the effect of short selling on the stocks in both pre-crisis and crisis periods in USA and demonstrate that daily shorting tends to rise with the stock’s return rather than increasing with poor return in pre-crisis period. Those studies document that short sellers are informed traders and their transactions help correct overpricing. A careful review of short selling literature shows that most of the work is in cross-sectional nature. Following a different approach, Lamont and Stein (2004) construct a value-weighted short sales ratio from monthly data and analyze its correlation with index return over prior 12 months for US market. The results document a highly negative correlation even at the peak of technology bubble in 2000, which is in contradiction with conclusions of cross-sectional studies. The authors argue that rather than too much shorting in a declining market, too little shorting in a rising market is a problem and any efforts to restrict short sales are likely to be misguided. Similar to Lamont and Stein (2004), Lynch et al. (2014) investigate the relationship between aggregate short selling and market return and find that short sellers do not trade against the market, thus they are momentum investors with regard to market return.

Another line of short selling research examines the association between short
sales and market liquidity and volatility. Autore et al. (2011) argue that restricting short sales may lead to declines in market liquidity through at least three channels. First, short sellers who have a notable share in total trading volume are banned from the market. Secondly, even though institutional funds want to take long positions in stocks, they may prefer not to do so if they can not hedge themselves due to shorting constraints. Thirdly, decreasing information flow resulting from short selling prohibitions increases uncertainty and this may lead to lower trading activity. The association between short sales and market volatility has not received much attention. Furthermore, while previous studies provide mixed empirical evidence regarding such relationship, they do not present a widely accepted theory about how shorting affects market volatility. Most of the studies apply event-study methodology and investigate whether short selling constraints has any effect on market quality.

Charoenrook and Daouk (2005) collect data on the short-selling and put option (a reduction in short sale constraints) trading regulations and practices from 111 countries and conclude that when short selling is possible, aggregate stock returns are less volatile and there is greater liquidity. The findings of Diether et al. (2009) and Bailey and Zheng (2012) that there is a positive relation between short selling and stock returns also point to the stabilizing role of short sellers in the market. On the other hand, Chang et al. (2007) examine the price effects after the inclusion of stocks into a ‘shortable stocks’ list and show that short sale constraints increase volatility. Lynch et al. (2014) conclude that aggregate short selling is higher when market is more illiquid and volatile. Other studies focus on the effects of regulatory restrictions on market liquidity and volatility during 2008 financial crisis. Marsh and Payne (2012) report that the liquidity in the market for financial stocks in UK drained away during the short selling ban. Boehmer et al. (2013) find that in US, the market quality
worsened during the ban on short selling as the bid-ask spreads widened and price volatility increased significantly for banned stocks. Consistently, Beber and Pagano (2013), investigating the impact of such bans on stock markets in 30 countries during financial crisis, conclude that the effect on market liquidity was even worse around the world compared to US.
3. Data and methodology

The data used in our study covers a period from January 3, 2005 to December 31, 2012 and comes from two different sources. For each constituent stock of BIST100, we obtain the daily short sales volume and total volume from Borsa Istanbul database (although short selling was allowed in 1995, the available data only goes back to 2005). We obtain daily market capitalization for each stock, daily BIST100 values and turnover from Bloomberg.

3.1. Construction of the analyzed variables

For day \( t \), we calculate aggregate short sales ratio \( SR_t \) for BIST100 as follows:

\[
SR_t = \frac{\sum_{i=1}^{N} SR_i(t) \times MC_i(t)}{\sum_{i=1}^{N} MC_i(t)}
\]  

(1)

In Eq. (1), \( N = 100 \) is the number of stocks included in BIST100 index, \( SR_i(t) \) is the ratio of short sales volume to total volume in stock \( i \) on day \( t \) and \( MC_i(t) \) is the market capitalization of company \( i \) at the end of day \( t \).

For day \( t \), the (unconditional) volatility proxy \( V_t \) for BIST100 is taken as follows:

\[
V_t = \frac{P_H(t) - P_L(t)}{(P_H(t) + P_L(t))/2}
\]  

(2)

where \( P_H(t) \) and \( P_L(t) \) are the daily maximum and minimum values of the BIST100 on day \( t \).

Our daily illiquidity measure is based on the work of Amihud (2002) and defined as

\[
ILQ_t = \frac{|r_{BIST100,t}|}{TRN_t}
\]  

(3)

The stocks included in the BIST100 index are updated in each quarter. Moreover, during the period of our study some of the companies (included in the index) implemented capital raise. These facts are taken into account and calculations are modified accordingly.
where $ILQ_t$ is the illiquidity on day $t$, $|r_{BIST100,t}|$ is the absolute value of the daily BIST100 return on day $t$ and $TRN_t$ is the turnover for BIST100 on day $t$. The ratio gives absolute percentage change in BIST100 index per TL (Turkish Lira) of trading volume. As the ratio gets lower, it signals that BIST100 market liquidity is higher.\(^5\)

We will analyze the dynamic relationship between the changes in $SR_t$, $V_t$, $ILQ_t$ and BIST100 index. For the first three variables, the daily changes will be taken as the first differences i.e. $r_{SR,t} = \Delta SR_t = SR_t - SR_{t-1}$, similarly $r_{V,t} = \Delta V_t = V_t - V_{t-1}$ and $r_{ILQ,t} = \Delta ILQ_t = ILQ_t - ILQ_{t-1}$. For the market return, we take $r_{BIST100,t} = (BIST100_t - BIST100_{t-1})/(BIST100_{t-1})$.

To capture the joint dynamics, we first estimate an unrestricted VAR($p$) model

$$r_t = \varphi_0 + \Phi_1 r_{t-1} + \ldots + \Phi_p r_{t-p} + \varepsilon_t$$  (4)

where $r_t = [r_{1,t}, \ldots, r_{n,t}]'$ is the vector of $n$ asset returns, $p$ is the order of VAR, $\varphi_0$ is a vector of constants with length $n$, $\Phi$ are coefficient matrices and $\varepsilon_t = [\varepsilon_{1,t}, \ldots, \varepsilon_{n,t}]'$ is the vector of VAR residuals.\(^6\)

In the next step, we obtain the conditional volatilities $h_{i,t}$ from univariate FIEGARCH($1,d,1$) model of Bollerslev and Mikkelsen (1996) to model volatility clustering (as in the ARCH and GARCH models), to capture asymmetric response of the volatility (as in the EGARCH models) and to take into account the characteristic of long memory in the volatility (as in the FIGARCH models, with the advantage of being weakly stationary if $d < 0.5$). Such modeling provides us a very extended flexibility.

\(^5\)As suggested by Amihud (2002), we multiply the illiquidity value by $10^6$.

\(^6\)We let $p$ vary from 1 to 10. The optimal lag $p$ is 5 according to Bayesian Information Criterion.
In particular, we estimate the following

\[ \ln h_{i,t} = \omega + (1 - \beta L)^{-1} (1 - \alpha L)(1 - L)^{-d} g(\varepsilon_{i,t-1}) \]

\[ g(\varepsilon_{i,t}) = \theta \varepsilon_{i,t} + \gamma (|\varepsilon_{i,t}| - E[|\varepsilon_{i,t}|]) \]

where \( L \) is the backwards shift operator i.e. \( L^k(X_t) = X_{t-k} \) and \((1 - L)^d\) is the financial differencing operator defined by the Maclaurin series expansion as,

\[ (1 - L)^d = \sum_{k=0}^{\infty} \frac{\Gamma(k - d)}{\Gamma(k + 1)\Gamma(-d)} \]

with \( \Gamma(.) \) is the gamma function.

In Eq.(5), \( \omega, \beta, d, \alpha \) respectively denote the location, autoregressive, differencing and moving average parameters of \( \ln h_{i,t} \). The i.i.d. residuals \( g(\varepsilon_{i,t}) \) depend on a symmetric response parameter \( \gamma \) and an asymmetric response parameter \( \theta \) that enables the conditional variances to depend on the signs of the terms \( \varepsilon_{i,t} \).

3.2. Consistent dynamic conditional correlation

The dynamic correlations between the analyzed variables will be obtained by the cDCC model of Aielli (2013) using VAR residuals. To consider cDCC modeling, we start by reviewing the DCC model of Engle (2002). Assume that \( E_{t-1}[\varepsilon_t] = 0 \) and \( E_{t-1}[\varepsilon_t \varepsilon'_t] = H_t \), where \( E_t[.] \) is the conditional expectation on \( \varepsilon_t, \varepsilon_{t-1}, \ldots \). The asset conditional covariance matrix \( H_t \) can be written as

\[ H_t = D_t^{1/2} R_t D_t^{1/2} \]

where \( R_t = [\rho_{ij,t}] \) is the asset conditional correlation matrix and the diagonal matrix of the asset conditional variances is given by \( D_t = diag(h_{1,t}, \ldots, h_{n,t}) \). Engle (2002) models the right hand side of Eq.(7) rather than \( H_t \) directly and
proposes the dynamic correlation structure

\[ R_t = \{Q_t^\ast\}^{-1/2}Q_t\{Q_t^\ast\}^{-1/2}, \]

\[ Q_t = (1-a-b)S + au_{t-1}u'_{t-1} + bQ_{t-1}, \]  

(8)

where \( Q_t \equiv [q_{ij,t}] \), \( u_t = [u_{1,t}, ..., u_{n,t}]' \) and \( u_{i,t} \) is the transformed residuals i.e. \( u_{i,t} = \varepsilon_{i,t}/h_{i,t} \), \( S \equiv [s_{ij}] = E[u_tu'_t] \) is the \( n \times n \) unconditional covariance matrix of \( u_t \), \( Q_t^\ast = diag\{Q_t\} \) and \( a, b \) are non-negative scalars satisfying \( a + b < 1 \). The resulting model is called DCC.

However, Aielli (2013) shows that the estimation of \( Q \) by this way is inconsistent since \( E[R_t] \not= E[Q_t] \) and he proposes the following consistent model with the correlation driving process

\[ Q_t = (1-a-b)S + a\{Q_{t-1}^{1/2}u_{t-1}u'_{t-1}Q_{t-1}^{1/2}\} + bQ_{t-1} \]  

(9)

where \( S \) is the unconditional covariance matrix of \( Q_t^{1/2}u_t \).
4. Empirical results

Table 1 provides descriptive statistics as well as the unit root test results for short selling, market illiquidity, volatility, the daily changes in these variables and market return for the whole sample period (unit root tests contain a constant).

According to Table 1, distributions of the stock market return is skewed to the left for the stock market and skewed to the right for the other variables. Also, all series exhibit excess kurtosis (fat tails). Skewness and kurtosis coefficients indicate that these series are far from normally distributed. This departure from normality is formally confirmed by the Jarque-Bera test statistics that rejects normality at the 1% level for all series. Moreover, augmented Dickey-Fuller (ADF) test rejects the null hypothesis of unit root for all the series at the 1% significance level. All the series are therefore stationary.7

Table 1: Descriptive statistics of the relevant variables from 02/01/2005 to 31/12/2012

<table>
<thead>
<tr>
<th></th>
<th>SR_t</th>
<th>V_t</th>
<th>ILQ_t</th>
<th>△SR_t</th>
<th>△V_t</th>
<th>△ILQ_t</th>
<th>r_{BIST BIST 100,t}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>0.0057</td>
<td>0.0043</td>
<td>0.0000</td>
<td>-0.0546</td>
<td>-0.0603</td>
<td>-0.0765</td>
<td>-0.0901</td>
</tr>
<tr>
<td>Mean</td>
<td>0.0435</td>
<td>0.0219</td>
<td>0.0102</td>
<td>0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>0.0006</td>
</tr>
<tr>
<td>Max</td>
<td>0.1455</td>
<td>0.0981</td>
<td>0.0768</td>
<td>0.0764</td>
<td>0.0604</td>
<td>0.0635</td>
<td>0.1213</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.0207</td>
<td>0.0114</td>
<td>0.0100</td>
<td>0.0128</td>
<td>0.0118</td>
<td>0.0112</td>
<td>0.0180</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.7957</td>
<td>2.0289</td>
<td>1.9679</td>
<td>0.1681</td>
<td>0.0366</td>
<td>-0.1294</td>
<td>-0.2186</td>
</tr>
<tr>
<td>Excess Kurtosis</td>
<td>0.5917</td>
<td>6.4824</td>
<td>5.4481</td>
<td>3.2377</td>
<td>3.0708</td>
<td>3.9951</td>
<td>3.1505</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>241***</td>
<td>4896***</td>
<td>3781***</td>
<td>887***</td>
<td>789***</td>
<td>1341***</td>
<td>846***</td>
</tr>
<tr>
<td>ADF</td>
<td>-7.7***</td>
<td>-15.1***</td>
<td>-14.9***</td>
<td>-39.8***</td>
<td>-39.5***</td>
<td>-45.3***</td>
<td>-25.8***</td>
</tr>
</tbody>
</table>

As it can be seen from Table 1, the average aggregate short sales ratio for the period between 2005 and 2012 is equal to 4.4% and short selling activity reaches its peak in 2008 with a daily short sales ratio of 14.5%. According to data, the average short sales ratio jumped to 4.9% in 2008 from 2.9% in 2007.

7In the tables, *, ** and *** denote significance at the 10%, 5% and 1% levels respectively.
and has never fallen below pre-crisis levels since then. Figure 1 also confirms the significance of the year 2008 on the short selling activity. Accordingly, daily short ratio jumps to higher levels after 2008 and low levels are observed again for a short time period only during the heightened concerns about the Greece and Eurozone debt crisis.

Figure 1: Daily values of the $SR_t$ from Jan 2005 to Dec 2012.

Figure 2 includes the time-varying volatility, illiquidity and market returns. It presents that year 2008 was a turning point not only for short selling activity but for market illiquidity and volatility as well. Having reached their maximum average values in 2008, market illiquidity and volatility started to fall. Accordingly, BIST100 market has become more liquid and less volatile during 2009-2012 compared to 2005-2008.
Figure 2: Daily values of the $V_t$, $ILQ_t$ and $r_{BIST100,t}$ from Jan 2005 to Dec 2012
Table 2: Parameter estimates for VAR(5), FIEGARCH(1, d, 1) and cDCC(1, 1) process

<table>
<thead>
<tr>
<th></th>
<th>(\Delta SR_t)</th>
<th>(\Delta V_t)</th>
<th>(\Delta ILQ_t)</th>
<th>(r_{BIST100})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coefficient</td>
<td>(p)-value</td>
<td>coefficient</td>
<td>(p)-value</td>
</tr>
<tr>
<td>(\Delta SR_{t-1})</td>
<td>-0.607***</td>
<td>0.00</td>
<td>-0.014</td>
<td>0.86</td>
</tr>
<tr>
<td>(\Delta SR_{t-2})</td>
<td>-0.425***</td>
<td>0.00</td>
<td>-0.003</td>
<td>0.92</td>
</tr>
<tr>
<td>(\Delta SR_{t-3})</td>
<td>-0.330***</td>
<td>0.00</td>
<td>-0.007</td>
<td>0.92</td>
</tr>
<tr>
<td>(\Delta SR_{t-4})</td>
<td>-0.235***</td>
<td>0.00</td>
<td>-0.003</td>
<td>0.89</td>
</tr>
<tr>
<td>(\Delta SR_{t-5})</td>
<td>-0.029</td>
<td>0.39</td>
<td>-0.047</td>
<td>0.05</td>
</tr>
<tr>
<td>(\Delta V_{t-1})</td>
<td>-0.016</td>
<td>0.63</td>
<td>-0.668***</td>
<td>0.00</td>
</tr>
<tr>
<td>(\Delta V_{t-2})</td>
<td>-0.022</td>
<td>0.59</td>
<td>-0.472***</td>
<td>0.00</td>
</tr>
<tr>
<td>(\Delta V_{t-3})</td>
<td>-0.031</td>
<td>0.45</td>
<td>-0.351***</td>
<td>0.00</td>
</tr>
<tr>
<td>(\Delta V_{t-4})</td>
<td>0.015</td>
<td>0.68</td>
<td>-0.229***</td>
<td>0.00</td>
</tr>
<tr>
<td>(\Delta V_{t-5})</td>
<td>0.005</td>
<td>0.87</td>
<td>-0.143***</td>
<td>0.00</td>
</tr>
<tr>
<td>(\Delta ILQ_{t-1})</td>
<td>-0.045</td>
<td>0.19</td>
<td>-0.048</td>
<td>0.16</td>
</tr>
<tr>
<td>(\Delta ILQ_{t-2})</td>
<td>-0.126***</td>
<td>0.00</td>
<td>0.095**</td>
<td>0.04</td>
</tr>
<tr>
<td>(\Delta ILQ_{t-3})</td>
<td>-0.073</td>
<td>0.13</td>
<td>0.102**</td>
<td>0.05</td>
</tr>
<tr>
<td>(\Delta ILQ_{t-4})</td>
<td>-0.093**</td>
<td>0.04</td>
<td>0.113***</td>
<td>0.01</td>
</tr>
<tr>
<td>(\Delta ILQ_{t-5})</td>
<td>-0.033</td>
<td>0.33</td>
<td>0.072**</td>
<td>0.02</td>
</tr>
<tr>
<td>(r_{BIST100_{t-1}})</td>
<td>-0.021</td>
<td>0.22</td>
<td>-0.100***</td>
<td>0.00</td>
</tr>
<tr>
<td>(r_{BIST100_{t-2}})</td>
<td>-0.039**</td>
<td>0.03</td>
<td>-0.027</td>
<td>0.14</td>
</tr>
<tr>
<td>(r_{BIST100_{t-3}})</td>
<td>-0.023</td>
<td>0.17</td>
<td>0.033**</td>
<td>0.05</td>
</tr>
<tr>
<td>(r_{BIST100_{t-4}})</td>
<td>0.004</td>
<td>0.83</td>
<td>0.001</td>
<td>0.96</td>
</tr>
<tr>
<td>(r_{BIST100_{t-5}})</td>
<td>-0.053**</td>
<td>0.00</td>
<td>0.034**</td>
<td>0.03</td>
</tr>
<tr>
<td>(constant)</td>
<td>0.000</td>
<td>0.59</td>
<td>0.000</td>
<td>0.94</td>
</tr>
</tbody>
</table>

| \(\omega\) | 0.836*** | 0.606 | 0.035 | 0.111*** | 0.041* |
| \(d\)      | -0.169   | 0.659*** | 0.517*** | 0.839*** | 0.338** |
| \(\alpha\) | 0.000    | 0.709*** | -0.652*** | 0.872*** | -0.063** |
| \(\beta\)  | 0.000    | 0.587*** | 0.669**  | -0.240   | -0.122** |
| \(\theta\) | 0.000    | 0.341*** | 0.464*** | 0.213*** | 0.191*** |

1. For the FIEGARCH process, refer to Eq. (5).
2. The values in the parenthesis are \(p\)-values obtained from robust standard errors.

<table>
<thead>
<tr>
<th>(cDCC) parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
</tr>
<tr>
<td>0.013***</td>
</tr>
</tbody>
</table>

1. For the cDCC process, refer to Eq. (9).
2. The values in the parentheses are \(p\)-values obtained from robust standard errors.
The VAR coefficients in Table 2 show the strong explanatory power of the lagged series on themselves. Interestingly, daily changes in $SR_t$ seem to have no explanatory power on the remaining variables. On the contrary, lagged stock market returns have highly significant explanatory power on others. The estimation results for FIEGARCH model, presented in Table 2, show that the estimates of long memory parameters differ significantly from zero and unity. Estimated values of the fractional differencing parameter $d$ indicate a high degree of persistence behavior for each series. The differencing parameter is relatively higher for the daily changes in the short ratio compared to others, indicating that persistence is even more amplified for this variable. It is also interesting to note that daily changes in short ratio, illiquidity and the stock market display strong evidence of volatility asymmetry as the parameter ($\theta$) is statistically significant at least at the 5% level.
Figure 3: Dynamic conditional correlations between daily changes in $SR_t$, $V_t$, $ILQ_t$ and BIST100 index
Figure 3 presents how the correlation between short selling and BIST100 market return moves during our sample period. We find evidence that short selling is positively related to contemporaneous market return. Accordingly, an increase in market return is associated with an increase in short sales on the same day. The correlation between daily changes in short sales and market return is always positive. Our results support the findings of Diether et al. (2009) that short sellers are contrarians and trade on short-term overreaction of stock prices. Different from them, we document that such relationship exists even contemporaneously. Our results are also in line with those of Bailey and Zheng (2012) who demonstrate that daily shorting tends to rise with the stock returns rather than increasing with poor returns in pre-crisis period. In our study, we find that such positive correlation is present even during the crisis, which has significant implications regarding the impact of short sales on the Turkish market. Trading in the opposite direction of the market suggests that short sellers do not destabilize the market, which contradicts with popular view that shorting triggers or exaggerates market declines. If they did so, then we would expect a negative correlation at least for some part of the sample period.

Figure 3 also demonstrates the dynamic correlation between aggregate short selling and market illiquidity. The result shows that short sales co-move negatively with illiquidity on the same day during most of 2005-2012 period. Actually, the number of days with positive correlation is only 21 in whole sample period and the correlation reaches 0.08 at most on these days. Negative correlation provides strong evidence against the claim that short selling leads to illiquidity in the market. Similar to the relationship between short selling and illiquidity, we find that shorting is negatively correlated with market volatility as well. In this case, correlation is always negative and ranges between -0.14 and -0.45. Accordingly, our findings indicate that increasing short selling is as-
sociated with greater liquidity and decreased volatility. However, the relations between short sales and market liquidity, and volatility seem to weaken during recent financial crisis.

To see the quantitative effects of the 2008 crisis on the dynamic relationship between short selling activity, volatility and liquidity, we estimate the following regression model

$$
\rho_{ij,t} = \nu_0 + \nu_1 t + \kappa D_{2008} + \eta_{ij,t}
$$

(10)

where \( i = SR \) and \( j = V \) and \( ILQ \). In Eq. (10), \( D_{2008} \) is a dummy variable taking 1 from 15/09/2008 (the collapse of Lehman Brothers) to 31/12/2009, and 0 elsewhere. \( D_{2008} \) is used to capture the effect of the financial turmoil of the 2008 crisis. For different \( j \)'s, the estimated coefficients are given in Table 3.

<table>
<thead>
<tr>
<th>( j )</th>
<th>( \nu_0 )</th>
<th>( \nu_1 )</th>
<th>( \kappa )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V )</td>
<td>-0.284***</td>
<td>-4.7×10^{-5}***</td>
<td>0.075***</td>
</tr>
<tr>
<td>( ILQ )</td>
<td>-0.178***</td>
<td>7.6×10^{-6}***</td>
<td>0.076***</td>
</tr>
</tbody>
</table>

In Eq. (10), \( \nu_0 \)'s taking a larger value for \( j = V \) in absolute terms is an evidence for the stronger relationship between short selling activity and volatility compared to short selling activity and liquidity. And the highly significant (and almost equal) positive \( \kappa \) coefficients show that the 2008 crisis significantly weakens the negative correlations between the daily changes in these variables. This situation suggests that during this time period, short selling activity is not effective as much as in the remaining time on liquidity and volatility.
5. Conclusion

The effect of short sales on stock market has been one of the most debated issues in finance literature especially after 2008 financial crisis. While governments, regulators and media blame short sellers for major market declines; financial economists suggest that short selling corrects mis-pricing and contribute to efficient stock markets.

In this paper, using daily short sale date of Borsa Istanbul, we investigate the relation between short selling and three variables, namely market return, illiquidity and volatility in Turkish stock market. Our findings suggest that short sellers are contrarian traders and increase their trading activity as stock prices rise on the same day. Such result shows that short sales indeed contribute to efficient markets by avoiding any over-valuation in stock prices. The popular view that short sellers destabilize the stock market seems to be unfounded as well since they reduce short sales in Turkish market when market return is negative. We also present strong evidence that any increase in shorting is associated with greater liquidity and decreased volatility.

Our results have important implications regarding short selling regulations in Turkey. Many governments and regulators imposed bans on short selling during recent financial crisis to end stock market declines. However, as we show in this article, short sellers in Turkey continue to act as contrarian traders even at the peak of 2008 financial turmoil. Moreover, even though no ban on short sales was put into effect in Turkey during this period, the correlations between shorting and market illiquidity and volatility remain mostly negative, an indication of advanced market quality thanks to short selling activity. This suggests that bans imposed in 2008 financial crisis may have been misguided and led to unintended consequences.

Regarding Turkish stock market, regulators like any authorities in other
emerging markets, aim to attract new investors, increase liquidity and sustain financial stability. BIST100 stocks are highly liquid and trading in those stocks account for 86% of total traded value as of end of 2012. Considering the fact that short sales improve market quality even for these stocks, it may be favorable to ease short selling in other stocks with smaller market capitalization and having less liquidity.
References


