*Proceedings of the Second European Academic Research Conference on Global Business, Economics, Finance and Banking (EAR15Swiss Conference) ISBN: 978-1-63415-477-2*
*Zurich-Switzerland, 3-5 July, 2015 Paper ID: Z5109*

# Do short selling and prices granger cause each other? Evidence from an emerging market

**Hasan F. BAKLACI,**
Professor, Izmir University of Economics,
Turkey.
**Email:** hasan.baklaci@ieu.edu.tr

**Omür SUER,**
Associate Professor,
Galatasaray University, Turkey.
**Email:** osuer@gsu.edu.tr

**Tezer YELKENCI,**
Graduate Research Assistant,
Izmir University of Economics, Turkey.
**Email:** tezer.yelkenci@ieu.edu.tr

## *Abstract*

*This study addresses the Granger causality between short selling activities and stock prices in Turkish stock market, utilizing intraday data and an advanced methodology developed by Dumitrescu and Hurlin (2012). In emerging markets, there is a limited amount of research that focuses on this highly debated issue, particularly during the latest global crisis. Thus, this study addresses this issue by examining this relationship in the Turkish stock market, which stands as an ideal venue to test this relationship, since it is one of the few markets that has avoided imposing any restrictions on short selling since its inception. The results denote that prices Granger cause short selling volume, whereas the reverse causality does not exist. When the prices are replaced by the volatility of price changes; however, the findings denote a bilateral causality between the short selling trades and the volatility of price changes.*
*The findings imply that the majority of short sellers in the Turkish stock market have the expectation of price reversals during market rises throughout the day. Furthermore, the findings also indicate that short selling activities result in some volatility rises in major stocks, but the effect is not sufficiently influential to destabilize the market*

***Keywords:*** Short selling, Turkish stock market, Panel Granger-Causality, Conditional Volatility
***JEL classification*:** C33, G12, G15

## 1. Introduction

The impact of short selling trades on the underlying stock market stability has been a highly debated issue, particularly during the recent global crisis. In general, short sellers have been highly blamed for sharp market declines. As such, many countries have banned short selling activities following the crisis, and some have unveiled a new regime for short selling in their domestic markets.

Some researchers (Chen and Singal, 2003; Henry and McKenzie, 2004) concluded that the short selling activities had a destabilizing impact on the underlying stock markets, creating significant price pressures and increased volatility. Correspondingly, other researchers (e.g. Cacares et al. 2015) found evidence that volatility was reduced by imposing constraints on short selling activities.

In contrast, another group of researchers (Boehmer and Wu, 2013; Chen and Rhee, 2010; Cohen, 2010) have concluded that the short selling activities contribute to the market efficiency in stock markets. Studies (Sobaci et al. 2014; Morales-Zumaquero and Sosvilla-Rivero, 2014 Chen and Zheng, 2009) which propose that the increase in short selling activities does not significantly impact volatility.

Furthermore, initial research that examines the causality link between short selling trades and subsequent stock returns has also found contradicting results. One group of researchers (Mohamad et. al, 2013; Diether et. al, 2009) have disclosed that the increase in short selling activities result in considerable declines in subsequent period stock returns. Another group (Shkilko et. al, 2012; Sum and Lin, 2015), on the other hand, affirm that the rise in short selling activities leads to positive abnormal returns in the subsequent trading periods. The reverse causality from the stock returns towards short selling activities indicates that short sellers are generally informed traders.

This particular study attempts to shed new light on this debated issue by examining the causality link between short selling trading volume and price changes in the Turkish stock market in an intraday setting. The Granger-causality relationship was detected for the 27 most actively traded stocks, included in BIST-30 Index using intraday data.

Despite its importance, there is a very limited literature examining the causality relationship between short selling and stock prices in emerging markets. In this respect, this particular study will contribute to the existing literature. Additionally, the Turkish stock market is an ideal venue to test this relationship, for the following reasons:

- It is the largest emerging market in which short selling is both allowed and practiced, and is one of the few markets where no limitations or bans in short selling trades have been imposed since its inception, even during the most recent global crisis.

- When compared with the Turkish derivatives market (TURKDEX), the majority of the emerging markets have more fully developed and more active derivatives markets, and thus provide convenient instruments to substitute for short selling activities for individual stocks. However, TURKDEX does not offer any derivatives trading for individual stocks, and hence the impact of short selling activities can be more effectively observed and analysed.

One of the most noteworthy contributions of this study lies in the methodology employed, developed by Dumitrescu and Hurlin (2012),, which provides robust results for high frequency series where the selection of optimal lag length is critical. Another advantage is that it provides more robust results in the case of unbalanced panel data.

One other distinguishing characteristics of our approach is that the conditional volatility series for the prices is produced in conformity with high frequency data characteristics, whereas the majority of prior studies (Cankaya et. al, 2011; Wei and Yang, 2011) have employed standardized volatility measures or models.

## 2. Data and Methodology

The panel data set is comprised of short selling and price data for 27 stocks in one-hour intervals ranging from 01.01.2013 to 28.02.2014, with 54,096 observations in total.

Until Holtz-Eakin et al. (1988) carried the analysis into panel data framework, Granger causality analysis had only been conducted between time series variables. However, the existence of cross sectional dependency in panel data tends to produce biased estimations. Dumitrescu and Hurlin (2012) attempted to eliminate this problem by developing a more sophisticated panel Granger Causality test. The major advantages of this approach in panel data settings can be listed as follows:

a. It controls for the cross sectional dependency between the variables;

b. Where time-series dimension ($T$) is longer than cross-sectional dimension ($N$), the causality test can be conducted even if the data set is unbalanced;

c. It can produce robust results even if the optimum lags are heterogeneous for each cross section. In other words, the model is sensitive neither to the lag length nor lag selection.

In this particular study, the following equations will be utilized to test for the causality between short selling volume on prices or volatility:

$$SS_{i,t} = \alpha_i + \sum_{k=1}^{K} \gamma_i^k SS_{i,t-k} + \sum_{k=0}^{K} \beta_i^k P_{i,t-k}|V_{i,t-k} + \varepsilon_{i,t} \quad (2.1)$$

$$P_{i,t-k}|V_{i,t-k} = \alpha_i + \sum_{k=1}^{K} \gamma_i^k P_{i,t-k}|V_{i,t-k} + \sum_{k=0}^{K} \beta_i^k SS_{i,t-k} + \varepsilon_{i,t} \quad (2.2)$$

$$\text{HNC: } \tilde{Z}_{N,T}^{HNC} = \frac{\sqrt{N}\left[W_{N,T}^{HNC} - N^{-1}\sum_{i=1}^{N} K_i \frac{(T_i - 2K_i - 1)}{(T_i - 2K_i - 3)}\right]}{\sqrt{N^{-1}\sum_{i=1}^{N} 2K_i \frac{(T_i - 2K_i - 1)^2 (T_i - K_i - 3)}{(T_i - 2K_i - 3)^2 (T_i - 2K_i - 5)}}} \qquad \text{HC: } F_{HC} = \frac{(SSR_3 - SSR_1)/K(N-1)}{SSR_1/[NT - N(1+K) - K]} \quad (2.3)$$

In Equations 2.1 and 2.2, $ShortSelling_{i,t}$ represents the short selling trades, whereas $P_{i,t-k}$ and $V_{i,t-k}$ represent the prices and the volatility of price changes, respectively. $K$ represents the optimum number of lags[1]. All coefficients are allowed to be different across cross-sections.

The null homogenous (non)-causality hypothesis indicates no existence of causality relation between short selling and prices, or volatility of price changes for any of the cross sections. As indicated above, rather than using the traditional standard deviation measure, the volatility is estimated with the conditional volatility series, obtained for each cross sectional data through the best fitting GARCH [GARCH (1,1)] model. Consequently, GARCH (1,1) model is utilized to test the causality analyses.

## 3. Empirical Results

Table 1 provides descriptive statistics for stock price, short selling trading volume, and stock price volatility. Jarque-Bera statistics indicate that all the series are far from normally distributed. Levin, Lin, Chu panel unit root test confirms that all the series are stationary.

**Table1. Descriptive statistics**

| | *ln(P)* | *ln(SS)* | *ln(V)* |
|---|---|---|---|
| **Mean** | 2.1932 | 14.966 | -7.6587 |
| **Median** | 2.1812 | 14.928 | -7.7920 |
| **Maximum** | 4.5626 | 19.680 | -4.4795 |
| **Minimum** | -0.0561 | 2.6246 | -10.814 |
| **Std. Dev.** | 0.9082 | 1.9127 | 0.6429 |
| **Skewness** | 0.1114 | -0.3932 | 1.3444 |
| **Kurtosis** | 2.8110 | 3.5860 | 5.2875 |
| **Jarque-Bera** | *27.405 | *308.66 | *399.10 |
| **Levin, Lin, Chu** | *-3.1800 | *-61.885 | *-19.601 |
| **Observation** | 54096 | 54096 | 54096 |

*Notes:* * and ** indicate statistical significance at the 1% and 5% level respectively.

The results obtained from panel Granger Causality analysis are provided in Table 2. Homogeneous non-causality (HNC) and homogenous causality (HC) tests provide different results for the price causality relation, while the same tests provide consistent results for volatility causality relation. However, HC test ignores cross sectional dependency, which might distort the results in terms of the homogeneity of the causality relationship. As indicated earlier, Dumitrescu-Hurlin (2012)'s HNC test controls for this cross sectional dependency and provides results and interpretations[2] of greater accuracy. Therefore, there is a homogeneous and unilateral causality relationship from prices towards the short selling volume, as revealed in Table 2. This finding implies that during market uptrend periods, short selling activities seem to

[1] The appropriate number of lags was determined as two, based on Akaike and Schwarz information criteria.
[2] The bidirectional causality suggested by HC test is valid for some stocks (heterogeneous) in the panel, whereas the results from HNC test are applicable for the whole panel (homogeneous).

increase, denoting that majority of short sellers have the expectation of price reversals. However, the results also show that when the prices are replaced by the volatility of price changes, there is a bilateral causality relationship between short selling activities and the volatility of price changes.

**Table2. Panel granger causality results**

| **Test** | $ln(P) \rightarrow ln(SS)$ | | $ln(SS) \rightarrow ln(P)$ | | **Decision** |
|---|---|---|---|---|---|
| *HNC* | $W$ | $\tilde{Z}$ | $W$ | $\tilde{Z}$ | $P \rightarrow SS$ |
| | 5.48482* | 5.13924* | 3.09147 | 0.14499 | |
| *HC* | $Z$ | | $Z$ | | $P \leftrightarrow SS$ |
| | 6.13297* | | 4.22467** | | |
| | $ln(V) \rightarrow ln(SS)$ | | $ln(SS) \rightarrow ln(V)$ | | |
| *HNC* | $W$ | $\tilde{Z}$ | $W$ | $\tilde{Z}$ | $V \leftrightarrow SS$ |
| | 5.18914* | 4.52178* | 14.1918* | 23.3066* | |
| *HC* | $Z$ | | $Z$ | | $V \leftrightarrow SS$ |
| | 5.66680* | | 60.16.01* | | |

*Notes:* * and ** indicate statistical significance at the 1% and 5% level respectively.
$W$ And$Z$, stands for Wald statistics and Z statistics.

## 4. Conclusion

This study attempts to unveil the Granger causality link between the short selling activities and stock prices in the Turkish stock market by utilizing a relatively new methodology, which is characterized by superior properties.

The results denote the presence of a short-term unilateral causality from prices towards short selling activities for the sample stocks. However, when the volatility of price changes is replaced with the level of prices in the same analysis, the findings signify a bilateral causality between the volatility of price changes and short selling activities for the BIST stocks.

These findings carry significant implications. In particular, the existence of a direct causality from prices toward the volume of short selling activities implies that the majority of short sellers have the expectation of price reversals in upward price movements in BIST. On the other hand, the absence of a causality relationship from short selling activities towards the prices is expected , since the ratio of short selling orders in total orders is quite thin (less than 20%), and thus unlikely to t have any structural impact on prices. Furthermore, information on the volume of short selling trades in individual stocks is not publicly available, whereas the market orders on the same stocks may be readily observed by all traders in BIST.

The findings also include some inferences which are worthy of the attention of the regulatory authorities. As such, the significant causality between short selling trades and stock return volatility implies a need at least to monitor short selling activities more closely, and perhaps, to consider putting in place certain restrictions on them.

## References

Boehmer, E. and Wu, J. (2013) Short Selling and the Price Discovery Process, *the Review of Financial Studies*, 26, 287-322.

Cacares, E., Moreno, D. and Rodrigues, R. (2015) A studies on short-selling constraints: total ban versus partial ban, *Applied Economics Letters*, 22, 99-103.

Cankaya, S., Eken, H.M. and Ulusoy, V. (2011) The Impact of Short Selling on Intraday Volatility: Evidence from the Istanbul Stock Exchange, *International Research Journal of Finance and Economics*, 93, 202-212.

Chen, H. and Singal, V. (2003) Role of Speculative Short Sales in Price Formation: The Case of theWeekend Effect, *The Journal of Finance*, 58, 685-705.

Chen, M. and Zheng, Z. (2009) The impact of short selling on the volatility and liquidity of stock markets: evidence from Hong Kong market, *Advances in Business Intelligence and Financial Engineering*, Atlantis Press, Paris, (Wen FH, Yu L., et al. eds.)

http://efinance.org.cn/cn/aboutme/cmx3.pdf

Chen, C.X. and Rhee, S.G. (2010) Short sales and speed of price adjustment: Evidence from the Hong Kong stock market, *Journal of Banking & Finance*, 34, 471–483.

Cohen, G. (2010) Do Short Sellers Outperform the Market? *Applied Economics Letters*, 17, 1319-1322.

Diether, K.B., Lee, K.H., and Werner, I.M. (2009) Short-Sale Strategies and Return Predictability, *the Review of Financial Studies*, 22, 575-607.

Dumitrescu, E.I. and Hurlin, C. (2012) testing for Granger non-causality in heterogeneous panels, *Economic Modelling*, 29, 1450-1460.

Granger, C. (1969) Investigating causal relations by econometric models and cross-spectral methods, *Econometrica*, 37, 424-438.

Henry, Ó.T. and McKenzie, M. (2004) The Impact of Short Selling on the Price-Volume Relationship: Evidence From Hong Kong, *Journal of Business*, 79, 671-691.

Holtz-Eakin, D., Newey, W. and Rosen, H.S. (1988) Estimating vector autoregression with panel data, *Econometrica*, 56, 1371-1395.

Mohamad, A., Jaafar, A., Hodgkinson, L. and Wells, J. (2013) short selling and stock returns: Evidence from the UK, *The British Accounting Review*, 45, 125-137.

Morales, Z. and Sosvilla, R. (2014) Temporary ban on short positions and financial market volatility: evidence from the Madrid Stock Market, *Applied Economics Letters*, http://dx.doi.org/10.1080/13504851.2014.982850.

Shkilko, A., Van Ness, B., and Van Ness, Robert. (2012) Short Selling and Intraday Price Pressures, *Financial Management*, 41, 345-370.

Sobacı, C., Şensoy, A. and Ertürk, M. (2014) Impact of Short Selling Activity on Market Dynamics: Evidence from an Emerging Market, *Journal of Financial Stability*, 15, 53-62.

Sum, V. and Lin, J.C. (2015) Short Interest Ratio and Equity Market Return: Causality and Impulse Response Functions, *Advances in Financial Planning and Forecasting*, 6, 233-247.

Wei, S.Y. and Yang, J.J.W. (2011) the Impact of Short Sale Restrictions on Stock Volatility, Evidence from Taiwan, *the International Journal of Business and Finance Research*, 5, 89-98.