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INSIDER TRADING ACTIVITIES AND RETURNS OF GERMAN BLUE CHIPS

Dagmar Linnertová[1], Oleg Deev[1]

[1] Department of Finance, Faculty of Economics and Administration, Masaryk University, Žerotínovo nám. 617/9, 601 77 Brno, Czech Republic

Abstract

LINNERTOVÁ DAGMAR, DEEV OLEG. 2015. Insider Trading Activities and Returns of German Blue Chips. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 63(6): 1995–2003.

The aim of this paper is to investigate the causality between stock returns and insider open market transactions. The Dumitrescu-Hurlin (2012) heterogeneous approach to panel Granger causality is chosen to examine the relationship. The investigation is conducted on the 30 most traded German blue chips during the period of 2006–2014. The strong causality is revealed in the one-month period. Thus, stock returns may be used to predict future insider trading activity. The strong causality between stock returns and future insider buying and selling transactions is further confirmed with three out of four employed insider trading indices. The fact of the legal insider trade (either buy or sell) is more important than its volume. The reverse relationship is weak and valid only for longer time horizon of twelve months. Our results indicate that insider traders do not degrade the market efficiency in the long run.

Keywords: insider trading, panel Granger causality, DAX, market manipulation

INTRODUCTION

New information is crucial for profitable trading on financial markets. Insider trading activities are usually considered an additional information signal about firm's future performance. Early studies suggest that insiders make abnormal returns (e.g. Rogoff (1964), Lorie and Niederhoffer (1968) or Jaffe (1964)) and in the short run are able to identify profitable as well as unprofitable situations in their own firms. Seyhun (1988) reveals that corporate insiders were able to predict 60 percent of variation in one-year ahead aggregate stock returns of their own firms. Karpoff and Lee (1991) discover that insiders sell their firm's common stocks at least for several months prior the announcement of the issue of new common stock or convertible debt. These findings are consistent with the hypothesis that managers have prior information that is conveyed to the market. Lamba and Khan (1999) find that insiders act on their private information before stock exchange listings (purchasing or postponing the sale of stock) or delistings (selling stocks before delisting). As a logical result of such findings, Rozeff and Zaman (1988) show that outsiders can earn abnormal returns by using publicly available insider trading data. At the same time, other evidence by Givoli and Palmon (1985), Seyhun (1986) and Heinkel and Kraus (1987) demonstrate that investors with insider information on average do not outperform the outsiders. Moreover, the abnormal returns associated with the insider trading become non-positive after one accounts for transaction costs such as bid-ask spreads and commission fees.

The most recent evidence on the topic largely supports asymmetric information hypothesis of insider trading. Tavakoli *et al.* (2012), Cohen *et al.* (2010), Gosnell *et al.* (1992) and Seyhun *et al.* (1997) find that the trades of directors or other managers have predictive power and that e.g. independent directors make positive abnormal returns before their trades, especially in firms with weak corporate governance standards. Insiders also trade before important events such as accounting scandals, takeover announcements or private-equity buyouts. Fidrmuc *et al.* (2006) investigate the market's reaction to insider transactions in the UK and analyse whether the market reaction depends on the firm's ownership. Their findings reveal that ownership by directors and outside shareholders has an impact on the abnormal returns. However, it is also important

to adjust for news released before directors' trades. In particular, trades preceded by news on mergers and acquisitions and CEO replacements contain significantly less information. Andriosopoulos *et al.* (2015) support the theory of Barber and Odean (2008) that retail investor decision-making is influenced by attention-grabbing events. Director purchases are just one such attention-grabbing event which is associated with significant positive price returns – the magnitudes of which are linked to the size of the purchase, the size of the fund and the investment mandate. Trading volumes increase at the time of the purchase, but most of the initial price responses and trading volumes dissipate over the following 15 days.

The impact of insider trading on stock prices rises the possibility of market manipulation. Insiders could easily trade and act with attempt to influence market prices. Lei and Wang (2014) investigate the insider trading in the US stock market between scheduled versus unscheduled corporate announcements to explore how corporate insiders use their private information. They find that insider buy (sell) more before positive (negative) announcements and their purchases are more profitable before unscheduled announcements than before scheduled ones. In this regard, restrictions on insider trading or requirement on prompt trading disclosures can only enhance the power of insider trades. Fishman and Hagerty (1992) show that mandatory disclosure can increase the expected trading profits of insiders because such disclosure can make it profitable to trade even without insider possessing private information about the asset's value. Pattitoni *et al.* (2013) investigate the effectiveness of internal dealings regulation and self-imposed blackout periods on companies in Italy. They find that company self-imposed blackout periods (periods around corporate events during which insiders should not trade) are often violated as insiders continue trading around corporate events. Their results suggest that managers are the only insiders able to realize abnormal returns and because monitoring all insiders is a costly activity all monitoring resources should be redirected from large shareholders to managers.

Given that insider trading activities have a significant impact on the pricing of stocks due to their morally hazardous behavior of using private corporate information, such activities result in changes of stock market efficiency. The discussion whether insiders do or do not make abnormal profit is crucial because it will show whether insiders harm or do not harm the markets. Insiders are usually blamed for lowering market efficiency, which is measured by the informational content of prices. However, if insiders do not make abnormal returns and their trades cannot predict future prices, market efficiency is not impaired. Theoretically, as suggested by Penman (1982), insider earns abnormal returns not only from their legal trading activities but also by sharing private corporate information with other interested parties, and therefore, increasing information asymmetries between individual investors. Bagehot (1971), Copeland and Galai (1983) or Fishman and Hagerty (1992) see insider trading as the source of the bid-ask spread which deters other traders from acquiring information and trading. On the other hand, as theorized by Manne (1967, 2005), if insiders are allowed to trade, their trading will make prices more informative. Manne basically sees possible market manipulation as an efficient way of compensating managers for the information they produce when they run a firm and because they then have a greater incentive to produce additional information of value to the firm. Degryse *et al.* (2014) investigate the information content of legal trades by corporate insiders in the Netherlands during the period of 2002–2005. They find that insider purchases are followed by economically large abnormal returns. They find important differences in information content of both between purchases and sales as well as between categories of insiders. The result is strongest for purchases by top executives and from small cap firms. This is consistent with the expectation that legal insider trading is an important channel through which information flows to the market. However, on the other side of evidence, but in different market conditions, Fernandes and Ferreira (2009) find that enforcement of insider trading laws does not improve efficiency in emerging markets.

Further studies of insider trading activities focus on the analysis of whether abnormal returns also propel insiders to sell or buy their company's stocks. Chowdhury *et al.* (1993), Iqbal and Shetty (2002) and Brio et al. (2009) employ Granger causality to investigate relationship between aggregate insider transactions and stock market returns. Chowdhury *et al.* (1993) find that stock market returns cause insider transactions. They also suggest that the degree of mispricing observed by insider is small partly because of unanticipated macroeconomics factors. Iqbal and Shetty (2002) demonstrate the large impact of stock returns on subsequent insider transactions at the aggregate and firm level. This impact according to their findings is negative. Thus, insiders buy after stock price decreases and sell after price increases. They also establish weak relationship between insider transactions and future stock returns. The same investigation but for the banking industry was applied by Brio at al. (2009). They reveal causality relationships between insider transactions and future stock movements only at firm's level.

The duality of the relationship between insider trading activities and stock returns is certainly country-specific, as was suggested by previous studies. Since the majority of studies on insider trading activities explore US or UK stock markets, we examine the validation of insider trading – stock returns causality on the biggest Eurozone stock market – German stock market. The German stock market is usually overlooked by researchers

of insider trading effects, but should be considered an interesting example for the purposes of our study. First, it functions within the bank-based financial system, where banks could acquire more information (even internal) than individual investors. Second, the legislation on insider information based transactions come into effect in 1994, later than in many other developed countries, with reporting requirement being added in 2002.

To our knowledge, there are only few studies investigating insider trading activities in the German stock market. Betzer and Theissen (2009) analyse 2050 transactions by corporate insiders in Germany in the period from July 1, 2002 to June 20, 2004 and find that insider trades are associated with significant abnormal returns. They discover that market model adjusted CARs amounted to 3.6% in 20 days after insider purchases and –3.54% after insider sales. Furthermore, insider trades that occur prior to an earnings announcement have a large impact on prices. This result is consistent with information asymmetries between corporate insiders and the capital market being larger prior to earnings announcements. At the same time, the position of the insider within the firm has no effect. Rau (2004) and Stotz (2006) find that insiders abuse their superior knowledge about firms' perspectives with the aim to gain abnormal returns. Furthermore, outsiders can profit from this information indirectly by basing their trading strategies on insiders' dealings.

The contribution of our analysis to the literature is twofold. First, the paper focuses on the formulated possible dual causality between insider trading activities and stock returns on the German stock market during time period that have not been previously examined. Hence, we cover not only returns growth triggered by insider transactions, but also insider transactions fueling market incentives for other participants. Second, we propose the application of the novel heterogeneous approach to Granger causality in panels as proposed by Dumitrescu and Hurlin (2012) to the analysis of insider transactions.

DATA AND METHODOLOGY

Thirty biggest German blue chip stocks were chosen for the purposes of our investigation. All stocks were traded on the Frankfurt Stock Exchange in the period January 2006 to December 2014. The data on insider activities are collected on monthly basis for each individual firm and obtained from Bloomberg. Insider transactions include open market transactions (net sell and buy in shares) of 12 kinds of legal insiders (different levels for the members of the executive board, members of the supervisory board, managers). Following Lamba and Khan (1999) and Iqbal and Shetty (2002) we only consider transactions of 100 shares or more because these transactions could be likely considered as information motivated. The total amount of insider transactions in the constructed dataset is 1,107.

Stock returns are calculated as logarithm of price differences:

$$y_i = \log \frac{P_i}{P_{i-1}}, \tag{1}$$

where P_i is monthly stock price at time i.

Tab. I provides descriptive statistics of the comprised dataset.

Tab. II summarizes annual stock returns and insider transactions in years 2006–2014. This basic dissection of the data provides meaningful insides. The returns are generally positive with exceptions of two crisis years of 2008 (–0.039) and 2011 (–0.014). In 2014, the number of shares bought by insiders has reached its maximum with over 16 million. The minimum was reached in 2009 with about half a million shares. The number of shares sold has achieved its maximum in 2009 with over 22 million shares and its minimum in 2010. The negative stock returns were reached in 2008 and 2011, when the market also achieved the minimum of insider selling transactions and maximum of buying transactions. This indicates that insiders purchase in the situation of the declining market. However, during the period of the global financial crisis (2007–2009) there are no significant insider sells. On the contrary, in 2007 insiders bought 106,916 shares per one transaction on average, that is the second largest transaction in the overall analyzed period (maximum was reach in 2014 with over 200 thousand stocks bought in one transition on average). The maximum amount of shares sold in one transaction was reached in 2009 with almost 600 thousand shares. German insiders sold shares before the global financial crisis, bought shares before the end of the widespread crisis and sold

I: *Descriptive statistics*

Statistic	Return	Number of buy transactions	Number of sell transactions	Number of shares sold	Number of shares bought
Mean	0.002	0.227	0.109	6,245,059	4,715,501
Median	0.008	0.000	0.000	0,000	0,000
Maximum	0.656	174	71	22,169,603	16,554,902
Std. Dev.	0.095	0.758	0.486	253,443,7	333,446,1
Observations	3.209	3.209	3.209	3209	3209

Source: Authors' calculations

II: *Yearly Observations of Mean Stock Returns and Insider Transactions*

Year	Mean return	Total number of transactions		Total number of shares	
		Buying	Selling	Bought	Sold
2006	0.012	66	40	4,775,750	6,666,691
2007	0.014	78	71	8,339,460	3,045,426
2008	–0.039	174	28	15,805,090	5,620,935
2009	0.011	52	37	536,192	22,169,603
2010	0.007	53	28	1,991,082	479,722
2011	–0.014	113	27	2,908,960	1,096,924
2012	0.016	58	35	4,734,465	8,24,375
2013	0.013	53	58	559,629	1,732,175
2014	0.000	81	28	16,554,902	803,656

Source: Authors'calculation

them again in the end of the crisis. It indicates that insiders probably anticipated the crisis and clearly knew that during the crisis the stocks of their firms are undervalued, and thus, took advantage as opposite to general market beliefs. Similarly, the large amount of shares bought by insiders in 2014 also preceded the growth of the German stock market in the first half of 2015.

To match the stationarity of return series, we measure the degree of insider transactions by four activity indices. The first two indices were suggested by John and Lang (1991) and later employed by Yur-Austin (1998), Iqbal and Shetty (2002) and Brio *et al.* (2008). The net number index NNI is defined as:

$$\mathrm{NNI} = \frac{(\mathrm{P} - \mathrm{S})}{(P + S)}, \tag{2}$$

where *P* represents aggregate number of insider buy transactions and *S* is aggregate number of insider sale transactions. This index evaluates insider trading activity due to positive or negative news reports, when positive new report leads to increase of buying transactions and decrease of selling transactions and vice versa.

Analogously, the volume of transactions is measured with the net share index (NSI):

$$\mathrm{NSI} = \frac{(\mathrm{PV} - \mathrm{SV})}{(PV + SV)}, \tag{3}$$

where PV and SV represent aggregate number of shares bought and sold by insiders in a particular month, respectively.

The remaining two indices characterize insider buying and selling separately. According to Chowdhury *et al.* (1993), insider buying transactions have more information content than sell transactions. Same findings are reported in studies of Sayhun (1990, 1992). The insider buying index PNI is donated as:

$$\mathrm{PNI} = \frac{\mathrm{P}}{(P + S)}, \tag{4}$$

while insider selling index SNI is defined as:

$$\mathrm{SNI} = \frac{\mathrm{S}}{(P + S)}. \tag{5}$$

Tab. III summarizes the values of insider transaction indices. The number of insider selling transactions was higher than the number of insider buying transaction only in 2007. In the same year, the aggregate number of shares sold by insider exceeded the aggregate number of shares bought

III: *Insider Transaction Indices (mean values across firms)*

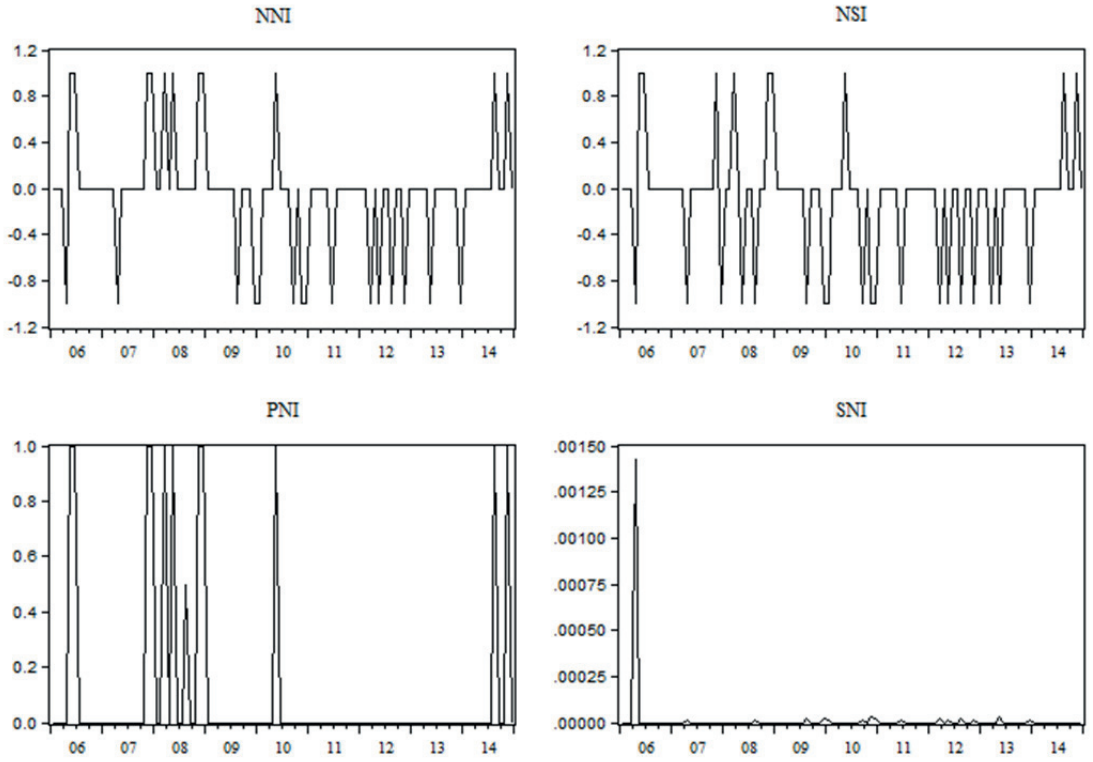
Year	NNI	NSI	PNI	SNI
2006	0.036	0.026	0.100	1.10×10^{-4}
2007	–0.002	–0.019	0.120	9.62×10^{-7}
2008	0.204	0.188	0.242	9.62×10^{-7}
2009	0.050	0.050	0.100	3.85×10^{-6}
2010	0.037	0.039	0.894	8.33×10^{-7}
2011	0.112	0.117	0.173	4.63×10^{-6}
2012	0.054	0.055	0.122	3.41×10^{-6}
2013	0.003	–0.002	0.097	2.73×10^{-7}
2014	0.075	0.069	0.125	3.48×10^{-6}

Source: Authors'calculation

IV: *Correlation between monthly returns and insider transactions represented by activity indices*

	Return	SNI	PNI	NSI	NNI
Return	1.000				
SNI	0.027	1.000			
PNI	–0.132	–0.031	1.000		
NSI	–0.138	–0.209	0.784	1.000	
NNI	–0.128	–0.213	0.827	0.962	1.000

Source: Authors'calculation



1: *Development of insider trading activity indices*
Source: Authors' calculations

by insider. The value of insider selling index SNI is very close to zero in all of analyzed periods, since the number of selling transactions are relatively smaller than the number of buying transactions.

Tab. IV reports correlation coefficients between stock returns and insider trading indices. The positive correlation is found between stock returns and insider selling transactions (SNI), while negative correlation is apparent between stock returns and insider buying transactions (PNI). These findings resemble those of Iqbal and Shetty (2002). Fig. 1 depicts the performance of indices in the period 2006–2014 on annual basis.

To analyze the relationships between stock returns and insider trading indicators, we use Granger (1969) causality procedure. But instead of taking time series pairwise approach to Granger causality, we follow Dumitrescu-Hurlin (2012) approach to non-causality in heterogeneous panel data with fixed effects. Since this econometric approach takes into consideration two dimensions of heterogeneity (the heterogeneity of the regression model and the heterogeneity of the causality relationships), we can rephrase the goal of the panel causality test as to find if one variable causes another variable somewhere in the panel.

Granger causality is computed by running bivariate regression that in a panel data context take the following form:

$$y_{i,t} = \alpha_{0,i} + \alpha_{1,i} y_{i,t-1} + \ldots + \alpha_{1,i} y_{i,t-1} + \beta_{1,i} x_{i,t-1} + \ldots \\ \ldots + \beta_{1,i} x_{i,t-1} + \epsilon_{i,t}, \quad (6)$$

$$x_{i,t} = \alpha_{0,i} + \alpha_{1,i} x_{i,t-1} + \ldots + \alpha_{1,i} x_{i,t-1} + \beta_{1,i} y_{i,t-1} + \ldots \\ \ldots + \beta_{1,i} y_{i,t-1} + \epsilon_{i,t}, \quad (7)$$

where t determines the time period dimensions of the panel and i denotes the cross-sectional dimensions. $\beta_i = (\beta_i^{(t)}, \ldots, \beta_i^{K})'$ and the individual effects $\alpha_{l,i}$ are assumed to be fixed in the time dimension, but allowed to be different across cross-sections:

$$\alpha_{0,i} \neq \alpha_{0,j}, \alpha_{1,i} \neq \alpha_{1,j} \ldots \alpha_{l,i} \neq \alpha_{l,j}, \forall i,j, \quad (8)$$

$$\beta_{1,i} \neq \beta_{1,j} \ldots \beta_{l,i} \neq \beta_{l,j}, \forall i,j. \quad (9)$$

Under the null hypothesis, we assume that there is no causality relationship for any of the units in the panel (the homogenous non-causality hypothesis):

$$H_0: \beta_i = 0, \forall i = 1, \ldots, N. \quad (10)$$

Under the alternative hypothesis, there is a causality relationship from $x_{i,t}$ to $y_{i,t}$ with varying β_i across groups:

$$H_1: \beta_i = 0 \quad \forall i = 1, \ldots, N,$$

$$\beta_i \neq 0 \qquad \forall i = N_1 + 1, N_1 + 2, \ldots, N, \quad (11)$$

where N_1 is unknown but satisfies the condition $0 < N_1/N < 1$.

The causality tests are conducted for constant lag (K) periods of 1, 3 and 12 months. The lag orders are identical for all cross-sectional units in the panel.

The average of individual Wald statistics $W_{i,T}$ associated with the individual test of the non-causality $H_0: \beta_i = 0$ is defined as:

$$W_{N,T}^{HNC} = \frac{1}{N}\sum_{i=1}^{N} W_{i,T}. \quad (12)$$

For $i = 1, \ldots, N$ each the individual Wald statistic $W_{i,T}$ is defined as:

$$W_{i,T} = \hat{\theta}_i' R' [\hat{\sigma}_i^2 R (Z_i' Z_i)^{-1} R']^{-1} R \hat{\theta}_i, \quad (13)$$

where $Z_i = [e : Y_i : X_i]$ is s $(T, 2K + 1)$ matrix and $R = [0 : I_K]$ is a $(K, 2K + 1)$ matrix. e indicates a $(T, 1)$ unit vector and $Y_i = [y_{1,t} : y_{2,t} : \ldots : y_{K,t}]$, $X_i = [x_{1,t} : x_{2,t} : \ldots : x_{K,t}]$. $\theta_i = (\alpha_i \beta_i')$ is the vector of parameters of the model.

Under the null hypothesis of non-causality, each individual Wald statistic converges to a chi-squared distribution with K degrees of freedom for $T \to \infty$

$$W_{i,T} \to \chi^2(K), \forall i = 1, \ldots, N. \quad (14)$$

By Lindberg-Levy central limit theorem the average statistic $W_{N,T}^{HNC}$ sequentially converges in distribution:

$$Z_{N,T}^{HNC} = \sqrt{\frac{N}{2K}}(W_{N,T}^{HNC} - K) \to N(0,1). \quad (15)$$

The standardized test statistic $\tilde{Z}_N^{HNC}$ for fixed T samples is:

$$\tilde{Z}_N^{HNC} = \sqrt{\frac{N}{2\times K}} \times \frac{(T-2K-5)}{(T-2K-1)} \times \left[\frac{(T-2K-3)}{(T-2K-1)} W_{N,T}^{HNC} - K\right] \to N(0,1). \quad (16)$$

The detailed characteristics of both test statistics are provided in Dumitrescu and Hurlin (2012).

RESULTS

We first test the causality from the index NNI to stock returns and vice versa. Then we test the same causality relationships with the other indices NSI, PNI and SNI, respectively. For each pair, Wald statistic and standardized test statistics were computed. These statistics are computed for one, three and twelve months' lags. The results are reported in Tabs. V–VIII.

Tab. V presents the results for the causality between the index NNI and stock returns and stock returns and the NNI index, respectively. The homogeneous non causality between stock returns and index NNI is rejected at 1% level for the lag of one and three months. Hence, the past stock returns may be useful for the forecasting of the standardized volume of net purchases in the period of one and three months, respectively.

Results of testing causality between the stock returns and index NSI that represents the volume of insider transactions are reported in Tab. VI. In that relationship, the non-causality between stock returns and volume of insider transactions is rejected at 1% level for lag one and 5% level for lag three. Thus, the past stock returns influence the volume of insider activities in the time horizon of the one and three months.

Results of the relationship between stock returns and index PNI that measures the share of insider

V: *Causality relationship – stock returns and NNI index*

Lag order	K = 1	K = 3	K = 12
Index NNI to Returns			
Wald stat.	0.847	2.539	12.789
Stand. stat.	–0.645	–1.119	0.420
Lag order	**K = 1**	**K = 3**	**K = 12**
Returns to Index NNI			
Wald stat.	2.720	5.004	12.631
Stand. stat.	6.363***	4.141***	0.274

Note: *, **, *** denote significance at the 10%, 5% and 1% respectively
Source: Authors' calculations

VI: *Causality relationship – stock returns and NSI index*

Lag order	K = 1	K = 3	K = 12
Index NSI to Returns			
Wald stat.	0.906	5.847	13.368
Stand. stat.	–0.424	–0.424	1.001
Lag order	**K = 1**	**K = 3**	**K = 12**
Returns to Index NSI			
Wald stat.	2.771	8.171	12.978
Stand. stat.	–0.425***	3.000**	0.614

Note: *, **, *** denote significance at the 10%, 5% and 1% respectively
Source: Authors' calculations

VII: *Causality relationship – stock returns and PNI index*

Lag order	K = 1	K = 3	K = 12
Index PNI to Return			
Wald stat.	1.090	3.278	14.816
Stand. stat.	0.261	0.459	2.430**
Lag order	**K = 1**	**K = 3**	**K = 12**
Return to Index PNI			
Wald stat.	1.977	3.980	11.781
Stand. stat.	3.583***	1.957*	0.572

Note: *, **, *** denote significance at the 10%, 5% and 1% respectively
Source: Authors' calculations

VIII: *Causality relationship – stock returns and SNI index*

Lag order	K = 1	K = 3	K = 12
Index SNI to Return			
Wald stat.	1.452	6.526	19.758
Stand. stat.	0.625	0.876	1.752
Lag order	**K = 1**	**K = 3**	**K = 12**
Return to Index SNI			
Wald stat.	1.863	7.256	16.785
Stand. stat.	0.364	0.459	1.456

Note: *, **, *** denote significance at the 10%, 5% and 1% respectively

buying transactions to the insider transactions as a whole are presented in Tab. V. The results suggest that in the horizon of one and three months the past stock returns may be employed to predict number of insider purchasing activities. In the horizon of twelve months, the situation is different and the past number of buying transaction has an impact on future stock returns.

Tab. VIII demonstrates the results of the causality testing between index SNI that measures the share of insider selling transactions to the number of insider transactions as a whole and stock returns. The homogeneous non causality hypothesis is not rejected in any tested situation. Thus, there is no evidence of the causality between these two variables.

CONCLUSION

In this paper, we have analyzed the causality relationships between stock returns and insider transactions using aggregate monthly panel data of German blue chips from 2006 to 2014. The examination is based on heterogeneous panel Granger causality of Dumitrescu and Hurlin (2012). Our findings show strong relationship between stock returns and future insider trading activities in the time period of one and three months. These results are confirmed be three out of four insider trading activity indices. The fact of the legal insider trade (either buy or sell) is more important than its volume. These effects diminishes in the longer time horizon. The reverse causality between insider transactions and subsequent stock returns based on our dataset of monthly observations is weak and exists only in the longer time horizon of 12 months. These findings are consistent with

the findings of Chowdhury *et al*. (1993) and Iqbal and Shetty (2002). But compared to previous studies on the German stock market, the effect of insider transactions on stock prices is not discovered in the longer (one month) time horizon, and thus seems to diminish in the long run, whereas the effect of stock price changes on insider trading activities is only present in the long run. Hence, corporate insiders could be considered as regular market participants, for whom insider transactions are the form of compensation as suggested by Manne (1967, 2005). As the result, insider traders do not degrade the market efficiency in the long run. However, and this is the main drawback of our study, our results cannot shed light on whether corporate insiders are able to manipulate the stock market, since most of manipulations are short-lived and infrequent.

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Contact information

Dagmar Linnertová: Dagmar.Linnertova@mail.muni.cz
Oleg Deev: oleg@econ.muni.cz