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Czarnitzki, Dirk; Stadtmann, Georg

Working Paper

## The behaviour of noise traders: empirical evidence on purchases of business magazines

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## Non-technical Summary

According to the prospect theory financial investors tend to sell winners too early and ride losers too long. Hence, financial investors are changing their positions more frequently in a bull market than in a bear market. In a bear market, financial investors stick to their (loss) positions to avoid that their paper loss is realized and wait for a recovery of the market. Therefore, investors are not in need of financial advice and possess a lower demand for business magazines. Hence, demand for financial advice should be high (low) in a bull (bear) market which increases (decreases) the propensity to buy a business magazine.

Regarding the emotional part of an investment the financial investor is less frequently buying a business journal in a bear market because she or he does not want to be reminded of her/his loss position by reading the "bad news" of the magazines. In the opposite market condition of a bull market, the financial investor buys a journal more frequently, because she or he gains pride by proving that his financial decisions turned out to be right.

We test the hypothesis that the overall performance of the German stock market index (DAX) is related to the sale figures of two business magazines. The "Boerse Online" magazine deals mainly with stock market related topics while "Wirtschaftswoche" is a more general business journal. However, it is expected to carry many information about the economic environment which are regarded to be important to evaluate future stock market performance. Additionally, we use the sale figures of two large magazines called "Der Spiegel" and "Focus". Both magazines are more general magazines. Hence, these more general magazines are used as a control group to test our hypothesis. The stock market's situation should not have any impact on the sales of Spiegel and Focus.

In fact it turns out that there exists a positive relationship as we hypothesized for the business but not for the more general magazines. The impact of the DAX on the sales is stronger for Boerse Online than for Wirtschaftswoche because this magazine is more closely related to the stock market. Further, the movement of the stock market does not influence the sale figures of our control group (Spiegel and Focus). This emphasizes our findings that the movement of the stock market is related to the sales figures of business magazines.

**The Behaviour of Noise Traders —  
Empirical Evidence on Purchases  
of Business Magazines<sup>1</sup>**

Dirk Czarnitzki  
Centre for European  
Economic Research (ZEW)  
P.O. Box 10 34 43  
D-68304 Mannheim  
Phone: +49/621/1235-158  
Fax: +49/621/1235-170  
e-mail: czarnitzki@zew.de

and

Georg Stadtmann  
Wissenschaftliche Hochschule  
für Unternehmensführung (WHU)  
Burgplatz 2  
D-56179 Vallendar  
Phone: +49/261/6509-283  
Fax: +49/261/6509-289  
e-mail: stadtmann@whu.edu

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**Abstract**

According to the prospect theory financial investors tend to sell winners too early and ride losers too long. Therefore, demand for financial advise should be high in a bull market and low in a bear market. Thus, we test the hypothesis whether the demand for business magazines is somehow related to the performance of the stock market. It turns out that the sales of these magazines are positively correlated with the stock market index. Due to the fact that the information provided in business magazines seem to be already reflected in stock prices, trading on those kind of data will be just like trading on noise. In conclusion, we are able to isolate a major influence factor for the expectation formation process of noise traders.

**Keywords:** Noise Trader, Stock Market, Business Magazine,  
Demand Estimation

**JEL Classification:** C22, D12, G14

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# 1 Introduction

According to a definition of Black (1986), noise traders trade on noise as if it were information. Unfortunately, financial investors can never be sure that the data they trade on is information rather than noise. "What if the information they have has already been reflected in prices? Trading on that kind of information will be just like trading on noise." (Black, 1986, p. 532).

Following the prospect theory, financial investors tend to sell winners too early and ride losers too long. Therefore, demand for financial advice should be high in a bull market and low in a bear market. In this study, we determine the relationship between the movement of the German stock market index DAX and the sales of business magazines. We hypothesize that the market for business magazines is positively correlated to stock market index. Therefore, we expect that the sale figures increase with an increase in stock prices and vice versa. It turns out that the sales of these magazines are positively correlated with the development of the stock market index.

The structure of the paper is as follows: The second section provides some theoretical considerations about the relationship of stock market performance and the demand for business magazines. The third section uses weekly sale figures for business magazines to test our hypothesis. The final section offers some concluding remarks and suggestions for further research.

# 2 Theoretical Considerations

"Consensus Incorporated" and the "Market Value Corporation" are American companies which survey market advisory services, newsletters, electronic bulletin boards to evaluate whether these information brokerage institutions are bullish or bearish on particular commodities. These kinds of information are condensed in a market sentiment index. It can be assumed that the data provided by the information brokerage institutions do not contain any news but only data which are already reflected in market prices. For example, Solt and Statman (1988) find that this market sentiment index contains no useful information for forecasting market returns. Hence, if those institutions publish data which are already reflected in market prices, these data cannot be regarded as information but must be classified as noise. Investors who rely on those kinds of data can therefore be considered as noise traders.

Sanders, Irwin and Leuthold (1996) use market sentiment indices to gain insight into the process how information brokerage institutions build their expectations. Due to the fact that noise traders rely on this kind of information, a major influence factor for the expectation formation process and the demand of noise traders can be isolated for a deeper analysis. The results of Sanders et al. indicate that traders who rely on information brokerage institutions are predominantly positive feedback traders, i.e. returns on different markets lead sentiment indices. This is in line with the finding of Solt and Statman (1988, p. 51) who conclude that there is indeed a relation between the sentiment index and the performance on the stock market. But the sentiment index is following stock market indices and not leading them. Therefore, we conclude that the data given in business magazines do not contain any new information to financial markets but only noise which is already reflected in market prices. Hence, investors who rely their decisions on the data of business magazines can be classified as noise traders.

It seems to be a well known fact in the literature of behavioral finance that investors have an aversion to loss realization. For example, Kahneman and Tversky (1979, 1992) developed the so called prospect theory which suggests the hypothesis that investors in stocks display a disposition to sell winners too early and ride losers too long. Shefrin and Statman (1985) as well as Odean (1998) present evidence that this effect can not only be observed in laboratory experiments but is also present in real-world financial markets. Decision makers in financial markets encounter considerable difficulties in closing positions at a loss. Realizing losses by selling a position seems to be difficult, because investors have to confess that their first judgement was wrong. Realizing a position at a loss means that financial investors can no longer calm themselves that the position is just a paper loss instead of a real one. The regret of having erred may also be leveraged by having to admit the mistakes to others (spouse, friends, co-workers, etc.). Regret is an emotional feeling associated with the knowledge that the past decision is proven to be wrong. "The positive counterpart to regret is pride. While closing a stock account at a loss induces regret, closing at a gain induces pride." (Shefrin and Statman, 1985, p. 782).

Shiller (1999, p. 1313) points out that there is a human tendency to feel the pain of regret at having made errors, even small errors. "One 'kicks oneself' at having done something foolish." Due to the fact that the emotional feelings seem to be related to the stock market we hypothesize that the sales of business magazines should be related to the performance of the stock market. If the stock market goes up, so that the average financial

investor and potential reader of a business journal is able to generate profits on his long position, the sale of the magazines should also increase. This effect can arise due to different reasons:

- As winners are sold to early and losers are ridden too long, financial investors are changing their positions more frequently in a bull market. Therefore, they are in need of more financial advice in a bull market which increases the propensity to buy a business journal. In a bear market instead, financial investors stick to their (loss) positions to avoid that their paper loss is realized and wait for a recovery of the market. Therefore, they are not in need of financial advice and possess a lower demand for business magazines.
- Regarding the emotional part of an investment the financial investor is less frequently buying a business journal in a bear market, because she or he does not want to be reminded of her/his loss position by reading the 'bad news' of the magazines. In the opposite market condition of a bull market, the financial investor buys a journal more frequently, because he gains pride by proving that his financial decisions turned out to be right.

Hence, the stock market index should be positively correlated with the sales of business magazines. This relationship is analysed empirically in the following section.

### **3 Empirical Analysis**

The data for the sale figures are publicly available from the World Wide Web (see [www.pz-online.de](http://www.pz-online.de)). The data used in the estimations below are weekly circulation figures of two major German business magazines called "Wirtschaftswoche" and "Boerse Online". The "Boerse Online" magazine deals mainly with stock market related topics while "Wirtschaftswoche" is a more general business journal. However, it is expected to carry many information about the economic environment which are regarded to be important to evaluate future stock market performance. Additionally, we use the sale figures of two large magazines called "Der Spiegel" and "Focus". Both are more general magazines and deal with all kinds of topics like news, politics, society, economics, culture, science and so on. These two magazines are used as a control group to test our hypothesis. The stock market's situation should not have any impact on the sales of Spiegel and Focus.

The time series cover the period from April 1996 to October 2000. Thus, the data set under consideration consists of about 230 weekly observations for all magazines. The condition of the German stock market is approximated by weekly averages of the "Deutscher Aktienindex" (DAX). As we estimate demand equations we also include the consumer price index (CPI) and the index of industrial production as a proxy for the income. Note that CPI and Income are not available weekly. We have to use monthly frequencies for these two variables. Descriptive Statistics are given in Table 1.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.
Sales of "Wirtschaftswoche"	179,472	8,520	166,596	210,177
Subscriptions of "Wirtschaftswoche"	113,573	2,688	110,052	125,614
Sales of "Boerse Online"	174,052	84,746	52,699	388,424
Subscriptions of "Boerse Online"	84,078	40,052	27,676	161,601
Sales of "Focus"	776,954	62,621	671,346	1,007,541
Subscriptions of "Focus"	320,611	20,362	284,472	354,015
Sales of "Spiegel"	1,039,493	33,702	957,161	1,176,577
Subscriptions of "Spiegel"	305,015	12,178	288,247	326,385
DAX	4,790.8	1,521.4	2,468.1	7,990.6
Income (Industrial Production Index)	107.06	3.77	99.3	114.3
CPI	104.18	1.64	101.2	107.4

Model I is a regression of  $\log(\text{Sales})_t$  on the logs of DAX, CPI, Income and a linear trend. This is proposed to be the long-run relationship between Sales and its determinants. We carry out tests on co-integration between the logarithm of magazines' sales and the exogeneous variables. Following MacKinnon (1991) and we run the cointegrating regression based on the Engle-Granger test as printed in Table 2. Then the residuals  $\hat{z}_t$  of these regressions are calculated and we compute the augmented Dickey-Fuller (DF) statistic to test whether  $\hat{z}_t$  is  $I(1)$  by running the regression  $\Delta\hat{z}_t = \gamma\hat{z}_{t-1} + \sum_i \alpha_i \Delta\hat{z}_{t-i} + \varepsilon_t$ . The estimated coefficient  $\gamma$  and its corresponding t-value are presented in Table 2. The critical value calculated by MacKinnon (1991) is about  $-4.17$  and we thus can reject the null hypothesis of no cointegration. Hence, the OLS estimator can be applied. As autocorrelation still occurs (see the Durbin-Watson test  $d$  in Table 2) we calculate Newey-West standard errors that are robust against first order autocorrelation of residuals.

The results in Table 2 are striking: The DAX is positively significant in the regressions of Boerse Online and Wirtschaftswoche which supports our hypothesis on noise traders' behaviour. Furthermore, the DAX has no

impact on our control group of Spiegel and Focus. This emphasizes our findings for the business magazines.

One could argue that consumers are used to purchase the same magazines on a regular basis, i.e. every week. Therefore, as an alternative approach we take into account the so-called "habit effect" (see Becker and Murphy, 1988). In Model II we add the lagged sales of the magazines as an explanatory variable to the regressions (see Table 3). For this equations, we calculate the  $Q$  statistic instead of the Durbin-Watson test in order to test for autocorrelation of the residuals. The  $Q$  test indicates serial correlation only for the Spiegel equation.

Again, it turns out that the DAX influences the number of business magazines sold per week. When the DAX is going up more Boerse Online and Wirtschaftswoche magazines are sold and vice versa. The impact of the DAX on the sales is stronger for Boerse Online because this magazine is more closely related to the stock market. The habit effect of consumers is supported by the highly significant coefficients .84 and .71 of the lagged dependent variable. The regressions for the control group do not find any positive effect of the DAX on sales of Spiegel and Focus (see Table 3). One can only identify an AR1 process. Neither the DAX nor the other control variables are statistically significant on the 5% level in the Spiegel or Focus regressions. This also supports our hypothesis on the noise traders' behaviour.

As a further step, we take the number of subscriptions into account of our analyses. Due to the fact that subscribers signed a longer term contract, they are not able to react on current incidents. Therefore, we construct a new dependent variable adjusted by subscriptions:  $\log(\text{Sales} - \text{Subscriptions})_t$ . If our behavioural story fits, the effects of the DAX should be stronger now. We repeat all our previous applications with the sale figures without subscriptions and present the results in Tables 4 and 5. Once more, the findings are in line with our hypothesis. All estimates are similar to the former ones and as expected the DAX effects are stronger for the regressions of Boerse Online and Wirtschaftswoche if one subtracts the subscriptions from the sale figures. Again, the DAX does not influence the sales of the control group's magazines.



Table 2: Regression results — Model I<sup>a</sup>

	Dependent Variable: $\log(\text{Sales})_t$			
	Boerse Online <sup>b</sup>	Wirtschaftswoche <sup>b</sup>	Focus <sup>b</sup>	Spiegel <sup>b</sup>
$\log(\text{DAX})_t$	1.47 (13.14)	.09 (2.81)	-.04 (-.55)	-.02 (-.84)
$\log(\text{CPI})_t$	-12.34 (-3.64)	-.44 (-.60)	-1.30 (-.61)	1.23 (1.39)
$\log(\text{Income})_t$	.53 (1.18)	.09 (.62)	.72 (1.58)	.16 (1.01)
Linear trend	.003 (8.19)	.0002 (1.54)	.0002 (.49)	-.0002 (-1.33)
Constant term	53.91 (3.74)	12.94 (4.35)	16.51 (1.96)	7.61 (2.07)
$R^2$	.97	.66	.02	.06
$d$	.45	.59	1.65	1.58
$\gamma$	-.21 (-5.11)	-.29 (-6.09)	-.83 (-12.86)	-.51 (-5.72)
Observations	232	232	235	235

<sup>a</sup> t-values in parentheses.  $\gamma$  is the estimated coefficient of the test on cointegration described in the text.  $d$  is the Durbin–Watson statistic.

<sup>b</sup> The standard errors of the regressions are estimated with the Newey–West procedure to control for first-order autocorrelation which is indicated by the Durbin–Watson test.

Table 3: Regression results — Model II<sup>a</sup>

	Dependent Variable: $\log(\text{Sales})_t$			
	Boerse Online	Wirtschaftswoche	Focus	Spiegel <sup>b</sup>
$\log(\text{Sales})_{t-1}$	.84 (13.59)	.71 (11.22)	.17 (2.77)	.21 (2.84)
$\log(\text{DAX})_t$	.30 (3.04)	.03 (2.01)	-.03 (-.52)	-.02 (-.42)
$\log(\text{CPI})_t$	-4.07 (-2.42)	-.20 (-.41)	-1.10 (-0.55)	.96 (.21)
$\log(\text{Income})_t$	.25 (1.03)	.006 (.006)	.63 (1.41)	.16 (.29)
Linear trend	.0006 (1.94)	.00007 (.99)	.0001 (.42)	-.0001 (-.24)
Constant term	17.08 (2.51)	4.21 (2.13)	13.64 (1.71)	5.99 (.08)
$R^2$	.99	.82	.05	.10
$Q \sim \chi^2(30)$	32.67	33.14	28.59	63.27
Observations	231	231	234	234

<sup>a</sup> t-values in parentheses.  $Q$  is the Box–Pierce statistic.

<sup>b</sup> The standard errors of the regression are estimated with the Newey–West procedure to control for first-order autocorrelation. See line  $Q$ .

Table 4: Regression results — Model III<sup>a</sup>

	Dependent Variable: $\log(\text{Sales} - \text{Subscriptions})_t$			
	Boerse Online <sup>b</sup>	Wirtschaftswoche <sup>b</sup>	Focus <sup>b</sup>	Spiegel <sup>b</sup>
$\log(\text{DAX})_t$	2.25 (11.45)	.17 (3.58)	-.06 (-.57)	-.03 (-.79)
$\log(\text{CPI})_t$	-21.95 (-3.87)	-.93 (-.73)	-1.01 (-.78)	1.79 (1.43)
$\log(\text{Income})_t$	.65 (.95)	.32 (1.27)	1.31 (1.73)	.28 (1.23)
Linear trend	.002 (2.91)	.0006 (3.02)	-.0007 (-1.30)	-.0005 (-2.91)
Constant term	91.03 (3.77)	12.38 (2.39)	12.22 (.88)	4.22 (.81)
$R^2$	.94	.78	.11	.09
$d$	.54	1.24	1.65	1.57
$\gamma$	-.24 (-5.48)	-.60 (-9.65)	-.83 (-12.90)	-.51 (5.73)
Observations	232	232	235	235

<sup>a</sup>  $t$ -values in parentheses.  $\gamma$  is the estimated coefficient of the test on cointegration described in the text.  $d$  is the Durbin–Watson statistic.

<sup>b</sup> The standard errors of the regressions are estimated with the Newey–West procedure to control for first-order autocorrelation which is indicated by the Durbin–Watson test.

Table 5: Regression results — Model IV<sup>a</sup>

	Dependent Variable: $\log(\text{Sales} - \text{Subscriptions})_t$			
	Boerse Online	Wirtschaftswoche	Focus	Spiegel <sup>b</sup>
$\log(\text{Sales} - \text{Subscr.})_{t-1}$	.79 (11.49)	.38 (5.20)	.17 (2.69)	.21 (2.91)
$\log(\text{DAX})_t$	.56 (3.39)	.11 (3.18)	-.05 (-.55)	-.03 (-.77)
$\log(\text{CPI})_t$	-8.05 (-2.57)	-.61 (-.54)	-.87 (-.25)	1.40 (1.29)
$\log(\text{Income})_t$	.48 (1.09)	.17 (.79)	1.13 (1.59)	.26 (1.24)
Linear trend	.0005 (1.41)	.0004 (2.21)	-.0006 (-1.16)	-.0004 (-2.58)
Constant term	32.71 (2.62)	7.87 (1.78)	10.08 (.74)	3.26 (.70)
$R^2$	.98	.81	.13	.13
$Q \sim \chi^2(30)$	32.34	29.91	30.98	66.26
Observations	231	231	234	234

<sup>a</sup>  $t$ -values in parentheses.  $Q$  is the Box–Pierce statistic.

<sup>b</sup> The standard errors of the regression are estimated with the Newey–West procedure to control for first-order autocorrelation. See line  $Q$ .

## 4 Conclusions

It seems to be a well acknowledged fact in the literature of behavioral finance that financial investors tend to sell winners too early and ride losers too long. This kind of effect has a drawback for the need and thus for the demand for financial advice. In a bull market financial investors tend to switch their positions more frequently while they stick to their loss position in a bear market and hope for a market recovery. We test the hypothesis that the overall performance of the German stock market index (DAX) is related to the sale figures of business magazines. In fact it turns out that there exists a positive relationship as we hypothesized. As a suggestion for future research, one may determine whether this effect is internationally stable or whether cultural differences exist between investors of different countries.

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