Bad news and intra-industry information transfer: Evidence from short selling around earnings announcements

Wei Zhang *

Accounting, Finance & Information System
College of Business
North Dakota State University
NDSU Dept. 2410
PO Box 6050
Fargo, ND 58108

April, 2011

* Email: wei.zhang@ndsu.edu. The author thanks Yeon Kim for assistance in data processing and acknowledges constructive comments from seminar participants in Arizona State University and North Dakota State University.

Bad news and intra-industry information transfer: Evidence from short selling around earnings announcements

Abstract

Prior accounting literature on earnings announcements has consistently shown that stock prices of non-announcing, competing firms respond to earnings announcements made by rival firms in the same industry. In this exploratory study, we take one step back from prices and returns, and examine short selling activities across announcing firms and non-announcing, competing firms. In the context of 222 earnings announcements in 95 industries, we find evidence that the probability of market-perceived bad news is indistinguishable across announcing firms and non-announcing, competing firms in the same industry. Moreover, the rate of short-sale order arrival is also indistinguishable across announcing firms and non-announcing, competing firms in the same industry. Our result suggests that short selling in announcing firms and competing firms of the same industry are motivated by a set of common industry-wide information.

Bad news and intra-industry information transfer: Evidence from short selling around earnings announcements

1. Introduction

Prior accounting literature on earnings announcements, starting from Foster (1981), has consistently shown that stock prices of non-announcing, competing firms respond to earnings announcements made by other firms in the same industry and that stock prices of competing firms reflect transfers of within-in-industry information made available by earnings announcements [Baginski (1987); Han, Wild, and Ramesh (1989); Han and Wild (1990); Freeman and Tse (1992); and Ramnath (2002)]. In this article, we examine the probability of bad news and rate of short-sale order arrival across announcing firms and non-announcing, competing firms in the same industry. We take the view that stock prices are driven by trading; trading is driven by order arrival; and order arrivals are driven by information. If rival firms are sensitive to a set of common industry-wide information as suggested by previous studies, one would expect that short-sale order arrival and the underlying bad news should be related across announcing firms and non-announcing, competing firms in the same industry. Examining the extent to which short-sale orders resulting from bad news facilitate the transfer of industry-wide information provides further insight on how prices are determined in financial markets.

Short selling is a process in which the short seller borrows stocks she does not own and sells them in anticipation of price declines. The short position is covered when the short seller buys the stocks back and returns them. Short selling involves a very specific set of risks: borrowing a stock may be expensive and difficult; the downside risk of a short position is theoretically unlimited; a short seller has to deal with short squeezes

when her lender demands immediate return of borrowed securities. Academic literature on short-selling presents overwhelming evidence that short-sellers are informed traders [Akin, Frino, McCorry, and Swan (1998), Asquith, Pathak and Ritter (2005), Diether, Lee, and Werner (2008), and Boehmer, Jones, and Zhang (2008)].

In this article, we take a step back from prices and returns, and look at short selling activities across announce firms and non-announcing, competing firms. We hypothesize that short-sale order arrival and the underlying bad news should be related across announcing firms and non-announcing competing firms in the same industry, since stock prices of firms in a particular industry are driven by a set of common industry-wide information as suggested by existing literature. In particular, we propose a exploratory method to test two hypotheses related to the probability of bad news and short-sale order arrival around earnings announcements: (1) the probability of bad news is closely related across announcing firms and non-announcing, competing firms in the same industry; and (2) the rate of short-sale order arrival is closely related across announcing firms and non-announcing, competing firms in the same industry.

The rest of the article is organized as follows. The next section describes the background and motivation for the proposed hypotheses. Section 3 proposes an extension of an existing empirical model to test our hypotheses. Section 4 provides the test results. Section 5 concludes.

2. Background and hypotheses development

Accounting research on intra-industry transfer focuses on the stock price reactions of non-announcing firms around information release date of other firms in the same industry. Earnings announcements [Firth (1996); Forster (1981); Clinch and Sinclair

(1987); Han and Wild (1990)], management forecasts of earnings [Baginski (1987); Han, Wild and Ramesh (1989)], equity offering [Szewczyk (1992)], and bankruptcy announcements [Lang and Stulz (1992)] have been extensively studied. These studies suggest that investors interpret information released by announcing firms as relevant information for other non-announcing firms in the same industry and trade accordingly. Based on a seasonal random walk expectation of earnings changes, Freeman and Tse (1992) found that earnings changes of firms in the same industry are positively correlated. This interpretation is consistent with the general intuition that similar, rival firms are sensitive to a set of common industry-wide information.

If stock prices of competing firms respond to earnings announcements made by other firms in the same industry, the relationship of short selling activities on announcing firms and non-announcing, competing firms is worth investigating. Recent literature has documented that, within the same industry, net trade volume of announcing firms and nor-announcing competing firms are significantly related around earnings announcements [Tookes (2008)]. Since information drives short-sale order arrival; and short-sale order arrival drives trading volume which is reflected in transaction prices, both industry-wide bad news perceived by short sellers and short-sale order arrival should be related across announcing firms and non-announcing firms around earnings announcements. This suggests the following hypothesis.

H1: The probability of bad news perceived by short sellers is indistinguishable across announcing firms and non-announcing, competing firms in the same industry around earnings announcement.

H1 stems from empirical results in previous studies on intra-industry information flow. In particular, it is well documented that announcements of unexpected increases (decreases) in earnings and dividends of a firm increase (decrease) the stock return of its industrial rivals [Firth (1976); Foster (1981); Baginski (1987)]. If stock prices of firms in an industry respond to a set of common industry-wide bad news, then the probability of bad news as perceived by market participants should be the same across firms in the same industry.

H2: The arrival of short-sale orders is indistinguishable across announcing firms and non-announcing, competing firms in the same industry around earnings announcements.

If the underlying information is the same across the industry, the order arrival, driven by market-perceived bad news, should be the same. H2 results directly from H1.

3. Proposed method of estimation

To estimate the probability of bad news and rate of short-sale order arrival, We extend and implement a model first proposed by Easley, Kiefer, O'Hara, and Paperman (1996) (EKOP (1996) hereafter). This model has been employed to address many important microstructure issues in many previous studies (see e.g. Easley et al. (1998); Easely et al. (2001); Easely and O'Hara, 2004; and Li et al., 2009). The information structure of our modified model is illustrated in Figure 1. The model assumes that at the beginning of each period, there is a probability α for the arrival of a signal about the value of the underlying asset traded. The signal can be good news or bad news with the probability of $1-\delta$ and δ respectively. During each trading period, orders arrive according to independent Poisson processes. The market maker sets prices as orders

arrive, conditional on information at the time of trade. Orders from informed traders arrive at the rate of μ, and order from uninformed, liquidity traders arrive at the rate of ε. In addition to the buy and sell orders from informed traders and uninformed liquidity traders in model of EKOP (1996), we extend the model to include orders from short sellers. Short sell orders are also assumed to follow an independent Poisson process; they arrive at the rate of μ_{ss}. We implicitly assume that short sell orders are informationally motivated and are from informed traders [Akin, Frino, McCorry, and Swan (1998), Asquith, Pathak and Ritter (2005), Diether, Lee, and Werner (2008), and Boehmer, Jones, and Zhang (2008)]..

To adapt the model in EKOP (1996) to the setting of public information such as earnings announcements, we take the view that trading is motivated by traders' updates based on their heterogeneous anticipation and interpretation of earnings announcements (see Li et al. 2009). The skilled investor can better process public information and tend to update it more precisely than the unskilled investor whose updates can be equally likely to be right and wrong. As a result, the skilled (unskilled) investors behave like informed (uninformed) traders in the EKOP (1996). The modified likelihood function is

$$L(\theta \mid B,S,SS) = (1-\alpha)e^{-\varepsilon}\frac{\varepsilon^B}{B!}e^{-\varepsilon}\frac{\varepsilon^S}{S!} + \alpha(1-\delta)e^{-(\varepsilon+\mu)^B}\frac{(\varepsilon+\mu)^B}{B!}e^{-\varepsilon}\frac{\varepsilon^S}{S!}$$
$$+ \alpha\delta e^{-\varepsilon}\frac{\varepsilon^B}{B!}e^{-(\varepsilon+\mu)}\frac{(\varepsilon+\mu)^S}{S!}e^{-\mu_{SS}}\frac{\mu_{SS}}{SS!} \qquad (1)$$

where B, S, and SS are the total number of buys, sells, and short sales per five-mintute interval around earning announcements per firm, and $\theta = (\alpha, \delta, \varepsilon, \mu, \mu_{SS})$ is the vector of model parameters. By imposing a structure across the five-minute interval as defined in

EKOP (1996), we obtain the following likelihood function for observations over N five-minute intervals

$$\prod_{i=1}^{N} L(\theta \mid B_i, S_i, SS_i), \tag{3}$$

where (B_i, S_i, SS_i) are trade data for period i = 1,…,N.

Maximizing the above likelihood function given the trade data provides estimates of the structural model: $\theta = (\alpha, \delta, \varepsilon, \mu, \mu_{SS})$. The probability of informed trading (PIN) as defined in EKOP (1996) can then be obtained as

$$PIN = \frac{\alpha\mu + \alpha\delta\mu_{ss}}{\alpha\mu + \alpha\delta\mu_{ss} + 2\varepsilon} \tag{4}$$

where $\alpha\mu + \alpha\delta\mu_{ss}$ is the arrival rate of information-based trade and $\alpha\mu + \alpha\delta\mu_{ss} + 2\varepsilon$ is the arrival rate of all trades.

4. Data and Sample Selection

As a part of the Security Exchange Commissions (SEC) mandate, NYSE has made publicly available the intraday short-sale data during the period between 2 January 2005 and 6 July 2007 (for detail description of the data, see Diether et al. (2008)). Thus, this paper covers the same period during which the NYSE tick-by-tick short-sale data are available. The data include ticker, price, volume, date, time, and trader type (exempt vs. nonexempt from short-sale rules) for all NYSE short sales. Since our interests focus on the activities from informed traders and not on the impact of short-sale rule, we exclude short sales that are exempt, which are presumed to be from uninformed market-making activities. Pilot firms in the SEC mandated study are also exempted by short-sale rules, and are therefore excluded from our data.

Our process of earnings announcements selection follows closely those of Freeman and Tse (1992) and Tookes (2008). The initial sample consists of all common stocks in *CRSP/Compustat* merged database (*CCM*) at anytime during the period between 2005 and 2007. A valid announcement is defined as an earnings announcement by a NYSE firm that occur within 90 days of quarter-end and that does not occur within four trading days of an earnings announcement by another firm in the same industry. Industries are defined as all firms with the same four-digit SIC codes. Financial institutions and conglomerates are excluded. Following previous literature (Freeman and Tse (1992), Tookes (2008)), we require announcers and competitors to have December fiscal year-end to synchronize quarters. We require that each industry has at least eight valid announcements over the sample period. Earnings announcements are obtained from *CRSP/Compustat* merged database (*CCM*). Since only NYSE short-sale data are available to us, we identify valid announcements for NYSE firms only. Focusing on NYSE firms only also has the benefit of avoiding the effects of differences in market microstructure. Following prior literatures (Chan et al. (2002), Tookes (2008)), we impose an active trade filter of 50 trades per day on the intraday short-sale data to attenuate the problem of nonsynchronous trading. After matching valid announcements from *CCM* with active NYSE firms from SEC-mandated data, the sample consists of 222 earning announcements associated with 222 unique announcing firms in 95 industries from 2 January 2005 to 6 July 2007. In addition, we identify a group of active competing firms in the same industries. From this group of active competitors for a given valid announcement, one competing firm in the same industry is randomly selected for each announcing firm.

To estimate parameters in Equation (1) and PIN, we obtain buys, sells, and short sales from NYSE Trades and Quotes (TAQ) and SEC-mandated short data. Bid and ask quotes from TAQ within 30 seconds prior to short trades are matched to short-sale transactions from SEC-mandated short data by (1) firm, (2) market center (all NYSE), (3) date, (4) price (short sale price = bid), (5) volume, and (6) time. These matched sale transactions are classified as short sales. We apply the Lee and Ready (1991) algorithm to the remaining trades and quotes from TAQ to classify buys and sells. The empirical test is based on five-day event windows around earnings announcements (days -2 to +2), where day 0 is the announcement day. We divide each trading day into 78 five-minute intervals from 9:30 am to 4:00 pm, Eastern Standard Time, and sum the total number of buys, sells and short sales for each interval. There are all together 1110 trading days and over 50,000 five-minute intervals in our sample.

5. Exploratory tests and results

Table 1 provides the sample statistics and summarizes the parameter estimates. The small standard errors indicate strong statistical significance for all parameter estimates. In particular, order arrival rates are estimated with great accuracy due to large number of buys, sells, and short sales during the sample period. To compare the parameters of announcing firms and competing firm, we use nonparametric statistics, specifically the Wilcoxon test (also called the Mann-Whitney test) as in EKOP (also see Easely et al., 2001; Easely and O'Hara, 2004; and Li et al., 2009). The Wilcoxon test allows us to test the null hypothesis that two samples are drawn from identical populations against the alternative that one population is different from another. Wilcoxon test statistics and p-value are reported in Table 1.

As in EKOP (1996), we first consider the information event parameter, α, to check the reasonableness of our approach. Table 1 shows that the mean α for announcing firms (0.224) is higher than that for competing firms (0.206). The Wilcoxon test in Table 1 shows that the hypothesis that α for announcing firms is that same as α for competing firms is strongly rejected (p-value is 0.002). During a 5-day period around earning announcements, it is reasonable to expect that the probability of information event in higher in announcing firms that in non-announcing firms.

The next parameters of interest are the arrival rates of informed and uninformed traders. A major source of asymmetric information during a period of earnings announcement is the heterogeneous anticipation and interpretation of information. The skilled investor who can better processed information behaves like informed traders. The unskilled investor who is equally likely to be right and wrong behaves like uninformed traders. Both are motivated to trade by information. The probability of information event is, thus, directly related to the arrival of informed and uninformed orders. The Wilcoxon test in Table 1 shows that informed order arrival rate, μ, for announcing firms is significantly higher than that for competing firms (p-value is 0.002). Our estimates for arrival rate of uninformed order, ε, exhibits similar behavior. The Wilcoxon test statistic in Table 1 also shows that the hypothesis that ε for announcing firms is that same as ε for competing firms is also strongly rejected (p-value is 0.025). The overall results so far reveal that our estimates for order arrivals of regular buy and sell (non-short) orders for announcing firms and competing firms are originated from different populations.

We now consider Hypotheses 1 and 2 outlined in section 2. If short selling in announcing firms and competing firms are driven by a set of common industry-wide

information, then the probability of bad news, δ, should not be different across the same industry. The Wilcoxon test in Table 1 supports H1: the null hypothesis that δ for announcing firms and competing firms comes from identical populations can not be rejected (p-value is 0.127), indicating that the probability of bad news is indistinguishable across announcing firm and non-announcing, competing firm in the same industry. The other main question we want to examine is whether the rate of short-sale order arrival in announcing and competing firms is the same across the same industry. The Wilcoxon test in Table 1 shows that the null hypothesis (H2) that μ_{ss} is indistinguishable for announcing firms and competing firms can not be rejected (p-value is 0.391). Our results strongly suggest that short selling is informationally motivated and short sale orders for announcing firms and competing firms are motivated by a common set of industry-wide information. The probability of informed trading (PIN) is a composite variable characterized by the interaction of our estimated parameters as defined by EKOP (1996). The p-value of Wilcoxon test statistic for PIN is 0.173; indicating that, within the same industry, the risk of informed trading in competing firms is indistinguishable from that in announcing firms.

To get a clearer picture of how heterogeneous anticipation and interpretation of the earnings announcement impacts trading across announcing firms and competing firms and over time, we examine trade parameters in Equation (1) of announcing firms and competing firms before and after earnings announcements. Table 2 presents pairwise Wilcoxon test statistics and p-values for trade parameters estimated from equation (1) before and after earnings announcements. Day -2 and day -1 denote the period prior to announcement day. Day +2 and day +1 denote the period after the announcement day.

We note from Panel A of Table 2 that all the parameters are insignificant during the two days before earnings announcements. The null hypothesis of identical populations can not be rejected for any of the parameters. This strongly indicates that, in the period leading to earnings announcements, the probability of informed trading (PIN) is the same across announcing firm and competing firm in the same industry. Furthermore, short selling in announcing firms and competing firms is from a common set of traders. The situation is very different after earnings announcements. As shown in Panel B of Table 2. During days +1 and +2, both informed trading parameters-- μ and μ_{ss} --are highly significant. The null hypothesis that short selling motivated by bad news in announcing firms and competing firms come from identical population is strongly rejected (p-values for δ and μ_{ss} are 0.0009 and 0.0123 respectively). After earnings announcements, order flow—both long and short-- from informed traders are significantly lower for competing firms than for announcing firms. Furthermore, the null hypothesis of identical population for information event and PIN are also rejected, albeit at slightly higher level of 10%.

6. Conclusion

In this paper, we examine the probability of bad news and rate of short-sale order arrival across firms in the same industry. In the context of 222 earnings announcements in 95 industries, we find compelling evidence that the probability of market-perceived bad news is indistinguishable across announcing firms and non-announcing, competing firms in the same industry. Moreover, the rate of short-sale order arrival is also indistinguishable across announcing firms and non-announcing, competing firms in the same industry. In addition, our results suggest that in the period leading to earning announcements, some informed traders capitalize on their informational advantage on

stocks of announcing firm by short selling stocks of non-announcing, competing firm in the same industry. Overall, our paper provides further insight on how intra-industry information is transferred and how stocks prices in financial market are determined.

References

Aitken, M., A. Frino, M. McCorry, and P. Swan, 1998, Short sales are almost instantaneously bad news: Evidence from the Australian Stock Exchange, *Journal of Finance* 53, 2205-2223.

Asquith, P., P. Pathak, and J. Ritter, 2005, Short interest, institutional ownership, and stock Returns, *Journal of Financial Economics* 78, 243-276.

Baginski, S., 1987, Intra-industry information transfer associated with management forecasts of earnings, *Journal of Accounting Research* 25, 196-216.

Boehmer, E., C. Jones, and X. Zhang, 2008, Which shorts are informed? *Journal of Finance* 63, 491-527.

Chan, K., Y. Chung, and W. Fong, 2002, The informational role of stock and option volume, *Review of Financial Studies* 15, 1049-1075.

Clinch, G and N. Sinclair, 1987. Intra-industry information transfer: a recursive systems approach. *Journal of Accounting and Economics* 9, 89-106.

Diether, K., K. Lee, and I. Werner, 2008, Short-sale strategies and return predictability, *Review of Financial Studies* 22, 575-607.

Easley, D., N. Kiefer, M. O'Hara, and J. Paperman, 1996, Liquidity, information, and less frequently traded stocks, *Journal of Finance* 51, 1405-1436.

Easley, D., M. O'Hara, and J. Paperman, 1998, Financial analyst and information-based trade, *Journal of Financial Market* 1, 175-201.

Easley, D., M. O'Hara, and G. Saar, 2001, How stock split affects trading: A microstructure approach, *Journal of Financial and Quantitative Analysis* 36, 25-51.

Easley, D. and M. O'Hara 2004, Information and the cost of capital, *Journal of Finance* 59, 1553-1583.

Foster, G., 1981, Intra-industry information transfer associated with earnings releases, *Journal of Accounting and Economics* 3, 201-232.

Firth, M., 1996, Dividend changes, abnormal returns and intra-industry firm valuations, *Journal of Financial and Quantitative Analysis 31*, 189-211.

Freeman, R., and S. Tse, 1992, An earnings prediction approach to examine inter-company information transfers, *Journal of Accounting and Economics* 15, 509-523.

Han, J. and J. Wild, 1990, Unexpected earnings and intra-industry information transfers: Further evidence, *Journal of Accounting Research* 28, 211-219.

Han, J., J. Wild and K. Ramesh, 1989, Manager's earnings forecasts and intra-industry information transfers, *Journal of Accounting and Economics* 11, 3-33.

Lang, L. and R. Stulz, 1992, Contagion and competitive intra-industry effects of bankruptcy announcements: An empirical analysis, *Journal of Financial Economics* 32, 45-60.

Lee, C. and M. Ready, 1991, Inferring trade direction from intraday data, *Journal of Finance* 46, 733-74.

Li, H., J. Wang, C. Wu, and Y. He, 2009, Are liquidity and information risks priced in the Treasury bond market? *Journal of Finance* 59, 491-527.

Ramnath, S., 2002, Investor and analyst reactions to earnings announcements of related firms: An empirical analysis, *Journal of Accounting Research* 40, 1351-1376.

Szewczyk, S., 1992, The intra-industry transfer of information inferred from announcements of corporate security offerings, *Journal of Finance* 47, 1935-45.

Tookes, H., 2008, Information, trading, and product market interaction: cross-sectional implication of informed trading, *Journal of Finance* 58, 379-413.

Table 1

This table presents means, medians, standard deviations, and median standard errors of parameters estimated from equation (1). α is the probability of an information event. δ is the probability of a low signal (bad news), μ is the rate of informed order arrival (both buys and sells), μ_{ss} is the rate of short sale order arrival, ε is the rate of uninformed orders arrival. The empirical test is based on five-day event windows around the earnings announcement day (days -2 to +2), where day 0 is the earnings announcement day. The pairwise Wilcoxon test statistics tests the null hypothesis that two sample groups (trade parameters for announcing firms and competing firms) are drawn from identical populations against the alternative that one population is different from another. Reported also are test statistics and *p*-value.

Parameters		announcing firms	competing firms	Wilcoxon test	*p*-value
α				-3.126	0.002
	mean	0.224	0.206		
	median	0.220	0.197		
	std. dev.	0.076	0.097		
	median SE	0.026	0.025		
δ				1.526	0.127
	mean	0.063	0.076		
	median	0.020	0.040		
	std. dev.	0.094	0.097		
	median SE	0.038	0.032		
μ				-3.068	0.002
	mean	18.860	14.630		
	median	13.840	11.090		
	std. dev.	23.950	11.410		
	median SE	0.681	0.606		
μss				-0.858	0.391
	mean	59.260	51.246		
	median	27.210	23.918		
	std. dev.	65.000	58.038		
	median SE	3.170	2.379		
ε				-2.265	0.025
	mean	10.180	8.330		
	median	7.337	5.469		
	std. dev.	9.579	7.309		
	median SE	0.117	0.093		
PIN				-1.363	0.173
	mean	0.194	0.183		
	median	0.192	0.18		
	std. dev.	0.069	0.072		
	median SE	0.021	0.02		

Table 2

This table presents the pairwise Wilcoxon test statistics and p-values for trade parameters estimated from equation (1) before and after earnings announcements. Day -2 and day -1 denote the period prior to the announcement day. Day +2 and day +1 denote the period after the announcement day. δ is the probability of a low signal (bad news), μ is the rate of informed order arrival (both buys and sells), μ_{ss} is the rate of short sale order arrival, ε is the arrival rate of uninformed orders. The pairwise Wilcoxon test statistics tests the null hypothesis that two sample groups (trade parameters for announcing firms and competing firms) are drawn from identical population against the alternative that one population is different from another.

Panel A:	Days -2, -1			
	Announcing firms	Competing firms		
Parameters	mean	mean	Wilcoxon Test	P-Value
α	0.2279	0.2226	0.1716	0.8637
δ	0.1161	0.1028	-0.5328	0.5942
μ	14.3400	15.9500	-0.5936	0.5528
μss	50.6190	49.6450	0.6195	0.5356
ε	8.6221	9.3847	-1.1735	0.2406
PIN	0.1976	0.1937	0.5174	0.6049
Panel B:	Days +1, +2			
	Announcing firms	Competing firms		
Parameters	mean	mean	Wilcoxon Test	P-Value
α	0.2369	0.2287	1.7106	0.0872
δ	0.0878	0.1326	-3.3293	0.0009
μ	18.9120	14.7412	2.7151	0.0066
μss	59.7505	50.7404	2.5035	0.0123
ε	11.0029	8.6358	3.5140	0.0004
PIN	0.1881	0.2103	-1.7601	0.0784

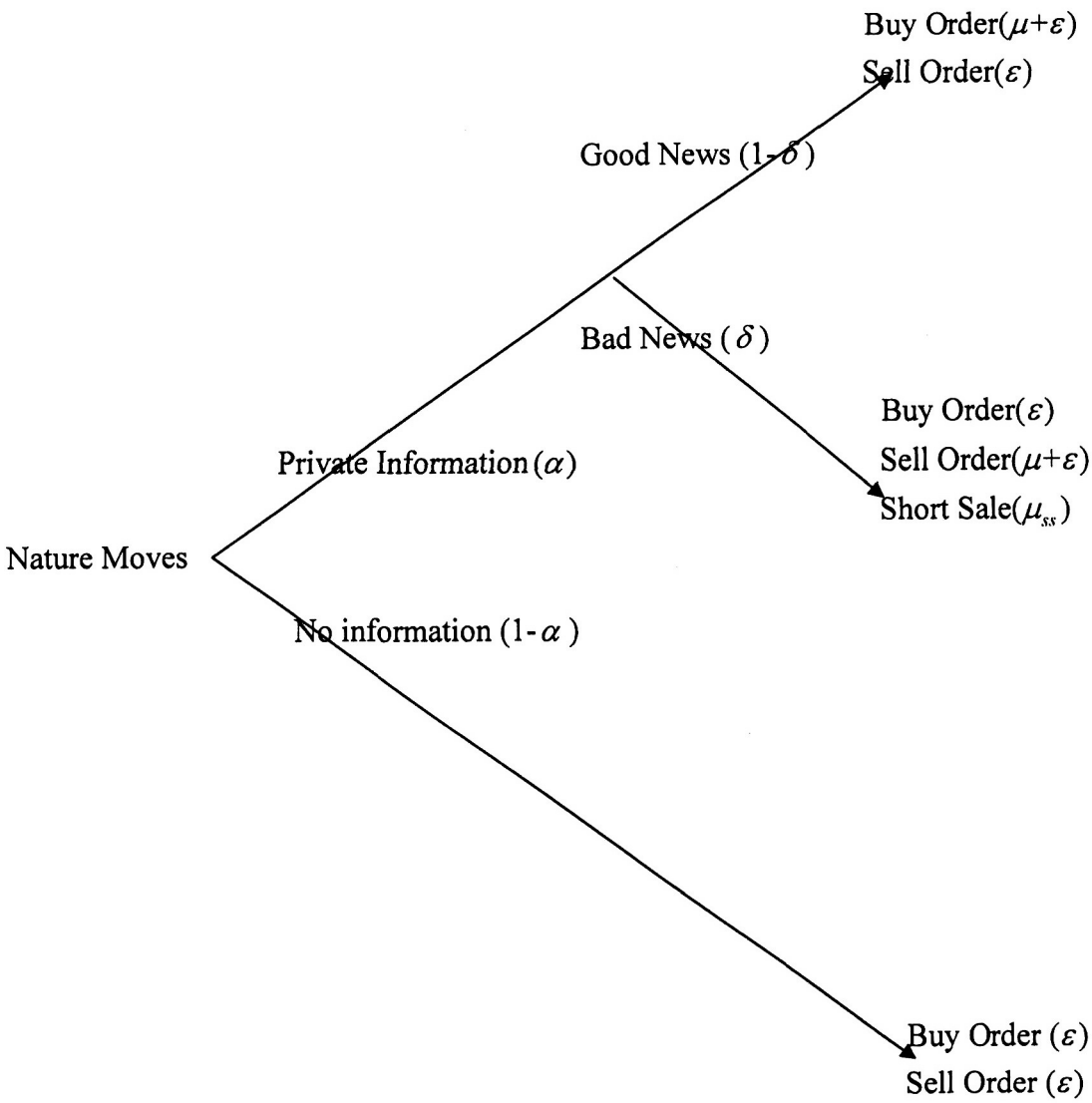

Figure 1: Tree diagram of the trading process with short-sale

This is figure gives the structure of the trading process with short-sale, where α is the probability of an information event, δ is the probability of a low signal, ε is the rate of informed order arrival and is the rate of uninformed order arrival, and μ_{ss} is the rate of short-sale order arrival.