

<http://ansinet.com/itj>

ITJ

ISSN 1812-5638

INFORMATION TECHNOLOGY JOURNAL

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Analysis of Implicit Transaction Costs Based on Stock Price Informativeness

¹Duan Shengjun, ¹Tian Cunzhi and ²Li Yunchun

¹Economic Research Center, Kunming University of Science and Technology,
650093, Kunming, China

²Construction Engineering School of Yunnan Agricultural University, 650201, Kunming, China

Abstract: This study used a model based on stock daily trading data to calculate implicit transaction costs, did a research from the perspective of the stock price informativeness which impact implicit transaction costs. Found that the impact of stock price informativeness on implicit transaction cost vary with itself. The relation between stock price informativeness and implicit transaction cost is nonlinear, when the stock price informativeness was smaller, it had a positive effect on implicit transaction cost and when the stock price informativeness was high, it has a negative effect.

Key words: Stock price informativeness, implicit transaction costs, asymmetric information

INTRODUCTION

Transaction cost theory is a core part in micro-market structure area. Securities transaction costs reflect transaction cost in trading process friction, including direct and indirect costs. Direct costs usually contains transaction fees, stamp tax and other taxes, these have a stable fluctuation on securities prices. Indirect cost is typically caused by trade friction, such as information costs, inventory costs and their effects are usually complicated and unstable. In order to measure the implicit transaction cost, scholars do many research, mainly deal with high-frequency data and get the result of short-term. This study uses the daily trading data to estimate the long-term implicit transaction costs and analyses it in a grand perspective.

Cost of asymmetric information is an important part of implicit transaction costs, Traders own information superiority would make their profit in the transaction. A fair and efficient market implicit transaction costs should be minimized, but in reality market frictions and transaction costs are unavoidable. To study the market, Fama (1970) proposed the efficient market hypothesis, according to the disclosure of information, he divided the market into weakly efficient market, semi-strong efficient market and the strong efficient market. Weakly efficient market contains historical information, semi-strong effective market includes the open information, strong efficient market contains all the information. The theory that stock price reflect all the information associated with the firm, including the market level, industry level and the

firm level information. Different information has a different impact on market, investors adopt investment strategy vary with it. Affected by market information, information costs will be reflected in the implicit transaction costs, this study based on the view to study the effects of market information on the implicit transaction costs.

LITERATURE REVIEW

Demsetz (1968) proposed a supply and demand analysis framework, market makers earn a bid-ask spread through providing liquidity to the market. Bagehot (1972) constructed an information model framework, market participants are divided into informed trading and uninformed traders. Copeland and Galai (1983) deemed that in a fully competitive market maker is risk neutral, then the bid-ask spread does not contain information costs, but contains inventories cost. When the market maker trade with informed trader, due to the lack of necessary information they may be faced a loss, information cost is necessary. Thus implicit transaction cost theory has being mature, the implicit transaction costs include explicit instruction processing costs, inventory costs and information costs.

Glosten and Harris (1988) decomposed spread into two components, one due to asymmetric information and another due to inventory costs, though Cross-sectional regression analysis gets stock spreads which are due to asymmetric information. Madhavan *et al.* (1997) developed and tested a structural model of intraday price formation that embodies public information shocks and

microstructure effects. Roll (1984) found trading costs induce negative serial dependence in successive observed market price changes, that the effective bid-ask spread can be measured. George *et al.* (1991) show that time variation in expected returns and partial price adjustments lead to a downward bias in Roll models, they introduced a new approach to estimate the spread. Easley *et al.* (1996) used a new empirical technique to estimate the risk of information, found that the probability of information-based trading is lower for high volume stocks. Thus, the research on implicit transaction costs gradually tend to information costs. Wang *et al.* (2005) based EKOP model, found that China's securities market information was negatively with market volatility and positively correlated with market liquidity.

Trading information inter prices mainly through two ways: the public release of information and trading behavior. Public information often comes from corporate financial reporting, macroeconomic data and national macroeconomic policies, etc.; trading behavior of the investors could release their private information. Tobin (1982) contends that the stock price contained more information in corporate level, the stock price is more close to its real value. Carlton and Fischel (1983) contend insider shares can earn positive abnormal returns by nonpublic information. Grossman and Stiglitz (1980) that the trading with informed traders makes stock prices absorb private information, then stock price reflects more true value. Roll (1988a) used the CAPM and APT model to calculate as systematic economic influences and as the firm influences. French and Roll (1986) and Roll (1988b) study suggests that the market trading is the most important channel by firm-level information entered in price. Durnev *et al.* (2003) argued that information impaction from company level can reflect the status of informed trading. Schutte and Unlu (2009) suggests that improving the stock price firms level information is help to reduce the information asymmetry between investors.

From the scholars research we can know that implicit transaction costs and stock price informativeness are closely linked, this study attempts to explore their relationship from an empirical perspective.

THEORETICAL MODEL AND HYPOTHESES

This article is based on previous studies. In order to avoid tedious calculations, the writer used a new model proposed by Corwin and Schultz (2012) to estimate implicit transaction costs. The model set daily high (low) prices are almost always buy (sell) orders. Hence, the high-low price ratio reflects both the stock's variance and its bid-ask spread. Further, the variance component of the

high-low ratio is proportional to the return interval, while the bid-ask spread component is not.

Specific, assume that the true or actual value of the stock price follows a diffusion process and the spread is S%. With $H_t^a (L_t^a)$ as the actual high (low) stock price on day t, $H_t^o (L_t^o)$ as the observed high (low) stock price for day, we can write:

$$\left[\ln(H_t^o / L_t^o) \right]^2 = \left[\ln \left(\frac{H_t^a (1+S/2)}{L_t^a (1-S/2)} \right) \right]^2 \tag{1}$$

Rearranging (1) gives:

$$\left[\ln(H_t^o / L_t^o) \right]^2 = \left[\ln \left(\frac{H_t^a}{L_t^a} \right) \right]^2 + 2 \left[\ln \left(\frac{H_t^a}{L_t^a} \right) \right] \times \left[\ln \left(\frac{2+S}{2-S} \right) \right] + \left[\ln \left(\frac{2+S}{2-S} \right) \right]^2 \tag{2}$$

Parkinson (1980) and Garman and Klass (1980) show that:

$$E \left\{ \frac{1}{T} \sum_{t=1}^T \left[\ln \left(\frac{H_t}{L_t} \right) \right]^2 \right\} = k_1 \sigma_{HL}^2 \tag{3}$$

where, $H_t (L_t)$ is the high (low) on day t and $k_1 = 4 \ln(2)$. Similarly, Parkinson (1980) shows: that:

$$E \left\{ \frac{1}{T} \sum_{t=1}^T \left[\ln \left(\frac{H_t}{L_t} \right) \right] \right\} = k_2 \sigma_{HL} \tag{4}$$

where, $k_2 = \sqrt{8/\pi}$. Taking expectations of (2) and substituting from Eq. 3 and 4 yields:

$$E \left\{ \left[\ln \left(\frac{H_t^o}{L_t^o} \right) \right]^2 \right\} = k_1 \sigma_{HL}^2 + 2k_2 \sigma_{HL} \ln \left(\frac{2+S}{2-S} \right) + \left[\ln \left(\frac{2+S}{2-S} \right) \right]^2 \tag{5}$$

Sum the expectation of Eq. 5 over two single days and to simplify the notation going forward, we set:

$$\alpha = \left[\ln \left(\frac{2+S}{2-S} \right) \right], \quad \beta = E \left\{ \sum_{j=0}^1 \left[\ln \left(\frac{H_{t+j}^o}{L_{t+j}^o} \right) \right]^2 \right\}$$

Then, we can get:

$$2k_1 \sigma_{HL}^2 + 4k_2 \sigma_{HL} \alpha + 2\alpha^2 - \beta = 0 \tag{6}$$

Equation 6 links the high-low price ratios on two consecutive single days with two unknowns: α and σ . To solve for these unknowns, define a second equation that links the high-low ratio from the two-day period and the same two unknowns. To further simplify the equation we set:

$$\lambda = \left[\ln \left(\frac{H_{t+1}^o}{L_{t+1}^o} \right) \right]^2$$

Yields:

$$2k_1\sigma_{HL}^2 + 2\sqrt{2}k_2\sigma_{HL}\alpha + \alpha^2 - \lambda = 0 \quad (7)$$

Simultaneous Eq. 6 and 7 can be obtained α , σ . Solving the equations we can get the spread as implicit transaction cost:

$$S = \frac{2(e^\alpha - 1)}{1 + e^\alpha}$$

In order to investigate how market trading information impact on implicit transaction cost, this study uses stock price informativeness (INFO) on behalf of the firm level information. Tobin (1982) study suggests that the more stock prices contain firms information, the price closer to the actual value of the enterprise and thus also more able to play the role of market allocation of resources. Durnev *et al.* (2004) regressed stock returns with market and industry yield, then calculate stock price informativeness by the following Eq:

$$r_{it} = \beta + \beta_m \cdot r_{mt} + \beta_j \cdot r_{jt} + \varepsilon_{ijt}$$

where, R_{it}^2 denotes the regression fit coefficients, Roll (1988a) argue that the non-synchronous of stock price volatility can be measured by $(1-R_{it}^2)$, which reflect firm information. R_{it}^2 indicates the synchronization of volatility, the greater its value represents the lower stock price informativeness. Defond and Hung (2004) study suggests that higher volatility asynchronous means stock price contains more information about the company's future performance. The study based on the CAPM to measure the volatility of individual stocks asynchrony, using Durnev *et al.* (2004) proposed logarithmic conversion method, expressing stock price informativeness as INFO, then:

$$INFO_{it} = \ln\left(\frac{1-R_{it}^2}{R_{it}^2}\right)$$

The larger INFO the higher stock price informativeness, indicating that investors take the initiative to collect and process firm information, make profit from arbitrage investments. Informed traders involved in the transaction hence the price information on the company level.

Information inters stock prices affect the implicit transaction costs. Therefore, to explore how information impact on implicit transaction costs is very important. Since Bagehot (1972), researchers began research the asymmetric information on the transaction costs, informed traders rely on their information superiority can make profit. So as a counter party to compensate for the loss, the market makers would hence transaction costs. Grossman and Stiglitz (1980) contend that transaction can absorb private information and further reflects the firm's true value. Durnev *et al.* (2003) argue that informed traders trading can exactly reflect the company's share price volatility. So that improve the stock price informativeness helps to reduce the degree of information asymmetry in the transaction, in addition, the high transaction costs will also hinder the informed traders into the deal.

Based on the analysis of transaction information, this study considers implicit transaction costs and stock information content has a close relationship, a high stock price informativeness is the result of informed traders participation in trading, that informed trading may increase transaction costs.

Comprehensive above analysis, this study makes the following assumptions:

- **H1:** Stock price informativeness may have a positive effect on implicit transaction costs
- **H2:** The relation of stock price informativeness and implicit transaction costs is non-linear

EMPIRICAL ANALYSIS

This study select Shanghai and Shenzhen's A shares as samples. Taking into account the annual implicit transaction costs would be analyzed, removed the sample which listed after 2011. Shanghai(Shenzhen) have been established in 1990 (1991), the study used the trading data in January 1992 to December 2012. Using matlab7.1 to calculate implicit transaction cost and INFO, finally gets 1922 firms of 22,066 data samples in 22 years. Implicit transaction costs statistical result is shown in Table 1. Table 1 Implicit transaction costs statistical indicators

It can be seen from the table, the Shanghai and Shenzhen implicit transaction costs generally showed a decreasing trend, which is about 2%. Through the above

Table 1: Implicit transaction costs statistical indicators

Year	Samples	Mean	STD	P1	P99
1991	10	0.0094	0.0121	0.0001	0.0358
1992	48	0.0513	0.0325	0.0114	0.1226
1993	155	0.0380	0.0289	0.0103	0.1799
1994	258	0.0392	0.0264	0.0092	0.1418
1995	278	0.0283	0.0229	0.0059	0.1652
1996	457	0.0302	0.0221	0.0081	0.1329
1997	648	0.0243	0.0196	0.0080	0.1220
1998	745	0.0211	0.0232	0.0083	0.1065
1999	839	0.0206	0.0153	0.0092	0.1082
2000	964	0.0198	0.0131	0.0100	0.0871
2001	1046	0.0161	0.0104	0.0085	0.0491
2002	1129	0.0165	0.0103	0.0079	0.0547
2003	1197	0.0177	0.0130	0.0069	0.1009
2004	1297	0.0205	0.0147	0.0083	0.1054
2005	1310	0.0244	0.0170	0.0101	0.1135
2006	1373	0.0216	0.0086	0.0120	0.0511
2007	1484	0.0235	0.0048	0.0127	0.0345
2008	1555	0.0240	0.0053	0.0134	0.0311
2009	1622	0.0203	0.0033	0.0133	0.0277
2010	1849	0.0187	0.0032	0.0116	0.0269
2011	1893	0.0165	0.0029	0.0100	0.0239
2012	1909	0.0167	0.0030	0.0091	0.0240
Total	22066				

Table 2:

Variable name	Variable description
Spread	Implicit transaction costs estimate based on above model
Info	Stock price informativeness
Size	Company size
Price	Share price
Delta	Annual volatility
Tor	Turnover
Yeild	Year yeild

discussion, to analysis the impact of firm information on implicit transaction costs, we select company size, stock, stock annualized yeild, annual turnover and annual fluctuations rate as the control variable. Specific variables and described in Table 2.

The data includes listed securities transaction data, financial data. Among them, the stock transaction data from the Shanghai and Shenzhen Stock Exchange daily trading data, listed companies' financial data from the Hong Kong Polytechnic University and Shenzhen GTA Information Technology Co., Ltd. jointly developed CSMAR database, the time span from 1992 to 2012. The explanatory variables and control variables descriptive statistics can be shown in Table 3.

To verify the hypothesis one (H1) consider the following model:

$$SPREAD_{it} = \alpha_1 + \beta_{11} \cdot INFO_{it} + \beta_{12} \cdot VAR_{it} + \mu_i + error_{it} \quad (1)$$

For hypothesis tow (H2), each share is divided into 3 groups according to the stock price informativeness, we take the top third and bottom third to do regression analysis. The Eq. as follows:

Table 3: Variables descriptive statistics

Var. name	Samples	Mean	SD	Min	Max
Spread	11542	0.020	0.005	0.010	0.042
Info	11516	0.697	0.756	-1.110	3.514
Ln size	11542	21.721	1.319	19.116	26.356
Price	11542	11.566	9.819	2.130	53.000
Tobinq	11542	1.726	1.012	0.730	6.041
Delta	11542	0.033	0.010	0.012	0.069
Tor	10213	5.976	3.685	0.650	16.965
Yeild	11231	0.398	0.996	-0.754	3.892

Table 4: Stock price informativeness regress result

	M1	M2	M3	M4
Info	0.018***	0.131***	-0.086***	0.196***
	-4.551	-5.391	-8.659	-28.399
Info ₂				-0.078***
				-30.768
Ln size	-0.073***	-0.040**	-0.078***	-0.060***
	-14.214	-2.177	-7.140	-12.152
Price	0.002***	-0.001	0.002*	0.002***
	-0.854	-1.736	-0.400	-0.441
Tobinq	-0.030***	-0.035***	-0.029***	-0.031***
	-8.150	-2.614	-4.060	-8.641
Delta	37.349***	39.720***	36.702***	40.569***
	-129.874	-55.067	-52.952	-137.821
Tor	0.002**	-0.009***	0.005**	-0.003***
	-2.487	-3.043	-2.417	-3.410
Yeild	-0.002	0.060***	-0.022***	-0.007**
	-0.587	-4.451	-3.232	-2.154
Constant	2.374***	1.637***	2.663***	1.983***
	-21.291	-4.109	-11.345	-18.457
N	12090	2450	4683	12090
R ₂ _W	0.708	0.862	0.621	0.732
F	3533.849	878.191	695.335	3496.662

Numerical represents regression coefficients and t statistic in order, ***, **, * denote coefficients significant at 1, 5, 10%

$$SPREAD_{it} = \alpha_2 + \beta_{21} \cdot INFO_{it} + \beta_{22} \cdot INFO_{it}^2 + \beta_{23} \cdot VAR_{it} + \mu_i + error_{it} \quad (2)$$

Based on the analysis above, to avoid market noise interference, process the data as follows: (1) Given the early market data is missing, the study removed the data before 2000; (2) Exclude special treatment or special transfer process (ST/PT) companies; (3) The value of SPREAD is small, for presenting convenience, we expands 100 times; (4) Exclude sample of insolvent companies, the total debt ratio greater than 100%; (5) Taking into account the sample outliers may exist, we do winsorize processing in 1% level for continuous variables. Through data filtering and processing, we finally get 1922 shares in January 2000 to December 2012, totally 11542 data. (all econometric analysis was done by STSTA 12).

Taking into account the characteristics of the panel data, we do Hausman test, the sample meets the fixed effects model, indicating that there are individual differences in each company. Almeida *et al.* (2004) used Tobin's Q to control the investment opportunities in the future, the study follows this view using Tobin's Q value to represent the business investment opportunities. The panel regression result is shown in Table 4.

In Table 4, M1 represents explanatory variables is INFO; M2 represents explanatory variables is the bottom third of INFO; M3 represents the top third of INFO; M4 denotes INFO square as the explanatory variable. From the results, in M1 INFO's regression coefficient is 0.018 at 1% significant level, indicating that the higher stock price informativeness the greater the implicit transaction costs. Stock price informativeness as a proxy for the probability of informed trading variable, informed traders involved in the transaction increases the implicit transaction costs. Noting that in M2 INFO's coefficients is significantly positive at the 1% level, while in M3 INFO's coefficients is significantly negative at the 1% level, indicating that stock price informativeness has a non-linear effect on implicit transaction costs. When INFO is small, the stock price contains less firm information, so it increases significantly implicit transaction costs. Because in insufficient market, the informed traders would bring private information to market and use their information advantage to profits, damaging the interests of non-informed traders. In M3, INFO's coefficient is negative, when the stock price informativeness is high, the price has being already contained enough firm informations, it has useless on improving information asymmetry, then market liquidity effect occupy a major position, so increasing stock price informativeness could improve market liquidity. In M2 INFO's coefficient is higher than that of M2's, indicating that when stock price informativeness is smaller, the positive effect on cost is more than the negative effect. In M4, INFO's squared coefficient is significant at the 1% level, showing nonlinear relation exists. Thus, Hypotheses 1 and 2 has been verified.

In order to test the robustness of the regression results, we use asset growth and sales growth to replace Tobin's Q (tinbq) and re-do the regression. The result is robust, to save space the results are not listed.

CONCLUSION

This study suggests that implicit transaction costs and stock price informativeness has nonlinear relation, when stock price informativeness is low, enhancing it can increase implicit transaction costs, but growing with it may reduce the costs. To reduce market transaction costs need to improve the market information disclosure mechanism. The kernel of capital market order is to maintain market transparency, therefore, we should reduce investors' adverse selection costs, give full play to the role of institutional investors to stabilize the market and protect small investors. In addition, we should also

strengthen the equity approval and supervision, do efforts to prevent insider trading and transfer of benefits. It's necessary to establish and improve the scientific supervision and monitoring system.

REFERENCES

- Almeida, H., M. Campello and M.S. Weisbach, 2004. The cash flow sensitivity of cash. *J. Finance*, 59: 1777-1804.
- Bagehot, W., 1972. Risk and reward in corporate pension funds. *Financial Anal. J.*, 28: 80-84.
- Carlton, D.W. and D.R. Fischel, 1983. The regulation of insider trading. *Stanford Law Rev.*, 35: 857-895.
- Copeland, T.E. and D. Galai, 1983. Information effects on the bid-ask spread. *J. Finance*, 38: 1457-1469.
- Corwin, S.A. and P. Schultz, 2012. A simple way to estimate bid-ask spreads from daily high and low prices. *J. Finance*, 67: 719-760.
- Defond, M.L. and M. Hung, 2004. Investor protection and corporate governance: Evidence from worldwide CEO turnover. *J. Account. Res.*, 42: 269-312.
- Demsetz, H., 1968. The cost of transacting. *Q. J. Econ.*, 82: 33-53.
- Durnev, A., R. Morck and B. Yeung, 2004. Value-enhancing capital budgeting and firm-specific stock return variation. *J. Finance*, 59: 65-105.
- Durnev, A., R. Morck, B. Yeung and P. Zarowin, 2003. Does greater firm-specific return variation mean more or less informed stock pricing? *J. Account. Res.*, 41: 797-836.
- Easley, D., N. Kiefer, M. O'Hara and J. Paperman, 1996. Liquidity, information and infrequently traded stocks. *J. Finance*, 51: 1405-1436.
- Fama, E.F., 1970. Efficient capital markets: A review of theory and empirical work. *J. Finance*, 25: 383-417.
- French, K.R. and R. Roll, 1986. Stock return variances: The arrival of information and the reaction of traders. *J. Financial Econ.*, 17: 5-26.
- Garman, M.B. and M.J. Klass, 1980. On the estimation of security price volatilities from historical data. *J. Bus.*, 53: 67-78.
- George, T.J., G. Kaul and M. Nimalendran, 1991. Estimation of the bid-ask spread and its components: A new approach. *Rev. Financial Stud.*, 4: 623-656.
- Glosten, L.R. and L.E. Harris, 1988. Estimating the components of the bid/ask spread. *J. Financial Econ.*, 21: 123-142.
- Grossman, S.J. and J.E. Stiglitz, 1980. On the impossibility of informationally efficient markets. *Am. Econ. Rev.*, 70: 393-408.

- Madhavan, A., M. Richardson and M. Roomans, 1997. Why do security prices change? A transaction-level analysis of NYSE stocks. *Rev. Financial Stud.*, 10: 1035-1064.
- Parkinson, M., 1980. The extreme value method for estimating the variance of the rate of return. *J. Bus.*, 53: 61-65.
- Roll, R., 1984. A simple implicit measure of the effective bid-ask spread in an efficient market. *J. Finance*, 39: 1127-1139.
- Roll, R., 1988. R^2 . *J. Finance*, 43: 541-566.
- Roll, R., 1988. The stochastic dependence of security price changes and transaction volumes: Implications for the mixture-of-distributions hypothesis. *J. Finance*, 43: 541-566.
- Schutte, M. and E. Unlu, 2009. Do security analysts reduce noise? *Financial Anal. J.*, 65: 40-54.
- Tobin, J., 1982. *Asset Accumulation and Economic Activity: Reflections on Contemporary Macroeconomic Theory*. University of Chicago Press, Chicago, IL., USA., ISBN-13: 9780226805023, Pages: 116.
- Wang, C., X. Dong and Z. Fang, 2005. On relations between information trading and the behavior of the stock price. *Syst. Eng.*, 23: 62-67.