Economics Letters 143 (2016) 103–106

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Can public information promote market stability?

Binbin Chen [a,*], Shancun Liu [a], Qiang Zhang [b]

[a] School of Economics and Management, Beihang University, Beijing, 100191, China

[b] School of Economics and Management, Beijing University of Chemical Technology, Beijing, 100029, China

HIGHLIGHTS

- With lower public information precision, multiple equilibria arise.
- Traders may reverse trading in multiple equilibria.
- There is a unique equilibrium if public information precision is sufficiently large.
- The reverse trading does not occur in unique equilibrium.

ARTICLE INFO

Article history:
Received 3 December 2015
Received in revised form
29 March 2016
Accepted 8 April 2016
Available online 12 April 2016

JEL classification:
D40
D82
G10

Keywords:
Information disclosure
Public information
Multiple equilibria
Reverse trading

ABSTRACT

We study the effect of public information revealing part of underlying fundamentals on market stability. It shows that accurate public information reduces the uncertainty faced by informed traders and increases their responsiveness to private information and expected volume. The reverse trading and multiple equilibria arise under lower public information precision and they disappear when public information precision increases sufficiently.

1. Introduction

Does public information disclosure promote the market stability and thus enhance the social welfare? Morris and Shin (2002) find that public information can enhance social welfare when private information precision is very low. Cornand and Heinemann (2008) show that social welfare will be improved when part of traders make use of public information. By studying the monopolistic competition model with heterogeneous information, Hellwig (2005) finds that public information can reduce price deviation and improve social welfare. He points out that the state of traders abandoning private information is optimal. Colombo and Femminis (2014) extend the "beauty content model" by introducing the upper bound of public information precision and they also support the transparent market system.

Scholars provide controversial evidence about the use of accurate public information. Amato et al. (2002) show that listed companies should be cautious in disclosing public information. Amador and Weill (2010) find that price informativeness and the welfare of traders decrease with public information precision. James and Lawler (2011) oppose the transparent market system because high public information precision can cause a consistent behavior of traders which in turn will reduce their utilities. Pancs (2014) evaluates the influence of public information based on the model of Glosten and Milgrom (1985) and finds that high public information precision deteriorates market quality.

Under the setting of information asymmetry and the presence of short-term traders, researchers have conducted in-depth research on this topic. Chen et al. (2014) propose an information asymmetry model with short-term traders. They find that lower price informativeness exists in the market with low public

* Correspondence to: Xueyuan Road 37#, Haidian distinct, Beijing 100191, China. Tel.: +86 13810162027.
E-mail address: chenbin925@126.com (B. Chen).

http://dx.doi.org/10.1016/j.econlet.2016.04.008

information precision. Cespa and Vives (2015) also introduce short-term traders and they show that the retrospective inference is very strong and there exists an unstable equilibrium with high liquidity. Price informativeness increases when public information is overly precise compared to private information.

We extend the recent literatures on public information issues by introducing asset liquidation value based on the assumption of Bernhardt and Taub (2008), who view the factors affecting asset liquidation value as many uncorrected multi-underlying fundamentals and assume that each informed trader has access to private information about part of them. However, in their research, the influence of other underlying fundamentals is not discussed in detail. We assume that asset liquidation value is a linear function, consisting of two underlying fundamentals, from one of which informed traders receive private information and with other listed company disclose public information. Then informed traders have incentives to reverse trading, and thus multiple equilibria occur. We find that the probabilities of reverse trading and multiple equilibria decrease with the increase of public information precision.

2. The model

2.1. Model assumptions

Consider a two-period market with a risky asset whose liquidation value is v. v consists of underlying fundamentals v_I and $v_O (v = v_I + v_O)$, where $v_I \sim N(0, \tau_I^{-1})$ and $v_O \sim N(0, \tau_O^{-1})$. p_t refers to asset price in period $t (t = 1, 2)$. And the asset is liquidated periodically.

There are noise traders and a continuum of informed traders indexed in the interval $[0, 1]$ in market. In period t, the net demand of noise traders is u_t, where $u_t \sim N(0, \tau_{ut}^{-1})$. One informed trader i receives private information $s_{it} = v_I + \varepsilon_{it}$ about the underlying fundamental v_I, where $\varepsilon_{it} \sim N(0, \tau_{\varepsilon t}^{-1})$ and $\int_0^1 \varepsilon_{it} di = 0$. It can be proved that $\tilde{s}_{i2} = (\tau_{\varepsilon 1} + \tau_{\varepsilon 2})^{-1} (\tau_{\varepsilon 1} s_{i1} + \tau_{\varepsilon 2} s_{i2})$ is a sufficient statistic of $\{s_{i1}, s_{i2}\}$ in the estimation of v. Furthermore, informed traders also receive public information $s_P = v_O + \eta$ disclosed by listed companies in period 2, where $\eta \sim N(0, \tau_P^{-1})$. Their demand schedule is $x_{i1} = X(s_{i1}, p_1)$ in period 1 and $x_{i2} = X(s_{i1}, s_{i2}, s_P, p_2)$ in period 2, respectively. All variables in set $\{v_I, v_O, \varepsilon_{it}, \varepsilon_P, u_t\}$ are independent.

Informed traders follow CARA utility function, $U(\pi_i) = -\exp(-\rho^{-1}\pi_i)$, where ρ is common risk-tolerance coefficient and $\pi_{it} = (v - p_t)x_{it}$ is return. Maximization condition expected of utility function is equal to

$$\max_{x_{it}} E[(v - p_t)|G_t]x_{it} - \frac{1}{2}\rho \mathrm{Var}[(v - p_t)|G_t]x_{it}^2. \tag{1}$$

G_t represents information set of informed traders where $G_1 = \{s_{i1}, p_1\}$ and $G_2 = \{s_{i1}, s_{i2}, p_1, p_2, s_P\}$. The optimal solution of Eq. (1) is

$$x_{it} = \frac{\rho E[(v - p_t)|G_t]}{\mathrm{Var}[(v - p_t)|G_t]}. \tag{2}$$

According to market clearing mechanism, the total position between informed and noise traders is equal to zero. Then

$$\int_0^1 x_{it} di + \theta_t = 0. \tag{3}$$

Considering normal distribution theory, we prove that x_{i1} and x_{i2} are linear functions of private information, asset price and public information, i.e., $x_{i1} = \beta_1 s_{i1} + f(p_1)$ and $x_{i2} = \beta_2 \tilde{s}_{i2} + \gamma s_P + h(p_1, p_2)$, where $f(p_1)$ and $h(p_1, p_2)$ are the linear functions of p_1 and $\{p_1, p_2\}$, respectively. According to Eqs. (2) and (3), p_1 is a linear function of $\beta_1 v_I + u_1$ and p_2 is a linear function of $\Delta\beta_2 v_I + u_2$ and s_P. Then $\beta_1 v_I + u_1$ is a sufficient statistic of p_1 and $\{\beta_1 v_I + u_1, \Delta\beta_2 v_I + u_2, \gamma s_P\}$ is sufficient statistic of $\{p_1, p_2\}$ in the estimation of v, where $\Delta\beta_2 = \beta_2 - \beta_1$. Thus G_1 and G_2 are observationally equivalent to $\{s_{i1}, \beta_1 v_I + u_1\}$ and $\{\tilde{s}_{i2}, \beta_1 v_I + u_1, \Delta\beta_2 v_I + u_2, s_P\}$ respectively.

2.2. Model solution

In our paper, $v_O(v_I)$ is the uncertainty faced by informed traders from the view of private (public) information. The uncertainty disappears when the precision of $v_O(v_I)$ is infinity. Cespa and Vives (2012) define the uncertainty of risk asset liquidation value as "residual uncertainty". And let v_O as "residual uncertainty" which informed traders faced in this paper.

Eqs. (2) and (3) yield the equilibrium shown in Proposition 1.

Proposition 1. *There is a unique linear equilibrium in period* 1. *The demand schedule of informed traders is:*

$$x_{i1} = \beta_1 s_{i1} - \frac{p_1}{\lambda_1}, \tag{4}$$

and equilibrium price is:

$$p_1 = \lambda_1(\beta_1 v_I + u_1), \tag{5}$$

where $\beta_1 = \frac{\rho \mathrm{var}[v_I|G_1]\tau_{\varepsilon 1}}{\mathrm{var}[v|G_1]}$, $\lambda_1 = \rho^{-1}\mathrm{var}[v|G_1] + \beta_1\tau_{u1}\mathrm{var}[v_I|G_1]$, $\mathrm{var}[v_I|G_1] = (\tau_I + \beta_1^2\tau_{u1} + \tau_{\varepsilon 1})^{-1}$ *and* $\mathrm{var}[v|G_1] = \mathrm{var}[v_I|G_1] + \tau_O^{-1}$.

Informed traders' responsiveness to private information is β_1 which is affected by ρ, τ_O, $\tau_{\varepsilon 1}$ and τ_I. Taking the partial derivative of β_1 with respect to other variables yields $\partial\beta_1/\partial\rho > 0$, $\partial\beta_1/\partial\tau_O > 0$, $\partial\beta_1/\partial\tau_{\varepsilon 1} > 0$ and $\partial\beta_1/\partial\tau_I < 0$. In other words, informed traders' responsiveness to private information increases with common risk-tolerance coefficient, the precision of v_O and private information and it decrease with the precision of v_I. Meanwhile, it can be proved that $\beta_1 \leq \min\{\rho\tau_O, \rho\tau_{\varepsilon 1}\}$.

We denote market depth as λ_1, consisting of two parts: $\rho^{-1}\left[(\tau_I + \beta_1^2\tau_{u1} + \tau_{\varepsilon 1})^{-1} + \tau_O^{-1}\right]$ which captures inventory risk premium due to traders' risk aversion, and $(\tau_I + \beta_1^2\tau_{u1} + \tau_{\varepsilon 1})^{-1}\beta_1\tau_{u1}$ which captures adverse selection risk premium faced by informed traders. Inventory risk premium equals zero when ρ approaches infinite, since traders are risk-neutral and thus require no compensation for their inventories. Adverse selection risk premium derives from the presence of informed traders in the market.

In period 2, we obtain the equilibrium shown in Proposition 2.

Proposition 2. *There is always the equilibrium in period* 2. *The demand schedule of informed traders is:*

$$x_{i2} = \beta_2\tilde{s}_{i2} + \gamma s_P - \frac{p_2}{\lambda_2} + \frac{p_1}{\lambda_1}\frac{\lambda_2^* - \lambda_2}{\lambda_2}, \tag{6}$$

and equilibrium price is:

$$p_2 = \lambda_2(\Delta\beta_2 v_I + u_2 + \gamma s_P) + \frac{p_1\lambda_2^*}{\lambda_1}, \tag{7}$$

where $\beta_2 = \frac{\rho \mathrm{var}[v_I|G_2](\tau_{\varepsilon 1} + \tau_{\varepsilon 2})}{\mathrm{var}[v|G_2]}$, $\gamma = \frac{\tau_P}{(\tau_O + \tau_P)\lambda_2}$, $\lambda_2 = \frac{\mathrm{var}[v|G_2]}{\rho} + \Delta\beta_2\tau_{u2}\mathrm{var}[v_I|G_2]$, $\lambda_2^* = \frac{\mathrm{var}[v|G_2]}{\rho} + \beta_1\tau_{u1}\mathrm{var}[v_I|G_2]$, $\mathrm{var}[v_I|G_2] = \left[\tau_I + \sum_{t=1}^2(\tau_{\varepsilon t} + \Delta\beta_t^2\tau_{ut})\right]^{-1}$, $\Delta\beta_2 = \beta_2 - \beta_1$, $\mathrm{var}[v|G_2] = \mathrm{var}[v_I|G_2] + (\tau_O + \tau_P)^{-1}$.