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EFFECTS OF INFORMATION ASYMMETRY ON ANALYSTS' FORECAST PROPERTIES

Using the sample of all firm-quarter observations between 2000 and 2010, we study the effects of information asymmetry on security analysts' forecast properties. Our results show that as accounting information provides less accurate signs on firms' prospects due to greater information asymmetry, the demand for private information increases after the release of quarterly earnings. As a result, analysts acquire more costly private information, avoiding less costly public information after the quarterly earnings announcements.

Keywords: *analysts; Barron model; information asymmetry.*

JEL Classification: *M4, G17.*

Чжун Сок Чо

ВПЛИВ ІНФОРМАЦІЙНОЇ АСИМЕТРІЇ НА ВЛАСТИВОСТІ АНАЛІТИЧНИХ ПРОГНОЗІВ

У статті з використанням квартальної вибірки по фірмах за 2000-2010 рр. досліджено вплив інформаційної асиметрії на властивості аналітичних прогнозів. Результати показали, що бухгалтерський облік надає менш точну інформацію про перспективи фірм в разі вищої інформаційної асиметрії, а попит на конфіденційну інформацію збільшується після оголошення квартального прибутку. В результаті аналітики отримують дорожчу приватну інформацію, уникаючи дешевшої публічної інформації після оголошення щоквартальних доходів.

Ключові слова: *аналітики; модель Беррона; інформаційна асиметрія.*

Таб. 4. Фор. 3. Літ. 23.

Чжун Сок Чо

ВЛИЯНИЕ ИНФОРМАЦИОННОЙ АСИММЕТРИИ НА СВОЙСТВА АНАЛИТИЧЕСКИХ ПРОГНОЗОВ

В статье с использованием квартальной выборки по фирмам за 2000-2010 гг. исследовано влияние информационной асимметрии на свойства аналитических прогнозов. Результаты показали, что бухгалтерский учет предоставляет менее точную информацию о перспективах фирм в случае большей информационной асимметрии, а спрос на конфиденциальную информацию увеличивается после объявления квартальной прибыли. В результате аналитики приобретают более дорогостоящую приватную информацию, избегая дешёвой публичной информации после объявления ежеквартальных доходов.

Ключевые слова: *аналитики; модель Бэррона; информационная асимметрия.*

1. Introduction. This study examines the effect of information asymmetry on security analysts' forecast properties. Companies provide information to investors through a variety of channels, either mandatory (e.g., annual and quarterly financial statements or earnings announcements) or voluntary (e.g., management earnings forecasts). Prior theoretical research provides evidence that the release of publicly available financial information would reduce information asymmetries at stock mar-

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ket. It also shows that the increase of publicly available information would reduce adverse selection costs and hence decrease information asymmetry between market participants (Verrecchia, 1982; Diamond, 1985; Bushman, 1991). Empirical research finds that both mandated and voluntary disclosures provide material information to the market and consequently induce lower information asymmetry among informed and uninformed investors (Diamond and Verrecchia, 1991; Kim and Verrecchia, 1994; Healy et al., 1999; Coller and Yohn, 1997; Leuz and Verrecchia, 2000). Disclosure literature has shown that high quality of financial disclosures reduces information asymmetries at the market and increases market liquidity (Diamond and Verrecchia, 1991; Lundholm, 1991; Welker, 1995; Leuz and Verrecchia, 2000).

Several theoretical research supports the association between public and private information, acting as either substitutes or complements (Verrecchia, 1982; Diamond, 1985; Bushman, 1991; Lundholm, 1991; Kim and Verrecchia; 1994). Related empirical research is characterized by similar results. Consistent with theoretical research, several studies document reduced bid-ask spreads coincident with improved disclosure (Greenstein and Sami, 1994; Welker, 1995; Coller and Yohn, 1997; Brown and Hillegeist, 2007)

Using a sample of all firm-quarter observations between 2000 and 2010, we study the effect of information asymmetry on security analysts' forecast properties. We use the measure of analyst consensus (hereafter, BKLS Consensus) developed by Barron, Kim, Lim and Stevens (1998) to estimate the degree to which analysts base their forecasts on private information relative to common information around earnings announcements. As an information asymmetry measure, we employ the bid-ask spread as a proxy for information asymmetry. Our results show that as accounting information provides less accurate signs on firms' prospects due to greater information asymmetry, analysts develop more private information and incorporate more private information relative to common information.

The rest of the paper is as follows. Section 2 describes the sample and methodology, and Section 3 presents the empirical results. Section 4 concludes.

2. Sample and methodology.

2.1. Sample. Our sample consists of all firm-quarter observations between 2000 and 2010 that meet the following criteria:

1. The quarterly (interim) earnings announcement date is available on the quarterly COMPUSTAT file.

2. Forecasts of quarterly earnings are available from the I/B/E/S Detail file for at least 2 individual analysts who issue a forecast of quarter q+1 earnings in the 45-day period before the quarter q earnings announcement date and who also revise these forecasts in the 30-day period after the quarter q earnings announcement.

3. Actual earnings for quarter q and q+1 are available from the I/B/E/S Actual earnings announcement files.

4. Bid-ask spread data from the CRSP database are available to calculate spread in the 45-day period immediately before the quarter q earnings announcement date.

5. Data for common shares outstanding and stock price at the end of quarter q are available on the COMPUSTAT quarterly file.

Our final sample consists of 13,648 firm-quarters matched across all 8 forecast windows (pre- and post-windows for 4 earnings announcements) and is distributed equally for each quarter. The number of observations varies year-by-year and increases in time.

Table1. **Distribution of number of firms**

Panel A. By fiscal Year		
Year	Frequency	%
2001	566	4.15
2002	673	4.93
2003	935	6.85
2004	1,176	8.62
2005	1,274	9.33
2006	1,377	10.09
2007	1,584	11.61
2008	1,882	13.79
2009	1,922	14.08
2010	2,259	16.55
Total	13,648	100.00
Panel B. By fiscal quarter (*q*)		
Quarter	Frequency	%
1st	3,192	23.39
2nd	3,406	24.96
3rd	3,865	28.31
4th	3,185	23.34
Total	13,648	100.00

2.2 BKLS Consensus measure. In this study, we use BKLS Consensus to estimate the degree to which analysts base their forecasts on private information relative to common information on earnings announcements. Barron, Kim, Lim and Stevens (hereafter, BKLS; 1998) develop BKLS Consensus (ρ), which is a measure of the cross-analysts correlation in forecast errors. BKLS Consensus is based on the idea that forecast dispersion and error relate in different ways to common (public) and idiosyncratic (private) components of an error in individual analysts' forecasts; in particular, forecast dispersion reflects only error from idiosyncratic information individual analysts rely upon, while error in mean forecast primarily reflects error in common information all analysts rely upon. As such, the BKLS model provides a direct linkage between properties of analysts' information and the observable characteristics of their forecasts, and allows for more precise tests regarding the common and idiosyncratic information analysts convey in their forecasts (Christen et al., 2005). BKLS show that one can estimate common and total forecast errors using the observable features of analysts' forecasts as follows:

$$c = \frac{C}{V} = \frac{\text{Common Forecast Error}}{\text{Average Total Error}} = 1 - \frac{D}{V} = \frac{(SE - \frac{D}{N})}{(SE - \frac{D}{N}) + D} = \frac{h}{(h + S)} \qquad (1)$$

where

N = the number of forecasts,

A_i = actual earnings for firm i,

F_i = individual analysts' earnings forecast for firm i,

$\overline{F_i}$ = mean forecast for firm i,

D = the sample variance (or dispersion) in forecasts, i.e., $\sum_{i=1}^{n} \frac{(F_i - \overline{F_i})^2}{(N-1)}$,

V = BKLS uncertainty, the variance of error in individual forecasts, i.e.,

$$\sum_{i=1}^{n} \frac{(F_i - A_i)^2}{N},$$

SE = the squared error in the mean forecast, i.e., $(A - \overline{F_i})^2$

h = BKLS precision of common (public) information,

s = BKLS precision of idiosyncratic (private) information.

2.3 Information asymmetry measure. The degree of information asymmetry is not directly observable. We, therefore, employ a widely used empirical proxy, the bid-ask spread (SPREAD) as a proxy for information asymmetry. Following previous studies (Amihud and Mendelson, 1986; Venkatesh and Chiang, 1986; Affleck-Graves et al., 2002; Kanagaretnam et al., 2005), we define SPREAD as the relative bid-ask spread using daily closing bids and asks. Less information asymmetry means less adverse selection, which implies a smaller bid-ask spread. We compute SPREAD over the pre-announcement period (-45, -1), inclusively, where day 0 is the COMPUSTAT earnings announcement date, to examine information asymmetry during the pre-announcement period. We define SPREAD as follows:

$$\text{SPREAD} = \frac{1}{D} \sum_{D=-45}^{-1} \frac{(\text{ASK} - \text{BID})}{(\text{ASK} + \text{BID})/2} \qquad (2)$$

3. Empirical results. Table 2 provides the descriptive statistics. The mean (median) change in BKLS Consensus ($\Delta\rho$), is -0.1353 (-0.0217). BKLS Uncertainty (Δv) also decreases. The declines in Consensus and Uncertainty after earnings announcements are consistent with the results of Barron et al. (2002, 2005, 2008). Because ρ reflects the amount of private information relative to other information, the decline in ρ indicates that the proportion of private information in the average forecast increases after earnings announcements. The mean (median) SPREAD, a proxy for information asymmetry, is 0.0017 (0.0009) for the pre-announcement period. On average, 28.11% of the firm-quarter observations have negative earnings (BADNEWS). Table 2 reports that the mean (median) number of total analysts following (ANALYSTS) is 8.11 (6.00) and our sample firms are relatively large.

Table 2. **Descriptive statistics of firm characteristics (n = 13,648)**

Variable	Mean	Std. dev	Q1	Q2	Q3
ρ	0.7564	0.2634	0.6139	0.8689	0.9610
h	163.3424	463.3459	12.4020	42.0951	133.4851
s	121.5179	726.8406	0.9482	7.7845	50.0999
$\Delta\rho$	-0.1353	0.4358	-0.2795	-0.0217	0.0677
Δ v	-0.0243	0.4990	-0.0102	-0.0019	0.0001
SPREAD	0.0017	0.0028	0.0006	0.0009	0.0017
BADNEWS	0.26	0.44	0.00	0.00	1.00
ANALYSTS	8.11	7.16	3.00	6.00	11.00
SIZE	14,942.85	34,106.62	1,463.81	3,980.41	13,132.70

Variable definitions:

ρ: BKLS Consensus

h: BKLS precision of common (public) information

s: BKLS precision of idiosyncratic (private) information

Δρ: change in BKLS Consensus around the quarter *q* earnings announcement (= $\rho^A - \rho^B$, where ρ^A (ρ^B) is BKLS

Consensus after (before) the quarter *q* earnings announcement.

Δv: change in BKLS Uncertainty around the quarter *q* earnings announcement (= $v^A - v^B$, where v^A (v^B) is BKLS.

Uncertainty after (before) the quarter *q* earnings announcement.

SPREAD: a proxy for information asymmetry (the relative bid-ask spread using daily closing bids and asks).

BADNEWS: 1 if quarter *q*'s actual earnings is less than the mean I/B/E/S forecast and 0 otherwise.

ANALYSTS: total number of individual (matched) analysts who issued at least one forecast of quarter *q*+1 earnings in the 45-day period before the quarter q earnings announcement date and who also revise these forecasts in the 30-day period after the quarter q earnings announcement.

SIZE: market capitalization at the end of quarter *q* (= Closing price * number of common shares outstanding at the end of quarter *q*).

Table 3 presents Spearman rank correlation coefficients between our variables of interest. These univariate results show that a negative and significant association between Δρ and SPREAD. There is a significant negative correlation between Δρ and BADNEWS. The correlations between Δρ and firms' information environment variables (ANALYSTS and SIZE) are positive and significant at the 1% level, respectively.

Even though the correlation analyses do not control for differences in firms' characteristics, the change in BKLS Consensus (Δρ) appears to be negatively associated with information asymmetry measure for the pre-announcement period. These results suggest that as accounting information provides less accurate signs of firms' prospects due to greater information asymmetry, the demand for private information increases after the release of quarterly earnings. Analysts develop more private information and incorporate more private information relative to common information. The correlations between other variables of interest are consistent with the results reported in the extant literature.

Table 3. **Spearman rank correlation of firm characteristics (n = 13,648)**

	Δρ	Δ v	SPREAD	BADNEWS	ANALYSTS	SIZE
Δρ	1.0000	0.2185***	-0.0389***	-0.0343***	0.0577***	0.0277***
Δ v		1.0000	-0.0402***	-0.0306***	-0.0339***	0.0348***
SPREAD			1.0000	0.0592***	-0.2346***	-0.6082***
BADNEWS				1.0000	0.0519***	-0.0409***
ANALYSTS					1.0000	0.3859***
SIZE						1.0000

All variables are defined in Table 2.

*, **, and *** indicate statistical significance (two-tailed tests) at the 10, 5, and 1% levels, respectively.

Following Barron et al. (2008), we run the following decile rank regressions, OLS regressions using decile ranks of the data[2]. To investigate the effect of information asymmetry on analysts' forecast properties, we regress analysts' forecast properties (AFP) on SPREAD and other controls. For heteroscedasticity and correlation among observations, we adopt Rogers' (1993) method to report p-values.

$$AFP = \alpha_0 + \alpha_1 SPREAD + \alpha_2 BADNEWS + \alpha_3 ANALYSTS + \alpha_4 SIZE + \sum year + \sum qtr + \varepsilon \quad (3)$$

AFP, our measure of analysts' forecast properties, is the dependent variable in our regression analyses. It is measured as 1) $\Delta\rho$, change in BKLS Consensus around the quarter q earnings announcement (= ρ^A - ρ^B, where $\rho^A(\rho^B)$ is BKLS Consensus after (before) the quarter *q* earnings announcement), 2) $\%\Delta h$, percentage change in BKLS precision of common (public) information, and 3) $\%\Delta s$, percentage change in BKLS precision of idiosyncratic (private) information.

Our main interest independent variable, SPREAD, measures the degree of information asymmetry for the pre-announcement period. In our setting, if public information set is less informative due to information asymmetry, uncertainty may increase and as a result, analysts acquire more costly private information, avoiding less costly public information after the quarterly earnings announcements. Therefore, we expect SPREAD to affect $\Delta\rho$ negatively and $\%\Delta s$ positively.

Following previous research (Barron et al., 2002, 2008), we include the following variables to control for possible biases. First, we include BADNEWS, an indicator variable, which equals 1 if quarter q's actual earnings is less than the mean I/B/E/S forecast and 0 otherwise. Stickel (1989) shows that negative earnings surprises motivate analysts to supply more forecasts and Barron et al. (2008) report that negative earnings surprises lead analysts to acquire more private information. In addition, we include ANALYSTS, the number of analysts matched before and after the quarter q earnings announcement, to control for firms' information environments. To proxy for any omitted variables associated with firm size, we include SIZE, which is the market capitalization at the end of quarter q. Finally, we include year and quarter dummies to control for time-period specific effects.

Table 4 reports the results of our regression analyses. As shown in model 1, the coefficient of SPREAD is negative and significant. The SPREAD coefficient is -0.0331 and significant at the 1% level, consistent with our univariate results showing that the pre-announcement period information asymmetry affects negatively BKLS Consensus. These results indicate that when information asymmetry is high, analysts increases their reliance on private information and incorporate more private (relative to public) information in their revised quarterly earnings forecasts.

In models 2 and 3 we investigate the effect of information asymmetry on changes in h ($\%\Delta h$) and s ($\%\Delta s$), BKLS Consensus' 2 components. The SPREAD coefficients are -0.0231 in model 2 and 0.0202 in model 3. These results verify the finding from model 1. The positive coefficient of SPREAD in model 3 shows that as information asymmetry is higher, analysts acquire and adopt more private information into their

[2] Our results are identical when we use the raw data.

forecasts after earnings announcements. In addition, the negative coefficient in model 2 shows that analysts reduce public information for higher information asymmetry. The results for the control variables are similar to those of previous research.

Combined, our results indicate that information asymmetry affects negatively BKLS Consensus. We find that when information asymmetry is high, analysts acquire and adopt more private information, relative to private information, after earnings announcements. As a result, BKLS Consensus, the ratio of common-to-total information in the average analyst forecast, decreases as information asymmetry is higher. These results show that when public information is less informative due to information asymmetry, uncertainty may increase and as a result analysts acquire more costly private information, avoiding less costly public information after the quarterly earnings announcements.

Table 4. **Regression analysis (n = 13,648)**

	Model 1		Model 2		Model 3	
Dependent variable	$\Delta\rho$		Δ h%		Δ s%	
	coef.	t-stat	coef.	t-stat	coef.	t-stat
intercept	4.5361	27.95***	4.7983	29.59***	4.7868	29.76***
SPREAD	-0.0331	-3.23***	-0.0231	-2.12**	0.0202	4.25***
BADNEWS	-0.2365	-3.94***	-0.1389	-2.36**	0.2486	4.25***
ANALYSTS	0.0584	5.89***	0.0227	2.23**	-0.0786	-7.76***
SIZE	-0.0164	-1.39	-0.0554	-4.47***	-0.0176	-1.47
year Dummies	Yes		Yes		Yes	
quarter Dummies	Yes		Yes		Yes	
adj. R^2	0.0043		0.0010		0.0092	

All variables are defined in Table 2.
*, **, and *** indicate statistical significance (two-tailed tests) at the 10, 5, and 1% levels, respectively.

4. Conclusion. We study the effect of information asymmetry on security analysts' forecast properties. Companies provide information to investors through a variety of channels, either mandatory (e.g., annual and quarterly financial statements or earnings announcements) or voluntary (e.g., management earnings forecasts). Prior research finds that both mandated and voluntary disclosures provide material information to the market and consequently lower information asymmetry at the market. In addition, some research supports the association between public and private information.

Using a sample of all firm-quarter observations between 2000 and 2010, we study the effect of information asymmetry on security analysts' forecast properties. We use BKLS Consensus developed by Barron, Kim, Lim and Stevens (1998) to estimate the degree to which analysts base their forecasts on private information relative to common information on earnings announcements. As an information asymmetry measure, we employ the bid-ask spread as a proxy for information asymmetry.

We find that as accounting information provides less accurate signs of firms' prospects due to greater information asymmetry, analysts develop more private information and incorporate more private information relative to common information. As a result, BKLS Consensus, the ratio of common-to total information in the average analyst forecast, decreases as information asymmetry is higherer. These results show that when public information is less informative due to information asymmetry,

uncertainty may increase and as a result analysts acquire more costly private information, avoiding less costly public information after the quarterly earnings announcements.

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