

The Declining Value-relevance of Accounting Information and Non-Information-based Trading: An Empirical Analysis*

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Abstract

Recently, a growing body of literature has suggested that financial statements have lost their value-relevance because of a shift from a traditional capital-intensive economy to a high-technology, service-oriented economy. These conclusions are based on studies that find a temporal decline in the association between stock prices and accounting information (earnings and book values). This paper empirically tests a theoretical prediction arising from the noisy rational expectations equilibrium model that suggests that the decline could be driven by non-information-based (NIB) trading activity, because such trading reduces the ability of stock prices to reflect accounting information. Specifically, Dontoh, Radhakrishnan, and Ronen (2004) show that when NIB trading increases, the R^2 s of a regression of stock price on accounting information declines. Our empirical tests confirm this prediction; that is, the decline in the association between stock prices and accounting information as measured by R^2 s is driven by an increase in NIB trading.

Keywords Noisy rational expectations equilibrium; Non-information-based trading; Value-relevance

JEL Descriptors D82, G14, M41

Le déclin de la pertinence à la valeur de l'information comptable et la négociation non fondée sur l'information : une analyse empirique

Condensé

Les études récentes ont créé l'impression généralisée selon laquelle les états financiers ont perdu de leur pertinence à la valeur (c'est-à-dire de leur pouvoir de renseigner leurs utilisateurs sur la valeur de l'entreprise), par suite du passage d'une économie traditionnelle, à prédominance de capital, à une économie de haute technologie, axée sur le service. L'on affirme, notamment, que les états financiers sont moins pertinents dans la détermination de la valeur fondamentale des sociétés de haute technologie, axées sur le service, qui ont par nature une

* Accepted by Gordon Richardson. We gratefully acknowledge the comments from the editor, Gordon Richardson, and two anonymous referees.

prédominance de connaissances (voir, par exemple, Elliott et Jacobsen, 1991 ; Jenkins, 1994 ; et Sever et Boisclair, 1990). Ramesh et Thiagarajan (1995), Chiang et Venkatesh (1998), Lev et Zarowin (1999), Francis et Schipper (1999) et Brown *et al.* (1999) observent un déclin dans le temps de la pertinence à la valeur de l'information comptable. Ils examinent dans leurs travaux la relation entre une combinaison de bénéfices, de fluctuation des bénéfices et de valeur comptable, d'une part, et de cours en vigueur des actions ou de rendements, d'autre part. Les auteurs de ces études considèrent généralement les carrés de R (R^2) ou les coefficients des variables explicatives dans ces régressions comme étant le reflet de la pertinence à la valeur. Une exception à ces constatations est signalée par Collins *et al.* (1997), qui montrent que lorsque les valeurs comptables sont ajoutées aux bénéfices à titre de variable indépendante supplémentaire, la pertinence à la valeur demeure stable ou s'améliore dans le temps. Ils constatent également que la pertinence marginale à la valeur des bénéfices (de la valeur comptable) décline (augmente) selon la fréquence des postes non récurrents et des résultats négatifs, ce qui donne à penser que les affirmations selon lesquelles le modèle comptable traditionnel du coût d'origine aurait perdu de sa pertinence à la valeur sont prématurées. Brown *et al.* (1999) affirment cependant qu'un facteur d'échelle commun au cours de l'action, au bénéfice par action et à la valeur comptable de l'action provoque une hausse artificielle de la pertinence à la valeur dans le temps. Une fois contrôlé ce facteur d'échelle, ils constatent que la pertinence marginale à la valeur des bénéfices ainsi que de la valeur comptable a , au contraire, décliné dans le temps. Ces études s'appuient sur une hypothèse implicite : le processus en vertu duquel le cours en vigueur de l'action reflète l'information (à la fois comptable et non comptable) pertinente à la valeur demeure inchangé dans le temps.

Les auteurs de la présente étude analysent l'incidence des activités de négociation, attribuables à des motifs autres que la révision des convictions des investisseurs relatives à la valeur fondamentale de l'action, sur la diminution du R^2 de la régression du cours de l'action sur l'information comptable. Ils qualifient ce type d'activités de *négociation non fondée sur l'information* (désignée *NIB*). Ils procèdent à un examen empirique de l'atténuation de l'association entre le cours de l'action et l'information comptable dans le temps et de sa relation avec la négociation non fondée sur l'information, en recourant à la prévision théorique dite du *modèle d'équilibre d'anticipations rationnelles bruité* de Dontoh *et al.* (2004). Ces derniers montrent que lorsque la négociation *NIB* augmente, la valeur de R^2 obtenue à partir d'une régression du cours de l'action sur l'information comptable diminue.

L'intuition relative à la prévision théorique repose sur l'observation selon laquelle la négociation *NIB* introduit du « bruit » dans le cours des actions qu'elle perturbe. Si les variables comptables ne devaient refléter rien d'autre que l'information relative aux fluctuations de la valeur fondamentale et qu'aucune autre donnée ne fournissait ce genre d'information, l'association entre les variables comptables et la valeur fondamentale serait parfaite. Or, la négociation *NIB* éloigne le cours de la valeur fondamentale du titre — la valeur conditionnelle à l'information pertinente à la valeur comme celle que livrent les bénéfices et la valeur comptable des capitaux propres. Il s'ensuit que l'augmentation de la négociation *NIB* accroît le bruit introduit dans le cours des actions et réduit ainsi l'association observée entre le cours des actions et l'information comptable pertinente à la valeur. Si, au fil du temps, la mesure dans laquelle les cours ont dévié de la valeur augmentait en raison du bruit accru introduit par la négociation *NIB*, la valeur de R^2 mesurée au moyen du cours des actions à

titre de variable dépendante enregistrerait une baisse correspondante. Le déclin temporel observé dans la valeur de R^2 peut donc résulter de l'augmentation de la négociation *NIB* plutôt que d'autres facteurs, ou peut s'ajouter à d'autres facteurs.

Pour effectuer une analyse empirique de cette prévision théorique, les auteurs procèdent à la régression du cours des actions sur les bénéfices et les valeurs comptables — qui, selon leur hypothèse, englobe l'information comptable — et obtiennent donc les R^2 annuels. Les auteurs constatent, comme dans les études antérieures, que la valeur de R^2 a décliné dans le temps. Ils estiment la valeur substitut de l'activité de négociation *NIB* en procédant à la régression du volume de négociation quotidien (auquel est appliqué le facteur d'échelle des actions en circulation) sur les moments de la distribution des révisions annuelles des prévisions des analystes et en utilisant la somme de la valeur estimée du coefficient de la coordonnée à l'origine et du résidu comme substitut au volume de négociation *NIB* quotidien moyen, chaque année. L'estimation du volume de négociation *NIB* que produisent les auteurs augmente dans le temps. Conformément à la prévision théorique, les auteurs constatent que les R^2 résultant de la régression du cours des actions sur les bénéfices et la valeur comptable sont en association négative avec la valeur substitut à la négociation *NIB* qu'ils utilisent, ce qui donne à penser que la négociation *NIB* accrue pourrait expliquer le déclin de R^2 dans le temps. De plus, les auteurs constatent que cette association négative est plus marquée chez les entreprises à forte prédominance d'actifs incorporels (ratio cours/valeur comptable), ce qui laisse croire que le déclin des valeurs de R^2 de la régression du cours des actions sur l'information comptable est en grande partie attribuable à la négociation *NIB* plutôt qu'au caractère inadéquat de l'information comptable pour ces entreprises vedettes. Intuitivement, l'on peut dire que le bruit introduit par la négociation *NIB* éloigne les cours de la valeur fondamentale des titres — la valeur conditionnée par l'information pertinente à la valeur comme celle que livrent la valeur comptable et les bénéfices. Par conséquent, si la mesure dans laquelle les cours dévient de la valeur croît dans le temps en raison du bruit accru introduit par la négociation *NIB*, la valeur de R^2 mesurée au moyen des variables dépendantes basées sur le cours des actions subira un déclin correspondant dans le temps.

L'hypothèse des auteurs repose sur la prévision théorique contenue dans Dontoh *et al.* (2004) selon laquelle l'atténuation de l'association entre le cours de l'action et l'information comptable, mesurée au moyen de R^2 , est en relation positive avec la négociation *NIB* accrue dans le temps. Pour tester l'hypothèse, les auteurs ont recours à la méthode de Collins *et al.* (1999), basée sur le modèle proposé par Ohlson (1995), dans laquelle le cours de l'action est fonction de ses bénéfices et de sa valeur comptable, une fois contrôlée l'information comptable marginale transmise par les entreprises déficitaires et les entreprises rentables. L'échantillon est constitué de toutes les entreprises de la base de données Compustat Industrials Annual, de 1983 à 2000, dont sont tirés le bénéfice net (*NI*) [élément de donnée 172], l'actif total (*TA*) [élément de donnée 6] et la valeur comptable des capitaux propres (*BV*) [élément de donnée 60], et à l'égard desquelles la base de données IBES contient des renseignements sur les prévisions de bénéfice par action des analystes, un an à l'avance (*FEPS*). Les auteurs retirent de l'échantillon les entreprises ayant une valeur comptable des capitaux propres négative. Les entreprises de l'échantillon sont appariées selon le cours de l'action et les actions ordinaires en circulation trois mois après la clôture de l'exercice, renseignements tirés de la base de données CRSP, qui servent à calculer la valeur de marché des capitaux propres (*MV*). Le volume de négociation quotidien et le nombre des actions ordinaires en

circulation chaque jour sont puisés dans la base de données CRSP, et le volume de négociation est « winsorisé » au 95^e percentile. Pour contrôler les effets des valeurs extrêmes, les auteurs rejettent les observations qui se trouvent dans les portions supérieures et inférieures de 0,5 % du cours/bénéfice ou du cours/valeur comptable et les observations qui ont un résidu « studentisé » de plus de quatre écarts types par rapport à zéro dans l'estimation de l'équation 1. Pour calculer la moyenne, l'écart type, l'asymétrie et l'aplatissement, les auteurs ont besoin de cinq révisions au minimum pour chaque entreprise dans une année t donnée quelconque et ils appliquent une estimation de Winsor aux variables des portions inférieure et supérieure de 5 % de la distribution annuelle transversale.

Les résultats obtenus par les auteurs confirment la prévision théorique, ce qui donne à penser que le déclin de la pertinence à la valeur de l'information comptable n'est peut-être pas aussi important que le laissent croire les associations. Ces observations soulèvent une question intéressante : à la lumière des effets de la négociation *NIB* sur la relation entre les cours et les données comptables, peut-on déduire à juste titre du degré observé d'association entre les deux qu'il y a « pertinence à la valeur » ? Il en ressort que les travaux à venir devraient porter sur le contrôle des répercussions de la négociation *NIB* avant que ne soient formulées des hypothèses quant à la « pertinence à la valeur ».

1. Introduction

Recent literature has created a widespread impression that financial statements have lost their value-relevance because of a shift from a traditional capital-intensive economy into a high-technology, service-oriented economy. In particular, it is claimed that financial statements are less relevant in assessing the fundamental value of high high-technology, service-oriented firms, which are by nature knowledge-intensive (see, for example, Elliott and Jacobsen 1991; Jenkins 1994; and Sever and Boisclair 1990). Ramesh and Thiagarajan (1995), Chiang and Venkatesh (1988), Lev and Zarowin (1999), Francis and Schipper (1999), and Brown, Lo, and Lys (1999) find a decline in the value-relevance of accounting information over time. These studies examine the association between a combination of earnings, change in earnings and book value, and contemporaneous stock prices or returns. The authors of these studies generally view the R^2 s or coefficients on the explanatory variables in these regressions as a reflection of value-relevance. An exception to these findings is provided by Collins, Maydew, and Weiss 1997, who show that when book values are added as an additional independent variable along with earnings, the value-relevance holds steady or improves over time. They also find that the incremental value-relevance of earnings (book value) declines (increases) in the frequency of nonrecurring items and negative earnings, suggesting that claims that the conventional historical cost accounting model has lost its value-relevance are premature. Brown et al. (1999), however, argue that a scale factor common to price per share, *EPS*, and book value per share induces a spurious increase in value-relevance over time. After controlling for the scale, they find that incremental value-relevance of both earnings and book value, has in fact, declined over time. An assumption implicit in these studies is that the process by which the contemporaneous stock price reflects value-relevant information (both accounting and nonaccounting) remains unchanged over time.

In this paper, we investigate the effect of trading activity for reasons other than revisions in investor beliefs about the fundamental value of the stock on the decline in the R^2 of the regression of stock price on accounting information. We refer to such trading as non-information-based (NIB) trading.¹ We empirically examine the declining association between stock price and accounting information over time and its relationship to NIB trading using the theoretical prediction of the noisy rational expectations equilibrium (NREE) model in Dontoh, Radhakrishnan, and Ronen 2004. Dontoh et al. show that when NIB trading increases, the R^2 obtained from a regression of stock price on accounting information decreases.

The intuition for the theoretical prediction is based on the observation that NIB trading injects noise into stock prices. If the accounting variables were to reflect nothing but information about changes in fundamental value, and no other data provided such information, the association between the accounting variables and fundamental value would be perfect. NIB trading, however, moves prices away from the security's fundamental value — the value conditional on value-relevant information such as earnings and book value of equity. It follows that increased NIB trading injects increased noise in stock prices and thereby reduces the observed association between stock prices and value-relevant accounting information. If, over time, the degree to which prices deviated from value increased because of increased noise injected by NIB trading, the R^2 measured using stock prices as dependent variables would correspondingly decline. Thus, the observed temporal decline in R^2 s may have resulted from increased NIB trading rather than, or in addition to, other factors.

To empirically investigate this theoretical prediction, we regress stock prices on earnings and book values, seen as encapsulating accounting information, and thus obtain the annual R^2 s. Consistent with earlier studies, we find that the R^2 s have declined over time. We estimate the proxy for NIB trading activity by regressing the daily trading volume (scaled by outstanding shares) on the moments of the distribution of analysts' forecast revisions annually and using the sum of the estimated intercept and the residual as the proxy for the average daily NIB trading volume each year. Our estimate of NIB trading is increasing over time. Consistent with the theoretical prediction, we find that the R^2 s obtained by regressing stock prices on earnings and book values is negatively associated with our NIB trading proxy, suggesting that increased NIB trading could be responsible for the decline in R^2 s over time. Moreover, we find that this negative association is more pronounced for the highly intangible-intensive (market-to-book ratio) firms, suggesting that the decline in R^2 s of the regression of stock price on accounting information is attributable to a large extent to NIB trading rather than to the inadequacy of accounting information for such (glamour) firms.

The paper is organized as follows. We discuss NIB trading and value-relevance in section 2. Concluding remarks are presented in section 3.

2. NIB trading and value-relevance

Hypothesis and research design

As discussed above, NIB trading injects noise into stock prices and, consequently, weakens the observed association between stock prices and value-relevant accounting information (see Dontoh et al., 2004). Intuitively, NIB-generated noise moves prices away from the security's fundamental value — the value conditioned on value-relevant information such as book value and earnings. Hence, if the degree to which prices deviate from value intensified over time because of increased noise injected by NIB trading, the R^2 measured using stock-price-based dependent variables would correspondingly decline over time.² Our hypothesis is based on the theoretical prediction contained in Dontoh et al., which is summarized below.³

HYPOTHESIS. *The decline in the association between stock price and accounting information as measured by the R^2 s is positively associated with increased non-information-based trading over time.*

To test the hypothesis, we use the approach of Collins, Pincus, and Xie 1999, based on the Ohlson 1995 model, which expresses the stock price as a function of its earnings and book value after controlling for the differential accounting information conveyed by loss and profit firms and is given by⁴

$$MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + error_{it} \quad (1),$$

where MV_{it} is the market value of firm i in year t three months after the fiscal year-end, BV_{it} is the book value of equity of firm i at fiscal year-end t , NI_{it} is the earnings before extraordinary items of firm i for the fiscal year ending in year t , and DL_{it} is an indicator variable that is one if the earnings is negative and zero otherwise. We scale all the variables in (1) by total assets (TA_{it}) to control for scale effects (see Brown et al. 1999).⁵ On the basis of earlier results on the value-relevance of accounting information over-time, we expect the R^2 s of (1) to decrease over time.

To proxy for NIB trading, we estimate information-based trading by using parameters of the distribution of individual analysts' earnings forecast revisions and subtracting the estimated information-based trading from trading volume to obtain NIB trading. Each individual analyst's one-year-ahead absolute forecast revision is defined as

$$REV_{ijkt} = |FEPS_{ijkt} - FEPS_{ij(k-1)t}| / |FEPS_{ij(k-1)t}|,$$

where $FEPS_{ijkt}$ represents the one-year-ahead earnings forecast for year t of firm i made by analyst j on dates k and $(k-1)$. The distribution of the one-year-ahead forecast revisions for each firm-year is characterized by the mean ($MNREV_{it}$), the standard deviation ($STDREV_{it}$), the skewness ($SKREV_{it}$), and the kurtosis ($KRREV_{it}$) of the revisions for firm i in year t , across all individual analysts' forecast revisions.

The percentage of common shares that is traded each day for each firm is computed as $PRVOL_{ikt} = TRVOL_{ikt}/CSOS_{ikt}$, where $TRVOL_{ikt}$ is firm i 's trading volume on day k in year t and $CSOS_{ikt}$ is the corresponding number of common shares outstanding. VOL_{it} , the percentage of daily average trading volume for firm i in year t , is computed as the mean of $PRVOL_{ikt}$ over day k . We then estimate the following equation for each year:

$$VOL_{it} = k_{0t} + k_{1t}MNREV_{it} + k_{2t}STDREV_{it} + k_{3t}SKREV_{it} + k_{4t}KRREV_{it} + error_{it} \quad (2),$$

where $MNREV_{it}$, $STDREV_{it}$, $SKREV_{it}$, and $KRREV_{it}$ are the mean, the standard deviation, the skewness, and the kurtosis of the distribution of the absolute value of analysts' forecast revisions for firm i in year t .⁶ We expect k_{2t} and k_{4t} to be positive, but because $MNREV_{it}$ and $SKREV_{it}$ can assume either positive or negative values, we offer no prediction of the sign of k_{1t} and k_{3t} . Non-information-based trading volume is then computed as

$$NIBVOL_{it} = VOL_{it} - (k_{1t}^*MNREV_{it} + k_{2t}^*STDREV_{it} + k_{3t}^*SKREV_{it} + k_{4t}^*KRREV_{it}) \quad (3),$$

where k_{it}^* are the estimates obtained from (2).

We use a research design that is similar to Collins et al. 1997 and examine whether the decrease in value-relevance of accounting information could be due to an increase in $NIBVOL_{it}$. Specifically, we compute the cross-sectional mean of $NIBVOL_{it}$ for year t as $MNIBVOL_t$. In time series, we then regress the R^2 s obtained from estimating (1) on $MNIBVOL_t$ as follows:

$$RSQ_t = b_0 + b_1MNIBVOL_t + error_t \quad (4),$$

where RSQ_t is the annual R^2 obtained from estimating (1), and $MNIBVOL_t$ is the mean non-information-based trading volume ($NIBVOL_{it}$; see (3)) in year t . On the basis of the hypothesis, we expect b_1 to be negative. Collins et al. (1997) use a similar specification to examine the factors for declining value-relevance as indicated by the estimated R^2 s of (1). Specifically, they consider the percentage of firms whose earnings number is negative each year ($MLOSS$), the percentage of firms with special items each year ($MONETIME$), and the percentage of firms operating in the intangible-intensive industry ($MINTANG$). We have controlled for the effect of negative earnings and one-time events by allowing the coefficients for the loss and profit firms to be different (see (1)). To consider the differing impact of intangible-intensity, we partition the sample on the basis of the market-to-book ratios and estimate (1).

The sample and the result

The sample consists of all firms in the COMPUSTAT Industrials Annual Database from 1983 to 2000 having data on net income, (NI) (data item 172), total assets

(TA) (data item 6), and book value of equity (BV) (data item 60), and for which the I/B/E/S data base has data on the individual analysts' one-year-ahead forecasts of earnings per share, *FEPS*. We deleted firms with negative book value of equity. The sample firms are matched with the stock price and common shares outstanding three months after the fiscal year-end from the CRSP data base, which are used to compute the market value of equity, MV. The daily trading volume and the daily common shares outstanding are obtained from the CRSP data base, and trading volume is winsorized at the 95th percentile. To control for the effects of extreme values, we delete observations that are in the top and bottom 0.5 percent of price-to-earnings or market-to-book value and observations that have a studentized residual of greater than four standard deviations away from zero in estimating (1). To compute the mean, the standard deviation, the skewness, and the kurtosis, we require at least five revisions for the firm for any given year t and winsorize the variables at the bottom and top 5 percent of the annual cross-sectional distribution. Our final sample contains 34,070 firm-year observations. The number of firms in the sample each year increases from about 3,102 in the 1970s to 6,087 in the 1990s. The mean (median) market value of equity increases from \$228 (\$29) million in the 1970s to \$1,197 (\$101) million in the 1990s; the book value of equity increases from \$170 (\$27) million in the 1970s to \$556 (\$61) million in the 1990s; net income increases from \$22 (\$3) million in the 1970s to \$61 (\$4) million in the 1990s; and the market-to-book ratio increases from 1.49 (1.02) in the 1970s to 3.71 (1.71) in the 1990s. The number of loss firms increases over time: the first quartile of earnings is negative in the 1990s, although it is positive in the 1970s. Overall, the sample characteristics, as well as our estimates of equilibrium, are similar to those of earlier studies.

We describe the behavior of R^2 s obtained by estimating (1) in panel A of Table 1. In the 1980s, the R^2 is about 56 percent; it declines to about 28 percent in the late 1990s, a 50 percent ($= (56 - 28)/28$) drop in the explanatory power of accounting information. We partition the sample into three groups based on high, medium, and low market-to-book ratios to proxy for high, medium, and low degrees of intangible intensity, respectively. The groups are formed on the basis of the market-to-book ratio at the beginning of the year, with the top (bottom) 30 percent of the market-to-book ratio classified as the high (low) intangible intensity group. We find that the R^2 of the high market-to-book ratio group declined from 47 percent in the 1980s to about 26 percent in the late 1990s, while the corresponding (untabulated) R^2 s for the low market-to-book ratio group are 33 percent and 25 percent, respectively. This shows that the decline in R^2 s is most prominent in the high market-to-book ratio group, which led earlier researchers to conclude that the value-relevance of accounting information has declined considerably for highly intangible-intensive companies. Indeed, prior research has argued that financial accounting information is of limited use to investors when valuing service and high-tech companies that invest in intangibles such as research and development and human capital. The argument is that although intangibles may contribute to the value of the company, accounting rules generally do not recognize them. Hence, financial accounting information may not be value-relevant for such intangible-

TABLE 1
Accounting information, non-information-based trading, and stock prices

Variables [†]	1983 to 1988		1988 to 1994		1995 to 2000							
	1,015		1,859		2,669							
	(1)	(5)	(1)	(5)	(1)	(5)						
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.						
Intercept, a_0	0.10	2.49	0.05	1.04	0.20	6.36	0.10	3.14	0.46	11.21	0.13	4.02
BV, a_1	1.59	3.78	1.62	1.58	1.01	3.63	1.04	3.10	3.10	5.32	3.10	2.75
NI, a_2	13.11	2.04	13.40	3.53	14.29	2.79	14.62	3.83	13.24	1.61	13.55	3.90
DL^*BV, a_3	8.82	8.15	5.44	7.34	5.90	5.72	3.80	4.59	7.00	8.45	3.65	4.96
DL^*NI, a_4	-14.43	-19.44	-14.15	-20.88	-16.23	-22.79	-15.87	-31.15	-15.72	-20.59	-15.07	-25.94
$NIBVOL, a_5$			0.03	1.99			0.11	2.21			0.68	3.06
$DL^*NIBVOL, a_6$			0.54	1.84			0.72	2.59			0.98	2.91
$R^2, \%$	55.98		58.59		50.60		54.02		28.38		35.04	

(The table is continued on the next page.)

TABLE 1 (Continued)

Equation*	1983 to 1988		1988 to 1994		1995 to 2000	
	304		558		801	
	(1)	(5)	(1)	(5)	(1)	(5)
Variables†	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
Intercept, a_0	0.68	5.20	0.75	8.97	1.54	14.73
BV, a_1	2.60	3.57	1.45	3.01	4.94	4.43
NI, a_2	11.38	1.07	13.50	1.27	10.77	0.88
DL^*BV, a_3	3.03	2.38	21.12	13.23	-8.42	-0.04
DL^*NI, a_4	-11.73	-9.28	-15.24	-15.38	-13.27	-11.72
$NIBVOL, a_5$						
$DL^*NIBVOL, a_6$						
$R^2, \%$	46.79	48.87	40.92	45.99	25.93	31.23

(The table is continued on the next page.)

TABLE 1 (Continued)

Notes:

* Equations are defined as follows:

$$(1): MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + error_{it}$$

$$(2): VOL_{it} = k_{0t} + k_{1t}MNREV_{it} + k_{2t} + STDREV_{it} + k_{3t}SKREV_{it} + k_{4t}KRREV_{it} + error_{it}$$

$$(3): NIBVOL_{it} = VOL_{it} - (k_{1t}^*MNREV_{it} + k_{2t}^*STDREV_{it} + k_{3t}^*SKREV_{it} + k_{4t}^*KRREV_{it})$$

$$(5): MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + a_{5t}NIBVOL_{it} + a_{6t}DL_{it}NIBVOL_{it} + error_{it}$$

All variables other than *NIBVOL* in (1) and (5) are scaled by total assets.

Equations (1) and (5) are estimated cross-sectionally for each year from 1983 to 2000. The *t*-statistics for each year are adjusted using White's procedure. The numbers in the table are the means of the coefficients and adjusted *t*-statistics over the relevant period.

† Variables are defined as follows:

MV_{it} is the market value of firm *i* in year *t* 3 months after the fiscal year-end.

BV_{it} is the book value of equity of firm *i* at fiscal year-end *t*.

NI_{it} is the earnings before extraordinary items of firm *i* for the fiscal year ending in year *t*.

MB_{it} is the market-to-book value of equity of firm *i*, computed using MV_{it} and BV_{it} .

DL_{it} is an indicator variable that is one if NI_{it} is negative and zero otherwise.

VOL_{it} is the percentage average daily trading volume for each firm, computed as the mean of the daily trading volume of firm *i* in year *t* divided by the common shares outstanding for that day in year *t*. VOL_{it} is computed for each firm *i* over the 12 months preceding the end of 3 months after the fiscal year-end.

$FEPS_{ijkt}$ is analyst *j*'s one-year-ahead forecast of earnings per share of firm *i* on date *k* for fiscal year *t*.

$REV_{ijkt} = |FEPS_{ijkt} - FEPS_{ij(k-1)t}| / |FEPS_{ij(k-1)t}|$ is the absolute forecast revision, where $(k-1)$ indicates the forecast preceding the one made on date *k*.

$MNREV_{it}$, $STDREV_{it}$, $SKREV_{it}$, and $KRREV_{it}$ are the mean, standard deviation, skewness, and kurtosis of the absolute value of forecast revisions (*REV*) for firm *i* in year *t*.

‡ The high market-to-book (*MB*) ratio group consists of firms in the top 30 percent ranked based on the market-to-book ratio annually.

§ The sample contains 34,070 firm-year observations spanning 1983–2000.

intensive firms. To summarize, we find that the R^2 s have declined over time and that the decline has been more pronounced in the highly intangible-intensive firms.

Our untabulated estimates of (2) indicate that the coefficients on the standard deviation and kurtosis of the revisions are positive, as suggested by the noisy rational expectation models. The R^2 s obtained by estimating (2) show a slight decline over time (26.20 percent in the early 1980s and 21.82 percent in the late 1990s), indicating that the information events explain a decreasing proportion of the trading volume over time. This suggests that non-information-based trading has been increasing over time. The R^2 s for the low intangible intensity (market-to-book ratio) firms are 23.42 percent and 16.29 percent in the early 1980s and late 1990s, respectively, and the R^2 s for the high intangible intensity (market-to-book ratio) firms are 28.24 percent and 23.35 percent for the early 1980s and late 1990s, respectively. This suggests that for firms with low intangible intensity (low market-to-book), the information events have a lower explanatory power than highly intangible-intensive (high market-to-book) firms.

Our untabulated results indicate that the daily NIB trading volume (3) was about 3 percent of the outstanding shares in the 1980s for all the market-to-book ratio groups, and in the late 1990s it was about 5.5 percent for the high market-to-book ratio group and about 4 percent for the low and medium market-to-book ratio groups. This implies that the NIB trading volume increased by about 83 percent $(= (5.5 - 3.0)/3.0)$ for the high market-to-book ratio and by about 33 percent $(= (4 - 3)/3)$ for the low and medium market-to-book ratios. Thus, there is an overall increase in NIB trading, with the high market-to-book ratio firms showing the largest increase.

We next examine the hypothesis by estimating (4). Table 2 provides the results.

Weighted least squares are used to estimate (4), where the observations are weighted by the number of companies used in estimating (1), and also by ordinary least squares, where each observation is equally weighted.⁷ The coefficients on *MNIBVOL* are negative and significant across all partitions of intangible intensity, indicating an overwhelming support for the theoretical prediction. The coefficients on *MNIBVOL* for the low, medium, and high market-to-book groups are -0.03 , -0.07 , and -0.11 , respectively, indicating that non-information-based trading has had a higher impact on stock prices for highly intangible-intensive firms. We next examine some extensions.

Extensions

Francis and Schipper (1999) contend that if volatility of market returns are increasing for non-information reasons, value-relevance tests will be biased toward the result that relevance is decreasing over time, as a greater portion of the variability in returns will be unexplained by accounting information. Although the NREE models do not directly provide us with a conjecture regarding the specific relationship between stock prices and NIB trading volume, we expect that including NIB trading volume will help improve the explanatory power of (1). In fact, one would expect a negative relation between R^2 and *MNIBVOL*, as we have shown in Table 2,

to be logically equivalent to a statistically significant coefficient on *NIBVOL* as an explanatory variable in (5) below. We use an augmented Collins et al. 1999 model to test this implication of NIB trading for explaining price variation. We estimate

$$MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + a_{5t}NIBVOL_{it} + a_{6t}DL_{it}NIBVOL_{it} + error_{it} \quad (5),$$

where all variables are as defined before.

TABLE 2
Value-relevance of accounting information and non-information-based trading

Panel A: Whole sample*				
Equation (4) [§]	Weighted least squares [†]		Ordinary least squares [‡]	
	Coefficient	<i>t</i> -statistic [#]	Coefficient	<i>t</i> -statistic [#]
Intercept, <i>b</i> ₀	0.82	31.49	0.81	27.05
<i>MNIBVOL</i> , <i>b</i> ₁	-0.13	-16.32	-0.13	-13.17
<i>R</i> ² , %	93.45		90.01	
Panel B: High market-to-book**				
Equation (4)	Weighted least squares		Ordinary least squares	
	Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic
Intercept, <i>b</i> ₀	0.71	17.97	0.66	8.59
<i>MNIBVOL</i> , <i>b</i> ₁	-0.11	-10.08	-0.10	-4.51
<i>R</i> ² , %	84.57		62.76	
Panel C: Medium market-to-book				
Equation (4)	Weighted least squares		Ordinary least squares	
	Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic
Intercept, <i>b</i> ₀	0.63	19.74	0.63	23.45
<i>MNIBVOL</i> , <i>b</i> ₁	-0.07	-5.80	-0.07	-6.67
<i>R</i> ² , %	81.62		84.16	
Panel D: Low market-to-book				
Equation (4)	Weighted least squares		Ordinary least squares	
	Coefficient	<i>t</i> -statistic	Coefficient	<i>t</i> -statistic
Intercept, <i>b</i> ₀	0.38	8.89	0.37	10.23
<i>MNIBVOL</i> , <i>b</i> ₁	-0.03	-2.55	-0.03	-2.33
<i>R</i> ² , %	35.84		24.53	

(The table is continued on the next page.)

TABLE 2 (Continued)

Notes:

- * The sample contains 34,070 firm-year observations from 1983 to 2000.
- † In the weighted least squares estimation, the observations are weighted by the number of companies used in estimating (1); see Brown et al. (1999).
- ‡ In the ordinary least squares estimation, each observation is equally weighted.
- § Equations are defined as follows:
- (1): $MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + error_{it}$.
- (2): $VOL_{it} = k_{0t} + k_{1t}MNREV_{it} + k_{2t}STDREV_{it} + k_{3t}SKREV_{it} + k_{4t}KRREV_{it} + error_{it}$.
- (3): $NIBVOL_{it} = VOL_{it} - (k_{1t}MNREV_{it} + k_{2t}STDREV_{it} + k_{3t}SKREV_{it} + k_{4t}KRREV_{it})$.
- (4): $RSQ_t = b_0 + b_1MNIBVOL_t + error_t$.
- RSQ_t is the R^2 obtained by estimating (1).
- $MNIBVOL_t$ is the cross-sectional mean for year t of $NIBVOL_{it}$, which for firm i in year t is the residual plus the intercept obtained from estimating (2) annually as defined in (3).
- # The t -statistics are adjusted using White's procedure.
- ** The high (low) market-to-book ratio group consists of firms in the top (bottom) 30 percent (30 percent) ranked annually based on the market-to-book ratio. The medium market-to-book ratio group contains the remaining 40 percent of the observations.

As with the estimation of (1), we scale the variables in (5) by TA . On the basis of the NREE model, we cannot conjecture the sign of the coefficient on $NIBVOL_{it}$ (a_{5t}), but given our earlier evidence and the Francis and Schipper 1999 conjecture, we expect the inclusion of $NIBVOL_{it}$ to improve the R^2 s relative to those of (1) that excludes $NIBVOL_{it}$. Table 1 provides the results of estimating (5) for the sample with analyst revisions spanning 1983 to 2000 as well as the estimates for the high intangible intensity (market-to-book ratio) group. For the purposes of comparison, we include in Table 1 the results of estimating (1) (which presents the regression without the $NIBVOL$ variable) so as to highlight the comparisons between the two. The coefficient on non-information-based trading volume (a_5) is not significantly different from zero for the early period (1983 to 1988) while for the later period (1995 to 2000) it is positive and significant for the whole sample and the high market-to-book ratio group. In the early years the addition of non-information-based trading volume improves the explanatory power by about 5 percent ($= (59 - 56/56)$), while in the later years the addition of non-information-based trading volume improves the explanatory power by about 25 percent ($= (35 - 28/28)$). This improvement is similar for the high market-to-book ratio group and it provides a certain degree of support for the Francis and Schipper conjecture.

Robustness tests using daily trading volume

We examine the association between our measure of NIB trading volume (*NIBVOL*) and the daily trading volume (*VOL*). In essence, we ascertain whether the average trading volume is a good proxy for NIB trading. The rank correlation between *NIBVOL* and *VOL* is around 90 percent, with the exception of 1983, when it is about 84 percent. Thus, in general, the daily trading volume is a good proxy for non-information-based trading activity. We thus obtain (5a) below by using the daily trading volume scaled by shares outstanding as a proxy for NIB trading to examine the decline in the value-relevance of accounting information over the longer time horizon — that is, 1963 to 2000.

$$MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + a_{5t}VOL_{it} + a_{6t}DL_{it}VOL_{it} + error_{it} \quad (5a).$$

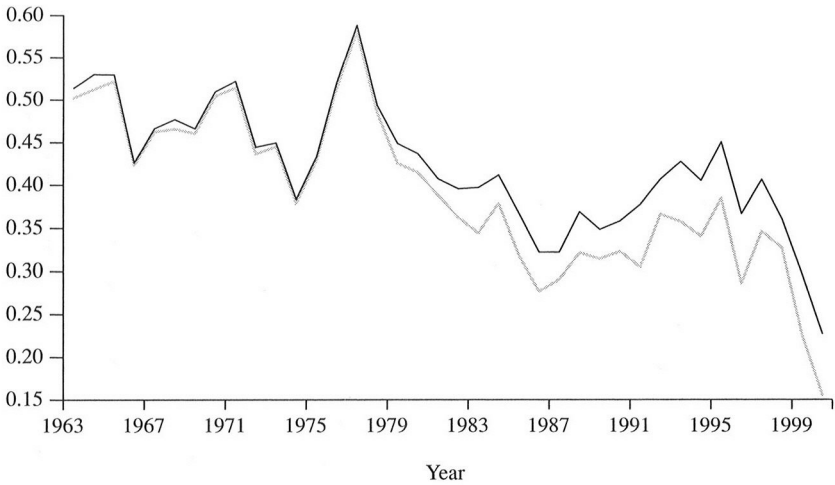
Because we no longer require analysts' data, we are able to estimate (5a) in Figure 1 using *VOL* instead of *NIBVOL* for a larger sample of firms (149,888 firm-year observations) starting from 1963 and correspondingly estimate (1) to compare the R^2 s of the estimations. The coefficient (a_{5t}) on trading volume (*VOL*) of (5a) is not significantly different from zero for the 1960s and 1970s, but for the 1980s and 1990s it is positive and significant for the whole sample and the market-to-book partitions. The effect of trading volume for loss firms is not significantly different from that for profit firms, as a_{6t} is not significantly different from zero for 35 of the 38 estimation years. The R^2 s of (1) and (5a) for the expanded sample are presented in Figure 1.

The decline in R^2 s is attenuated by the inclusion of trading volume (5a). In the 1960s and 1970s the R^2 s are about 48 percent, and in the 1980s and 1990s the R^2 s are about 37 percent, which represents a decline of 22 percent ($= (48 - 37)/48$), compared with a decline of 47 percent ($= (48 - 31)/48$) when (1) is estimated. Thus, a temporally increasing portion of the decline in R^2 s is accounted for by the inclusion of non-information-based trading volume as proxied by trading volume.

3. Concluding remarks

Prior studies have focused on the examination of the value-relevance of accounting numbers (such as earnings and book values) that documented a decline in contemporaneous associations between the accounting numbers and stock prices (levels or changes). In this paper, we empirically examine a theoretical prediction based on the noisy rational expectation equilibrium model that the declining value-relevance could be due to increased non-information-based (NIB) trading activity. We find support for the theoretical prediction, which suggests that the decline in the value-relevance of accounting information may not be as large as the associations indicate. An intriguing question is suggested by our findings: in light of the effects of NIB trading on the relationship between prices and accounting numbers, can the observed degree of association between the two be properly interpreted as "value-relevance"? One implication of this question is that future research should control for the effects of NIB trading before making "value-relevance" inferences.

Figure 1 Accounting information, trading volume, and stock prices, 1963–2000*



Notes:

* Variables are defined as follows:

MV_{it} is the market value of firm i in year t 3 months after the fiscal year-end.

BV_{it} is the book value of equity of firm i at fiscal year-end t .

NI_{it} is the earnings before extraordinary items of firm i for the fiscal year ending in year t .

MB_{it} is the market-to-book value of equity of firm i , computed using MV_{it} and BV_{it} .

DL_{it} is an indicator variable that is one if NI_{it} is negative and zero otherwise.

VOL_{it} is computed for each firm i over the 12 months preceding the end of 3 months after the fiscal year-end.

† Equation (1): $MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + error_{it}$

‡ Equation (5a): $MV_{it} = a_{0t} + a_{1t}BV_{it} + a_{2t}NI_{it} + a_{3t}DL_{it}BV_{it} + a_{4t}DL_{it}NI_{it} + a_{5t}VOL_{it} + a_{6t}DL_{it}VOL_{it} + error_{it}$

Equation (5a) is equation (5) where $NIBVOL$ is replaced with VOL . All variables other than VOL in equations (1) and (5a) are estimated cross-sectionally for each year from 1963 to 2000. The t -statistics for each year are adjusted using White's procedure. The numbers in the table are the means of the coefficients and adjusted t -statistics over the relevant period. The sample contains 149,888 firm-year observations from 1963 to 2000.

Endnotes

1. The incidence and significance of such trading are now recognized in finance circles. Grossman (1995) characterized non-information-based trading as follows: "in general, there may be many reasons for trade other than information. After all, the traditional view of the market is of a location where resources are reallocated. Reasons for these non-informational trades include cross-sectional changes in wealth, risk-preferences, liquidity needs, unanticipated investment opportunities and all other factors that do not directly relate to the payoffs of traded securities." For instance, in response to random shocks in their wealth or preferences, traders may rebalance their global portfolios, including nonfinancial assets. The results of such rebalancing, when restricted to a single market such as the stock market, may appear as random perturbations in asset holdings that are unrelated to information about underlying market values. For a similar notion, see also Krause and Smith 1989 (558).
2. See O'Dean 1998 and 1999 for evidence consistent with the notion that NIB trading increased in the 1990s.
3. See also Dontoh and Ronen 1993, Dontoh et al. 2003, and Kim and Verrechia 1991.
4. Collins et al. (1999) use the book value of equity at the beginning of the period, but (1) is specified in terms of the book value at the end of the period. If we were to use the book value of equity at the beginning of the period, we would need to add the dividends to the market value of equity in (1). Our specification is consistent with Ohlson's 1995 model. We obtain similar results when we use the beginning-of-year book value.
5. We also scaled the variables by net sales and beginning-of-year market value and obtained qualitatively similar results.
6. To show that using the daily trading volume provides consistent estimates, we use the following simple example. Consider the following true trading volume generating process as given by $V_{idt} = NIB_t + a_t REV_{idt}$, where V_{idt} is the trading volume of firm i on day d in year t , REV_{idt} is the revision of the forecast for firm i on day d in year t , NIB_t is the non-information-based trading volume, and a_t is the coefficient on the revision. Let $NIB_t = 0.05$ and $a_t = 0.10$. Firms 1 and 2 have the following observable realizations of REV_{idt} and V_{idt} for five days in year t : $\{(0.5, 0.1), (0, 0.05), (0, 0.05), (0.7, 0.12), (0, 0.05)\}$ and $\{(0, 0.05), (0, 0.05), (0.1, 0.06), (0.1, 0.06), (0.4, 0.09)\}$. It can be verified that V_{idt} is generated by the assumed process; for example, $0.12 = 0.05 + (0.1 \cdot 0.7)$. The mean revisions for firms 1 and 2 are 0.24 and 0.12, respectively; that is, $0.24 = (0.5 + 0 + 0 + 0.7 + 0)/5$ and $0.12 = (0 + 0 + 0.1 + 0.1 + 0.4)/5$, and the mean daily trading volumes are 0.074 and 0.062, respectively. Using the mean daily trading volume and mean revisions, the slope estimate $a_t = (0.074 - 0.062)/(0.24 - 0.12) = 0.1$, and the intercept estimate $NIB_t = 0.074 - (0.1 \cdot 0.24) = 0.05$.
7. See Brown et al. 1999, who use the weighted least squares estimation.

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