EQUITY VALUATION IN THE PRESENCE OF ACCOUNTING NOISE: EMPIRICAL EVIDENCE USING PROFIT MARGINS

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Equity Valuation in the Presence of Accounting Noise: Empirical Evidence using Profit Margins*

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Abstract: We investigate the way investors utilize accounting data in equity valuation in the presence of various sources of accounting noises that impede the persistence and the predictive value of reported earnings. Our empirical findings are consistent with the hypothesis that investors implement ratio analysis of disaggregated earnings data to imperfectly detect accounting noises of various types and adjust for them when pricing firms' equity. In appears that investors look at deviations of reported earnings components from their expected fundamental ratios, using them as imperfect indicators of hidden nonrecurring earnings items arising from reporting manipulations, measurement biases and economic events of a transitory nature. These indicators assist investors to partially clear reported earnings of noises and elicit the persistent kernel of earnings as an improved basis for equity valuation. The empirical evidence also suggests that investors rely more heavily on this process of clearing accounting earnings of noises when pricing firms with relatively stable financial ratios.

Keywords: Financial Accounting, Equity Valuation, Financial Ratios, Profit Margins, Earnings Persistence, Reporting bias, Earnings Management.

JEL classification: D82; G14; M41; M43.

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1. Introduction

The usefulness of accounting information in equity valuation has long been an important research interest in the accounting literature. The perception of earnings as the premier piece of information provided in the financial statement has led many to concentrate on accounting earnings as the sole explanatory variable of stock returns (e.g., Beaver et al., 1980; Easton and Harris, 1991). Other studies have introduced additional accounting variables, such as earnings components (e.g., Lipe, 1986; Barth et al., 1992; Ramakrishnan and Thomas, 1998), balance sheet components (e.g., Ohlson and Penman, 1992; Penman, 1998), revenues (e.g., Ertimur et al., 2003; Jegadeesh and Livnat, 2006), cash flows and accruals (e.g., Rayburn, 1986; Wilson, 1987; Dechow, 1994; Sloan, 1996; Balsam et al., 2002; Dechow and Schrand, 2004), financial ratios (e.g., Ohlson, 1980; Freeman et al., 1982; Ou and Penman, 1989; Nissim and Penman, 2001), indicators of earnings quality (e.g., Lev and Thiagarajan, 1993; Abarbanell and Bushee, 1997; Rajgopal et al., 2003; Penman and Zhang 2004), various note disclosures (e.g., Landsman, 1986; Barth, 1991; Amir, 1996), non-financial indicators (e.g., Amir and Lev, 1996), and non-linearity in estimation (e.g., Das and Lev, 1994; Beneish and Harvey, 1998). The accumulated empirical evidence indicates that accounting earnings are used by investors as noisy measures of equity values and further points to various sources of accounting noises that suppress earnings quality in estimating equity values.

Biases in reporting are commonly perceived as the primary source of accounting noises detracting from the usefulness of accounting earnings to equity investors (e.g., Lev, 1989). Along this line, the Financial Accounting Standard Board (*FASB*) asserts in Statement of Financial Accounting Concepts (*SFAC*) No. 2 (*FASB*, 1980) that accounting information may not represent faithfully what it purports to represent because it has one or both of two types of reporting bias: measurement and measurer. The *measurement* bias is defined as being inherent in the accounting measurement method. The *measurer* bias is defined as a personal distortion introduced by the measurer, who may misapply the accounting measurement method through lack of skill or lack of integrity or both. Measurer biases, therefore, either stem from unintentional errors of managers in applying accounting measurement methods or result from intentional managerial manipulations to attain a predetermined outcome. Because they are unsystematic and transient in nature, reporting biases of all types diminish the persistence and the predictive value of reported earnings, thereby introducing a substantial amount of noise into the process of accounting-based equity valuation. However, not only do earnings comprise items lacking recurring potential due to reporting biases, they also contain other items that fundamentally reflect transitory economic events and thus constitute another important source that adds noise to the equity valuation process.

The ample empirical literature indicating the widespread existence of various accounting noises that detract from the quality of earnings further documents their effect on the association between earnings data and equity prices, mostly suggesting that investors place different valuation weights on different reported components of earnings (e.g., Ohlson and Penman, 1992; Sloan, 1996, Ramakrishnan and Thomas, 1998). While investors can indeed identify some accounting noises by simply looking at the decomposition of earnings into its reported components (e.g., discontinued operations, various gains and losses), most accounting noises are hidden and cannot be detected in that way. The empirical literature on the role of accounting data in equity valuation, despite its impressive volume, has been rather silent about the way that investors reveal hidden accounting noises of various types and the means by which they incorporate such noises into the valuation process. While composing a comprehensive and specified descriptive picture of the resultant statistical association between accounting information and equity values, the extant empirical evidence sheds very little light on (i) the process whereby equity investors endeavor to detect hidden accounting noises and adjust for them when pricing firms' equity, (ii) the extent to which this process is effective, and (iii) the factors that determine its efficacy. Our narrow understanding of these issues is surprising in light of the enormous concern of market participants and policy-makers about management reporting manipulations and other inherent accounting biases and imperfections. Motivated by this void in the literature, our study aims at investigating the way investors utilize accounting data in equity valuation in the presence of accounting noises.

Our approach is conceptually rooted in a theory developed by Amir, Einhorn and Kama (2008) (henceforth, AEK), where they model the process of earnings management and form a valuation equation that takes this activity into consideration. The resulting valuation model suggests that ratio analysis of disaggregated earnings might assist investors in detecting earnings management while pricing equity. Though AEK focus on intentional measurer biases, which are determined endogenously as an equilibrium consequence of a reporting game between managers and investors, the logic behind their analysis also applies to other types of exogenous reporting biases (namely measurement biases and unintentional measurer biases) as well as to earnings items of a transitory economic nature. This allows us to relate in our empirical analysis to all sources of accounting noises. Recognizing that the particular source of each accounting noise is irrelevant to equity valuation, we apply AEK's theory in order to shed light on a powerful and general tool that serves equity investors to mitigate all kinds of accounting noises, without actually identifying any of them in isolation.

AEK's analysis builds on the ratios that typically characterize different components of earnings, such as the ratios between sales revenues and certain expense items that are the basis of various profit margins. Such ratios have a stochastic nature because they are highly sensitive to changes in the business environment. Following AEK, we argue that accounting noises of all types are likely to alter the fundamental stochastic behavior of earnings ratios due to their disproportional effect on the various earnings components. Investors can identify deviations of the reported earnings components from their expected fundamental ratios, knowing that these deviations can either stem from economic changes or result from accounting noises. While such ratio analysis of disaggregated earnings data is incapable of perfectly distinguishing economic changes from accounting noises, it nevertheless provides investors with imperfect indicators of accounting noises. These indicators allow investors to imperfectly detect hidden nonrecurring accounting items (arising from either reporting biases or transitory economic events) and adjust for them when pricing equity. When the fundamental stochastic behavior of earnings ratios is relatively stable, deviations of reported earnings components from their expected fundamental ratios are likely to be more indicative of accounting noises because of their lower sensitivity to economic changes. Accordingly, in applying the theoretical framework suggested by AEK, we use profit margins as a specific form of earnings ratios, taking advantage of their relatively clear and systematic economic behavior.

Based on AEK, we design a valuation model that links share prices and stock returns to reported earnings and to the deviation of earnings from what is implied by fundamental (normal) profit margins. Our valuation model refines the commonly used models by introducing an additional explanatory variable that captures the deviation of actual earnings from those implied by normal profit margins. In designing this variable, we use several alternative measures of profit: gross profit, operating profit before depreciation and amortization (*EBITDA*), operating profit (*EBIT*), and net profit from continuing operations before extraordinary items (net income). For each profit measure, we designate the firm-specific average profit margin over several prior periods as a proxy for the firm-specific normal profit margin. Using this proxy, we define the deviation of each of the alternative profit measures from the normal profit as the difference between the actual profit and the corresponding normal profit margin multiplied by current sales. Incorporating the deviation variable into the conventional valuation models, we then estimate our modified model using yearly cross-sectional regressions. The empirical estimation is based on a large sample that covers the years 1971-2006 and includes all available firm/year observations with complete price and financial data on Compustat and CRSP, excluding financial institutions and public utilities.

We find that deviations of actual earnings from what is implied by fundamental profit margins are valued negatively by the market, after controlling for earnings, and their inclusion in conventional valuation models improves the power of earnings in explaining share prices and stock returns. When we apply our empirical analysis to a sub-sample of firms with less noisy profit margins, the results become even more incisive and significant, indicating a higher positive coefficient on earnings and a lower negative coefficient on deviations from normal earnings. The empirical findings are consistent with our hypothesis that deviations from normal earnings implied by normal profit margins serve as effective indicators of hidden accounting noises, enabling investors to adjust reported earnings for such noises and thereby enhancing the usefulness of reported earnings in evaluating firm equity. The results also support our prediction that the efficacy of such indicators in detecting accounting noises is especially high when profit margins are exposed to a relatively low level of economic volatility. Another interesting result that arises from our empirical analysis is the gradual increase in the explanatory power of the deviation from normal earnings as we go down the income statement toward more comprehensive earnings measures. This result is consistent with the argument that accounting noises are more likely to occur in line items that are situated lower down in the income statement, such as operating accruals and special items.

In addition, we examine the pattern over time of our estimated annual cross-sectional regression coefficients. Consistent with prior studies, the estimation of the conventional valuation models yields a positive coefficient on the earnings variable that tends to decrease over the years 1971-1999, even though it seems to be relatively flat in 2000-2006. When we incorporate the deviation from normal earnings as an additional explanatory variable into the model, the estimated positive coefficient on the earnings variable remains flat as time goes on and even increases slightly in the more recent years of our sample period, while the negative coefficient on the deviation from normal earnings decreases over the entire sample period. That is, while the valuation coefficient on normal earnings per share has stayed relatively stable over time, the valuation coefficient on the component of earnings that is suspected by investors of being infected by accounting noises has become more negative over time. We interpret these findings as suggesting that the magnitude of accounting noises has increased over the years, but the consequent reduction in the usefulness of earnings to investors has been mitigated by the enhanced power of deviations from normal earnings in indicating accounting noises.

The main contribution of this study is the theory-based link between accounting noises and equity valuation. We depart from conventional valuation models by introducing a powerful, yet simple, tool that serves investors to imperfectly clear reported earnings of hidden accounting noises of various types. This tool, which takes the form of the deviation from fundamental earnings ratios, is constructed as a non-linear combination of both current and past earnings items and ratios, and is theoretically and empirically shown to be useful in equity valuation because of its efficacy in detecting various accounting noises. Interestingly, our study also offers a wide conceptual framework that nests and binds together many previously observed patterns in equity valuation, providing them with an accounting context rather than a statistical description. Our analysis suggests a role in equity valuation for disaggregated current and historical earnings data, brings financial ratios into the valuation process, explains non-linearity in the association between accounting data and equity values, and highlights the valuation implications of profit variability.

The paper proceeds as follows. The next section introduces the theoretical background and develops our empirical predictions. Section 3 discusses the empirical design. Section 4 presents the sample, data sources and descriptive statistics. Section 5 provides the results of our analysis, while section 6 offers concluding remarks.

2. Theoretical Background and Empirical Predictions

Our empirical predictions are derived from the theoretical analysis of AEK, which demonstrates how ratio analysis can be utilized by investors to detect reporting biases and adjust for them in an accounting-based equity valuation. AEK focus on intentional measurer biases, which are determined endogenously as an equilibrium consequence of a reporting game between managers and investors. The same insights, nevertheless, also apply to other types of exogenous reporting biases (i.e. measurement biases and unintentional measurer biases) as well as to accounting noises arising from hidden items of a transitory economic nature. While clearing earnings of accounting noises of all types enables the market to better evaluate firms' equity, the identification of the particular source of each accounting noise is irrelevant to equity valuation. This allows us to draw empirical predictions that pertain to all sources of accounting noises, without the need to classify them and to identify any of them in isolation.

AEK's analysis is based on the observation that earnings components tend to be proportional to each other due to their fundamental economic nature. Examples include the ratios that usually exist between revenues and certain expense items, such as the cost of goods sold, marketing expenses and administration expenses. Ratios of this kind are usually noisy as they are largely influenced by changes in the economic environment. Their fundamental stochastic behavior is likely to be even more fluctuant in the presence of accounting noises, which tend to be embedded in various earnings components in a disproportional way.

Various components of earnings vary in the degree to which they are subject to measurement problems and in the extent to which they are exposed to measurement biases and unintentional measurer biases. The same is true for intentional measurer biases due to the inherent diversity in managers' incentives and abilities when manipulating different earnings components. Managers normally wish to bias income items and expense items in opposite directions, and they also have different degrees of leeway in manipulating various items of earnings. Therefore, a reporting bias of any type in one earnings item is not likely to be accompanied by a perfectly proportional bias in another earnings item. It is generally accepted, for example, that accrual-based items (such as bad debts, depreciations and amortizations, restructuring charges and asset impairments) are subject to larger reporting biases than cash-based items. Like reporting biases, earnings items that reflect transitory economic events are also unlikely to be proportionally embedded in different components of earnings, because various components of earnings purport to represent the outcomes of different economic events and transactions. The disproportion in the way in which both reporting biases and items of a transitory economic nature are hidden in the different components of earnings works to alter the fundamental stochastic behavior of earnings ratios. This might have important implications for the ability of shareholders to identify and clear out accounting noises.

Equity holders can use disaggregated earnings information to compute the actual deviation of reported earnings components from their expected fundamental ratios, knowing that such deviations may stem from either economic changes or from accounting noises of various types. Investors thus obtain imperfect indicators of accounting noises, although they are still incapable of flawlessly distinguishing between economic changes and accounting noises. These indicators enable investors to more accurately evaluate firms' equity based on reported earnings.[1] AEK also point to two important properties of deviations of earnings components from their expected fundamental ratios that determine their efficacy as indicators of accounting noises. In particular, such deviations are predicted to be more effective in detecting accounting noises (i) when the earnings components involved in the underlying benchmark ratio are more diverse in their sensitivity to accounting noises, and (ii) when these earnings components are more tightly related to each other in their fundamental economic nature.

AEK's theoretical framework outlines a new perspective for evaluating extant indicators of accounting noises and also provides guidance in designing alternative indicators. For example, prior studies focused on discretionary accruals as a conventional indicator of earnings management – a specific type of accounting noise (e.g., Healy, 1985; Jones, 1991; Dechow and Sloan, 1991; DeFond and Jiambalvo, 1994; Dechow et al., 1995; Kothari at al. 2005; Daniel et al., 2008). Discretionary accruals, as commonly computed based on the modified Jones model, can be roughly viewed as a special case of the indicators suggested by AEK, because they mostly represent a deviation of earnings from the expected ratio between accruals and cash revenues. The widespread use of discretionary accruals

[1]Besides their direct effect in improving the value-relevance of reported earnings by imperfectly revealing reporting biases and manipulations, as well as transitory items, and allowing investors to clear them out, these indicators also have an indirect effect of suppressing managerial misreporting incentives, which further contributes to enhancing the value-relevance of reported earnings.

apparently stems from their reliance on ratios between two earnings components – accruals and cash revenues – that are very different in their vulnerability to reporting manipulations. However, these two components do not seem to be fundamentally very tightly proportional to each other, which might be the reason for the relatively modest incremental power of discretionary accruals in explaining stock prices (e.g., Guay et al., 1996).

Adopting a different approach, we focus on deviations of earnings components from various profit margins as alternative indicators of reporting manipulations, which are also effective in indicating other accounting noises. The merit of these indicators is their relatively high resistance to economic changes, due to their reliance on ratios between earnings components that are fundamentally very tightly proportional to each other. Applying AEK's theory to profit margins as a special form of earnings ratios, we predict that deviations of actual earnings from what is implied by fundamental profit margins serve investors to detect accounting noises and adjust for them when pricing firms' equity based on accounting reports. Accordingly, we expect such deviations to be valued negatively by the market, after controlling for earnings. Our first hypothesis is therefore:

H1: Deviation of earnings from what is implied by fundamental profit margins is negatively associated with share prices and returns, after controlling for earnings.

While this prediction applies to all firms, we expect stronger results for firms that have exhibited relatively stable profit margins. In such firms, deviations of actual earnings from what is implied by normal profit margins are less likely to stem from economic changes, and thus they are expected to be more indicative of accounting noises and more effective in enhancing the usefulness of earnings to investors. This leads us to our second hypothesis:

H2: The associations of share prices and returns with earnings and their deviation from what is implied by fundamental profit margins, as predicted in H1 above, are stronger in firms with relatively stable profit margins.

3. Empirical Design

The extensive research endeavor to elicit an understanding of the way investors utilize accounting data in evaluating and pricing firms has yielded two pivotal types of empirical models: price-level models and return-earnings models. Price-level models use accounting variables such as earnings and book values of equity per share to explain either share prices or market-to-book ratios, whereas return-earnings models use accounting earnings deflated by beginning of period share prices to explain stock returns. While the issue of model specification is important, as argued in Kothari and Zimmerman (1995), we avoid it by applying our analysis to all conventional specifications. Building on AEK's theoretical framework, and using profit margins as a special form of earnings ratios, we refine the conventional specifications by introducing an additional explanatory variable in the form of the deviation of actual earnings from normal earnings implied by normal profit margins.

We begin with a standard price-level model motivated by Ohlson (1995), where firm *i*'s share price at the end of period *t* (P_{it}) is regressed on book value of equity per share at the end of period *t* (BPS_{it}) and net earnings per share from continuing operations for the period *t*. As a preliminary stage in our refinement of this model, we introduce four alternative measures of profit for firm *i* in period *t*: net income from continuing operations per share (IPS_{it}^{1}), operating income before interest and taxes per share (IPS_{it}^{2}), operating income before depreciation and amortization per share (IPS_{it}^{3}), and gross profits per share (IPS_{it}^{4}).

When using any specific profit measure IPS_{it}^{j} (j=1,2,3,4), we break down the net income from continuing operations per share, IPS_{it}^{1}, into two components: $IPS_{it}^{1} = IPS_{it}^{j} + DIF_{it}^{j}$, where IPS_{it}^{j} is the relevant measure of profit and DIF_{it}^{j} is the difference between net income from continuing operations per share and the profit measure IPS_{it}^{j}.[2] The base cross-sectional price-level model for any profit measure j=1,2,3,4 is thus:

$$P_{it} = \alpha_{0t} + \alpha_{1t} BPS_{it} + \alpha_{2t} IPS_{it}^{j} + \alpha_{3t} DIF_{it}^{j} + \varepsilon_{it} \tag{1}$$

The above model imposes a uniform valuation coefficient on all the components of the profit measure IPS_{it}^{j}. However, it follows from AEK that, in the presence of accounting noises, the component of the profit measure IPS_{it}^{j} that deviates from what is implied by the normal profit margin is valued less by investors due to the higher probability that it results from various kinds of accounting noises. Our cardinal modification of the standard price-level model therefore involves the inclusion of an explanatory variable S_{it}^{j} that captures the deviation of the profit measure IPS_{it}^{j} from what is implied by the corresponding normal profit margin for any profit measure j=1,2,3,4. Defining the actual profit margin PM_{it}^{j} of firm i in period t as IPS_{it}^{j} divided by the sales per share SPS_{it}, our proxy $NOPM_{it}^{j}$ for the firm-specific normal profit margin in period t is the average profit margin over the preceding four periods: $NOPM_{it}^{j} = \sum_{k=t-4}^{t-1} PM_{ik}^{j} / 4$. We emphasize that our proxy of the firm-specific normal profit margin is measured using reported earnings data rather than the underlying (unobservable) true earnings data. This problem is partially mitigated by averaging the firm-

[2] When net income from continuing operations is used as the measure of profit (i.e., j=1), DIF_{it}^{1} is zero.

specific profit margins over several reporting periods, provided that deviations of the reported earnings items from the corresponding true earnings items mean-revert over time. We, however, choose to restrict this averaging procedure to the preceding four years, even though using more back data is potentially more powerful, because firms' characteristics may change dramatically over time. Using our proxy of the firm-specific normal profit margin, we compute for any profit measure *j*=1,2,3,4 the deviation S_{it}^{j} from normal earnings for firm *i* in period *t*, as implied by the corresponding normal profit margin, in the following way: $S_{it}^{j} = IPS_{it}^{j} - NOPM_{it}^{j} * SPS_{it}$.

We predict that the deviation variable S_{it}^{j} is value-relevant because it serves investors as a noisy indicator of accounting noises. We expect that the noisier the fundamental profit margins the lower the power of S_{it}^{j} to indicate accounting noises, and thus also the lower its effect on the stock price. To examine this latter prediction, we compute for each firm *i* in any period *t*, and for each profit measure *j*=1,2,3,4, the variance of profit margins PM_{ik}^{j} in the preceding four periods ($k = t-4, t-3, t-2, t-1$) and use an indicator variable – D_{it}^{j} – that obtains the value of one if this variance is above the sample median in period *t* and zero otherwise. Incorporating the variables S_{it}^{j} and D_{it}^{j} in the base price-level model presented in Eq. (1), our resulting first cross-sectional valuation model for any profit measure *j*=1,2,3,4 is:

$$P_{it} = \alpha'_{0t} + \alpha'_{1t}D_{it}^{j} + \alpha'_{2t}BPS_{it} + \alpha'_{3t}IPS_{it}^{j} + \alpha'_{4t}D_{it}^{j}IPS_{it}^{j} + \alpha'_{5t}DIF_{it}^{j} + \alpha'_{6t}S_{it}^{j} + \alpha'_{7t}D_{it}^{j}S_{it}^{j} + \varepsilon_{it} \qquad (1')$$

Consistent with prior research, we expect the coefficients on book value of equity and earnings components to be positive in any period *t* ($\alpha'_{2t}, \alpha'_{3t}$ and α'_{5t} > 0). Hypothesis H1 relates to the coefficient on the deviation from earnings implied by normal profit margins, which is expected to be negative (α'_{6t} < 0). Hypothesis H2 pertains to the case of stable profit margins (i.e., $D_{it}^{j} = 0$), where we expect the deviation from earnings implied by normal profit margins to be more effective in detecting accounting noises (α'_{7t} > 0), and accordingly we also expect the earnings to be more highly valued due to the ability of the market to better adjust for various kinds of accounting noises (α'_{4t} < 0). We emphasize that our analysis of the impact of accounting noises on equity valuation and our resulting predictions only apply to the coefficients on the earnings variable, and do not pertain to the coefficient on the book value of equity. This is because accounting noises tend to mean-revert over time, and as such they are likely to be mainly embedded in the periodical earnings measure while having a much weaker effect on the accumulated measure of book value of equity.

Another valuation model that is commonly used in the literature (e.g., Amir et al., 1993; Harris et al., 1994) regresses firm *i*'s market-to-book ratio at the end of period *t* (PB_{it}) on the earnings per share in period *t* divided by the book value of equity per share at the end of period *t* . Applying this valuation model to our four alternative profit measures, we obtain a deflated version of the base valuation model presented in Eq. (1):

$$P_{it} / BPS_{it} = \beta_{0t} + \beta_{1t} 1 / BPS_{it} + \beta_{2t} IPS_{it}^{j} / BPS_{it} + \beta_{3t} DIF_{it}^{j} / BPS_{it} + \eta_{it} \qquad (2)$$

Similarly, to get a deflated version of the valuation model presented in Eq. (1'), we divide both sides of the equation by the book value of equity per share (BPS_{it}) at the end of period *t*. This generates our second cross-sectional valuation model for any profit measure *j*=1,2,3,4:

$$P_{it}/BPS_{it} = \beta'_{0t} + \beta'_{1t}D^j_{it} + \beta'_{2t}1/BPS_{it} + \beta'_{3t}IPS^j_{it}/BPS_{it} + \beta'_{4t}D^j_{it}IPS^j_{it}/BPS_{it} + \beta'_{5t}DIF^j_{it}/BPS_{it} + \beta'_{6t}S^j_{it}/BPS_{it} + \beta'_{7t}D^j_{it}S^j_{it}/BPS_{it} + \eta'_{it} \quad (2')$$

Consistent with our prior expectations, we predict that the coefficients β'_{3t}, β'_{5t}, and β'_{7t} are positive, and that the coefficients β'_{4t} and β'_{6t} are negative.

In addition to the price-level models presented above in Eq. (1') and Eq. (2'), we also use a return-earnings valuation model that uses stock returns as the dependent variable. We begin with a model where both deflated earnings levels and changes serve as explanatory variables for stock returns (R_{it}), as in Easton and Harris (1991). We incorporate into it our four alternative measures of profit, breaking down earnings levels and changes into two components for each profit measure *j*=1,2,3,4: $IPS^1_{it}/P_{it-1} = IPS^j_{it}/P_{it-1} + DIF^j_{it}/P_{it-1}$ and $\Delta IPS^1_{it}/P_{it-1} = \Delta IPS^j_{it}/P_{it-1} + \Delta DIF^j_{it}/P_{it-1}$, where Δ denotes the change in each variable. This leads to the following base cross-sectional return-earnings model for any profit measure *j*=1,2,3,4:

$$R_{it} = \gamma_{0t} + \gamma_{1t}IPS^j_{it}/P_{it-1} + \gamma_{2t}\Delta IPS^j_{it}/P_{it-1} + \gamma_{3t}DIF^j_{it}/P_{it-1} + \gamma_{4t}\Delta DIF^j_{it}/P_{it-1} + \theta_{it} \quad (3)$$

It should be emphasized that the base return-earnings model presented in Eq. (3) is consistent with the base price-level model presented in Eq. (1). Specifically, assuming stationary coefficients in Eq. (1), Eq. (3) can be obtained by applying Eq. (1) to two successive periods *t*-1 and *t* and then taking the difference and deflating by the share price (P_{it-1}) at the end of period *t*-1. In a similar way, we can apply Eq. (1') to two successive periods *t*-1 and *t* , take the difference and deflate it by the share price at the end of period *t*-1.

The resulting equation constitutes our third cross-sectional valuation model for any profit measure j = 1, 2, 3, 4:

$$R_{it} = \gamma'_{0t} + \gamma'_{1t} D^j_{it} + \gamma'_{2t} IPS^j_{it} / P_{it-1} + \gamma'_{3t} \Delta IPS^j_{it} / P_{it-1} + \gamma_{4t} D^j_{it} \Delta IPS^j_{it} / P_{it-1} + \gamma'_{5t} DIF^j_{it} / P_{it-1} + \gamma'_{6t} \Delta DIF^j_{it} / P_{it-1} + \gamma'_{7t} \Delta S^j_{it} / P_{it-1} + \gamma'_{8t} D^j_{it} \Delta S^j_{it} / P_{it-1} + \phi'_{it} \quad (3')$$

We expect the regression coefficients on variables that represent components of earnings to be positive ($\gamma'_{2t}, \gamma'_{3t}, \gamma'_{5t}, \gamma'_{6t}$ > 0), but predict that they decrease due to the high volatility of profit margins, which makes it difficult for the market to identify accounting noises (γ'_{4t}< 0). We also expect the coefficient on the change in the deviation from normal earnings implied by normal profit margins to be negative (γ'_{7t} < 0). Finally, we predict that the negative effect of the deviation variable on stock returns is mitigated by the high volatility of profit margins (γ'_{8t} > 0).

The base models (presented in Eq. (1), (2) and (3) above) serve in our empirical tests as benchmarks against which the modified models (presented in Eq. (1'), (2') and (3') above) are compared. We estimate both the base models and the modified models using yearly cross-sectional regressions. The rationale behind our use of yearly data lies in the perception that annual financial reports, as compared to quarterly reports, exhibit more stable earnings ratios, and are also more subject to earnings management activities, which cause a large portion of the accounting noises. Since firms file 10Ks by 90 days after fiscal year-end, we use share price (P_{it}) at three months after the fiscal year-end. For the same reason annual stock return (R_{it}) is calculated over the 12 months extending from nine months prior to fiscal year-end until three months after the fiscal year-end. Table 1 provides the definitions of the variables used in this study.

(Table 1 about here)

4. Sample and Descriptive Statistics

The initial sample includes all public companies covered by Compustat and CRSP during 1971-2006. We delete observations with missing annual data on market value of equity, book value of equity, sales per share, profits per share and profit margins over the preceding four years. We also delete observations with missing data on stock price three months after fiscal year-end. For estimating the return model, we delete observations with missing data on stock returns over the 12 months extending from nine months prior to fiscal year-end until three months after fiscal year-end. We exclude financial institutions and public utilities (4-digit SIC codes 6000-6999 and 4900-4999) because the structure of their financial statements is incompatible with those of industrial companies. To limit the effect of extreme observations, each year we rank the sample according to the variables and remove the extreme one percent of the observations on each side. In addition, we delete observations for which return on equity (*ROE*) is below -0.5 and net profit margin is below -1 (i.e., negative 100%). Table 2 presents the number of observations for each year.

(Table 2 about here)

Table 3 provides descriptive statistics for the main variables. As panel A indicates, the distributions of share prices (P), market-to-book ratio (PB) and stock returns (R) are skewed to the right, as reflected by the mean being larger than the median. Similarly, book value of equity per share (BPS), sales per share (SPS) and the four accounting profit measures ($IPS^1, IPS^2, IPS^3, IPS^4$) are also skewed to the right. Also, as expected, the gross profit margin (mean 0.35) is larger than the *EBITDA* margin (mean 0.12), which in turn is larger than the *EBIT* margin (mean 0.08) and the net profit margin (mean 0.03). Furthermore, the standard deviations of profit margins relative to the mean (coefficient of variation) become larger as we go down the income statement. In the full sample, the ratio of the standard deviation of PM^4 to its mean is about 0.5, compared with a ratio of 1.0, 1.25 and 3 for PM^3, PM^2 and PM^1, respectively. This pattern holds for the positive earnings sample as well, suggesting that profit margins become more volatile as we go down the income statement.

The distribution of S^j – the deviation of earnings from what is implied by normal profit margins – under the four alternative measures of profit deserves particular attention. In Panel B, we added descriptive statistics of the S^j variables for a sub-sample of companies with positive profit. The reason for this is that earnings management, an important source of accounting noises, is more likely to occur in companies with positive profits. At the gross profit level, the mean/median of the deviation variable S^4 is -0.02/0.01 for the entire sample and 0.07/0.03 for the positive earnings sub-sample. Going down the income statement to the operating level, the mean/median deviation variable S^3 is -0.03/0.01 for the entire sample and 0.09/0.05 for the sub-sample of companies with positive earnings, whereas the mean/median of the deviation variable S^2 is -0.03/0.01 for the entire sample and 0.11/0.05 for the positive earnings sample. Lastly, for the net profit measure, the mean/median of the deviation variable S^1 is -0.01/0.02 for the entire sample and 0.16/0.06 for the positive earnings sample.

The deviation measures appear to be larger and more positive in companies with positive earnings than in companies that report losses. This result is consistent with the argument that, unlike profitable companies, loss companies are less likely to engage in income-increasing earnings management activities. Indirectly, it is also consistent with empirical findings on the discontinuity of earnings around zero. In the full sample, the deviation measures are skewed to the left, as their median is larger than their mean. This is probably due to the relatively negligible deviations in loss companies. More interestingly, the deviation measures become skewed to the right in the sample of positive earnings, as their median is lower than their mean. This distributional shape is similar to the structure of the underlying earnings measures, which are also skewed to the right, implying that reporting biases are probably proportional in their magnitude to the initial level of earnings. Focusing on the positive earnings sample, it appears that the deviation measures become larger, both in their mean and median, as we go down the income statement. This is consistent with the common perception of operating accruals and special items as more fertile ground for various accounting noises.

(Table 3 about here)

Figure 1 presents the median annual profit margin over the sample period 1971-2006 for the net profit margin (PM^1), the margin of *EBIT* (PM^2), the margin of *EBITDA* (PM^3) and the gross profit margin (PM^4). As expected, the gross profit margin is larger than the *EBITDA* margin, which in turn is larger than the *EBIT* margin and the net profit margin. Also, with the exception of the gross profit margin, the time-series behavior of the profit margins is similar across the board. This behavior is cyclical over time with relatively little fluctuation. The gross profit margin, on the other hand, exhibits an almost steady increase over time, which might reflect the over-time continuing evolution of high technology industries, which are typically characterized by higher gross profit margins as compared to traditional industries.

(Figure 1 about here)

Figure 2 presents median variability of preceding profit margins over the years 1971-2006. For each firm/year, we compute the variance of each profit margin PM^j (j=1,2,3,4) in the preceding four years and present the median variance across all firms. All four profit margins exhibit a similar time-series behavior of their variability. It was relatively constant until 1981, but increased steadily from 1981 until 2004. In recent years, we observe a decline in the variability of all profit margins. These changes in the variability of the profit margins over the years could have a significant effect on the ability of investors to detect accounting noises and the propensity of managers to enhance the magnitude of accounting noises by intentionally biasing their reporting.

(Figure 2 about here)

Figure 3 presents median deviations of profits from what is implied by the corresponding normal profit margins over the sample period 1971-2006. Overall, median deviations are mean-reverting during the sample period. In addition, there seems to be a relation between economic prosperity and the magnitude of the deviations. In particular, we observe large declines in the deviations during the years 1982 and 2001. We also observe smaller declines in recession years such as 1974 and 1991. This is probably because of the dependency of the managerial misreporting incentives on the economy-dependent prior market expectations. Apparently, as managers know that their current reporting biases will induce offsetting biases in future reports, they tend to schedule income-increasing (income-decreasing) reporting biases in prosperity (recession) years where the market expectations are relatively high (low).

(Figure 3 about here)

In Panel A of Table 4, we present Pearson (above diagonal) and Spearman (below diagonal) correlations between deviation measures. We compute cross-sectional correlations in each year and then average these yearly correlations over all years. Generally, the deviation measures are positively and highly correlated. Also, the correlation between any two deviation measures decreases with the distance between them. For instance, the Spearman correlation between the deviation from net profit (S^1) and the deviation from

EBITDA (S^2) is 0.82, whereas the correlation between S^1 and the deviation from gross profit (S^4) is only 0.48.[3]

Panel B of Table 4 presents Pearson (left) and Spearman (right) correlations for other selected pairs of variables. When considering the correlations of the four profit measures with their deviation from what is implied by the corresponding normal profit margins, it appears that all of them are positive. This result implies that accounting noises, when they apply to any profit measure, tend to be proportional to the initial level of the relevant profit measure. These correlations increase as we go down the income statement, the net income measure exhibiting the highest correlation. Also, the correlations between the current profit margins and the corresponding average profit margins over the preceding four years (i.e., normal profit margin) are positive and generally high for all four profit measures. These correlations increase as we go up the income statement, the lowest being the correlation of current net profit margin with normal net profit margin. This suggests that accounting noises are likely to be detected in more comprehensive measures of income.

Panel C of Table 4 presents average firm-by-firm Pearson (left) and Spearman (right) correlations for selected earnings variables and their corresponding lagged variable. The Pearson/Spearman correlations of the four profit variables IPS_{it}^{j} (*j*=1,2,3,4) with their corresponding lagged variable $IPS_{i,t-1}^{j}$ are all positive and generally high, monotonically increasing in j from 0.47/0.49 for $j=1$ to 0.77/0.75 for $j=4$. This indicates the predictive value of reported profit measures, especially those which are situated higher up in the

[3] We calculated the correlation between discretionary accruals (DA) and our deviation measures (S^j), where DA is measured using the time-series version of the Jones (1991) model with the modification to cash revenues as suggested by Dechow et al. (1995). The Spearman correlation between S^1 and DA is 0.11, which suggests that although our deviation measure is associated with the measure of discretionary accruals, the two measures capture different firm-specific attributes. As expected, the correlation between S^j and DA decreases monotonically when *j* increases and the profit measure becomes less comprehensive. We also divided the sample in each period into deciles according to discretionary accruals. We find that S^1 increases monotonically as we move from the lowest to highest discretionary accruals decile (not tabulated).

income statement and are less exposed to accounting noises. The predictive value of each profit measure IPS^j is further enhanced after removing the component of profit that is suspected to arise from accounting noises, as captured by the deviation variable S^j. Indeed, the normal profit variables $IPS_{it}^j - S_{it}^j$ (j=1,2,3,4) exhibit higher correlations with their corresponding lagged variable $IPS_{i,t-1}^j - S_{i,t-1}^j$ as compared to the original profit variables. Also, these correlations, which are all bounded in the range of 0.77-0.82, seem rather similar across the four profit measures. So, unlike the original profit measures IPS^j (j=1,2,3,4), the normal profit measures $IPS^j - S^j$ (j=1,2,3,4) obtained after the removal of detected accounting noises do not seem to vary much in their persistence. The improvement in the persistence and the predictive value of the profit measure IPS^j after the removal of S^j is therefore more salient when j decreases and we go down the income statement toward more comprehensive profit measures that are highly sensitive to accounting noises.

(Table 4 about here)

5. Empirical Results

Tables 5, 6 and 7 report estimations of the base regression models presented in Eq. (1), (2) and (3) and the modified models presented in Eq. (1’), (2’) and (3’). The three modified models are estimated under four specifications of profit: net profit (j = 1), *EBIT* (j = 2), *EBITDA* (j = 3) and gross profit (j = 4), whereas the base models are estimated under the conventional specification of net profit. We estimate each equation in each year and report average coefficients and *t*-statistics as in Fama and MacBeth (1973).

Table 5 reports estimations of the base price-level regression model presented in Eq. (1) and the modified price-level model presented in Eq. (1’). We find positive coefficients, as expected, on book value per share (BPS), profit per share (IPS^j) and the difference between net profit and the profit measure used in the model (*DIF*). As expected by H1, the coefficient on the deviation from net profit implied by the normal net profit margin (S^1) is negative and significant at the 0.01 level (-1.82, t = -6.20). When considering the underlying annual regressions separately, the coefficient on S^1 is negative in 30 of the 36 annual regressions and significant at the 10% level or better (2-tailed test) in 27 years, while it is positive and significant at the 0.10 level in only two of the 36 annual regressions (not tabulated). Also, in the presence of S^1 as an explanatory variable, the coefficient on the net profit (IPS^1) is higher (5.63, t = 17.25) than the corresponding coefficient in the base model (3.74, t = 13.89), where the variable S^1 is absent. The improved specification is also reflected in the R^2, which increases from 0.61 in the base model to 0.63 in the modified model (significant at the 0.01 level). It follows thus that the deviation of net profit from what is implied by the normal net profit margin is valued negatively by the market and works to enhance the power of earnings in explaining equity values, implying that it assists investors in detecting accounting noises and adjusting for them. As j increases and we go up the income statement to less comprehensive profit measures, the coefficient on S^j monotonically increases (and eventually even becomes significantly positive), whereas the positive coefficient on IPS^j monotonically decreases.[4] These results suggest that investors are more likely to consider deviations from more comprehensive profit measures, such as *EBIT* and net profit, to be a consequence of accounting noises. In contrast, they probably attribute deviations from gross profit margins to an improvement in production efficiency rather than to accounting noises.

[4] The coefficient on s^2 is negative in 23 of the 36 annual regressions and significant at the 0.10 level or better in 17 annual regressions. The coefficient on s^3 is negative in 24 of the 36 annual regressions and significant at the 0.10 level or better in 17 annual regressions. The coefficient on s^4 is negative in 16 of the 36 annual regressions and significant at the 0.10 level or better in only 7 annual regressions (not tabulated).

As predicted by H2, the volatility of profit margins, as measured here by the indicator variable D^j, has a significant effect on the valuation coefficients of both the profit measures and their deviation from the corresponding normal profit margins. For the net profit measure (*j*=1), the coefficient on $D^1 \times S^1$ is positive (1.23, *t* = 2.96), suggesting that when past net profit margins are more noisy, the signal embedded in the deviation from the normal net profit margin is less indicative of accounting noises. This makes the net profit measure less useful to investors and they thus place a lower valuation coefficient on it, as reflected by the negative coefficient on $D^1 \times IPS^1$ (-2.22, *t* = -5.42). When *j* increases and the profit measure becomes less comprehensive, the coefficient on $D^j \times S^j$ monotonically decreases, while the coefficient on $D^j \times IPS^j$ monotonically increases.

Overall, the results in Table 5 provide evidence in support of H1 and H2. Deviations from normal profit implied by normal profit margins are negatively associated with stock prices and they improve the power of earnings in explaining stock prices, implying that investors use them to detect and back out accounting noises. The valuation effects of these deviations are stronger as the profit measure becomes more comprehensive, which is consistent with the claim that accounting noises are more likely to occur in more comprehensive profit measures (that is, in operating and non-operating expenses). The valuation effects are also stronger in firms with more stable past profit margins, supporting the argument that deviations from normal profit implied by normal profit margins in such firms are more indicative of accounting noises, making the reported earnings more useful to equity investors.

(Table 5 about here)

In Table 6, we present results for estimating the deflated price-level models presented in Eq. (2) and (2') – where the dependent and independent variables are deflated by book value of equity per share. As in prior studies, the coefficients on both deflated profit components (IPS^j / BPS, and DIF^j / BPS) are positive and significant at the 0.01 level. Consistent with H1, the coefficients on S^j / BPS (deflated deviation from profit implied by normal profit margins) are all negative.[5] Also, the coefficient on the deflated net profit (IPS^1 / BPS) in the presence of the explanatory variable S^1 / BPS is higher (10.91, t = 19.71) than the corresponding coefficient in the base model (4.56, t = 18.91), where the variable S^1 / BPS is absent. The merit of the modified specification is also reflected in the R^2, which increases from 0.22 in the base model to 0.28 in the modified model (significant at the 0.01 level). As j increases and the profit measure becomes less comprehensive, the negative coefficient on S^j / BPS monotonically increases, whereas the positive coefficient on IPS^j / BPS monotonically decreases. This suggests, once again, that accounting noises are more likely to occur in more comprehensive income measures.

Consistent with H2, for companies with more volatile profit margins, the valuation coefficient on the deviation from normal profit implied by normal profit margins is less negative, as reflected by the positive coefficients on $D^j \times S^j / BPS$ (all significant at the 0.01 level). The coefficient on the profit measure is also lower in these companies, as reflected by the negative coefficients on $D^j \times IPS^j / BPS$ (significant at the 0.01 level, except for the gross profit measure). These results, which are mostly significant for all four profit margins (j = 1, 2, 3, 4), become less striking as the profit measures become less comprehensive. Specifically, as j increases, the positive coefficient on $D^j \times S^j / BPS$ monotonically decreases, and similarly the negative coefficient on $D^j \times IPS^j / BPS$ monotonically increases.

[5] The coefficient on S^1 / BPS is negative in 35 of the 36 annual regressions and significant at the 0.10 level or better in 22 annual regressions. The coefficient on S^2 / BPS is negative in 26 of the 36 annual regressions and significant at the 0.10 level or better in 7 annual regressions. The coefficient on S^3 / BPS is negative in 19 of the 36 annual regressions and significant at the 0.10 level or better in two. The coefficient on S^4 / BPS is negative in 12 of the 36 annual regressions but in none of them is it significant at the 0.10 level or better (not tabulated).

(Table 6 about here)

The results of estimating the return-earnings models as in Eq. (3) and (3') are reported in Table 7. Unlike the price models, which are estimated based on 36 cross-sectional annual regressions, the return model is estimated by 35 annual regressions because it includes change variables. Under the standard specification presented in Eq. (3), which includes only earnings levels and changes as explanatory variables of stock returns, the coefficients on earnings levels and changes are positive, as expected, and the average R^2 is 10%, which is slightly higher than the average R^2 (7.7%) in Easton and Harris (1991, Table 3). Also, the coefficients on both earnings components (price-deflated IPS^j and DIF^j) and their changes (price-deflated ΔIPS^j and ΔDIF^j) in the remaining specifications are generally positive, as expected, and most of them are significant at the 0.01 level. The R^2 in these modified specifications are between 0.11 and 0.14, which is higher than in the benchmark specification.

We observe a sharp increase in the coefficient on the earnings change variable when we segregate the change in deviation of earnings from what is implied by normal profit margins and include it as a separate independent variable. Consistent with H1, the coefficients on $\Delta S^1 / P_{-1}$ and $\Delta S^2 / P_{-1}$ are significantly negative. As *j* increases and the profit measure becomes less comprehensive, the coefficient on $\Delta S^j / P_{-1}$ monotonically increases (and eventually even becomes significantly positive), whereas the positive coefficients on IPS^j / P_{-1} and $\Delta IPS^j / P_{-1}$ decrease almost monotonically.[6] These results suggest that changes in the components of earnings that are suspected of being accounting noises are less

[6] The coefficient on $\Delta S^1 / P_{-1}$ is negative in 29 of the 35 annual regressions and significant at the 0.10 level or better in 10 annual regressions. The coefficient on $\Delta S^2 / P_{-1}$ is negative in 23 of the 35 annual regressions and significant at the 0.10 level or better in 9 annual regressions. The coefficient on $\Delta S^3 / P_{-1}$ is negative in 21 of the 35 annual regressions and significant at the 0.10 level or better in 5 annual regressions. The coefficient on $\Delta S^4 / P_{-1}$ is negative in 6 of the 35 annual regressions and in none of them is it significant at the 0.10 level or better (not tabulated).

valued by the market than changes in other earnings components. It also follows from the results that deviations from more comprehensive profit measures are more likely to be considered accounting noises.

As predicted, the volatility of past profit margins has a significant effect on the valuation coefficients of changes in earnings and in their deviations from what is implied by normal profit margins. First, the coefficients on $D^1 \times \Delta S^1 / P_{-1}$ and $D^2 \times \Delta S^2 / P_{-1}$ are positive, as expected by H2, and significant at the 0.01 level. Furthermore, as predicted, the coefficients on $D^j \times \Delta IPS^j / P_{-1}$ are significantly negative at the 0.01 level for all profit measures. When j increases and the profit measure becomes less comprehensive, the coefficient on $D^j \times \Delta S^j / P_{-1}$ monotonically decreases (and eventually even become negative), whereas the negative coefficient on $D^j \times \Delta IPS^j / P_{-1}$ monotonically increases. These results are consistent with our argument that accounting noises are less likely to be detected in companies with more volatile profit margins where normal profit margins constitute noisier benchmarks, and consequently earnings changes are less valued by the market in such companies.

(Table 7 about here)

As argued in section 3, Eq. (1'), (2') and (3') are consistent with each other. Starting with Eq. (1'), which is the valuation model suggested by AEK, we then derived Eq. (2') and (3') as other versions of Eq. (1'). In particular, we deflate both sides of Eq. (1') by the book value of equity per share at the end of period t in order to get Eq. (2'), while Eq. (3') is obtained by applying Eq. (1') to two successive periods t-1 and t and taking the difference deflated by the share price at the end of period t-1. However, for completeness, and since the resulting Eq. (3') includes only the change in the deviation variable, $\Delta S^j / P_{-1}$, we also estimate an expanded version of Eq. (3'), which includes the level of the deviation variable,

S^j / P_{-1}, and its interaction with our volatility indicator, D^j, as additional explanatory variables. Our additional return-earnings model is thus:

$$
\begin{aligned}
R_{it} &= \gamma'_{0t} + \gamma'_{1t} D^j_{it} + \gamma'_{2t} IPS^j_{it} / P_{it-1} + \gamma'_{3t} \Delta IPS^j_{it} / P_{it-1} + \gamma'_{4t} D^j_{it} IPS^j_{it} / P_{it-1} \\
&+ \gamma'_{5t} D^j_{it} \Delta IPS^j_{it} / P_{it-1} + \gamma'_{6t} DIF^j_{it} / P_{it-1} + \gamma'_{7t} \Delta DIF^j_{it} / P_{it-1} + \\
&\gamma'_{8t} S^j_{it} / P_{it-1} + \gamma'_{9t} \Delta S^j_{it} / P_{it-1} + \gamma'_{10t} D^j_{it} S^j_{it} / P_{it-1} + \gamma'_{11t} D^j_{it} \Delta S^j_{it} / P_{it-1} + \phi'_{it}
\end{aligned}
\qquad (3'')
$$

The results from estimating Eq. (3'') are reported in Table 8. Consistent with our results in Table 7, the coefficients on $\Delta S^1 / P_{-1}$ and $\Delta S^2 / P_{-1}$ remain significantly negative. In addition, the coefficient on $\Delta S^3 / P_{-1}$ also becomes significantly negative. However, the coefficient on S^j / P_{-1} in the augmented specification is significantly negative only for the net profit measure (*j=1*). Also, as long as we refer to the net profit (*j=1*), the effect of the volatility of past profit margins on all valuation coefficients is consistent with our predictions, as reflected by the significantly positive coefficients on $D^1 \times S^1 / P_{-1}$ and $D^1 \times \Delta S^1 / P_{-1}$ as well as by the significantly negative coefficients on $D^1 \times IPS^1 / P_{-1}$ and $D^1 \times \Delta IPS^1 / P_{-1}$. This effect, however, gradually diminishes as *j* increases and the profit measure becomes less comprehensive.

(Table 8 about here)

The regression results reported in Tables 5-8 are based on average annual coefficients and *t*-statistics as in Fama and MacBeth (1973). We now take a closer look at the time-series behavior of the annual valuation coefficients on earnings per share and book values of equity per share in a manner similar to that used by Collins et al. (1997) and Francis and Schipper (1999). Specifically, we estimate Eq. (1) and (1') and examine whether the annual valuation coefficients in these models change systematically over time.

The solid line in Figure 4 presents the annual valuation coefficients for earnings per share (IPS^1) obtained from the estimation of the standard price model in Eq. (1). Visual inspection suggests that these coefficients decreased over time until 1999, as has been argued by prior studies (e.g., Lev and Zarowin, 1999; Collins et al., 1997; Francis and Schipper, 1999). The dotted line in Figure (4) presents the annual valuation coefficients for IPS^1 obtained from the estimation of Eq. (1'), which refines Eq. (1) by including the deviation of earnings from what is implied by past net profit margins (S^1) as an additional explanatory variable of share prices. Here, the annual coefficients do not seem to decrease over time. This may shed a different light on prior empirical evidence that has been previously interpreted as indicating a reduction in the value-relevance of earnings over time.

(Figure 4 about here)

For each independent variable included in Eq. (1) and (1'), Table 9 presents results for a time regression of the form $Coeff_t = \delta_o + \delta_1\ Time_t + \upsilon_t$, where $Coeff_t$ is the valuation coefficient of the particular variable obtained from the yearly cross-sectional estimation of Eq. (1) or (1') in period t and $Time_t$ is a time counter. We report results for two estimation periods: 1971-2006 (36 observations), which is the entire sample period in this study, and 1971-1999 (29 observations), which is more comparable with prior studies.

Results from estimating Eq. (1) suggest that the valuation coefficients on book value of equity increase over time in both sample periods, as reflected by the positive coefficient on *Time*. The valuation coefficient on earnings per share decreases over time when the sample period is restricted to 1971-1999, as reflected by the negative coefficient on *Time* (-0.09, t = -3.18). This result, which is consistent with prior findings, does not hold for the entire sample period (*Time* coefficient = 0.01, t = 0.30). When the years 2000-2006 are included in the sample period, the valuation coefficients on earnings do not exhibit any systematic behavior over time.

When considering the behavior over time of the valuation coefficients obtained from Eq. (1'), the most striking result is that the valuation coefficients on earnings (IPS^1) in Eq. (1') increased over the entire sample period 1971-2006 (*Time* coefficient = 0.08, t = 2.81) and stayed flat in the period 1971-1999 (*Time* coefficient = 0.01, t = 0.23). Furthermore, in both sample periods, the coefficients on the deviation of earnings from those implied by past net profit margins (S^1) decreased over time. This result, which is significant at the 0.01 level in both sample periods, suggests that while the valuation coefficient on normal earnings per share has stayed relatively stable over time, the valuation coefficient on the component of earnings that is suspected by investors of representing accounting noises has become more negative as the years go by. We interpret our findings as implying that the magnitude of accounting noises has increased over the years, but the consequent reduction in the usefulness of earnings has been mitigated by the enhanced power of deviations from normal earnings in indicating accounting noises. Interestingly, our findings indicate that deviations from normal earnings implied by normal profit margins have become more indicative of accounting noises over the years, despite the increase in the volatility of profit margins over time (see Figure 2). This is probably because of the countervailing (and apparently dominant) effect of the increase in the magnitude of accounting noises on the indicative power of deviations from normal earnings.

(Table 9 about here)

Our analysis thus far has concentrated on profit margins. Our principal argument is that the fundamental relations between profit measures and sales, as reflected in normal (past) profit margins, are essential in assessing the value relevance of earnings. However, our framework is not limited to fundamental profit margins, and can be applied to other fundamental relations. To demonstrate this and add robustness to our results, we apply our framework to return on equity (ROE). Similarly to our previous analysis, we argue that the deviation of earnings from what is implied by normal return on equity should be valued negatively by equity investors.

We define the return on equity ROE_{it} of firm i in period t as EPS_{it} / BPS_{it}.[7] Accordingly, our proxy $NROE_{it}$ for the normal return on equity of firm i in period t is the average return on equity over the preceding four years - $NROE_{it} = \sum_{k=t-4}^{t-1} ROE_{ik} / 4$, whereas the indicator variable D_{it}^{ROE} obtains the value of one if the variance of the return on equity over the preceding four years is above the sample median in period t and zero otherwise. The deviation S_{it}^{ROE} of earnings per share from what is implied by normal return on equity is measured as $S_{it}^{ROE} = EPS_{it} - NROE_{it} * BPS_{it}$. Table 10 presents results for estimating Eq. (1'), (2') and (3') after replacing the independent variables IPS_{it}^{j}, S_{it}^{j} and D_{it}^{j} by the variables EPS_{it}, S_{it}^{ROE} and D_{it}^{ROE}, respectively.

In all three models, the coefficient on the deviation variable ($S^{ROE}, S^{ROE} / BPS$ and $\Delta S^{ROE} / P_{-1}$, respectively) is negative, as expected, and significant at the 0.01 level.[8] Also, similarly to our previous results, the negative coefficient on the deviation variable ($S^{ROE}, S^{ROE} / BPS$ and $\Delta S^{ROE} / P_{-1}$, respectively) and the positive coefficient on the earnings variable ($EPS, EPS / BPS$ and $\Delta EPS / P_{-1}$, respectively) are larger in magnitude for companies with more stable return on equity. This is reflected by the positive coefficients on $D^{ROE} \times S^{ROE}, D^{ROE} \times S^{ROE} / BPS$ and $D^{ROE} \times \Delta S^{ROE} / P_{-1}$, respectively, and by the negative coefficient on $D^{ROE} \times EPS$, $D^{ROE} \times EPS / BPS$ and $D^{ROE} \times \Delta EPS / P_{-1}$, respectively.

[7] The ROE variable is measured with book value of equity at the end of the period. When we repeated the analysis using average book value of equity in the ROE's denominator, we obtained virtually identical results.

[8] The coefficient on S^{ROE} in the price regression is negative in 30 of the 36 annual regressions and significant at the 0.10 level or better in 27 annual regressions. The coefficient on S^{ROE} / BPS in the market-to-book model is negative in 31 of the 36 annual regressions and significant at the 0.10 level or better in 17 annual regressions. The coefficient on $\Delta S^{ROE} / P_{-1}$ in the return model is negative in 27 of the 35 annual regressions and significant at the 0.10 level or better in 9 annual regressions.

(Table 10 about here)

6. Concluding Remarks

In this study, we investigate how the market accounting-based process of equity valuation is affected by the presence of various kinds of accounting noises that suppress the persistence and the predictive value of reported earnings. The empirical findings are consistent with the hypothesis that investors utilize ratio analysis of disaggregated earnings data in equity valuation to imperfectly detect accounting noises and adjust for them. The empirical evidence also indicates that investors more notably rely on this process of clearing reported accounting information of noises when pricing firms with relatively stable financial ratios.

This study emphasizes that the quality of accounting information cannot be fully evaluated without taking into consideration the capability of external users to clear the reported accounting information of various hidden noises, particularly implying that the usefulness of accounting earnings to equity investors could have been underestimated by prior studies. Besides extending our understanding of the means by which investors detect accounting noises embedded in reported earnings and adjust for them when pricing firms' equity, this study also provides a theoretically based nest that ties together many previously documented statistical patterns in equity valuation, placing them all in the same conceptual accounting context. In particular, our analysis suggests a role for disaggregated current and past accounting data in equity valuation, employs financial ratios in the valuation process, explains non-linearity in the association between accounting data and equity values, and highlights the valuation implications of earnings volatility.

Our study offers several possibilities for future research. While it highlights the importance of accounting disaggregation and ratio analysis in improving the ability of capital market participants to discern and overcome various types of accounting noises, further investigation is needed with respect to the dependency of their ability to do so upon their sophistication and their skills in analyzing disaggregated accounting information. This issue could be addressed by an empirical examination of whether the market is more capable of detecting accounting noises and adjusting for them when pricing firms with more institutional holdings or more extensive analyst coverage. Future research may also inquire into the extent to which the particular accounting disaggregation rules and practices affect the market's efficacy in identifying and clearing out accounting noises, based on ratio analysis of disaggregated accounting data. It would be interesting, for example, to examine whether the market better overcomes accounting noises in pricing firms that provide more refined disclosures on the components of earnings, or following the issuance of an accounting standard that mandates additional disclosure on the components of earnings (e.g., segment reporting).

With regard to accounting noises that stem from earnings management activities, particular attention should be paid to the interrelation between managers' reporting strategies and the market pricing rule, which are both determined as an equilibrium outcome of a reporting game between managers and investors. While investors invoke their expectations regarding managers' reporting strategies when pricing firms in an effort to detect earnings manipulations, managers are in turn also likely to choose their reporting strategies based on their expectations about the market pricing rule. Hence, beyond investigating the impact of earnings management activities on the valuation procedure that investors implement when pricing the equity of firms, there is potential for future research into the important inverse impact of the market valuation procedure on managerial misreporting incentives. Being aware of the ability of investors to imperfectly detect their reporting manipulations, managers are expected to engage less in these activities in the first place, especially in situations where they expect investors to be highly capable of identifying reporting manipulations. This suggests an interesting avenue for future research, which may examine whether there is indeed less earnings management in firms that are characterized by stable financial ratios, in firms with more institutional holdings or more extensive analyst coverage, in firms that disclose more details on the components of earnings, or following the issuance of an accounting standard that mandates additional disclosure on the components of earnings.

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Table 1
Definitions of Variables

P_{it}	Share price of firm *i* three months after fiscal year-end *t*.
R_{it}	Firm *i*'s stock return during period t, starting from nine months prior to fiscal year-end *t* until three months after fiscal year-end *t*.
BPS_{it}	Firm *i*'s book value of equity per share at fiscal year-end *t*.
PB_{it}	Market-to-book ratios, measured as firm *i*'s share price three months after fiscal year end *t* divided by book value of equity per share at fiscal year-end *t*.
LMV_{it}	Natural logarithm of market value of firm *i*'s shareholders' equity three months after fiscal year-end *t*.
IPS_{it}^{1}	Firm *i*'s earnings per share for period *t*.
IPS_{it}^{2}	Firm *i*'s earnings before interest and taxes (*EBIT*) per share during period *t*.
IPS_{it}^{3}	Firm *i*'s earnings before interest, taxes, depreciation and amortization (*EBITDA*) per share during period *t*.
IPS_{it}^{4}	Firm *i*'s gross profit per share during period *t*.
ROE_{it}	Return on equity, measured as earnings per share divided by book value of equity per share.
SPS_{it}	Firm *i*'s sales per share during period *t*.
DIF_{it}^{j}	The difference between IPS_{it}^{1} and IPS_{it}^{j}, where *j*=1,2,3,4.
PM_{it}^{j}	The profit margin that corresponds to the profit measure *j*, measured as IPS_{it}^{j} divided by SPS_{it}, where *j=1,2,3,4*.
$NOPM_{it}^{j}$	The normal profit margin that corresponds to the profit measure *j*, measured as the average across the preceding four years of the profit margin PM_{it}^{j}, where *j*=1,2,3,4.
S_{it}^{j}	Deviation of the profit measure *j* from what is implied by normal profit margins, measured as the difference between IPS_{it}^{j} and $NOPM_{it}^{j}$ multiplied by SPS_{it}, where *j*=1,2,3,4.
D_{it}^{j}	An indicator variable that obtains the value of 1 if the variance of the profit margin PM_{it}^{j} over the preceding four periods is above the sample median in period *t* and 0 otherwise, where *j*=1,2,3,4.

Table 2
Sample Selection*

Year	Full Sample	Year	Full Sample
1971	1,160	**1989**	2,236
1972	1,299	**1990**	2,347
1973	1,469	**1991**	2,483
1974	1,556	**1992**	2,522
1975	1,628	**1993**	2,599
1976	2,188	**1994**	2,668
1977	2,385	**1995**	2,717
1978	2,344	**1996**	2,863
1979	2,277	**1997**	2,939
1980	2,206	**1998**	2,920
1981	2,168	**1999**	2,908
1982	2,201	**2000**	2,879
1983	2,302	**2001**	2,723
1984	2,289	**2002**	2,749
1985	2,281	**2003**	2,803
1986	2,188	**2004**	2,883
1987	2,296	**2005**	2,788
1988	2,274	**2006**	2,209
Total Observations			84,747
Total Different Companies			9,018

* Note: The table presents the number of observations for each year. The initial sample includes all observations with complete price, return and financial data on Compustat and CRSP, excluding financial institutions (1-digit SIC = 6) and public utilities (2-digit SIC = 49). We remove the extreme 1% of observations (on each side) for each of the variables. We also remove observations for which ROE is below -0.5 and net profit margin is below -100%.

Table 3
Variable Descriptive Statistics*

Panel A: Full Sample

Variable	N	Mean	Std. Dev.	5th Pcl.	25th Pcl.	Med.	75th Pcl.	95th Pcl.
P	84,747	14.21	18.11	1.22	4.13	9.13	18.30	42.04
PB	84,747	2.10	2.03	0.48	0.93	1.52	2.54	5.57
R	70,994	0.10	0.33	-0.40	-0.15	0.06	0.31	0.74
BPS	84,747	8.85	11.69	0.82	2.83	5.88	11.04	25.28
LMV	84,747	4.92	2.24	1.54	3.24	4.76	6.46	8.83
SPS	84,747	26.93	45.52	1.59	5.87	14.11	31.39	90.51
IPS^1	84,747	0.73	1.55	-0.79	0.11	0.50	1.18	2.93
IPS^2	83,790	1.64	2.51	-0.37	0.31	1.02	2.28	5.57
IPS^3	84,115	2.55	3.64	-0.04	0.59	1.58	3.33	8.19
IPS^4	84,886	7.10	10.20	0.54	1.96	4.33	8.65	21.62
PM^1	84,747	0.03	0.09	-0.08	0.01	0.04	0.07	0.15
PM^2	83,790	0.08	0.10	-0.06	0.03	0.07	0.12	0.23
PM^3	84,115	0.12	0.12	-0.01	0.06	0.11	0.17	0.34
PM^4	84,886	0.35	0.17	0.11	0.22	0.32	0.45	0.69
S^1	84,747	-0.01	1.38	-1.63	-0.26	0.02	0.30	1.46
S^2	83,790	-0.03	1.42	-1.83	-0.35	0.01	0.34	1.58
S^3	84,115	-0.03	1.35	-1.76	-0.33	0.01	0.32	1.51
S^4	84,886	-0.02	1.50	-1.84	-0.32	0.01	0.32	1.69

Panel B: Positive Earnings Sample

Variable	N	Mean	Std. Dev.	5th Pcl.	25th Pcl.	Med.	75th Pcl.	95th Pcl.
S^1	70,583	0.16	1.10	-0.92	-0.13	0.06	0.36	1.53
S^2	69,972	0.11	1.24	-1.34	-0.22	0.05	0.39	1.68
S^3	70,212	0.09	1.21	-1.33	-0.21	0.05	0.37	1.59
S^4	70,680	0.07	1.41	-1.56	-0.24	0.03	0.36	1.78

*Note: The table provides descriptive statistics on the research variables for the full sample (Panel A) and a sub-sample of observations with positive earnings per share (Panel B). See Table 1 for definitions of variables and Table 2 for sample selection.

Table 4
Selected Correlations*

Panel A:

	S^1	S^2	S^3	S^4
S^1		0.81	0.76	0.40
S^2	0.82		0.97	0.53
S^3	0.77	0.95		0.60
S^4	0.48	0.58	0.64	

Panel B:

	$j=1$	$j=2$	$j=3$	$j=4$
$Corr(IPS^j, S^j)$	0.36, 0.33	0.21, 0.22	0.11, 0.12	0.06, 0.05
$Corr(PM^j, NOPM^j)$	0.48, 0.59	0.62, 0.69	0.73, 0.77	0.89, 0.91

Panel C:

	$j=1$	$j=2$	$j=3$	$j=4$
$Corr(IPS_{it}^j, IPS_{i,t-1}^j)$	0.47, 0.49	0.59, 0.58	0.64, 0.63	0.77, 0.75
$Corr(IPS_{it}^j - S_{it}^j, IPS_{i,t-1}^j - S_{i,t-1}^j)$	0.78, 0.77	0.82, 0.79	0.82, 0.80	0.81, 0.79

*Notes:

1. Panel A presents Pearson (above diagonal) and Spearman (below diagonal) correlations for the four deviation measures. Panel B presents average yearly Pearson (left) and Spearman (right)) correlations for other selected variables. Panel C presents average firm-by-firm Pearson (left) and Spearman (right) correlations for selected earnings variables and their corresponding lagged variable. Panel C includes only firms with at least 8 observations, where the average number of observations for each firm is 17.

2. For definitions of variables, see Table 1.

Table 5
The Relation between Share Price, Earnings and Deviation Level*

j	BPS	IPS^j	$D^j \times IPS^j$	DIF^j	S^j	$D^j \times S^j$	$Adj\text{-}R^2$ *Average N*
1	0.86	3.74					0.61
	14.22***	13.89***					2,354
1	0.76	5.63	-2.22		-1.82	1.23	0.63
	12.92***	17.25***	-5.42***		-6.20***	2.96***	2,354
2	0.71	4.38	-0.55	2.44	-0.31	0.17	0.63
	12.99***	15.51***	-2.95***	7.02***	-2.34**	0.85	2,327
3	0.71	3.90	-0.03	2.92	-0.07	0.03	0.64
	12.91***	15.31***	-0.35	10.19***	-0.34	0.19	2,337
4	0.82	3.37	0.16	3.21	0.23	-0.28	0.64
	16.97***	14.99***	4.10***	13.80***	2.17**	-1.90*	2,358

*Notes:

1. The table presents mean coefficients and *t*-statistics for yearly cross-sectional regressions (as in Fama and MacBeth, 1973). See Table 1 for definitions of variables.

2. The regression equation is:

$$P_{it} = \alpha'_{0t} + \alpha'_{1t} D^j_{it} + \alpha'_{2t} BPS_{it} + \alpha'_{3t} IPS^j_{it} + \alpha'_{4t} D^j_{it} IPS^j_{it} + \alpha'_{5t} DIF^j_{it} + \alpha'_{6t} S^j_{it} + \alpha'_{7t} D^j_{it} S^j_{it} + \varepsilon_{it}$$

3. *, **, *** – significantly different from zero at the 0.10, 0.05 and 0.01 levels, respectively. The average annual number of observations for each regression model is presented below adjusted R^2s.

Table 6
The Relation between Price to Book Ratio, Earnings and Deviation Level*

j	$\frac{1}{BPS}$	$\frac{IPS^j}{BPS}$	$\frac{D^j \times IPS^j}{BPS}$	$\frac{DIF^j}{BPS}$	$\frac{S^j}{BPS}$	$\frac{D^j \times S^j}{BPS}$	*Adj-R^2* *Average N*
1	0.99	4.56					0.22
	9.00***	18.91***					2,354
1	0.89	10.91	-7.79		-5.45	5.34	0.28
	8.75***	19.71***	-14.71***		-14.81***	14.36***	2,354
2	0.87	7.08	-3.46	2.92	-1.77	1.99	0.29
	8.61***	20.23***	-11.17***	10.68***	-9.08***	9.29***	2,327
3	0.88	6.29	-2.12	3.79	-1.01	1.21	0.28
	8.69***	20.23***	-9.52***	17.97***	-6.39***	7.09***	2,337
4	0.89	4.67	-0.04	4.36	-0.12	0.28	0.26
	8.35***	23.39***	-0.86	24.44***	-1.06	2.76***	2,358

*Notes:

1. The table presents mean coefficients and *t*-statistics for yearly cross-sectional regressions (as in Fama and MacBeth, 1973). See Table 1 for definitions of variables.

2. The regression equation is:

$$P_{it} / BPS_{it} = \beta'_{0t} + \beta'_{1t} D^j_{it} + \beta'_{2t} 1 / BPS_{it} + \beta'_{3t} IPS^j_{it} / BPS_{it} + \beta'_{4t} D^j_{it} IPS^j_{it} / BPS_{it}$$
$$+ \beta'_{5t} DIF^j_{it} / BPS_{it} + \beta'_{6t} S^j_{it} / BPS_{it} + \beta'_{7t} D^j_{it} S^j_{it} / BPS_{it} + \eta'_{it}$$

3. *, **, *** – significantly different from zero at the 0.10, 0.05 and 0.01 levels, respectively. The average annual number of observations for each regression model is presented below the adjusted R^2s.

Table 7
The Relation between Annual Return and Deviation Changes*

j	$\frac{IPS^j}{P_{-1}}$	$\frac{\Delta IPS^j}{P_{-1}}$	$\frac{D^j \times \Delta IPS^j}{P_{-1}}$	$\frac{DIF^j}{P_{-1}}$	$\frac{\Delta DIF^j}{P_{-1}}$	$\frac{\Delta S^j}{P_{-1}}$	$\frac{D^j \times \Delta S^j}{P_{-1}}$	*Adj-R^2* *Average N*
1	0.63 11.82***	0.38 8.18***						0.10 2,028
1	0.56 11.17***	1.02 9.14***	-0.75 -8.72***			-0.29 -4.21***	0.33 4.50***	0.11 2,028
2	0.69 13.13***	0.93 10.35***	-0.50 -9.54***	0.46 5.60***	0.05 1.47	-0.12 -2.36**	0.15 2.85***	0.14 1,992
3	0.66 14.40***	0.83 11.09***	-0.34 -6.98***	0.46 9.40***	0.13 2.49***	-0.04 -1.01	0.03 0.46	0.15 1,995
4	0.49 12.13***	0.48 9.13***	-0.07 -2.73***	0.45 11.29***	0.19 6.10***	0.15 6.09***	-0.11 -3.64***	0.12 2,001

*Notes:

1. The table presents mean coefficients and *t*-statistics for yearly cross-sectional regressions (as in Fama and MacBeth, 1973). See Table 1 for definitions of variables.

2. The regression equation is:

$$R_{it} = \gamma'_{0t} + \gamma'_{1t} D^j_{it} + \gamma'_{2t} IPS^j_{it} / P_{it-1} + \gamma'_{3t} \Delta IPS^j_{it} / P_{it-1} + \gamma_{4t} D^j_{it} \Delta IPS^j_{it} / P_{it-1} + \gamma'_{5t} DIF^j_{it} / P_{it-1} + \gamma'_{6t} \Delta DIF^j_{it} / P_{it-1} + \gamma'_{7t} \Delta S^j_{it} / P_{it-1} + \gamma'_{8t} D^j_{it} \Delta S^j_{it} / P_{it-1} + \phi'_{it}$$

3. *, **, *** – significantly different from zero at the 0.10, 0.05 and 0.01 levels, respectively. The average annual number of observations for each regression model is presented below the adjusted R^2s.

Table 8
The Relation between Annual Return and Deviation Levels and Changes*

j	$\frac{IPS^j}{P_{-1}}$	$\frac{\Delta IPS^j}{P_{-1}}$	$\frac{D^j \times IPS^j}{P_{-1}}$	$\frac{D^j \times \Delta IPS^j}{P_{-1}}$	$\frac{DIF^j}{P_{-1}}$	$\frac{\Delta DIF^j}{P_{-1}}$	$\frac{S^j}{P_{-1}}$	$\frac{\Delta S^j}{P_{-1}}$	$\frac{D^j \times S^j}{P_{-1}}$	$\frac{D^j \times \Delta S^j}{P_{-1}}$	*Adj-R²* *Average N*
1	0.84	0.99	-0.29	-0.66			-0.26	-0.23	0.23	0.24	0.12
	7.72***	8.22***	-2.59***	-6.70***			-2.93***	-3.04***	2.64***	3.06***	2,028
2	0.78	0.87	-0.10	-0.39	0.49	0.04	0.03	-0.12	-0.07	0.12	0.15
	14.01***	8.48***	-2.39***	-4.95***	6.44***	1.10	0.61	-2.05**	-1.29	2.02**	1,992
3	0.64	0.82	0.04	-0.32	0.46	0.13	0.09	-0.08	-0.13	0.06	0.15
	14.83***	10.06***	1.27	-5.61***	9.92***	2.59***	2.38***	-1.81*	-3.17***	1.00	1,995
4	0.47	0.50	0.05	-0.10	0.45	0.19	0.04	0.12	-0.01	-0.09	0.12
	11.79***	9.25***	6.71***	-4.01***	11.30***	6.15***	1.44	3.75***	-0.17	-2.27**	2,001

*Notes:

1. The table presents mean coefficients and *t*-statistics for yearly cross-sectional regressions (as in Fama-MacBeth, 1973). See Table 1 for definitions of variables.

2. The regression equation is:

$$R_{it} = \gamma'_{0t} + \gamma'_{1t} D^j_{it} + \gamma'_{2t} IPS^j_{it} / P_{it-1} + \gamma'_{3t} \Delta IPS^j_{it} / P_{it-1} + \gamma'_{4t} D^j_{it} IPS^j_{it} / P_{it-1} + \gamma'_{5t} D^j_{it} \Delta IPS^j_{it} / P_{it-1} + \gamma'_{6t} DIF^j_{it} / P_{it-1}$$
$$+ \gamma'_{7t} \Delta DIF^j_{it} / P_{it-1} + \gamma'_{8t} S^j_{it} / P_{it-1} + \gamma'_{9t} \Delta S^j_{it} / P_{it-1} + \gamma'_{10t} D^j_{it} S^j_{it} / P_{it-1} + \gamma'_{11t} D^j_{it} \Delta S^j_{it} / P_{it-1} + \phi'_{it}$$

3. *, **, *** – significantly different from zero at the 0.10, 0.05 and 0.01 levels, respectively. The average annual number of observations for each regression model is presented below the adjusted R^2s.

Table 9
Behavior of Valuation Coefficients over Time*

Coefficient	*Int.*	*Time*	*Adj-R²*	*Int.*	*Time*	*Adj-R²*
	1971-2006 (36 obs.)			**1971-1999 (29 obs.)**		
	Base model – Eq. (1)					
BPS	0.46	0.02	0.37	0.27	0.04	0.67
t-statistic	4.72^{+}	4.67^{+}		3.02^{+}	7.64^{+}	
$\boldsymbol{IPS^1}$	3.59	0.01	0.00	4.69	-0.09	0.25
t-statistic	6.45^{+}	0.30		9.97^{+}	-3.18^{+}	
	1971-2006 (36 obs.)			1971-1999 (29 obs.)		
	Modified model – Eq. (1')					
BPS	0.40	0.02	0.32	0.20	0.04	0.66
t-statistic	4.04^{+}	4.14^{+}		2.25	7.43^{+}	
$\boldsymbol{IPS^1}$	4.14	0.08	0.17	4.96	0.01	0.00
t-statistic	6.79^{+}	2.81^{+}		7.48^{+}	0.23	
$\boldsymbol{D^1 \times IPS^1}$	0.06	-0.12	0.26	0.63	-0.17	0.28
t-statistic	0.08	-3.62^{+}		0.73	-3.44^{+}	
$\boldsymbol{S^1}$	0.05	-0.10	0.35	0.19	-0.11	0.27
t-statistic	0.11	-4.44^{+}		0.33	-3.39^{+}	
$\boldsymbol{D^1 \times S^1}$	-1.83	0.17	0.47	-2.50	0.23	0.51
t-statistic	-2.97^{+}	5.70^{+}		-3.53^{+}	5.48^{+}	

***Notes:**

1. The table presents results of estimating the change over time in the valuation coefficients of the price regressions. First, we estimate the base model presented in Eq. (1) and the modified model presented in Eq. (1') and obtain annual regression coefficients. Then, we estimate the behavior of these annual coefficients over two periods: 1971-2006 and 1971-1999.

2. The base model – Eq. (1) is: $P_{it} = \alpha_{0t} + \alpha_{1t} BPS_{it} + \alpha_{2t} IPS^1_{it} + \varepsilon_{it}$. The modified model – Eq. (1') is: $P_{it} = \alpha'_{0t} + \alpha'_{1t} D^1_{it} + \alpha'_{2t} BPS_{it} + \alpha'_{3t} IPS^1_{it} + \alpha'_{4t} D^1_{it} IPS^1_{it} + \alpha'_{6t} S^1_{it} + \alpha'_{7t} D^1_{it} S^1_{it} + \varepsilon_{it}$. See Table 1 for definitions of variables.

3. For each independent variable included in Eq. (1) and Eq. (1'), the corresponding time model is: $Coeff_t = \delta_o + \delta_1\ Time_t + \upsilon_t$, where $Coeff_t$ is the regression coefficient of the particular variable for year *t* and $Time_t$ is a time counter.

4. The *t*-statistics are presented below the coefficients, where + indicates significance at the 0.01 level.

Table 10
Sensitivity Analysis: ROE*

Panel A: Price-level valuation model

$$P_{it} = \alpha'_{0t} + \alpha'_{1t} D_{it}^{ROE} + \alpha'_{2t} BPS_{it} + \alpha'_{3t} EPS_{it} + \alpha'_{4t} D_{it}^{ROE} EPS_{it} + \alpha'_{6t} S_{it}^{ROE} + \alpha'_{7t} D_{it}^{ROE} S_{it}^{ROE} + \varepsilon_{it}$$

BPS	***EPS***	$D^{ROE} \times EPS$	S^{ROE}	$D^{ROE} \times S^{ROE}$	***Adj-R²*** ***Avg. N***
0.89	3.56				0.61
13.88***	13.09***				2,366
0.78	5.26	-1.90	-1.62	0.88	0.62
12.22***	18.45***	-5.89***	-5.26***	2.00**	2,366

Panel B: Market-to-book valuation model

$$P_{it} / BPS_{it} = \beta'_{0t} + \beta'_{1t} D_{it}^{ROE} + \beta'_{2t} 1 / BPS_{it} + \beta'_{3t} EPS_{it} / BPS_{it} + \beta'_{4t} D_{it}^{ROE} EPS_{it}^{j} / BPS_{it}$$
$$+ \beta'_{6t} S_{it}^{ROE} / BPS_{it} + \beta'_{7t} D_{it}^{ROE} S_{it}^{ROE} / BPS_{it} + \eta'_{it}$$

$\frac{1}{BPS}$	$\frac{EPS}{BPS}$	$\frac{D^{ROE} \times EPS}{BPS}$	$\frac{S^{ROE}}{BPS}$	$\frac{D^{ROE} \times S^{ROE}}{BPS}$	***Adj-R²*** ***Avg. N***
1.03	4.51				0.22
8.97***	20.15***				2,366
0.96	11.48	-8.09	-6.46	6.14	0.28
8.69***	21.47***	-17.03***	-15.04***	15.29***	2,366

Panel C: Return-earnings model

$$R_{it} = \gamma'_{0t} + \gamma'_{1t} D + \gamma'_{2t} EPS_{it} / P_{it-1} + \gamma'_{3t} \Delta EPS_{it} / P_{it-1} + \gamma_{4t} D_{it}^{ROE} \Delta EPS_{it} / P_{it-1}$$
$$+ \gamma'_{7t} \Delta S_{it}^{ROE} / P_{it-1} + \gamma'_{8t} D_{it}^{ROE} \Delta S_{it}^{ROE} / P_{it-1} + \phi'_{it}$$

$\frac{EPS}{P_{-1}}$	$\frac{\Delta EPS}{P_{-1}}$	$\frac{D^{ROE} \times \Delta EPS}{P_{-1}}$	$\frac{\Delta S^{ROE}}{P_{-1}}$	$\frac{D^{ROE} \times \Delta S^{ROE}}{P_{-1}}$	***Adj-R²*** ***Avg. N***
0.67	0.41				0.10
12.11***	8.87***				2,000
0.58	1.23	-0.93	-0.34	0.39	0.11
10.91***	8.21***	-9.52***	-3.80***	4.74***	2,000

*Notes:

1. The table presents mean coefficients and *t*-statistics for yearly cross-sectional regressions (as in Fama and MacBeth, 1973).
2. Definitions of variables:

$\boldsymbol{EPS_{it}}$ – Firm *i*'s earnings per share for period *t*.

$\boldsymbol{ROE_{it}}$ – Firm i's return on equity for period t; $ROE_{it} = EPS_{it} / BPS_{it}$.

$\boldsymbol{NROE_{it}}$ – The normal return on equity, measured as the average return on equity over the preceding four years; $NROE_{it} = \sum_{k=t-4}^{t-1} ROE_{ik} / 4$.

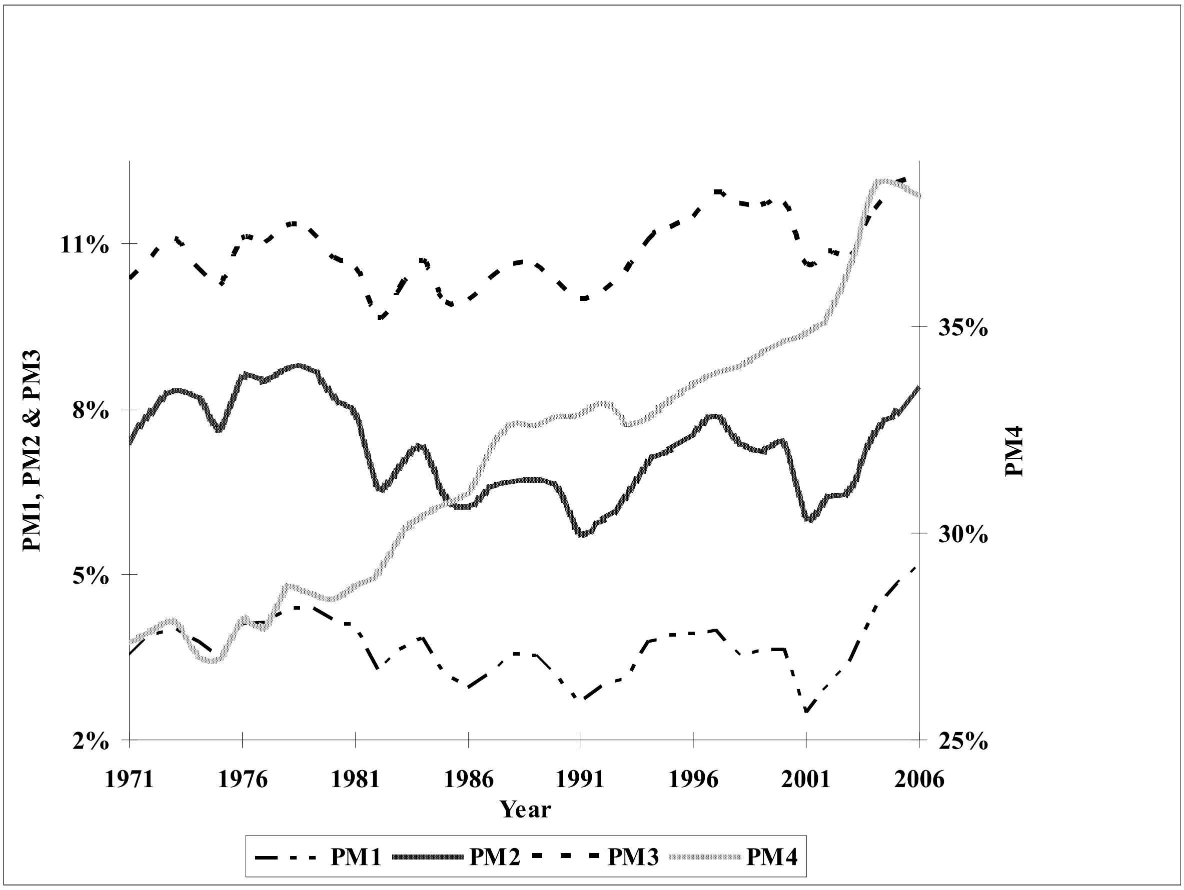
$\boldsymbol{S_{it}^{ROE}}$ – Deviation of earnings per share from what is implied by the normal return on equity, measured as the difference between EPS_{it} and $NROE_{it}$ multiplied by BPS_{it}; $S_{it}^{ROE} = EPS_{it} - NROE_{it} * BPS_{it}$.

$\boldsymbol{D_{it}^{ROE}}$ – an indicator variable that obtains the value of 1 if the variance of the return on equity ROE_{it} over the preceding four periods is above the sample median in period *t* and 0 otherwise.

For other variable definitions, see Table 1.

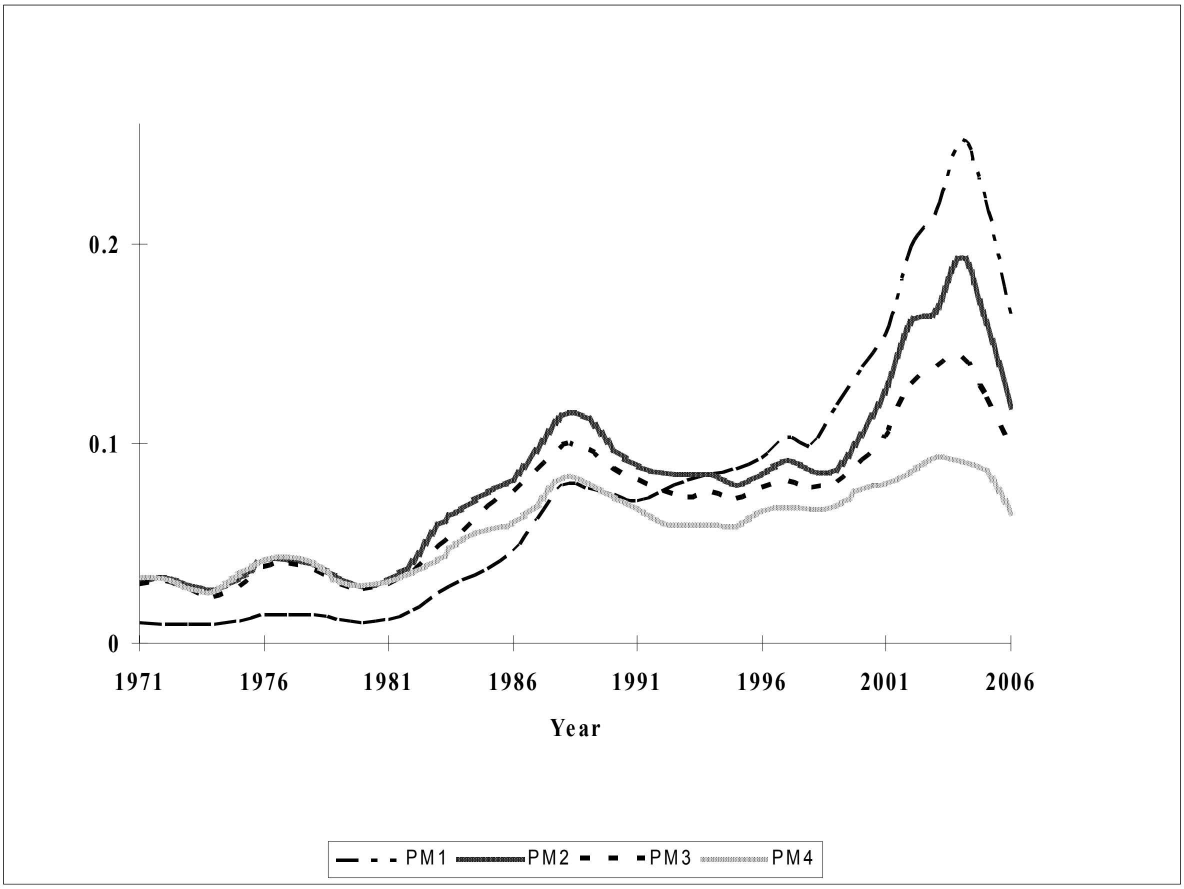
3. *, **, *** – significantly different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Figure 1
Median Profit Margins over 1971 – 2006*



*Note: Figure 1 presents the cross-sectional median of the profit margin PM^j, for each profit measure j=1,2,3,4 and for each year for the years 1971-2006.

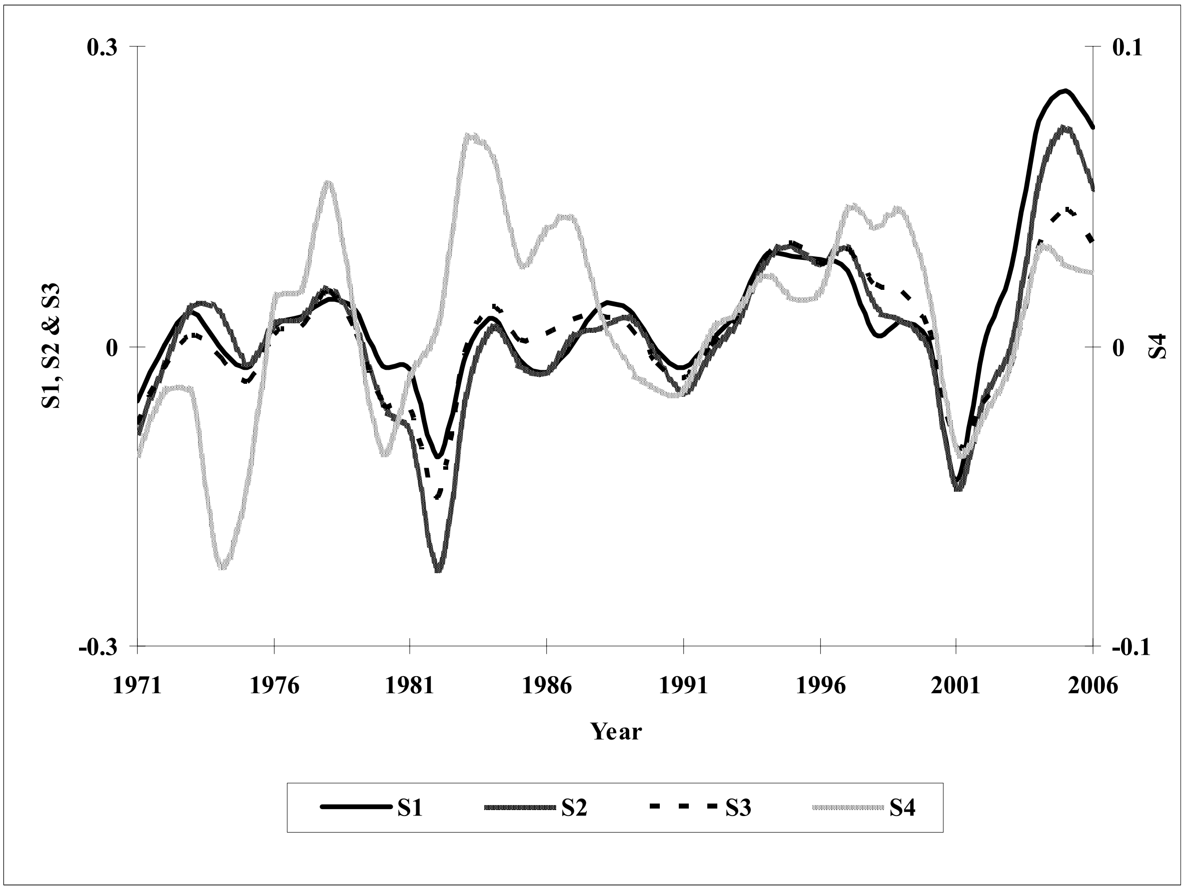
Figure 2
Median Annual Past Variance of Profit Margins over 1971-2006*



*Note: Figure 2 presents, for each profit measure j=1,2,3,4 and for each year 1971-2006, the yearly cross-sectional median of the past variance of the profit margin PM^j in the preceding four years (median figures are multiplied by 100).

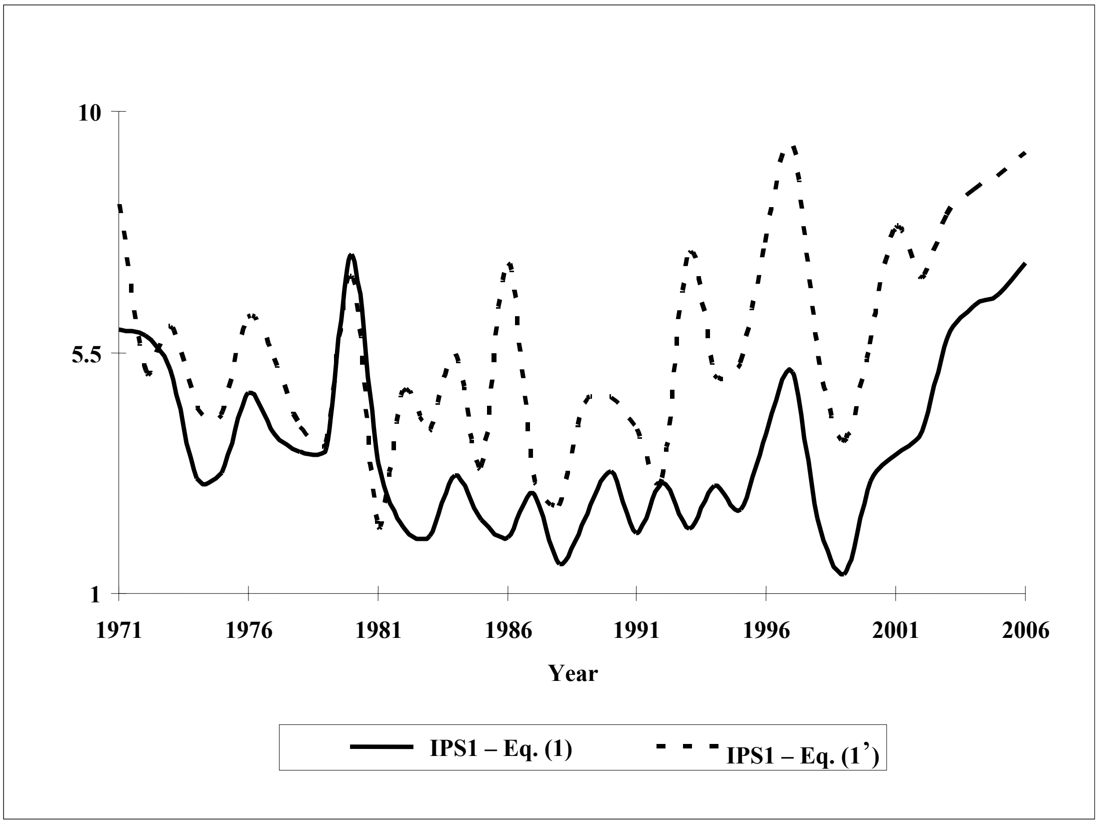
Figure 3

Median Deviation over 1971 – 2006*



* Note: The table presents the cross-sectional median of the deviation variable S^j, for each profit measure j=1,2,3,4 and for each year 1971-2006.

Figure 4
Coefficients on Earnings over 1971 – 2006*



***Notes:**

1. The solid line presents, for each year 1971-2006, the annual coefficient on net income (IPS^1) obtained from the yearly cross-sectional estimation of the base model in Eq. (1): $P_{it} = \alpha_{0t} + \alpha_{1t} BPS_{it} + \alpha_{2t} IPS^1_{it} + \varepsilon_{it}$.

2. The dotted line presents, for each year 1971-2006, the annual coefficient on net income (IPS^1) obtained from the yearly cross-sectional estimation of the modified model in Eq. (1'): $P_{it} = \alpha'_{0t} + \alpha'_{1t} D^1_{it} + \alpha'_{2t} BPS_{it} + \alpha'_{3t} IPS^1_{it} + \alpha'_{4t} D^1_{it} IPS^1_{it} + \alpha'_{6t} S^1_{it} + \alpha'_{7t} D^1_{it} S^1_{it} + \varepsilon_{it}$.

3. See Table 1 for definitions of variables.