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# *Ownership Structure and Analysts' Earnings Forecasts: UK Evidence*

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# Ownership Structure and Analysts' Earnings Forecasts: UK Evidence


## Abstract

This study investigates the association between the ownership structure of a firm and the accuracy of individual one-year-ahead earnings forecasts made by UK analysts. The relationship is explored in the presence of individual analyst and firm-specific characteristics using a research-tailored dataset comprising 11,659 individual analysts' forecasts made over the period, 1996 to 2001. To address the multidimensional variation in the dependent variables employed in the study (i.e., a forecast made by analyst *i* for firm *j* in year *t*) and the unique nature of the research question (i.e., the combined use of firm and analyst-specific characteristics), we use an analyst-firm fixed effects estimator. We are not aware of any UK studies in the field that investigate the role of ownership structure of a firm in determining the accuracy of analysts' forecasts. Furthermore, to the best of our knowledge, use of the analyst-firm fixed effect estimator in this context is also novel. The results of the study suggest that insider ownership is associated with forecast accuracy in a non-linear way. Moreover, although analysts are more optimistic for firms with a higher institutional ownership, institutional shareholders seem to be ineffective at addressing the agency disclosure problem. As a result, forecasts made for high institutional ownership firms are less accurate.



Keywords: Analysts' forecasts, ownership structure.

JEL Codes: G1, G3.

## 1. Introduction

Financial analysts play a crucial role in financial markets via the provision of (price-sensitive) information pertaining to the activities of firms.[1] This importance, coupled with an increased focus on the quality of corporate governance mechanisms, makes the evaluation of the quality of analysts' earning forecasts in the light of such mechanisms an essential task. To address this issue we explore the potential impact of a firm's ownership structure on the accuracy of individual analysts' forecasts. This is achieved using a sample of individual analysts' forecasts (i.e., analyst *i* following firm *j* in year *t*) and models that control for both firm and analyst-specific characteristics.

Previous evidence suggests that the amount of information disclosed to market participants affects the accuracy of analysts' earnings forecasts. Lang and Lundholm (1996), for instance, find that forecast accuracy increases with an increase in the rating of a firm's disclosure. These findings are extended to disclosure in management discussion and analysis (Barron *et al*. 1999), accounting policy disclosure at a country level (Hope, 2003), and explored in out-of-sample analysis (Eng and Teo, 2000). Collectively, these results imply that firms that disclose more information to outsiders are found to be associated with more accurate forecasts.

There are also well established theories that imply an alternative mechanism by which ownership structure can affect analyst forecast accuracy. Specifically, in the classic work of Berle and Means (1932), they point out that as the interest of managers and owners may not always

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1 Kothari *et al*. (2003), for instance, find that analysts' earnings forecasts influence the price of securities and that negative earnings surprises cause the loss of millions of pounds of shareholders' wealth; whereas Frankel *et al*. (2002) and Chung and Jo (2002) suggest that analysts' forecasts have a strong impact on investors' perceptions about the future performance of a firm.

coincide, managers, with the aim of pursuing their own interests, may "hide" certain pieces of information and act to the detriment of shareholders (and analysts). This argument is extended by Jensen and Meckling (1976), who argue that an increase in managerial ownership results in a closer alignment of owners' and managers' interests. Similarly, they argue that the proportion of ownership held by institutional investors and their concentration may be effective mechanisms in addressing the agency problem and enhancing the transparency and openness of a firm. Consequently, by using the arguments proposed by Jensen and Meckling (1976), one can enrich the set of variables used to explain analyst forecast accuracy.

The paper also sheds light on the role of corporate governance mechanisms on analysts' forecast accuracy. As these mechanisms are used to control the managers and increase the openness and transparency of a firm, as suggested by the agency theory and recommended in The Code of Best Practice (now the Combined Code), then their effectiveness can be judged with respect to their impact upon analysts' forecasts.[2] Based on these arguments, this paper explores the impact of insider and institutional ownership, and also the concentration of institutional ownership on the accuracy of individual analysts' forecasts.

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2 According to The Cadbury Code of Best Practice, "The [Cadbury] Committee objective [was] to help to raise the standards of corporate governance and the level of confidence in financial reporting and auditing". It is argued that "openness on the part of companies, within the limits set by their competitive position, is the basis for the confidence which needs to exist between business and all those who have a stake in its success" (Cadbury, 1992, p. 15). Despite the widespread recognition of recommendations related to corporate governance, their effectiveness has been under scrutiny from academics and practitioners. See Shleifer and Vishny (1997) and Hermalin and Weisbach (2003) for comprehensive surveys of the literature. Another important note that has to be made here is that managerial control would be required only in the context of agency theory. If one adopts the stewardship theory concept (i.e., that the managers are trustworthy and they act in the interests of shareholders) then motivation mechanisms would have to be employed to encourage managers to achieve better results.

The remainder of this paper is organized as follows. Section 2 motivates our hypotheses, and Section 3 explains the statistical models used in the study. Section 4 describes the sample and data, while Section 5 contains the empirical results. Section 6 concludes the study.

## 2. Hypotheses development

This section discusses the potential relationship between the accuracy of analysts' forecasts and ownership structure with respect to three viable associations, viz., linear, non-linear and piecewise linear.

### *2.1. The accuracy of analysts' forecasts and insider ownership*

The first of the main hypotheses tested in this paper can be formally stated as follows:

$H_0^1$: There is no relation between insider ownership and the accuracy of individual analysts' forecasts.

This hypothesis is motivated via the follow reasoning. In their seminal work, Jensen and Meckling (1976) suggest that insider ownership may serve as an important governance mechanism to alleviate the agent-principal problem. In particular, they argue that an increase in insider ownership results in a closer alignment of owners' and managers' interests. These expectations are known in the literature as *the convergence of interest hypothesis*. As a result of this convergence, managers may have less to "hide", disclosing more information to outsiders that may result in more accurate earning forecasts.

Stulz (1988) holds a different view regarding the above. He argues that at a low level of insider ownership, a further increase in insider ownership is associated with a greater convergence of interest. However, when managerial ownership reaches a high level, because of the high voting power of managers, it is difficult, if not impossible, to dispose of the management. Consequently, the insiders are entrenched in their positions and they act to the detriment of shareholders' interest. This argument is known in the literature as *the entrenchment hypothesis*.[3] Also, Bhushan (1989) argues that because of the higher secrecy at high levels of insider ownership, the amount of information provided to outsiders, including analysts, may decrease, and thus the accuracy of analysts' forecast may suffer. This may also be the result of lower trading opportunities, and thus, lower trading commissions received by analysts who follow high insider ownership firms (Bhushan, 1989, Irvine, 2001). Knowing that they will be less rewarded for following thinly traded firms, analysts may put less effort into following these firms (von Nandelstadh, 2002). As a result, high insider ownership firms may be associated with less accurate analysts' forecasts.[4]

By contrast, evidence presented by Morck *et al.* (1988) suggests a linear piecewise domination of the convergence of interests and entrenchment hypotheses.[5] It is possible that at insider ownership levels between 0% and 5%, and beyond 25%, the convergence of interest hypothesis dominates (i.e., there is a positive association between the accuracy of analysts' forecast and insider ownership). However, within the 5% and 25% range of insider ownership, the

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3 See, for instance, Hermalin and Weisbach (2003) for comprehensive survey of the literature.

4 Insiders with higher shareholdings, however, may benefit from the positive effects of disclosure because (i) good news would positively affect share prices; and (ii) the share price formation process takes into account both the quality and the quantity of information disclosed (assuming that markets are efficient). Rational investors perceive non-disclosure ''worse'' than the disclosure of bad news (Verrecchia, 1983), and not disclosing bad news may result in costly litigation. Thus, even at high levels of insider ownership, managers may tend to increase disclosure.

5 Assuming linearity between insider ownership and firm performance, the authors find a positive linear relationship between insider ownership and Tobin's Q for ownership levels between 0% and 5% and for levels of ownership beyond 25%, but a negative relationship over the 5% and 25% range of managerial ownership.

entrenchment hypothesis "takes over" and the accuracy of analysts' forecasts is negatively associated with insider ownership.

In terms of the direction of analysts' forecast errors and insider ownership, based on the convergence of interest hypothesis, analysts' levels of optimism may increase with a rise in insider ownership. However, this tendency may prevail up to a point when a further increase in insider ownership would lead to managerial entrenchment that may result in a decrease in analysts' optimism. However, following Bhushan's (1989) higher secrecy for higher insider ownership firm argument and the tendency of analysts to be more optimistic in more uncertain environments (Scherbina, 2004), analysts optimism may prevail even at high levels' of insider ownership.[6]

The above arguments suggest that insider ownership may be an efficient governance mechanism, although its effectiveness may increase/decrease in a linear, non-linear or piecewise linear fashion. Based on Jensen and Meckling's (1976) convergence of interest hypothesis, we may expect a positive linear association between insider ownership, and the accuracy of analysts' forecasts. However, following Stulz's (1988) entrenchment hypothesis, insider ownership may be related to the accuracy of forecasts in an inverse U-shaped fashion. Finally, following Morck, *et al.* (1988), the possibility of a linear piecewise relationship between our variables of interest is not excluded.[7]

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6 As argued by Acker and Athanassakos (1997) and Scherbina (2004), because of the trade-off between career concerns and the pressure to be more optimistic, in a more uncertain environment, analysts feel less accountable and issue more optimistic forecasts. The optimistic forecast has two components, one is because analysts deliberately add their private estimates, and the other arises when sufficiently negative views are "kept quiet" (Scherbina, 2004). In a more uncertain environment, the private signals about the future earnings are spread out. Therefore, even if analysts get some negative private signals, the greater uncertainty conditions them to be quiet, and this further biases the mean of the reported forecasts in an upward direction. Therefore, both components of the optimistic bias, result in more optimistic forecasts for firms with higher uncertainty.

7 Although there are studies that could not detect any significant relationship between ownership structure and firm value (for instance, Himmelberg *et al*. 1999, Demsetz and Villalonga, 2001).

*2.2. The accuracy of analysts' forecasts and institutional ownership*

The second of the main hypotheses tested in this paper can be formally stated as follows:

$H_0^2$: There is no relation between institutional ownership and the accuracy of individual analysts' forecasts.

The reasoning for the above hypothesis runs as follows. Exploring the incentives confronted by institutional investors in a takeover setting, Pound (1988) formulates three hypotheses: (i) the efficient-monitoring hypothesis, according to which institutional investors have greater expertise and can monitor management at lower cost than small atomistic shareholders;[8] (ii) the conflict-of-interest hypothesis that holds that institutional investors may vote with management because of other profitable business relationships with the firm;[9] and (iii) the strategic-alignment hypothesis that holds that some institutional shareholders maintain strategic alliances with the incumbent management. If, indeed, as hypothesized by Pound's efficient monitoring hypothesis, institutional investors use their abilities to effectively and closely monitor the management of the firm, then managers may have less information to hide, that may result in greater information available to analysts, and thus, more accurate forecasts. At the same time, greater institutional investors' monitoring may lead to higher financial performance, and therefore, higher

8 Allen *et al*. (2000), for instance, argue that institutional investors prefer higher dividends relative to individual investors mainly due to tax effects and restrictions that discourage holding investments that pay low dividends. According to them, institutional investors have a greater ability to discipline management. First, they have greater incentives, ability, and a more "sophisticated" investor-base to gather and analyse the information. Second, institutional investors are more effective at distinguishing "high quality" from "low quality" information.

9 For instance, an insurance company may hold a significant portion of a corporation's stock and concurrently act as its primary insurer. Pound (1988) argues that voting against management may significantly affect the insurer's business relationship with the management, whereas voting with them results in no obvious penalty.

expectations regarding future earnings. Therefore, high institutional ownership may also be associated with more optimistic forecasts.

A similar expectation may be also derived from an analyst coverage perspective. Bhushan (1989) notes that an in-house analysis performed by institutions does not appear to be a substitute for analysts' services. He argues, therefore, that the demand for analysts' services increases with an increase in the number of institutional shareholders and their ownership. Moreover, greater demand for analysts' services is associated with higher trading opportunities (Bhushan, 1989, Irvine, 2001), and therefore, higher effort on behalf of analysts (von Nandelstadh, 2002). Hence, it may be that analysts are more accurate for firms with higher institutional ownership.

However, it may be the case that due to conflicting interests, institutional investors are ineffective at monitoring management and align their interest with the incumbent management (i.e., conflict-of-interest and strategic-alignment hypotheses).[10] This means that institutional investors would not exercise effectively their monitoring role, thus resulting in less information available to outsiders (and analysts).[11] Moreover, Goergen and Renneboog (1999) argue that due to the low holding of institutional shareholdings in the UK, the later may be less motivated to effectively monitor the activity of the firm; consequently, this may encourage institutional investors to free ride on corporate control. Therefore, the accuracy of analysts' forecasts, including the level of optimism, may be lower for high institutional ownership firms.

### *2.3. The accuracy of analysts' forecasts and number of institutional shareholders*

The final hypothesis tested in this paper can be formally stated as follows:

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10 See, amongst others, Singh and Davidson (2003) and O'Neil and Swisher (2003).

11 Donnelly and Lynch (2002) argue that outsiders who own large blocks of shares have alternative information sources resulting in a lower information environment.

$H_0^3$: There is no relation between the number of institutional shareholders and the accuracy of individual analysts' forecasts.

The main reasoning for the above is the following. If the demand for analysts' services is higher for firms with a greater number of institutional shareholders (Bhushan, 1989), based on the greater trading opportunities and more effort on the behalf of analysts hypotheses (Irvine, 2001 and von Nandelstadh, 2002), then it may be that the accuracy of analysts' forecasts may be higher for firms with a greater number of institutional shareholders.[12] However, as argued by Donnelly and Lynch (2002) an increase in the number of small atomistic institutional shareholders may make it more difficult for institutional investors to unify and to act as a strong monitoring force. Therefore, it may be the case that with an increase in the number of institutional shareholders, the accuracy of forecasts does not improve.

## 3. Research Design

### *3.1. Evaluating the accuracy of analysts' earnings forecasts*

Three different proxies are used to evaluate the accuracy of individual analysts' forecasts for the purpose of this paper: (i) forecast error in absolute terms,[13] (ii) dispersion amongst analysts' forecasts, and (iii) forecast bias (i.e., optimistic versus pessimistic forecasts).

[12] See, for instance, Frankel *et al*. (2002) and Chung and Jo (2002).

[13] The absolute forecast error is chosen, as opposed to the squared error, as the former may be more representative of the loss function employed by analysts (see, for instance, Gu and Wu, 2003 and Basu and Markov, 2004).

A number of previous studies use the unstandardised absolute value of forecast errors to evaluate the dynamics and quality of analysts' earning forecasts across time.[14] However, where forecast errors are compared across firms, the error may be partly a function of the scale effect. Therefore, Acker and Athanassakos (1997), amongst others, choose to deflate the forecast error by actual earnings. This approach, however, has the disadvantage of generating outliers when the actual earnings are close to zero. This is a less frequent occurrence when the share price is used as the denominator.[15] Therefore, following Thomas (2002), and in order to avoid any effects of information leakage (e.g., the stock price drifts upwards in advance of a positive earnings surprise), the share price five days prior to the earning announcement date is used.[16]

Forecast error in this paper is measured as the absolute difference between the actual earnings announced by firm *j* in year *t*, and the forecast made by analyst *i* for firm *j* in year *t* deflated by the share price of firm *j* five days prior to the earning announcement in year *t* multiplied by 100.[17] It may be, however, that the richness of the information environment of a firm may also have an impact on the disagreement amongst analysts that follow that particular firm. This disagreement is measured by the dispersion of forecasts, which is computed as the standard deviation of individual forecasts made by analysts that follow firm *j* in year *t*, standardised by the

14 See, for instance, Stickel (1992) and Chan *et al*. (2003).

15 Abarbanell and Lehavy (2003), Gu and Wu (2003), and Mikhail *et al*. (2003) deflate quarterly (monthly) forecast errors by the share price at the beginning of the quarter (month). Richardson *et al*. (2003) use as a deflator the share price at the beginning of the fiscal year, while Easterwood and Nutt (1999) and Cohen and Lys (2003), employ share prices at the time of the forecasts.

16 The share price on the announcement day would be influenced by the earning surprise expectation, while the share price at the beginning of the year may be too removed from the event.

17 It should be noted that previous studies that explore the accuracy of forecasts at an individual analyst level (Clement, 1999, Jacob, Lys and Neale, 1999, and Bolliger, 2001) measure forecast error using the proportional mean absolute forecast error: $PMAFE_{ijt} = DAFE_{ijt} / \overline{AFE}_{jt}$, where $DAFE_{ijt} = AFE_{ijt} - \overline{AFE}_{jt}$; and $AFE_{ijt}$ is the absolute forecast error made by analyst *i* for firm *j* in year *t*, and $\overline{AFE}_{jt}$ is the mean absolute forecast error for firm *j* for year *t*. The aim of the above studies is to explore the impact of individual analyst characteristics only on the accuracy of forecasts. The scope of the current paper, however, is to explore the joint impact of individual analyst and firm-specific characteristics on the accuracy of individual analyst forecasts. Therefore, as explained later in the paper, an analyst-firm fixed effects estimator is used, where we demean the variables by an analyst-firm specific effect.

share price five days prior to the earning announcement date and multiplied by 100. A higher value of dispersion is associated with greater variation among analysts' forecasts and implies larger information asymmetry.

Finally, forecast bias is employed as a third measure of the accuracy of analysts' forecasts. Contrary to the forecast error, bias is defined as the difference between the actual earnings forecast announced by firm *j* in year *t* and the forecast made by analyst *i* for firm *j* in year *t* deflated by the stock price of firm *j* five days prior to the earnings announcement in year *t* multiplied by 100. Although, this measure of forecast accuracy is the sign version of error, it addresses a separate issue regarding the accuracy of forecasts and, therefore, should be viewed as a different dependent variable. In employing error as a dependent variable we are interested in the magnitude of the forecast error (e.g., by how much the forecast error in absolute terms changes if insider ownership changes). However, when the forecast bias is employed, the interest lies in whether analysts are more optimistic or pessimistic.

### *3.2. The testing models*

Due to the high level of correlation between institutional ownership and the number of institutional shareholders, we explore the impact of these variables in two different models. Moreover, Model 1 is evaluated in the presence of firm-specific characteristics only, whereas Model 2 and 3 take into account both firm and analyst-specific characteristics.

Model 1: $AF_{ijt} = b_0 + b_1 INSOW_{jt} + b_2 INSOW_{jt}^2 + b_3 INSTOW_{jt} + b_4 HORIZON_{ijt} + b_5 LNMRKCAP_{jt} + b_6 GROWTH_{jt} + b_7 LOSS_{jt} + b_8 LEVERAGE_{jt} + d_{ijt}$.

Model 2: $AF_{ijt} = b_0 + b_1 INSOW_{jt} + b_2 NRINST_{jt} + b_3 NOREVIEW_{ijt} + b_4 LNMRKCAP_{jt} + b_5 ROASD_{jt} + b_6 EXP_{ijt} + b_7 EFF_{ijt} + b_8 BRKSIZE_{ijt} + d_{ijt}$.

Model 3: $AF_{ijt} = b_0 + b_1 HORIZON_{ijt} + b_2 LNMRKCAP_{jt} + b_3 ROASD_{jt} + b_4 EXP_{ijt} + b_5 TOP10_{ijt} + b_6 NRIND_{ijt} + d_{ijt}$.

There follows below a description of the variables used to address the research question:

***(i) Variables used to evaluate the accuracy of analysts' earnings forecasts***

***$AF_{ijt}$*** – accuracy of individual forecasts made by analyst *i* for firm *j* in year *t* measured as:

***$ERROR_{ijt}$*** = $|A_{jt} - F_{ijt}|/SP_{jt}*100$, where $A_{jt}$ is the actual earning reported by firm *j* in year *t*; $F_{ijt}$ is the earning forecast made by analyst *i* that follows firm *j* in year *t*; and $SP_{jt}$ is the share price of firm *j* for year *t* five days prior to the earning announcement date.

***$DISPERSION_{jt}$*** - dispersion of forecasts, calculated as the standard deviation of individual earnings forecasts divided by share price five days prior to the earning announcement date for firm *j* in year *t*.

***$BIAS_{ijt}$***= $(A_{jt} - F_{ijt})/SP_{jt}*100$, – similar to $FE_{ijt}$, but not in the absolute value. A negative *BIAS* indicates optimism, while a positive *BIAS* indicates pessimism

***(ii) Variables used to evaluate the ownership structure of a firm***

***$INSOW_{jt}$*** - the proportion of shares held by insider members of the board as a proportion of outstanding shares for firm *j* in year *t*.

Following Morck *et al* (1988):

***$INSD1_{jt}$*** - equal to $INSOW_{jt}$ if $INSOW_{jt} < 0.05$; or equal to 0.05 if $INSOW_{jt} = 0.05$.

***$INSD2_{jt}$*** - equal to 0 if $INSOW_{jt} < 0.05$; or equal to $INSOW_{jt}$ minus 0.05 if $0.05 = INSOW_{jt} < 0.25$; or equal to 0.20 if $INSOW_{jt} = 0.25$.

***$INSD3_{jt}$*** - equal to 0 if $INSOW_{jt} < 0.25$; or equal to $INSOW_{jt}$ minus 0.25 if $INSOW_{jt} = 0.25$.

***$INSTOW_{jt}$*** - the proportion of shares held by institutional shareholders with a shareholding greater than three percent of the outstanding shares for firm *j* in year *t*.

***$NRINST_{jt}$*** - the number of institutional shareholders with a shareholding greater than three percent of the outstanding shares for firm *j* in year *t*.

***(iii) Firm-specific control variables***

***$LNMRKCAP_{jt}$*** - the natural logarithm of market capitalization of firm *j* in year *t*.

***$ROASD_{jt}$*** - the standard deviation of the return on assets over the last five years for firm *j* in year *t*.

***$GROWTH_{jt}$*** - a measure of the growth of firm *j* in year *t* ($MRKCAP_{jt}/MRKCAP_{jt-1}$).

***$LOSS_{jt}$*** - a dummy variable that takes a value of unity when a firm's earnings before interest and tax are negative, and zero if it is positive or equal to zero for firm *j* in year *t*.

***$LEVERAGE_{jt}$*** - the proportion of total debts against total assets for firm *j* in year *t*.

***(iv) Analyst-specific control variables***

***$EFF_{ijt}$*** - the effort put in by analyst *i* in following firm *j* in year *t*, calculated as the inverse proportion of the number of firms followed by analyst *i* in year *t*.

***$EXP_{ijt}$*** - years of experience of individual analyst *i* that follow firm *j* in year *t*, based on the assumption that 1990 (the start year in our initial sample) is the year one of experience.

***$BRKSIZE_{ijt}$*** - the number of analysts that work for the brokerage houses that employ analyst *i* that follows firm *j* in year *t*.

***$TOP10_{ijt}$*** - a dummy variable that takes a value of unity if the brokerage house that employ analyst *i* that follows firm *j* in year *t* has a rank higher or equal to 10 according to the Institutional Investor All-Europe Research Team ranking as published in the Institutional Investor Magazine, and zero otherwise.

***$NRIND_{ijt}$*** - the number of industries followed by analyst *i* that produces forecast for firm *j* in year *t*.

***(v) Forecast-specific control variables***

***$HORIZON_{ijt}$*** - the average number of trading days between analyst *i*'s earnings forecasts announcement date and the reported date for firm *j* in year *t*.

***$NOREVIEW_{ijt}$*** - the average number of times the forecasts made by analyst *i* for firm *j* in year *t* is reviewed.

***$d_{ijt}$*** - disturbance term.

### 3.3. An overview of the empirical analysis of the research

The exploration of the research question addressed in this paper requires the estimation of the individual analysts' forecast accuracy variables as functions of the relevant firm and analyst characteristics. The dimensions and complexity of the data employed pose a challenge in evaluating the above association in the context of ordinary least squares (OLS). As discussed in the next section, the sample used in the research is not only comprised of 488 analysts covering over 532 firms during a 6-year period, but each analyst may cover a (possibly time-varying) number of firms in any given year, and each firm may be covered by multiple (and a time-varying number of) analysts in any given year. As a result, the residual terms in a simple pooled regression may not be identically and independently distributed (hereafter *i.i.d.*), and hence the statistical assumptions underlying OLS may be violated.

To address these econometric issues, we adopt the following approach. As a first step, a univariate analysis is performed aimed at comparing the differences in the mean (median) accuracy of forecasts above and below the median of the independent variables.[18] Then, due to the multidimensional variation in the dependent variables employed in the research (i.e., a forecast made by analyst *i* for firm *j* in year *t*) and the specific nature of the research question (i.e., a combined use of analyst and firm-specific characteristics), we use an analyst-firm fixed effects estimator. Finally, following Clement (1999) and Bolliger (2001), we check the robustness of the findings in the context of an individual analyst's forecast sample using pooled and Fama-MacBeth regression estimators. The advantage of the latter approach is two-fold. Firstly, estimating the regression equation on an annual basis addresses the potential serial

[18] A *t*-test is used to explore the differences in the mean accuracy of forecasts, and a Wilcoxon rank-sum test to evaluate the median differences.

correlation problem in the data.[19] Secondly, the time-series pattern of the coefficients may be informative. Given the importance of the analyst-firm fixed effects estimator for the current paper, it may be useful to discuss this estimator in relation to previously employed methods in greater detail.

Specifically, exploring the impact of analyst-specific characteristics (e.g., experience and effort) on individual analysts' forecast errors, Clement (1999) and Bolliger (2001) employ a firm-year fixed effects estimator.[20] They have chosen this approach with the aim of removing the combined firm-year effects on the individual analysts' forecast errors. This would allow a more accurate evaluation of the impact of analyst-specific characteristics on the dependent variables. In practical terms this means that the independent variables in the model are de-meaned by the firm-year average value, and then the de-meaned values are employed in the OLS context (see Greene, 1997).[21]

However, a distinctive characteristic of the research question addressed in this paper is that unlike Clement (1999) and Bolliger (2001), who evaluate the impact of analyst-specific characteristics only on the forecast error of individual analysts, we explore the impact of both firm *and* analyst-specific characteristics on the accuracy of individual analysts' forecasts. The nature of our research question sets a challenge to Clement's (1999) and Bolliger's (2001) method of analysing the data. As we are interested in the impact of both firm and analysts-specific characteristics on the accuracy of forecasts, de-meaning the independent variables by the

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19 See, for instance, Wu (2000) and Markov and Tamayo (2003).

20 Clement (1999) shows that the firm-year effects estimator is more effective than separate firm and year effects.

21 Let us assume a reduced form of Clement's (1999) and Bolliger's (2001) model: $ERROR_{ijt}=f(EXP_{ijt},EFF_{ijt})$ (see Table A for description). In a firm-year fixed effects estimator the following transformations would be required: $ERROR_{ijt}=f(EXP^*_{ijt}, EFF^*_{ijt})$, where $EXP^*_{ijt}= EXP_{ijt} - \overline{EXP}_{jt}$, $EFF^*_{ijt}= EFF_{ijt} - \overline{EFF}_{jt}$, $\overline{EXP}_{jt}$ and $\overline{EFF}_{jt}$ are the average experience and efforts of analysts following firm $j$ in year $t$.

firm-year values would remove the impact of firm-specific variables.[22] Therefore, a combined analyst-firm fixed effects estimator is used. The variables, in this case, are adjusted, respectively, by analyst-firm specific means (i.e., the average ownership for firm *j* that analyst *i* follows over t number of years).[23] The latter approach offers several benefits compared to using the average (median) forecasts sample: (i) it offers the opportunity to test the hypotheses on a large sample of forecasts; (ii) it allows use of individual analysts' characteristics without averaging across individuals; (iii) it explores the determinants of the accuracy of forecasts across individual analysts in the presence of both firm and analyst-specific characteristics; and (iv) it avoids use of potentially inappropriate econometric techniques. Indeed, by performing the analysis on individual analysts' forecasts we have the chance to account for factors that would otherwise not be unaccounted for.[24]

## 4. Sample Data

The initial sample of one year ahead individual analysts' earnings forecasts is drawn from the *I/B/E/S UK Detailed File*. It consists of 263,350 earnings forecasts made from January 1990 through December 2002. Despite its overall quality, the *I/B/E/S* database does contain a number of omissions and inconsistencies. Therefore, to proceed further, we eliminate observations with

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22 Assume the following model: $ERROR_{ijt}=f(INSOW_{jt}, SIZE_{jt}, EXP_{ijt}, EFF_{ijt})$. In a firm-year fixed effects context the model takes the following form: $ERROR_{ijt}=f(INSOW^*_{jt}, SIZE^*_{jt}, EXP^*_{ijt}, EFF^*_{ijt})$, where $INSOW^*_{jt}= INSOW_{jt} - \overline{INSOW_{jt}}$, $SIZE^*_{jt}= SIZE_{jt} - \overline{SIZE_{jt}}$, $EXP^*_{ijt}= EXP_{ijt} - \overline{EXP_{jt}}$, $EFF^*_{ijt}= EFF_{ijt} - \overline{EFF_{jt}}$. However, $INSOW^*_{jt}$ and $SIZE^*_{jt}$ are equal to zero (i.e., $INSOW_{jt}=\overline{INSOW_{jt}}$). Therefore, Clement and Bolliger's methodological approach would not be appropriate for the purpose of this research.

23 The analyst-firm fixed effects estimator would take the following form: $ERROR_{ijt}=f(INSOW'_{jt}, SIZE'_{jt}, EXP'_{ijt}, EFF'_{ijt})$, where $INSOW_{jt}= INSOW_{jt} - \overline{INSOW_{ij}}$, $SIZE'_{jt}= SIZE_{jt} - \overline{SIZE_{ij}}$, $EXP'_{ijt}= EXP_{ijt} - \overline{EXP_{ij}}$, $EFF'_{ijt}= EFF_{ijt} - \overline{EFF_{ij}}$. In addition, in order to address the potential autocorrelation and heteroskedasticity problems that may be inherent in the nature of the data used in these types of research (see Cohen and Lys, 2003), all the estimators are run in the robust mode, where the *t(z)*-values are calculated using the White-estimator of variance (White, 1980).

24 For instance, $TOP10_{ijt}$ is a dummy variable that takes a value of 1 if the brokerage house employing the analyst belongs to high status brokerage houses, or zero otherwise. The mean value of this dummy variable across analysts that follow a particular firm (as in the case of using mean/median forecasts sample) would not make sense. This can be accounted for only in the context of the individual analyst forecast sample.

an unidentified analyst code, missing reported dates and actual earning per share values (see details in Table 1, Panel A). Previous evidence suggests that the information environment of a firm is richer closer to the announcement date of annual earnings and that the most recent forecasts are the most accurate ones.[25] For these reasons, forecasts very near the end of the forecasting period are attractive measures for assessing differences in the accuracy of forecasts across firms. After selecting the most recent forecasts made by a particular analyst for a particular firm, the size of the sample is reduced to 59,410 forecasts (Table 1, Panel B).[26]

The firm-specific financial information was mainly collected from Datastream and supplemented with information from Annual Reports. From the total of 59,410 individual analysts' forecasts, the match in DataStream was found for 78.8 % of observations (Table 1, Panel B). In addition, the Annual Reports for the early years of the analysis (1990-1995) could not be retrieved. For all these reasons, the sample is reduced to earnings forecasts made during 1996 to 2001.[27] Financial companies were also excluded from the sample because they are subject to externally imposed scrutiny from organisations such as the Financial Security Agency. Finally, after eliminating the outliers, the dataset contains 27,350 individual analysts' forecasts.[28] It should be noted that we do not impose any restrictions on the financial year ends of the firms included in the sample.[29]

25 See, O'Brien (1988), Easterwood and Nutt (1999), Clement (1999), and Richardson *et al*. (2003).

26 Although we restrict our sample to the most recent forecasts, we take into consideration the total number of forecasts by using the number of reviews of a particular forecast as a control variable.

27 There were only 8 firms that had at least two forecasts made during all 13 years of the research (1990-2002). In addition, the number of forecasts available for 2002 was small.

28 Following Ali, Klein and Rosenfeld (1992), Easterwood and Nutt (1999), and Thomas (2002) observations that have a forecast error greater than the associated share price are treated as outliers. In addition, observations with a dispersion of forecasts greater than twenty percent were also eliminated from the sample (Thomas, 2002). There are 45 forecast error-related outliers and 99 dispersion-related outliers.

29 For instance, O'Brien (1988) with the purpose of ensuring that all the analysts have access to the same macroeconomic information at the time of forecast, require that all the firms included in the sample should have the same financial year ends. However, other studies (e.g., Ali, Klein and Rosenfeld, 1992, and Thomas, 2002) use a panel of firms with different fiscal year ends. 44.3 percent of the observations in our sample have their financial year ends in December, 22.1 percent in March, with the others scattered during the year. To avoid a drastic reduction in the size of the sample in case the December year ends firms are used only, we check the robustness of the results based on the later sample.

However, we check the robustness of the results based on the sample of firms with December financial year ends.[30]

In addition, due to the specific nature of the analyst-firm fixed effects estimator, it is required that each analyst in the sample should follow a firm for at least three years. This requirement is imposed for two main reasons. First, to exclude the forecasts made by non-active analysts. And second, to allow the calculation of meaningful analyst-firm means for analyst and firm-specific variables.[31]

Despite the problems of attrition (which are not unique to this study), the sample of data that we construct has several distinct advantages. First, to the best of our knowledge, this is a novel dataset that combines both firm and analyst-specific characteristics. Second, notwithstanding, the size of the used dataset is large being comprised of 11,659 forecasts made for 532 firms by 488 analysts. And finally, the three dimensional variation of the dependent variables (i.e., analyst, firm and time) gives us the opportunity to use more appropriate econometric techniques. However, the rigorous selection criteria used to shape the sample and the elimination of forecast data due to missing values in the initial dataset, does create the potential for selection bias. Using Verbeek and Nijman's (1992) methodology, however, the existence of a selection bias problem is rejected.[32]

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30 See Panel A-C of Table 7, column 6 and 7, where Model 1 is also tested on a sample of firms with financial year ending in December.

31 See, for instance, Himmerberg, Hubbard and Palia (1999) who require three years of available observations per firm when exploring the association between ownership structure and firm value in a panel data context.

32 Following Verbeek and Nijman (1992), we create a dummy variable $r_{ijt}$ that denotes whether or not observations for $y_{ijt}$ are available. In other words, $r_{ijt}$=1 if $y_{ijt}$ is observed, and $r_{ijt}$ =0 otherwise. Based on the idea of a combined analyst-firm fixed effects, $T_{ij}$ is calculated as the total number of periods $ij$ is observed, where $T_{ij}=\sum_{s=1}^{T} r_{ijs}$ . Because the condition of consistency is that the error term should not depend on $r_{ijt}$, $E[\tilde{e}_{ijt} \mid r_{ij}]=0$, where $i=1\ldots N$, $j=1\ldots M$ and $t=1\ldots T$, where $\tilde{e}_{ijt}$ are the residual values. In order to check for selection bias Verbeek and Nijman (1992) suggest to include $T_{ij}$ in the model to check their significance. The results of this study (available upon request) indicate that the models do not suffer from selection bias.

## 5. Empirical Results

### *5.1. Descriptive statistics*

As can be seen from Panel B of Table 1, the number of observations does not change significantly across years, manifesting no particular trend (Table 2).[33] On average, there are 1,943 individual (or 413 firm-year) forecasts per year, while the mean number of forecasts per industry is 40.66, and the firms included in the sample belong to 49 industries.[34]

The mean (median) market capitalisation of firms included in the sample is £4.81 billion (£978 million), with a maximum of £172 billion and a minimum of £2.79 million. The average firm in the sample has 24.5 pence worth of total debts per pound of total assets, and a growth rate of 10.4 percent over 1996 to 2002. On average, inside shareholders hold 3.1% of outstanding shares, whereas institutional shareholding is 24.3%. There are, on average, 3.54 institutional shareholders per firm and the mean ownership per institutional shareholder is 7%.

In general, as shown in Table 3, UK analysts appear to be reasonably accurate at forecasting short-term earnings. The median difference between actual and estimated earnings per share is 1.50 pence, with a corresponding standardised median absolute forecast error of 0.467% of the share price five days prior to the earning announcement. The median dispersion of individual analysts' forecasts is 0.400%. Consistent with Abarbanell and Lehavy (2003), our results suggest

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33 In the initial sample, however, that consisted of forecasts made during 1990 to 2002, the number of observations in each consecutive year increases reflecting the expanding nature of *I/B/E/S* coverage.

34 The most representative industry in the sample is the retail trade (11.6 percent) followed by the manufacture of food products (6.4 percent).

that analysts' forecast biases have a negative-skew distribution (i.e., the mean forecast bias is equal to -0.321% compared to 0.044% for the median forecast bias).

The average analyst in the sample has 4.42 years of experience, putting in an effort of 0.086 units, which corresponds to an analyst following an average of 11.63 firms per year (1/0.086=11.63 firms).[35] In addition, on average, analysts review a forecast 2.82 times, the maximum number of times a particular forecast is reviewed by an individual analyst is 19. The average age of a forecast in the sample is 152 trading days. As argued previously, timing is an important factor that influences the accuracy of analysts' forecasts. Therefore, next we discuss the time-related nature of the three measures of forecast accuracy considered in the paper.

### *5.2. Time profile and the accuracy of analysts' forecasts*

As expected, the results presented in Table 4 (Panel A) suggest that the accuracy of analysts' forecasts improves during the year. For instance, the mean error of forecasts with a horizon of more than 240 days is 1.6 times larger compared to the mean error for forecasts made with a horizon of less than 30 days (2.393% compared to 1.485%).[36] However, the dispersion of individual forecasts does not show any evidence of improvement during the year. Rather, it seems that shorter-horizon forecasts are more dispersed compared to earlier forecasts. In the case of bias, the results suggest that the levels of UK financial analysts optimism decreases over the year.

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35 Analyst effort is measured as the inverse of the number of firms followed by analyst *i* for firm *j* in year *t* (Table A). To the best of our knowledge, this measure of analyst effort has not been employed in any previous studies.

36 It should be mentioned, however, that as based on our sample, the increase in the mean forecast error is not systematic over the forecasting horizon. For instance, the mean forecast errors made at the 30, 60 and 180 day horizons are very similar (i.e., 1.485, 1.474 and 1.480, respectively), whereas at the horizons older than 240 day the mean forecast error is higher (i.e., 2.393 percent). Therefore, on average, the forecast error is greater for earlier forecasts, but this effect is more pronounced beyond the 240 day horizon.

Interesting evidence is found when analysing the dynamics of the accuracy of earnings forecasts across the explored years (see Table 4, Panel B). Specifically, the results suggest that the error and dispersion of UK analysts' forecasts increased over the time span of the study. For instance, the median forecast error (dispersion) increases from 0.486 (0.316)% in 1996 to 0.675 (0.576)% in 2001.[37] However, the reduction in the accuracy of analysts' forecasts is not systematic across the years. From 1996 to 1998, both forecast error and dispersion have decreased. By contrast, from 1998 onwards, both measures of the accuracy of forecasts have increased. This evidence may be explained by the sharp decline in stock markets at the end of 1999 and the fact that it is more difficult for analysts to produce accurate forecasts during periods of economic regime change (Richardson *et al.*, 2003).

In the case of forecast bias, the results suggest that UK financial analysts are pessimistic for the first five years of the analysis. However, in 2001 this tendency is suddenly reversed with analysts becoming optimistic in producing earnings forecasts. Indeed, as shown in Figure 1, the proportion of pessimistic forecasts dominates the proportion of optimistic forecasts, except in year 2001. With the onset of the recession in 2001, the proportion of pessimistic/optimistic forecasts appears to change. From an average ratio of 54.52/43.28 percent (pessimistic over optimistic forecasts) during 1996-2000, the proportion has changed to 43.5/56.1 in 2001. It seems that analysts underestimate earnings in the boom years, and overestimate earnings in the recession period (Richardson *et al.*, 2003).

Under closer inspection of the magnitude of the median forecast error (Figure 2), it is evident that optimistic forecasts suffer from higher forecast error. For instance, on average (across the six

[37] An analysis based on a percentile-basis suggests the same conclusion.

years of the sample period), the median forecast error of the optimistic forecasts is 2.2 times larger compared to the median error of pessimistic forecasts, the difference being statistically significant at the one percent level. Moreover, not only do the optimistic forecasts have a higher median forecast error, they are also more dispersed. A possible explanation for the lower accuracy of more optimistic forecasts may be based on the detrimental effect of bad news.[38] A pessimistic forecast may jeopardise the analysts' relationship with the management of the firm that they follow. Therefore, in producing pessimistic forecasts, analysts may be careful not to go "too far" with the "bad news". At the same time they may be "more generous" in presenting "good news" in order to cultivate a better relationship with the management.[39] A greater level of generosity in presenting optimistic forecasts, however, may be constrained by analysts' career-related concerns and the external employment market (see, for instance, Jacob *et al.*, 2000).

### *5.3. Univariate analysis*

The evidence presented in Table 5 suggests that firms with higher insider ownership have lower forecast error, dispersion and bias (i.e., more optimistic forecasts).[40] Moreover, analysts' forecast error and dispersion decrease with an increase in institutional ownership. However, as based on the median analysis, analysts seem to produce less optimistic forecasts for firms with higher institutional ownership. In addition, a greater number of institutional shareholders seem to be associated with higher forecast error, dispersion and bias (i.e., less optimism).

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38 See Kothari *et al*. (2003), and Brown (2001).

39 It may be argued that managers may be more satisfied with lower earnings forecasts, because in this way it may be easier for them to beat the forecasts. However, lower earnings forecasts may have a negative influence on investors' opinion about the future prospects of the firm. Therefore, it may be that, with the aim of satisfying managers and investors, analysts overestimate the optimistic forecasts at some optimal level.

40 A firm is considered to have a high (low) insider ownership if the proportion of insider ownership for this particular firm is above (below) the median insider ownership of the sample.

*5.4. Multivariate analysis*

*Insider ownership and the accuracy of analysts' forecasts*

Panels A-C of Table 7 present the results of testing Model 1 in the context of OLS analysis using the median forecasts produced by analysts that follow firm *j* in year *t*.[41] Specifically, column 1 of each panel in Table 7 exhibit the results of exploring the association between insider ownership and the accuracy of analysts' forecasts is the context of Jensen and Meckling's (1976) convergence of interest hypothesis (i.e., a strictly negative linear association). Then, in columns 2-4, the association is tested using Morck, Shleifer and Vishny's (1988) suggestion of a linear piecewise relationship. In column 5, we investigate whether the relationship between insider ownership and accuracy of analysts' forecasts has a quadratic form (Stulz, 1988). Finally, in columns 6 and 7 of each panel of Table 7, Jensen and Meckling's (1976) convergence of interest hypothesis and Stulz's (1988) entrenchment hypothesis are tested using December yearends firms only.

In addition, as discussed in section 3.3, due to the specific nature of our sample and research question, we test our hypotheses using the individual analysts' forecasts sample and employing more advanced econometric techniques. Specifically, in Tables 8-10, we test Models 1-3 using

[41] As discussed in section 3.3, we employ an OLS analysis because by separating the sample into different deciles (*INSD1*, *INSD2*, and *INSD3*), the restriction of 3 forecasts made by an analyst *i* for firm *j*, required for an analyst-fixed effects estimator, is not met. Moreover, due to the nature of the individual analyst forecasts sample, the residual term in an OLS analysis may not be *i.i.d*. Therefore, as an initial step, for the purpose of testing Model 1, in the context of OLS analysis, the forecast error for each firm is calculated using the median value of forecasts produced by analysts that follow firm *j* in year *t*. Specifically, the forecast error will be calculated as the difference between actual earnings reported by firm *j* in year *t* and median value of forecasts made by analysts that follow firm *j* in year *t*, standardised by the share price of firm *j* in year *t* five days prior to the earning announcement date multiplied by the 100.

an analyst-firm fixed effects, pooled and Fama-MacBeth estimators, respectively for forecast error, dispersion and bias.[42]

The results in Table 7, Panel A and B (column 1) imply that, as based on the linear specification model in its simplest form, a one unit increase in insider ownership, *ceteris paribus*, is associated with a 2.75 (0.796) percent lower forecast error (dispersion). This evidence offers support for the convergence of interest hypothesis. It seems that at a low level of insider ownership, the conflict between the principal and the agent is greater and, thus, results in a greater agency disclosure problem, and subsequently higher forecast error and dispersion. However, with an increase in insider ownership, the accuracy of analysts' forecasts tends to improve in a linear fashion.[43]

The results presented in Table 7, Panel A and B (columns 2-4) test Morck *et al.*'s (1988) suggestion of a non-monotonic linear relationship.[44] The evidence suggests a steady negative association between forecast error, dispersion and insider ownership across all the deciles. Hence, the results do not provide support for Morck *et al.*'s (1988) non-monotonic linear argument, but do provide evidence consistent with Jensen and Meckling's convergence of interest hypothesis. The forecast bias seems to be insignificantly associated with insider ownership across all the deciles, including the strict negative association (Table 7, Panel C).

Stulz's argument that the relationship takes a quadratic functional form is tested next. The OLS results suggest that the insider ownership squared term is found to be insignificantly associated

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42 See a detailed discussion about the employed estimators in section 3.3.

43 These results support the findings presented by Nagar, Nanda and Wysocki (2002) and Warfield, Wild and Wild (1995) that there is a positive association between managerial ownership and a firm's level of disclosure and price informativeness of earnings. However, both authors do not check for a potential non-linear association.

44 In practical terms we impose the linear relationship assumption via the creation of the insider ownership dummy variables. Following Morck *et al.* (1988), we create these dummy variables on a summation basis. For instance, if the insider ownership of a firm is 0.43, then *INSD1*=0.05, *INSD2*=0.20 and *INSD3*=0.18.

with forecast error. However, in the context of the December year ends sample, the squared term is significantly associated with forecast error (Table 7, column 7). The quadratic specification using the December year ends sample presents particular support for the convergence of interest and the entrenchment hypotheses at different levels of insider ownership. In terms of dispersion and forecast bias, however, the insider ownership squared term is found to be insignificant (Tables 7, Panel B and C).

The above analysis, however, has been performed in an OLS context. However, as argued in section 3, because of the three dimensional variation of the dependent variable (forecasts made by analyst *i* for firm *j* in year *t*), the OLS regressions may be misspecified. Therefore, more appropriate techniques are employed to explore this issue, that is, the analyst-firm fixed effects estimator using the individual analysts' forecasts sample.

As can be seen from Table 8, in this case, a 1% increase in insider ownership, *ceteris paribus*, reduces forecast error by 11.45%, the result being significant at the one percent level. The minimum forecast error is reached at 18 % of insider ownership.[45] Further percent increases in insider ownership above this point, *ceteris paribus*, result in a 14.73 % increase in forecast error. The results are robust across the pooled and Fama-MacBeth regressions estimators. The reported non-linear relationship between forecast error and insider ownership suggests that managers respond to two opposing forces at different levels of insider ownership (i.e., the convergence of interest and entrenchment hypotheses). Therefore, the effectiveness of insider ownership, as a governance tool, depends on which force dominates over a particular range of insider ownership. At a lower level of insider ownership, any marginal increase in insider ownership results in a

[45] The inflection point is the percentage of equity at which the value of forecast error reaches its minimum in the estimated regression. The minimum point is calculated based on the assumption that the first derivative of the model is equal to zero and the second derivative is positive.

lower forecast error. However, upon reaching a certain point of ownership, marginal insider ownership increases lead to increases in the forecast error.

The lower trading opportunities hypothesis provides another possible explanation for the above reported positive association, after a certain level of insider ownership, between forecast error and insider ownership. It may be that at high levels of insider ownership, the liquidity of stocks is lower, thus resulting in lower trading opportunities (Bhushan, 1989).[46] Facing this problem, analysts may put less effort into following a high insider ownership firm, thus resulting in higher forecast error. Indeed, the correlation results (Table 6) indicate that the amount of effort spent by an analyst in following a firm is negatively associated with insider ownership. The expected rewards for higher insider firms seem to be lower than the required effort.[47]

Weaker results are found for the association between insider ownership and dispersion (Table 9). A unit increase in insider ownership at a lower level of ownership, *ceteris paribus*, is found to decrease dispersion by 1.771 percent. Yet, although positively associated with dispersion, the squared term of insider ownership is insignificantly associated with dispersion. The results are robust across the pooled and Fama-MacBeth estimators. Also, interesting results are found for the association between forecast bias and insider ownership (Table 10). Analysts' optimism seems to decrease with an increase in insider ownership at lower levels of ownership, but their optimism increases after a certain point of insider ownership. In particular, at low levels of insider ownership, a unit increase in insider ownership, *ceteris paribus*, increases forecast bias (i.e., lower optimism) by 9.452%. However, beyond 16% of insider ownership, a further one percent increase in insider ownership, *ceteris paribus*, results in 12.535% lower forecast bias

[46] Managers may not sell their holding as often as other groups of shareholders might do, this resulting in lower liquidity of stocks (Bhushan, 1989).

[47] Stulz (1988), McConnell and Servaes (1990, 1995), Shleifer and Vishny (1997) and Fan and Wong (2002), amongst others, report a quadratic relationship between insider ownership and shareholders' value.

(i.e., higher optimism). The results, however, are not robust in the context of the Fama-MacBeth regressions estimator.

The current evidence, thus, rejects the $H_0^1$ null hypothesis of no relationship between insider ownership and the accuracy of analysts' forecasts. By contrast, the results suggest that at a lower level of insider ownership, the information environment of a firm may be richer (i.e., more accurate forecasts). However, as a result of the greater agency disclosure problem, with an increase in insider ownership the accuracy of forecasts reduces and analysts become more optimistic. These results, however, should be intercepted with caution as they are not robust across all the estimators.

Thus, consistent with the information asymmetry and agency theories, our findings support the view that a manager's natural tendency is to allocate the resources of a firm in their own best interest. However, this interest conflicts with the interests of outside shareholders. As management's equity ownership increases, the interests of management and outsiders are likely to coincide more closely (i.e., the convergence of interest hypothesis). However, this beneficial effect is only temporal. At a high level of insider ownership, managers have more voting and control power and they become entrenched in their position (i.e., the entrenchment hypothesis). At high levels of managerial ownership, it may not be in the managers' best interest to provide additional disclosure to outsiders (i.e., "the hide away" strategy). By disclosing more information, managers enhance the ability of capital and labour markets to effectively monitor and discipline them (Shleifer and Vishny, 1997). At high levels of ownership, managers choose to disclose less information to outsiders - a fact that results in higher forecast error and a greater level of optimism. As argued by Shleifer and Vishny (1997), at high levels of insider ownership, the agent-principal problem shifts to a conflict between controlling owners and minority stockholders. Controlling owners, in these circumstances, may use the resources of the firm to generate private benefits that are not shared by the minority shareholders. Thus, the evidence suggests that insider ownership can be used as an effective instrument at reducing the agency disclosure problem, but within certain limits only.

*Institutional ownership and the accuracy of analysts' forecasts*

Contrary to the expectation based on the efficient-monitoring hypothesis, our results suggest that both forecast error and dispersion increases with a rise in institutional ownership. In particular, a one unit increase in institutional ownership, *ceteris paribus*, increases the forecast error (dispersion) by 0.84 (0.681) percent (Table 8 and 9). The results reject the $H_0^2$ null hypothesis of no relationship between institutional ownership and the accuracy of analysts' forecasts. By contrast, it is suggested that institutional investors are not sufficiently effective at mitigating the agency disclosure problem and that an increase in institutional ownership is associated with less accurate analysts' forecasts. This evidence supports Goergen and Renneboog's (1999) argument that most UK institutional investors have a low-cost strategy and consequently do not employ the resources to actively monitor the large number of companies in their portfolios. In order to remain cost-efficient, institutional investors may prefer to divest from lower information environment firms rather than to engage in active monitoring that may result in increased disclosure. These findings present indirect support for Plender's (1997) claim that UK institutional investors do not frequently exercise their voting rights, giving more space for managers' non-value maximising behaviour. Furthermore, in line with the conflict-of-interest and strategic-alignment hypotheses, it may be that because of other conflicting interests, institutional investors and managers find it mutually advantageous to cooperate.

The observed association between institutional ownership and forecast bias is also interesting. A one unit increase in institutional ownership, *ceteris paribus*, decreases forecast bias by 1.143 percent (i.e., greater optimism), the result being significant at the one percent level. However, the association is not robust to the use of the pooled and Fama-MacBeth regressions estimators. The (weak) evidence of greater optimism for firms with a higher institutional ownership supports Allen *et al.*, 's (2000) suggestion that market participants view institutional investors as being more sophisticated and more efficient compared to ordinary shareholders. Institutional investors have greater abilities and possibilities to collect and analyse information. They work hard to buy stocks that are undervalued and offer good prospects; they employ analysts, researchers and other specialists to get the best information about the companies. Therefore, high institutional ownership may signal strong fundamentals (i.e., greater optimism) because institutional investors make their living from buying and selling stocks. However, this may also be the effect of greater optimism for low information environment firms (Scherbina, 2004).

Thus, it does appear that although UK analysts seem to be more optimistic about higher institutional ownership firms, the institutional shareholders appear to be inefficient at mitigating the agency disclosure problem for the firm in which they hold shares. Moreover, they actually seem to act to the detriment of shareholders' interests, associating their interests with the insiders of the firms at reducing the amount of information disclosed to outsiders.

*Number of institutional shareholders and the accuracy of analysts' forecasts*

Previous evidence suggests that, due to the fact that an in-house institutional analysis is not a substitute for analysts' services, an increase in the number of institutional shareholders is associated with a higher demand for analysts' services (Bhushan, 1989). At the same time, taking into account the role of the analysts in the financial markets, it is expected that with an increase in the number of analysts following a firm, the information environment of a firm becomes richer (Frankel, *et al.* 2002, and Chen and Cheng, 2002). However, the results of this study do not support the above arguments. All the measures of analysts' forecast accuracy are insignificantly associated with the number of institutional shareholders (Model 2, Table 8, 9, and 10). Moreover, these results do not support Donnelly and Lynch's (2002) finding that more diffused institutional shareholding is associated with less efficient institutional monitoring (i.e., less disclosure and, thus, less accurate forecasts). In short, the evidence suggests that the number of institutional investors simply does not have any significant impact on the accuracy of analysts' forecasts.[48]

## 6. Summary and Conclusions

This paper explores the impact of the ownership structure of a firm on the accuracy of individual analysts' forecasts. Using an analyst-firm fixed effects estimator and an individual analysts' forecasts sample, there is evidence of a U-shaped relationship between insider ownership and forecast error.[49] At lower levels of insider ownership (up to 18 percent), the forecast error decreases. However, for ownership levels above this point, increased insider ownership is associated with higher forecast error. By contrast, an inverted U-shaped relationship is found between insider ownership and individual analysts' forecast bias. The results suggest that analysts are less optimistic for firms with a lower level of insider ownership (up to 16 percent), but a further increase in insider ownership is associated with more optimistic forecasts. It seems that, as suggested by the information asymmetry and agency theories, as management's equity ownership increases, the interest of management and outsiders are likely to coincide more

48 A detailed explanation of the estimated coefficients of the control variables is available upon request.

49 A series of sensitivity tests have been performed. We explore whether the size and profitability of a firm has an impact on the associations explored in this paper. The results, however, suggest that these associations do not vary across firms with different deciles of size nor performance (i.e., extremely poor, good or moderate performance).

closely (i.e., the convergence of interest hypothesis). However, this beneficial effect is only temporal, as with an increase in insider ownership, their voting and control power increases and they become entrenched in their position (i.e., the management entrenchment hypothesis). Due to the greater uncertainty associated with greater secrecy, analysts are more optimistic in producing earnings forecasts for high insider ownership firms (Scherbina, 2004).

Institutional shareholders seem to be ineffective at mitigating the agency disclosure problem. By contrast, the evidence suggests that there may be a tendency for institutional investors to align their interest with managers' opportunistic behaviour regarding the disclosure of as little information as possible about the activity of the firm. In addition, the results suggest that the number of institutional shareholders appears not to affect the accuracy of individual analysts' forecasts. It may be that with an increase in the diffusion of institutional investors, they find it cost ineffective to monitor the management of the firms. Alternatively, it is possible that institutional investors find it difficult to unify in order to be more effective at monitoring the management.

Thus, overall the evidence presented in this paper suggests that the accuracy of UK analysts' one year ahead forecasts is influenced by the ownership structure of the firm. In particular, as our evidence suggests, insider ownership may serve as an efficient governance mechanism at mitigating the agency disclosure problem, but within certain limits. However, contrary to the efficient-monitoring hypothesis, institutional ownership appears to be an inefficient mechanism at addressing the agency disclosure problem.

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## Table 1. Sample selection.

*Panel A.* We start with a total of 263,350 one-year ahead earning forecasts available in the *I/B/E/S UK Detailed File* made by the financial analysts during the 1990-2002 period. The observations that have missing *I/B/E/S*-specific characteristics, such as reported date, analyst code and actual earning per share, are eliminated from the sample. After eliminating the forecasts with all this missing information, the sample is comprised of 151,212 individual forecasts, but which also include the revised forecasts. For instance, if analyst *i* follows firm *j* in year *t* and the forecast has been reviewed five times since it has been initially made to the announcement date, then all five forecasts would be included in the sample.

| | Individual forecasts | Firm-year forecasts | Firms | Brokerage houses | Analysts |
|---|---|---|---|---|---|
| 1990-2002 UK EPS forecasts | 263,350 | 14,634 | 1,869 | 179 | 1,813 |
| After eliminating observations with missing | | | | | |
| Reported date | 207,770 | 11,703 | 1,773 | 160 | 1,730 |
| Analyst code | 161,982 | 10,532 | 1,704 | 138 | 1,729 |
| Actual EPS | 155,346 | 8,936 | 1,596 | 130 | 1,718 |
| Different year-firm actual EPS value | 151,212 | 8,775 | 1,585 | 128 | 1,713 |

*Panel B.* For the purpose of this paper, from the 151,212 forecasts we select the most recent forecasts made by analyst *i* for firm *j* in year *t*. This yields a sample of 59,410 individual forecasts. Then we eliminate forecasts made for firms not available in Datastream, financial firms and forecasts made during 1990-1995&2002. Due to the specific nature of the employed methodology to explore the individual analysts forecasts, we require that forecasts included in the sample should be made by analysts that follow a particular firm for at least three years. This requirement yields a sample of 11,659 individual analyst forecasts.

| | Individual forecasts | Firm-year forecasts | Firms | Brokerage houses | Analysts |
|---|---|---|---|---|---|
| The most recent forecasts | 59,410 | 8,775 | 1,585 | 128 | 1,713 |
| Available in DataStream | 46,838 | 5,456 | 1,072 | 102 | 1,646 |
| Financial firms and 1990-1995&2002 | 27,580 | 3,183 | 844 | 84 | 1,299 |
| Annual Reports found | 27,494 | 3,151 | 840 | 84 | 1,299 |
| Outliers | 27,350 | 3,109 | 834 | 84 | 1,297 |
| Analyst *i* follows firm *j* at least for 3 years | 11,659 | 2,480 | 532 | 53 | 488 |

## Table 2. Sample composition over time and industries.

The sample used in the study is comprised of 11,659 individual analysts' forecasts made for an average of 413 firms per year that on average belong to 48 industries.

| Year | Individual forecasts | Firm-year | Industries | Number of individual forecasts per industry | |
|---|---|---|---|---|---|
| | | | | Mean | Median |
| 1996 | 1,346 | 345 | 46 | 29.26 | 21.00 |
| 1997 | 1,976 | 414 | 48 | 41.13 | 28.50 |
| 1998 | 2,499 | 475 | 47 | 53.17 | 37.00 |
| 1999 | 2,412 | 461 | 49 | 49.22 | 35.00 |
| 2000 | 1,999 | 427 | 49 | 40.80 | 32.00 |
| 2001 | 1,429 | 358 | 47 | 30.40 | 22.00 |
| Average | 1,943 | 413 | 48 | 40.66 | 29.25 |
| Total | 11,659 | 2,480 | 49 | | |

## Table 3. Descriptive statistics.

This table exhibits the descriptive statistics for variables used in the study. ERRORP is the absolute difference between the actual earning per share and individual earning forecasts made by analyst *i* for firm *j* in year *t* in pence. See the description of the remaining variables in Table A (N=11,659).

| Variables | Min | Max | Mean | Median | St. Dev. |
|---|---|---|---|---|---|
| Panel A: Analysts' related characteristics | | | | | |
| ERRORP, pence | 0.000 | 188.600 | 5.277 | 1.500 | 11.260 |
| ERROR, % | 0.000 | 89.760 | 1.736 | 0.467 | 5.333 |
| DISPERSION, % | 0.000 | 18.980 | 0.919 | 0.400 | 1.818 |
| BIAS, % | -89.760 | 57.110 | -0.321 | 0.044 | 5.599 |
| HORIZON | 6.00 | 249.000 | 152.00 | 144.00 | 102.726 |
| NOREVIEW | 1.000 | 19.000 | 2.820 | 2.000 | 1.785 |
| EXP | 1.000 | 11.000 | 4.420 | 4.000 | 2.145 |
| EFF | 0.010 | 1.000 | 0.086 | 0.043 | 0.141 |
| BRKSIZE | 1.000 | 79.000 | 30.030 | 28.000 | 18.402 |
| TOP10 | 0.000 | 1.000 | 0.364 | 0.001 | 0.481 |
| NRIND | 1.000 | 8.000 | 3.150 | 2.000 | 1.862 |
| Panel B: General firm-specific characteristics | | | | | |
| MRKCAP, (£M) | 2,798 | 172,248 | 4,813 | 978 | 13,701 |
| ROASD | 0.000 | 0.960 | 0.044 | 0.028 | 0.051 |
| GROWTH | 0.000 | 31.620 | 1.104 | 1.035 | 0.739 |
| LOSS | 0.000 | 1.000 | 0.051 | 0.000 | 0.220 |
| LEVERAGE | 0.000 | 1.830 | 0.245 | 0.225 | 0.172 |
| Panel C: Ownership-specific characteristics | | | | | |
| INSDOWN | 0.000 | 0.739 | 0.031 | 0.001 | 0.084 |
| INSTOWN | 0.000 | 0.883 | 0.243 | 0.218 | 0.172 |
| NRINST | 0.000 | 14.000 | 3.540 | 3.000 | 2.326 |

**Table 4. The differences in the accuracy of individual analysts' forecasts across horizons and years.**

*Panel A.*

| Horizon | No forecasts | ERROR | | DISPERSION | | BIAS | |
|---|---|---|---|---|---|---|---|
| | | Mean | Median | Mean | Median | Mean | Median |
| 30 | 1,270 | 1.485 | 0.425 | 1.089 | 0.445 | -0.331 | 0.000 |
| 60 | 1,433 | 1.474 | 0.403 | 0.971 | 0.409 | 0.005 | 0.057 |
| 120 | 2,383 | 1.835 | 0.431 | 0.906 | 0.413 | 0.236 | 0.082 |
| 180 | 2,400 | 1.480 | 0.411 | 0.813 | 0.356 | -0.196 | 0.076 |
| 240 | 1,892 | 1.511 | 0.440 | 0.829 | 0.362 | -0.372 | 0.038 |
| Older than 240 | 2,281 | 2.393 | 0.683 | 0.992 | 0.423 | -1.191 | -0.056 |
| Average | 11,659 | 1.696 | 0.465 | 0.933 | 0.401 | -0.308 | 0.033 |

*Panel B.*

| Years | Median ERROR | Median DISPERSION | Median BIAS | ERROR | | | DISPERSION | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Pessimism | Optimism | Difference | Pessimism | Optimism | Difference |
| 1996 | 0.486 | 0.316 | 0.033 | 0.364 | 0.935 | -0.571*** | 0.316 | 0.315 | 0.001 |
| 1997 | 0.405 | 0.316 | 0.025 | 0.335 | 0.730 | -0.395*** | 0.314 | 0.316 | -0.002 |
| 1998 | 0.359 | 0.308 | 0.062 | 0.327 | 0.553 | 0.226*** | 0.303 | 0.324 | -0.021 |
| 1999 | 0.419 | 0.422 | 0.071 | 0.351 | 0.747 | -0.396*** | 0.384 | 0.516 | -0.132*** |
| 2000 | 0.562 | 0.576 | 0.083 | 0.459 | 0.868 | -0.409*** | 0.432 | 0.821 | -0.389*** |
| 2001 | 0.675 | 0.576 | -0.142 | 0.422 | 1.051 | -0.629*** | 0.416 | 0.626 | -0.210*** |
| Overall | | | | 0.367 | 0.802 | -0.435*** | 0.366 | 0.469 | -0.103*** |

## Table 5. The accuracy of analyst forecasts for low and high ownership values.

This table compares the accuracy of individual analysts' forecasts for low and high ownership firms. Median value of ownership is used as a cut-off point. For instance, the mean value of forecast error for firms with low insider ownership (i.e., below the median of insider ownership) is 1.996 percent compared to 1.476 percent for firms with high insider ownership (i.e., above the median of insider ownership). Differences in mean are assessed using a *t*-test, while differences in median are evaluated using a Wilcoxon rank-sum test. See the description of the variables in Table A (N=11,659).

| | INSDOW | | INSTOW | | NRINST | |
|---|---|---|---|---|---|---|
| Variables | Mean | Median | Mean | Median | Mean | Median |
| ERROR | | | | | | |
| Low ownership | 1.996 | 0.462 | 1.451 | 0.413 | 1.701 | 0.420 |
| High ownership | 1.476 | 0.473 | 2.019 | 0.512 | 1.756 | 0.490 |
| Differences | 0.520*** | -0.011 | -0.568*** | -0.099*** | -0.055 | -0.070*** |
| DISPERSION | | | | | | |
| Low ownership | 1.001 | 0.451 | 0.756 | 0.348 | 0.817 | 0.360 |
| High ownership | 0.837 | 0.348 | 1.081 | 0.454 | 0.979 | 0.429 |
| Differences | 0.166*** | 0.103*** | -0.325*** | -0.106*** | -0.162*** | -0.069*** |
| BIAS | | | | | | |
| Low ownership | -0.075 | 0.035 | -0.372 | 0.010 | -0.219 | 0.040 |
| High ownership | -0.567 | 0.054 | -0.270 | 0.095 | -0.381 | 0.074 |
| Differences | 0.492*** | -0.019 | -0.102 | -0.085*** | 0.162 | -0.034*** |

**** denotes significance at the 0.01 level (2-tailed), ** denotes significance at the 0.05 level (2-tailed),* denotes significance at the 0.1 level (2-tailed)*

## Table 6. Correlation table: ownership structure and the accuracy of analysts' forecasts.

| | ERROR | DISPER | BIAS | INSD | INST | NRINST | HORIZON | NOREV | LNMRK | ROASD | GROWTH | LOSS | LEVER | EXP | EFF | BRKS | IITOP10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ERROR | 1 | | | | | | | | | | | | | | | | |
| DISPER | 0.369(**) | 1 | | | | | | | | | | | | | | | |
| | 0.000 | | | | | | | | | | | | | | | | |
| BIAS | -0.092(**) | -0.265(**) | 1 | | | | | | | | | | | | | | |
| | 0.000 | 0.000 | | | | | | | | | | | | | | | |
| INSDOWN | -0.032(**) | -0.003 | -0.008 | 1 | | | | | | | | | | | | | |
| | 0.001 | 0.784 | 0.406 | | | | | | | | | | | | | | |
| INSTOWN | 0.066(**) | 0.106(**) | -0.022(*) | -0.002 | 1 | | | | | | | | | | | | |
| | 0.000 | 0.000 | 0.016 | 0.859 | | | | | | | | | | | | | |
| NRINST | 0.020(*) | 0.060(**) | -0.006 | 0.005 | 0.763(**) | 1 | | | | | | | | | | | |
| | 0.030 | 0.000 | 0.514 | 0.576 | 0.000 | | | | | | | | | | | | |
| HORIZON | 0.048(**) | -0.012 | -0.075(**) | 0.043(**) | 0.027(**) | 0.042(**) | 1 | | | | | | | | | | |
| | 0.000 | 0.194 | 0.000 | 0.000 | 0.004 | 0.000 | | | | | | | | | | | |
| NOREV | 0.003 | 0.071(**) | 0.021(*) | -0.063(**) | -0.056(**) | -0.077(**) | -0.368(**) | 1 | | | | | | | | | |
| | 0.787 | 0.000 | 0.027 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | | | | | |
| LNMRK | -0.086(**) | -0.162(**) | 0.024(*) | -0.241(**) | -0.501(**) | -0.518(**) | -0.076(**) | 0.160(**) | 1 | | | | | | | | |
| | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | | | | |
| ROASD | 0.132(**) | 0.179(**) | -0.069(**) | -0.044(**) | 0.184(**) | 0.107(**) | 0.009 | 0.011 | -0.109(**) | 1 | | | | | | | |
| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.344 | 0.255 | 0.000 | | | | | | | | |
| GROWTH | 0.098(**) | -0.050(**) | 0.130(**) | 0.025(**) | 0.024(**) | 0.006 | -0.023(*) | -0.028(**) | 0.089(**) | 0.027(**) | 1 | | | | | | |
| | 0.000 | 0.000 | 0.000 | 0.007 | 0.009 | 0.497 | 0.011 | 0.003 | 0.000 | 0.003 | | | | | | | |
| LOSS | 0.303(**) | 0.227(**) | -0.082(**) | -0.019(*) | 0.165(**) | 0.082(**) | 0.005 | -0.006 | -0.142(**) | 0.382(**) | -0.018(*) | 1 | | | | | |
| | 0.000 | 0.000 | 0.000 | 0.042 | 0.000 | 0.000 | 0.606 | 0.538 | 0.000 | 0.000 | 0.047 | | | | | | |
| LEVER | -0.027(**) | 0.044(**) | -0.035(**) | -0.089(**) | 0.065(**) | -0.037(**) | 0.025(**) | 0.061(**) | 0.126(**) | 0.109(**) | -0.025(**) | 0.047(**) | 1 | | | | |
| | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.000 | 0.006 | 0.000 | | | | | |
| EXP | 0.016 | 0.044(**) | -0.029(**) | 0.042(**) | 0.040(**) | 0.043(**) | 0.189(**) | 0.078(**) | -0.082(**) | 0.038(**) | -0.021(*) | 0.043(**) | 0.042(**) | 1 | | | |
| | 0.075 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.023 | 0.000 | 0.000 | | | | |
| EFF | 0.003 | 0.016 | -0.034(**) | -0.048(**) | -0.064(**) | -0.093(**) | 0.010 | -0.050(**) | 0.157(**) | 0.028(**) | -0.002 | 0.009 | 0.073(**) | -0.086(**) | 1 | | |
| | 0.720 | 0.076 | 0.000 | 0.000 | 0.000 | 0.000 | 0.260 | 0.000 | 0.000 | 0.003 | 0.838 | 0.327 | 0.000 | 0.000 | | | |
| BRKS | -0.007 | -0.022(*) | 0.012 | -0.072(**) | -0.030(**) | -0.042(**) | 0.045(**) | 0.102(**) | 0.131(**) | -0.033(**) | -0.013 | -0.023(*) | 0.061(**) | -0.048(**) | 0.037(**) | 1 | |
| | 0.462 | 0.018 | 0.192 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.159 | 0.013 | 0.000 | 0.000 | 0.000 | | |
| IITOP10 | -0.004 | -0.007 | 0.001 | -0.058(**) | -0.041(**) | -0.041(**) | 0.051(**) | 0.057(**) | 0.132(**) | 0.001 | -0.013 | 0.000 | 0.062(**) | -0.054(**) | 0.124(**) | 0.675(**) | 1 |
| | 0.696 | 0.476 | 0.956 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.947 | 0.161 | 0.982 | 0.000 | 0.000 | 0.000 | 0.000 | |

** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed).

**Table 7. The accuracy of analysts' forecasts and ownership structure.**

*Panel A. Forecast error and ownership structure.*

| | Expected | A strict linear relationship [Jensen and Meckling, 1976] | Piecewise linear relationship [Morck, Shleifer and Vishny, 1988] | | | A non-linear relationship, [Stulz, 1988] | A strict linear relationship, December YearEnds | A non-linear relationship, December YearEnds |
|---|---|---|---|---|---|---|---|---|
| Intercept | | 2.692** | 2.478** | 2.625** | 2.197** | 2.753** | 4.870*** | 5.677*** |
| | | 2.52 | 2.31 | 2.45 | 2.17 | 2.47 | 2.65 | 2.81 |
| INSDOW | - | -2.755*** | - | - | - | -3.518 | -4.697*** | -14.437*** |
| | | -3.99 | | | | -1.53 | -3.41 | -3.33 |
| INSD1 | - | - | -10.370 | - | - | - | - | - |
| | | | -1.57 | | | | | |
| INSD2 | + | - | - | -5.131*** | - | - | - | - |
| | | | | -3.69 | | | | |
| INSD3 | - | - | - | - | -4.232*** | - | - | - |
| | | | | | -4.63 | | | |
| INSDOW2 | + | - | - | - | - | 1.672 | - | 27.133*** |
| | | | | | | 0.43 | | 2.73 |
| INSTOW | - | -0.584 | -0.432 | -0.564 | -0.456 | -0.582 | -0.689 | -0.852 |
| | | -0.95 | -0.74 | -0.91 | -0.74 | -0.95 | -0.84 | -1.03 |
| HORIZON | + | 0.004** | 0.004** | 0.004** | 0.004** | 0.004** | 0.004* | -0.004* |
| | | 1.97 | 2.00 | 1.95 | 1.94 | 1.97 | 1.74 | -1.61 |
| LNMRKCAP | - | -0.198*** | -0.201** | -0.194*** | -0.167** | -0.201*** | -0.296** | -0.345*** |
| | | -2.64 | -2.49 | -2.58 | -2.35 | -2.60 | -2.50 | -2.68 |
| GROWTH | + | 0.861** | 0.853** | 0.857** | 0.849** | 0.861** | 1.324*** | 1.328*** |
| | | 2.40 | 2.37 | 2.39 | 2.35 | 2.40 | 5.10 | 5.19 |
| LOSS | + | 6.173*** | 6.157*** | 6.180*** | 6.214*** | 6.166*** | 4.414*** | 4.394*** |
| | | 4.79 | 4.76 | 4.79 | 4.81 | 4.78 | 2.96 | 2.96 |
| LEVERAGE | - | -0.824 | -0.834 | -0.792 | -0.836 | -0.819 | -1.116 | -1.279 |
| | | -1.28 | -1.30 | -1.23 | -1.30 | -1.27 | 0.297 | -1.19 |
| Adj. R-Sq., % | | 11.55 | 11.44 | 11.54 | 11.43 | 11.55 | 11.77 | 12.16 |
| Observations | | 1,957 | 1,957 | 1,957 | 1,957 | 1,957 | 867 | 867 |

***** denotes significance at the 0.01 level (2-tailed), ** denotes significance at the 0.05 level (2-tailed),* denotes significance at the 0.1 level (2-tailed)*

All *t*-statistics (given in the second entry of each cell) are based on White's (1980) estimator of the variance-covariance matrix.

*Panel B. Dispersion of forecasts and ownership structure.*

| | Expected | A strict linear relationship [Jensen and Meckling, 1976] | Piecewise linear relationship [Morck, Shleifer and Vishny, 1988] | | | A non-linear relationship, [Stulz, 1988] | A strict linear relationship, December YearEnds | A non-linear relationship, December YearEnds |
|---|---|---|---|---|---|---|---|---|
| Intercept | | 2.958*** | 3.110*** | 2.882*** | 2.830*** | 2.977*** | 2.869*** | 3.100*** |
| | | 6.63 | 6.71 | 6.44 | 6.52 | 6.57 | 3.45 | 3.62 |
| INSDOW | - | -0.796*** | - | - | - | -1.02 | -1.151 | -3.937* |
| | | -2.66 | | | | -1.17 | -1.48 | -1.90 |
| INSD1 | ? | - | -4.721*** | - | - | - | - | - |
| | | | -2.19 | | | | | |
| INSD2 | ? | - | - | -1.064 | - | - | - | - |
| | | | | -1.59 | | | | |
| INSD3 | ? | - | - | - | -1.458*** | - | - | - |
| INSDOW2 | + | - | - | - | - | 0.491 | - | 7.762 |
| | | | | | | 0.34 | | 1.48 |
| INSTOW | - | 0.173 | 0.193 | 0.201 | 0.201 | 0.173 | 0.451 | 0.405 |
| | | 0.68 | 0.78 | 0.79 | 0.79 | 0.68 | 0.99 | 0.87 |
| HORIZON | + | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.002 | -0.002 |
| | | -1.13 | -1.10 | -1.16 | -1.15 | -1.13 | -1.22 | -1.13 |
| LNMRKCAP | - | -0.155*** | -0.165*** | -0.151*** | -0.148*** | -0.157*** | -0.156*** | -0.170*** |
| | | -5.34 | -5.48 | -5.17 | -5.24 | -5.29 | -3.12 | -3.28 |
| GROWTH | + | -0.071 | -0.070 | -0.074 | -0.074 | -0.071 | 0.135 | 0.136 |
| | | -1.07 | -1.06 | -1.11 | -1.11 | -1.07 | 1.10 | 1.10 |
| LOSS | + | 1.894*** | 1.878*** | 1.901*** | 1.905*** | 0.893*** | 1.816*** | 1.810*** |
| | | 6.07 | 6.07 | 6.09 | 6.08 | 6.09 | 3.87 | 3.87 |
| LEVERAGE | + | 0.440** | 0.433** | 0.449** | 0.435** | 0.442** | 0.163 | 0.116 |
| | | 1.97 | 1.94 | 2.01 | 1.95 | 1.98 | 0.36 | 0.26 |
| Adj. R-Sq., % | | 10.81 | 10.86 | 10.73 | 10.76 | 10.81 | 11.10 | 11.31 |
| Observations | | 1,957 | 1,957 | 1,957 | 1,957 | 1,957 | 867 | 867 |

**** denotes significance at the 0.01 level (2-tailed), ** denotes significance at the 0.05 level (2-tailed),* denotes significance at the 0.1 level (2-tailed)*

All *t*-statistics (given in the second entry of each cell) are based on White's (1980) estimator of the variance-covariance matrix.

*Panel C. Forecast bias and ownership structure.*

| | Expected | A strict linear relationship [Jensen and Meckling, 1976] | Piecewise linear relationship [Morck, Shleifer and Vishny, 1988] | | | A non-linear relationship, [Stulz, 1988] | A strict linear relationship, December YearEnds | A non-linear relationship, December YearEnds |
|---|---|---|---|---|---|---|---|---|
| Intercept | | -0.223 | 0.548 | -0.327 | -0.311 | -0.064 | 2.291 | 2.384 |
| | | -0.19 | 0.42 | -0.27 | -0.28 | -0.05 | 1.12 | 1.07 |
| INSDOW | - | -0.232 | - | - | - | -2.200 | -1.318 | -2.436 |
| | | -0.32 | | | | -0.90 | -0.92 | -0.54 |
| INSD1 | ? | - | -10.654 | - | - | - | - | - |
| | | | -1.52 | | | | | |
| INSD2 | ? | - | - | 0.306 | - | - | - | - |
| | | | | 0.21 | | | | |
| INSD3 | ? | - | - | | 0.407 | - | - | - |
| | | | | | 0.44 | | | |
| INSDOW2 | + | - | - | - | - | 4.316 | - | 3.115 |
| | | | | | | 1.03 | | 0.33 |
| INSTOW | - | -0.263 | -0.386 | -0.211 | -0.222 | -0.258 | -2.437*** | -2.455*** |
| | | -0.39 | -0.60 | -0.33 | -0.33 | -0.39 | -2.64 | -2.64 |
| HORIZON | + | -0.007*** | -0.007*** | -0.007*** | -0.007*** | -0.007*** | -0.004 | -0.004 |
| | | -3.11 | -3.08 | -3.11 | -3.11 | -3.11 | -1.36 | -1.37 |
| LNMRKCAP | + | 0.020 | 0.027 | 0.027 | 0.026 | 0.010 | -0.197 | -0.202 |
| | | 0.25 | 0.30 | 0.32 | 0.33 | 0.12 | -1.49 | -1.41 |
| GROWTH | - | 0.816** | 0.832** | 0.812** | 0.812** | 0.817** | 1.035** | 1.035** |
| | | 1.96 | 2.02 | 1.95 | 1.95 | 1.96 | 2.16 | 2.16 |
| LOSS | - | -3.115** | -3.185** | -3.107** | -3.108** | -3.131** | -1.194 | -1.197 |
| | | -2.19 | -2.23 | -2.18 | -2.18 | -2.20 | -0.72 | -0.72 |
| LEVERAGE | ? | 0.056 | 0.031 | 0.056 | 0.060 | 0.069 | 1.344 | 1.325 |
| | | 0.08 | 0.04 | 0.08 | 0.08 | 0.10 | 1.09 | 1.07 |
| Adj. R-Sq., % | | 4.23 | 4.35 | 4.23 | 4.23 | 4.25 | 4.25 | 3.74 |
| Observations | | 1,957 | 1,957 | 1,957 | 1,957 | 1,957 | 867 | 867 |

**** denotes significance at the 0.01 level (2-tailed), ** denotes significance at the 0.05 level (2-tailed),* denotes significance at the 0.1 level (2-tailed)*

All *t*-statistics (given in the second entry of each cell) are based on White's (1980) estimator of the variance-covariance matrix.

The regression results for the pooled and Fama-MacBeth regressions presented in Table 8-10 are obtained by demeaning the independent variables by their respective analyst-firm means. The *t*-statistics for analyst-firm fixed effects and pooled regressions (given in the second entry of each cell) are based on White's (1980) estimator of the variance-covariance matrix. The *t*-statistics for Fama-MacBeth regressions are calculated as $\bar{x}/(s_x/\sqrt{n})$ where the x's are the regression coefficients for the individual year, $s_x$ is the standard deviation of the regression coefficients across the years, and n is the number of years (N=11,659).

**Table 8. Forecast error and ownership structure** (N=11,659).

| | Expected | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth |
| INSDOW | - | -11.447*** | -11.447*** | -15.227** | -3.139*** | -3.139*** | -4.513* | - | - | - |
| | | -3.54 | -3.19 | -1.92 | -3.39 | 3.27 | -1.72 | | | |
| INSDOW2 | + | 14.725*** | 14.725*** | 23.891** | - | - | - | - | - | - |
| | | 3.22 | 2.88 | 2.02 | | | | | | |
| INSTOW | - | 0.840* | 0.840 | -0.070 | - | - | - | - | - | - |
| | | 1.75 | 1.15 | -0.03 | | | | | | |
| HORIZON | + | 0.003*** | 0.003*** | 0.004*** | - | - | - | 0.003*** | 0.003*** | 0.004*** |
| | | 7.56 | 5.96 | 3.84 | | | | 6.75 | 5.29 | 2.99 |
| LNMRKCAP | - | -1.481*** | -1.481*** | -2.058*** | -1.247*** | -1.247*** | -1.720** | -1.250*** | -1.250*** | -1.703** |
| | | -8.40 | -6.84 | -3.01 | -8.27 | -5.56 | -2.52 | -8.31 | -5.59 | -2.53 |
| GROWTH | + | 0.575*** | 0.575** | 0.520 | - | - | - | - | - | - |
| | | 5.55 | 2.01 | 0.63 | | | | | | |
| LOSS | + | 4.791*** | 4.791*** | 4.706* | - | - | - | - | - | - |
| | | 7.37 | 5.40 | 1.84 | | | | | | |
| LEVERAGE | - | -1.436*** | -1.436** | -2.122 | - | - | - | - | - | - |
| | | -2.92 | -2.50 | -1.11 | | | | | | |
| NRINST | - | - | - | - | -0.028 | -0.028 | -0.016 | - | - | - |
| | | | | | -0.70 | -0.58 | -0.09 | | | |
| NOREVIEW | - | - | - | - | -0.031 | -0.031 | -0.033 | - | - | - |
| | | | | | -1.11 | -0.88 | -0.85 | | | |
| ROASD | + | - | - | - | 14.481*** | 14.480*** | 9.017 | 14.626*** | 14.626*** | 9.479 |
| | | | | | 4.51 | 4.05 | 1.27 | 4.57 | 4.10 | 1.36 |
| EXP | - | - | - | - | 0.116*** | 0.116*** | 0.389*** | 0.044 | 0.044 | 0.355*** |
| | | | | | 3.88 | 3.17 | 3.36 | 1.50 | 1.18 | 3.07 |
| EFF | - | - | - | - | 0.801 | 0.801 | 0.986 | - | - | - |
| | | | | | 1.15 | 1.05 | 1.43 | | | |
| BRKSIZE | - | - | - | - | 0.004 | 0.004 | 0.002 | - | - | - |
| | | | | | 0.83 | 0.57 | 0.31 | | | |
| TOP10 | - | - | - | - | - | - | - | -0.027 | -0.027 | -0.065 |
| | | | | | | | | -0.17 | -0.12 | -0.32 |
| NRIND | + | - | - | - | - | - | - | 0.019 | 0.019 | 0.047 |
| | | | | | | | | 0.60 | 0.54 | 0.85 |
| Adj. R-Sq., % | | 62.09 | 3.90 | | 59.76 | 1.57 | | 59.94 | 1.75 | |

**Table 9. Dispersion and ownership structure** (N=11,659).

| | Expected | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth |
| INSDOW | - | -1.771* | -1.771* | -1.124 | -0.310 | -0.309 | -0.182 | - | - | - |
| | | -1.66 | -1.63 | -0.49 | -0.95 | -0.98 | -0.25 | | | |
| INSDOW2 | + | 2.333 | 2.333 | 2.018 | - | - | - | - | - | - |
| | | 1.58 | 1.52 | 0.55 | | | | | | |
| INSTOW | - | 0.681*** | 0.680*** | 0.475* | - | - | - | - | - | - |
| | | 2.93 | 2.62 | 1.73 | | | | | | |
| HORIZON | + | -0.001 | -0.001 | 0.001 | - | - | - | -0.001*** | -0.001** | -0.001 |
| | | -0.06 | -0.06 | -0.79 | | | | -2.71 | -2.44 | -2.01 |
| LNMRKCAP | - | -0.936*** | -0.936*** | -1.059*** | -0.785*** | -0.785*** | -0.858*** | -0.794*** | -0.794*** | -0.867*** |
| | | -11.04 | -10.98 | -3.62 | -11.52 | -10.97 | -4.35 | -11.55 | -11.02 | -4.51 |
| GROWTH | + | 0.207*** | 0.207*** | 0.320 | - | - | - | - | - | - |
| | | 5.56 | 5.79 | 1.91 | | | | | | |
| LOSS | + | 0.867*** | 0.867*** | 0.728 | - | - | - | - | - | - |
| | | 5.14 | 4.47 | 1.51 | | | | | | |
| LEVERAGE | + | 0.680*** | 0.680*** | 0.022 | - | - | - | - | - | - |
| | | 3.60 | 2.87 | 0.04 | | | | | | |
| NRINST | - | - | - | - | 0.025 | 0.025 | 0.029 | - | - | - |
| | | | | | 1.54 | 1.38 | 0.65 | | | |
| NOREVIEW | - | - | - | - | 0.061*** | 0.060*** | 0.055*** | - | - | - |
| | | | | | 4.94 | 4.43 | 5.33 | | | |
| ROASD | + | - | - | - | 6.706*** | 6.706*** | 5.520* | 6.726*** | 6.726*** | 5.714* |
| | | | | | 7.78 | 6.26 | 2.40 | 7.72 | 6.25 | 2.52 |
| EXP | ? | - | - | - | 0.082*** | 0.082*** | 0.030 | 0.106*** | 0.106*** | 0.058** |
| | | | | | 6.90 | 6.57 | 2.07 | 8.65 | 8.38 | 2.65 |
| EFF | - | - | - | - | 0.189 | 0.189 | -0.225 | - | - | - |
| | | | | | 0.97 | 0.88 | -0.33 | | | |
| BRKSIZE | ? | - | - | - | -0.001 | -0.001 | 0.002 | - | - | - |
| | | | | | -0.38 | -0.34 | 0.99 | | | |
| TOP10 | - | - | - | - | - | - | - | 0.025 | 0.025 | 0.091 |
| | | | | | | | | 0.37 | 0.33 | 1.56 |
| NRIND | ? | - | - | - | - | - | - | 0.006 | 0.006 | 0.003 |
| | | | | | | | | 0.43 | 0.42 | 0.19 |
| Adj. R-Sq., % | | 62.09 | 4.57 | | 41.08 | 1.57 | | 40.90 | 4.65 | |

**Table 10. Forecast bias and ownership structure** (N=11,659).

| | Expected | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth | Analyst-firm fixed effects | Pooled regressions | Fama-MacBeth |
| INSDOW | - | 9.452*** | 9.451** | 4.985 | 2.565*** | 2.565** | 3.665 | - | - | - |
| | | 2.74 | 2.51 | 0.670 | 2.67 | 2.52 | 1.54 | | | |
| INSDOW2 | + | -12.535*** | -12.535** | -6.355 | - | - | - | - | - | - |
| | | -2.57 | -2.34 | -0.595 | | | | | | |
| INSTOW | - | -1.143** | -1.143 | -2.161 | - | - | - | - | - | - |
| | | -2.15 | -1.46 | -0.763 | | | | | | |
| HORIZON | - | -0.004*** | -0.004*** | -0.003 | - | - | - | -0.004*** | -0.004*** | -0.004** |
| | | -8.46 | -6.63 | -2.71 | | | | -7.79 | -6.11 | -2.64 |
| LNMRKCAP | + | 1.020*** | 1.020*** | 0.856 | 1.022*** | 1.022*** | 1.092 | 1.018*** | 1.018*** | 1.143 |
| | | 6.59 | 4.80 | 0.84 | 7.01 | 4.52 | 0.97 | 7.02 | 4.51 | 1.04 |
| GROWTH | - | -0.189** | -0.189 | -0.740 | - | - | - | - | - | - |
| | | -2.15 | -0.58 | -0.99 | | | | | | |
| LOSS | - | -3.524*** | -3.524*** | -2.503 | - | - | - | - | - | - |
| | | -5.15 | -3.80 | -0.77 | | | | | | |
| LEVERAGE | ? | 1.754*** | 1.754*** | 2.646 | - | - | - | - | - | - |
| | | 3.33 | 2.85 | 1.61 | | | | | | |
| NRINST | - | - | - | - | 0.019 | 0.019 | -0.052 | - | - | - |
| | | | | | 0.45 | 0.37 | -0.30 | | | |
| NOREVIEW | + | - | - | - | 0.069** | 0.069* | 0.027 | - | - | - |
| | | | | | 2.36 | 1.85 | 0.86 | | | |
| ROASD | - | - | - | - | -10.321*** | -10.321*** | -7.364 | -10.475*** | -10.475*** | -7.478 |
| | | | | | -3.09 | -2.73 | -1.19 | -3.16 | -2.79 | -1.19 |
| EXP | - | - | - | - | -0.135*** | -0.136*** | 0.332 | -0.037 | -0.037 | 0.381** |
| | | | | | -4.21 | -3.48 | 2.13 | -1.18 | -0.95 | 2.85 |
| EFF | - | - | - | - | -0.353 | -0.352 | -0.276 | - | - | - |
| | | | | | -0.49 | -0.44 | -0.34 | | | |
| BRKSIZE | ? | - | - | - | -0.009* | -0.009 | -0.003 | - | - | - |
| | | | | | -1.90 | -1.31 | -0.75 | | | |
| TOP10 | ? | - | - | - | - | - | - | -0.027 | -0.027 | 0.032 |
| | | | | | | | | -0.17 | -0.12 | 0.12 |
| NRIND | ? | - | - | - | - | - | - | 0.005 | 0.005 | -0.081** |
| | | | | | | | | 0.89 | 0.12 | -2.66 |
| Adj. R-Sq., % | | 61.00 | 2.20 | | 59.77 | 1.57 | | 60.04 | 1.24 | |

**Figure 1. The proportion of pessimistic/optimist forecasts: an analysis on a yearly basis.**

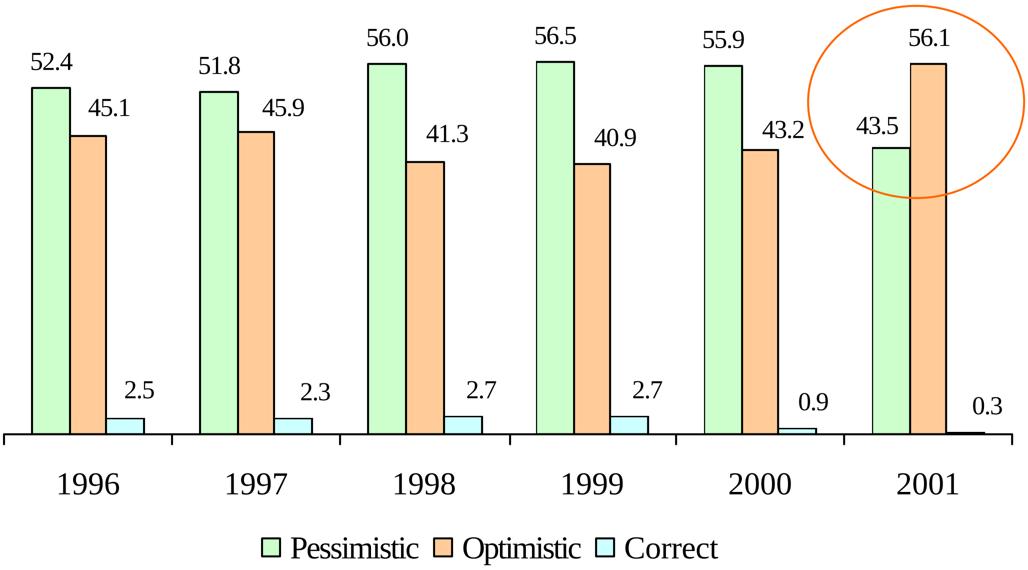


**Figure 2. Yearly median forecast error for optimistic versus pessimistic forecasts.**