

# **Expectations Management**

Tsahi Versano  
Yale University  
[tsahi.versano@yale.edu](mailto:tsahi.versano@yale.edu)

and

Brett Trueman  
UCLA Anderson School of Management  
[brett.trueman@anderson.ucla.edu](mailto:brett.trueman@anderson.ucla.edu)

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## Abstract

Empirical evidence suggests the existence of a market premium for firms whose earnings exceed analysts' forecasts and that firms respond by managing analysts' expectations downward. This paper provides a theoretical analysis of the driving forces behind expectations management, paying particular attention to the differing roles played by publicly-communicated and privately-communicated analyst forecast guidance. We find that private guidance plays the primary role in influencing firm price, with public expectations management serving a supplementary role. Firms bias their public forecasts in a direction *opposite* to the private guidance provided to analysts, in order to reduce investors' assessment of the level of private bias. We show that the magnitudes of private and public bias increase with the precision of the information privately communicated to the analyst. In addition, it is shown that if the manager could commit, ex-ante, not to privately communicate at all with the analyst, he would choose to do so. However, if commitment were not possible, the manager would find it optimal to privately communicate as much information as he could to the analyst, thereby maximizing the levels of private and public expectations management. These results suggest that Regulation Fair Disclosure, which restricted private communication between managers and analysts, plays an important role in reducing managers' motivation to engage in private and public expectations management. Our findings also suggest a simple rational explanation for the market premium for beating analysts' expectations. In this context, we show that the quality of reported earnings is an important determinant of the magnitude, and even existence, of this premium.

# Expectations Management

## Introduction

There is abundant empirical evidence in the accounting literature suggesting the existence of a market premium for firms whose earnings exceed the prevailing consensus analyst forecast.<sup>1</sup> There is also evidence that firms respond to this by managing analysts' earnings expectations downward, in order to achieve beatable targets, and by managing earnings upward in order to beat those targets.<sup>2</sup> While there is a stream of analytical research devoted to understanding the driving forces behind earnings management, little is known analytically about the dynamics behind expectations management.<sup>3</sup> A salient feature of expectations management, which distinguishes it from earnings management, is that it works by way of a third party – the analyst – with whom a firm's manager can communicate both publicly (by releasing a public forecast of earnings) and privately (through private expectations guidance). In this paper we investigate how managers use these public and private channels of communication in order to guide analysts' forecasts. Conventional wisdom suggests that firms use these two channels interchangeably. We show that the forces driving expectations management are more complicated, and that managerial public and private forecasts serve very different purposes with respect to expectations management.

We begin our analysis by providing necessary conditions for expectations management to be an effective strategy for enhancing a manager's welfare. At the most basic level, the manager must have private information about current earnings and the analyst must have private

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<sup>1</sup> See Bartov et al. (2002) and Kasznik and McNichols (2002).

<sup>2</sup> See, for example, Dechow et al. (1995), DeGeorge et al. (1999), Matsumoto (2002), Skinner and Sloan (2002), Richardson et al. (2004), Burgstahler and Eames (2006), Cotter et al. (2006), and Das et al. (2011).

<sup>3</sup> Theoretical research on earnings management include Dye (1988), Trueman and Titman (1988), and Fischer and Verrecchia (2000). See also the references in Beyer et al. (2010).

information about both current and future earnings. More substantively, we show that it is also necessary for the manager and analyst to share private information. The importance of this private communication between the manager and analyst in ensuring that expectations management is effective has not been fully appreciated in the literature.

We continue our analysis by examining a setting in which these necessary conditions are satisfied and in which expectations management is effective. In this setting the analyst issues an initial forecast of the firm's current period earnings at the beginning of the period. The firm's manager, who has private information about the firm's earnings, then issues a (possibly biased) public forecast of earnings and privately communicates another (possibly biased) forecast to the analyst. After observing the manager's public and private forecasts, and receiving her own private signal of earnings during the period, the analyst updates her earnings forecast. At the end of the period the manager issues a (possibly biased) report of earnings, and investors set the firm's price, based on all the publicly available information. In determining the biases in his public and private forecasts, and in reported earnings, the manager's goal is to maximize the firm's post-earnings announcement stock price.

In our setting we make the relatively weak assumptions that the period's earnings are the sum of a persistent component (reflecting the firm's long-term profitability) and a transitory component (perhaps reflecting a period-specific event), and that the private information the analyst observes during the period is weighted more heavily toward the transitory component. As a consequence, investors interpret a downward revision in the analyst's forecast as likely due to her observing unfavorable news about the transitory component and interpret an earnings report that exceeds the revised forecast as favorable news regarding the persistent component. Looked at another way, a positive (negative) earnings surprise is considered by investors to be a

signal that the firm's long-term profitability is higher (lower) than expected. This leads to the empirical prediction that firms whose earnings exceed expectations have a higher post-earnings announcement stock price than do those whose earnings fall short. This theoretical implication of our model is consistent with the "meet or beat" phenomenon empirically documented by Bartov et al. (2002) and Kasznik and McNichols (2002).

In this setting we show that the manager engages in public expectations management only if he also provides private forecast guidance to the analyst. This suggests that public expectations management serves a supplementary role to private expectations management, rather than playing a primary role. In fact, we show that investors only use the manager's public forecast to learn about his private communication with the analyst. As a result, when the manager privately guides the analyst's forecast downward, he also biases his public forecast *upward*. The positive public bias is introduced in order to reduce investors' assessment of the extent of the downward guidance provided to the analyst.

Setting the costs of expectations management via public and private channels equal, we find that the manager engages in a greater level of private bias than of public bias. This is because private expectations management more effectively influences the post-earnings announcement stock price than does public expectations management. This is a result of the manager's public forecast being an imprecise indicator of the amount of guidance privately provided to the analyst. We also find that the magnitudes of public and private bias are increasing in the precision of the information that the manager privately communicates to the analyst. This suggests that Regulation Fair Disclosure (Reg FD), which restricted private communication between managers and analysts, has also served to limit the level of private *as well as public* expectations management.

If we allow the manager to choose the precision of the information communicated privately to the analyst, then the manager will share all of his information, as long as the cost of public expectations management is sufficiently low (and the amount of public bias is sufficiently high). As a result, he will also maximize the amount of private and public expectations management. In so doing, the manager maximizes the weight that the analyst places on the manager's downwardly biased private guidance and minimizes the weight she places on the upwardly biased public forecast. However, if the cost of public expectations management is high enough (so that the amount of public bias is low enough), the manager will choose not to communicate any information privately to the analyst. In this case the levels of public and private forecast bias are zero. These results illustrate the important role that the cost of public expectations management plays in determining the extent to which the manager chooses to communicate private information to the analyst and guide her expectations.

Finally, we show that the quality of reported earnings is an important determinant of the magnitude, and even existence, of a market premium for firms whose earnings exceed analysts' forecasts. As reported earnings become noisier, the market premium for beating expectations decreases, and eventually becomes negative. The reason is that when noise in the accounting reporting system is high, the primary role of the analyst's forecast is to provide information about real earnings as a whole, rather than about the earnings components. The post-announcement stock price then becomes an increasing (rather than decreasing) function of the analyst's disclosed forecast. This result can be used to explain the finding in Das et al. (2011) that the nature of the relation between earnings and expectations management is a function of firm characteristics reflecting the amount of noise in reported earnings.

The plan of this paper is as follows. In Section I we provide necessary conditions for expectations management to be effective. This is followed in Section II by the development of a model with effective expectations management. In Section III we analyze the equilibrium in this model, paying particular attention to the relation between public and private expectations management. A summary and conclusions appear in Section IV.

## **I. Necessary conditions for effective expectations management**

In this section we develop necessary conditions for expectations management to be effective within a general setting. We consider a two period economy in which shares of a risky firm and a riskless asset are available for trading. All investors in the market are assumed to be risk neutral and symmetrically informed, and the risk-free rate of return is set equal to zero, without loss of generality. The firm generates earnings of  $e_1$  and  $e_2$  in periods 1 and 2, respectively. The total of these earnings is assumed to equal the firm's total net cash inflow over the two periods, which is paid out as a liquidating dividend to shareholders at the end of the second period. There is one analyst who covers the firm, and whose role it is to forecast each period's earnings.

There are three dates in period 1. At date 1 the firm's manager releases a forecast of first period earnings,  $MF$ , based on the private information he receives at that time,  $I_M$ . If the manager releases a forecast different from his expectation of period 1 earnings, he is said to be engaging in expectations management. At date 2, the firm's analyst receives private information,  $I_A$ . Based on this information and on her observation of  $MF$ , the analyst issues a forecast,  $AF$ , equal to her expectation of period 1 earnings. At the end of the period, date 3, the period's earnings are announced.

Investors use their observations of  $MF$ ,  $AF$ , and  $e_1$  to set the post-earnings announcement price at the end of period 1:

$$P_1(MF, AF, e_1) = e_1 + E(e_2 | MF, AF, e_1), \quad (1)$$

where  $E(e_2 | MF, AF, e_1)$  is investors' expectation of period 2 earnings, given their information at the end of the first period. The price of the firm at the end of period 2,  $P_2$ , is simply equal to the firm's liquidating dividend,  $e_1 + e_2$ .

In deciding on the forecast to release, the manager's objective is to maximize the expectation of his utility,  $U$ , where:

$$U = \alpha_1 P_1 + \alpha_2 P_2 - c \quad (2)$$

and  $\alpha_1, \alpha_2 \neq 0$ . The variable,  $c$ , is the cost of engaging in expectations management. It is assumed to be positive if the manager manages expectations and zero, otherwise.

Given that the total cash flow over the two periods is independent of the manager's forecast, so is the price,  $P_2$ . This means that for expectations management to be effective, its expected impact on  $P_1$  must be non-zero. It also means that there is no value to the manager in biasing his second period forecast. Consequently, our analysis focuses solely on the first period.

We define expectations management as effective if the manager's forecast disclosure affects the end-of-period price *by means of* the analyst's reported forecast. Expectations management is not considered to be effective if its impact on price comes solely from its *direct effect* on investors' assessment of firm value. While that direct effect may be interesting in its own right, it does not capture what is generally thought of as expectations management.

Our formal definition of effective expectations management is as follows:

*Definition:* Expectations management is said to be effective if and only if for some pair of forecasts,  $(MF, MF')$ ,  $MF \neq MF'$ :

$$P_1(MF', AF(MF', I_A), e_1) - P_1(MF, AF(MF, I_A), e_1) \neq P_1(MF', AF(MF, I_A), e_1) - P_1(MF, AF(MF, I_A), e_1) \quad (3)$$

or, equivalently:

$$P_1(MF', AF(MF', I_A), e_1) \neq P_1(MF', AF(MF, I_A), e_1). \quad (4)$$

The left-hand side of equation (3) reflects the effect on price of the manager releasing forecast  $MF'$ , rather than forecast  $MF$ , and with the analyst using  $MF'$ , rather than  $MF$ , in forming her own forecast. The right-hand side captures the effect on price of the manager releasing  $MF'$  instead of  $MF$ , while the analyst continues to use  $MF$  in calculating her earnings expectation. The difference between the left-hand and right-hand sides is the impact on price stemming solely from the analyst's use of  $MF'$  rather than  $MF$ . If this were zero for every pair of forecasts, then the manager would not be able to affect price indirectly through the analyst's disclosure and expectations management would not be considered effective.

As this definition makes clear, in order for expectations management to be effective, it is necessary for the manager's private information,  $I_M$ , to be incrementally valuable in forecasting current period earnings, over and above the analyst's own private information,  $I_A$ . Otherwise, the analyst would ignore the manager's forecast. Her forecast,  $AF(MF, I_A)$ , would be independent of that of the manager and condition (4) would not be satisfied.<sup>4</sup> It is also necessary

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<sup>4</sup> In fact, a stronger condition is necessary: the manager's private information,  $I_M$ , must be incrementally valuable in forecasting current earnings, over and above the analyst's own private information,  $I_A$ , and the analyst's

that the analyst's private information,  $I_A$ , be informative about current earnings incremental to the information provided to investors by the manager's forecast. Otherwise, the analyst's forecast would be identical to that of the manager and  $P_1$  would not be a function of her forecast. Third, the analyst's private information,  $I_A$ , must be incrementally valuable to investors in forecasting future earnings, over and above the information provided to them by the manager's forecast and the current period's earnings. Otherwise, investors would not use the analyst's forecast in forming their own expectation of future earnings.<sup>5</sup>

In order for the manager to have an incentive to engage in expectations management, condition (4) must also hold in expectations for the manager. That is, conditional on his information at date 1, it must be that for some pair of forecasts,  $(MF, MF')$ ,  $MF' \neq MF$ :

$$E\left[P_1(MF', AF(MF', I_A), e_1) | I_M\right] \neq E\left[P_1(MF, AF(MF, I_A), e_1) | I_M\right]. \quad (5)$$

When this condition holds, we say that expectations management is effective *ex-ante*. If the condition is not satisfied, then the expected impact on price stemming from expectations management would be zero. The following proposition provides a necessary condition for (5) to hold:

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observation of  $MF$ . This means that the manager's forecast cannot fully reveal his private information about earnings. If it did, then the analyst would be able to undo any bias in  $MF$ , and the bias would then not have any effect on the analyst's forecast.

<sup>5</sup> In fact a stronger condition is necessary: the analyst's private information,  $I_A$ , must be incrementally valuable to investors in forecasting future earnings, over and above the information provided to investors by the manager's and analyst's forecasts, and current period earnings. Otherwise, investors would be able to infer  $I_A$  from the public information and, hence, conditional on  $I_A$ , the end-of-period price would be independent of  $AF$ .

*Proposition 1:* For expectations management to be effective ex-ante, it is necessary that the manager and analyst share private information, conditional on the manager’s forecast and the current period earnings.

Proof: See the Appendix.

To understand mathematically why this is true, note that

$E[P_1 | I_M] = E[e_1 + E[e_2 | MF, AF(MF, I_A), e_1] | I_M]$ . By the law of iterated expectations, if  $I_M$  were not informative about  $I_A$  conditional on  $\{MF, e_1\}$ , then  $AF$  would drop out from the right-hand side of the expression, yielding  $E[P_1 | I_M] = E[e_1 + E[e_2 | MF, e_1] | I_M]$ . The manager’s expectation for the end-of-period price would be independent of the analyst’s forecast, thereby rendering expectations management ineffective ex-ante.

Intuitively, if the manager and analyst did not share private information, then the manager would not have superior knowledge of the manner in which the analyst is using the manager’s forecast in calculating her own earnings expectation. Consequently, from the managers’ perspective at date 1, investors would be correctly inferring, on average, the analyst’s private information,  $I_A$ , from knowledge of the manager’s and analyst’s forecasts. This would make the analyst’s forecast ex-ante irrelevant to investors and there would then be no incentive for the manager to engage in costly expectations management.

Figure 1 illustrates the necessary conditions discussed above. Conditional on the public information, the manager must possess private information about the firm’s first period earnings that the analyst does not have, while the analyst must possess private information about current

and future earnings. The overlap reflects the necessary condition that the manager and analyst share some private information (Proposition 1).

## II. A setting with effective expectations management

In this section we introduce a setting in which expectations management is effective ex-ante. An essential feature of this setting is that the analyst's forecast of current period earnings remain useful to investors in predicting future real earnings once current earnings are announced. We incorporate this feature into our model by making the relatively weak assumptions that a firm's real earnings are comprised of components with different levels of persistence and that the analyst's private signals about these components have differing precisions. Specifically, we assume that the firm's real earnings in period  $t$ ,  $e_t$ ,  $t=1,2$ , are comprised of two components,  $i_t$ , and  $m_t$ :

$$e_t = i_t + m_t. \quad (6)$$

The components  $i$  and  $m$  are independent, normally distributed random variables, with prior means (as of the beginning of period 1) of zero and variances of  $V_i$  and  $V_m$ , respectively. Unless otherwise stated, all variances in our model are assumed to be strictly greater than zero and bounded. We assume that the analyst provides an initial earnings forecast at the beginning of the period (before observing any information during the period). The above assumptions imply that the analyst's beginning-of-period earnings forecast is equal to zero and that the beginning-of-period price of the firm is also equal to zero.

It is assumed that  $\text{cov}(i_1, i_2) = p_i V_i$  and  $\text{cov}(m_1, m_2) = p_m V_m$ . The parameter  $p_i$  ( $p_m$ ) represents the persistence of component  $i$  ( $m$ ) between the two periods. We assume that

component  $m$  is more persistent than component  $i$  ( $p_m > p_i$ ) and that  $0 < p_i, p_m < 1$ . Consistent with this, we sometimes refer to  $m$  as the persistent component of earnings and to  $i$  as the transitory component.

The firm's accounting earnings for period  $t$  are assumed equal to real earnings,  $e_t$ , plus noise,  $\varepsilon_{et}$ . The variable  $\varepsilon_{et}$  is normally distributed with a mean of zero and a variance of  $V_{\varepsilon e}$ , and is independent of all other variables in the model. We sometimes refer to  $V_{\varepsilon e}$  as the noise in the accounting reporting system.

At date 1 of the first period the manager observes a noisy signal of the period's accounting earnings. Denoted by  $z_e$ , it is given by:

$$z_e = e_1 + \varepsilon_{e1} + \varepsilon_z, \quad (7)$$

where  $\varepsilon_z \sim N(0, V_{\varepsilon z})$ . The variable  $\varepsilon_z$  captures the noise in the manager's private information and is assumed to be independent of all other variables. After observing  $z_e$ , the manager publicly releases a forecast of earnings,  $MF$ , given by:

$$MF = z_e + b_{MF}, \quad (8)$$

where  $b_{MF}$  is the amount of bias that the manager introduces into his public forecast. At the same time that the manager publicly discloses  $MF$ , he provides the analyst with a private forecast of reported earnings. Denoted by  $MP$ , this forecast is given by:

$$MP = z_e + b_{MP}, \quad (9)$$

where  $b_{MP}$  is the level of bias introduced by the manager into his private forecast.<sup>6</sup> Note that we express the manager's forecasts as his *signal* plus bias, rather than as his expectation of reported earnings plus bias. This is solely for ease of presentation. Since his expectation for reported earnings is a known linear function of his signal, this alternative method of presentation is without loss of generality.

At date 2 of the first period the firm's analyst receives a noisy signal of  $i$ , denoted by  $z_i$ , where:

$$z_i = i + \varepsilon_i, \quad (10)$$

and  $\varepsilon_i \sim N(0, V_{\varepsilon i})$ , independent of all other variables. More generally, the analyst could also be provided with a noisy signal of the earnings component,  $m$ , as long as the precision of this signal were less than that of  $z_i$ . The assumption that the analyst observes more precise information during the period about the transitory earnings component reflects the notion that knowledge of persistent components is likely accumulated over time, while knowledge of transitory components is likely gained during the period in which they arise. For simplicity, and without any qualitative effect on our results, we assume in our analysis below that  $V_{\varepsilon i} = 0$ , so that the analyst learns the value of the transitory earnings component,  $i$ , perfectly during the period.

After observing  $MF$ ,  $MP$ , and  $i$ , the analyst publicly releases a revised forecast,  $AF$ , of current-period reported earnings,  $e_{1r}$ :

$$AF(MF, MP, i) = E[e_{1r} | MF, MP, i]. \quad (11)$$

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<sup>6</sup> As shown below, the equilibrium levels of bias,  $b_{MF}$  and  $b_{MP}$ , are functions of the information privately observed by the manager. For expositional simplicity we suppress the functional notation.

In forming her expectation, the analyst makes use of her conjectures of the biases introduced into the manager's public and private forecasts, denoted by  $\hat{b}_{MF}$  and  $\hat{b}_{MP}$ , respectively. The analyst's expectation is conjectured to be a linear function of her information:

$$AF(MF, MP, i) = \gamma_0 + \gamma_{MF}MF + \gamma_{MP}MP + \gamma_i i. \quad (12)$$

At the end of the period, date 3, the manager observes the firm's accounting earnings,  $e_1 + \varepsilon_{e1}$ , and reports earnings of  $e_{1r}$ , where:

$$e_{1r} = e_1 + \varepsilon_{e1} + b_e \quad (13)$$

and  $b_e$  is the bias that the manager introduces into his report. Using the publicly observable information,  $\{MF, AF, e_{1r}\}$ , investors set the end-of-period 1 price,  $P_1$ , equal to their expectation of the sum of the real earnings over the two periods:

$$P_1(MF, AF, e_{1r}) = E(e_1 + e_2 | MF, AF, e_{1r}). \quad (14)$$

The price function is conjectured to be linear in the public information:

$$P_1(MF, AF, e_{1r}) = \beta_0 + \beta_{MF}MF + \beta_{AF}AF + \beta_e e_{1r}. \quad (15)$$

In setting the price, investors use their conjectures for the biases introduced by the manager into the public and private forecasts,  $\hat{b}_{MF}$  and  $\hat{b}_{MP}$ , as well as their conjecture of the bias in reported earnings, denoted by  $\hat{b}_e$ .

In choosing  $b_{MF}$ ,  $b_{MP}$ , and  $b_e$ , the manager's goal is to maximize his expected utility:

$$E(U) = E[P_1(MF, AF, e_{1r}) | I_M] - \frac{c_{MF}}{2}(b_{MF} - \varepsilon_{MF})^2 - \frac{c_{MP}}{2}(b_{MP} - \varepsilon_{MP})^2 - \frac{c_e}{2}b_e^2. \quad (16)$$

where  $I_M$  denotes the manager's information set. The second, third, and fourth terms on the right-hand side of expression (16) are the costs to the manager of engaging in public expectations

management, private expectations management, and earnings management, respectively. The cost parameters,  $c_{MF}$ ,  $c_{MP}$ , and  $c_e$ , are all positive. The variables  $\varepsilon_{MF}$  and  $\varepsilon_{MP}$  reflect market uncertainty over the cost of biasing the public and private forecast, respectively.<sup>7</sup> These variables are assumed to be normally distributed with means of zero and variances of  $V_{\varepsilon_{MF}}$  and  $V_{\varepsilon_{MP}}$ , respectively, and to be independent of each other and of all other variables in the model. The manager learns the values of  $\varepsilon_{MF}$  and  $\varepsilon_{MP}$  at date 1; however, they remain unknown to investors and the analyst. The optimal levels of public and private expectations management, and earnings management solve:

$$b_j = \arg \max_{b_j} \{E[P_1(MF, AF, e_{1r}) | I_M] - \frac{c_{MF}}{2}(b_{MF} - \varepsilon_{MF})^2 - \frac{c_{MP}}{2}(b_{MP} - \varepsilon_{MP})^2 - \frac{c_e}{2}b_e^2\}, \quad (17)$$

where  $j = MF, MP, e$ , respectively.

In equilibrium, the conjectured strategies of the manager must be fulfilled:

$$\hat{b}_{MF} = b_{MF}; \hat{b}_{MP} = b_{MP}; \hat{b}_e = b_e. \quad (18)$$

We have the following:

*Proposition 2:* A unique linear equilibrium exists in which the manager engages in public and private expectations management and in earnings management. In equilibrium, the analyst's forecast is given by:

$AF(MF, MP, i) = \gamma_0 + \gamma_{MF}MF + \gamma_{MP}MP + \gamma_i i$ , where:

$$\gamma_{MF} = \frac{(V_m + V_{\varepsilon e})V_{\varepsilon_{MP}}}{D} > 0;$$

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<sup>7</sup> Dye and Sridhar (2004) and Beyer (2009) use this formulation in order to introduce uncertainty into the cost functions of an owner/manager.

$$\gamma_{MP} = \frac{(V_m + V_{\varepsilon e})V_{\varepsilon MP}}{D} > 0;$$

$$\gamma_i = \frac{V_{\varepsilon MP}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon MP} + V_{\varepsilon z})}{D} > 0; \text{ and}$$

$$D \equiv V_{\varepsilon MF}V_{\varepsilon MP} + (V_{\varepsilon MF} + V_{\varepsilon MP})(V_m + V_{\varepsilon e} + V_{\varepsilon z}).$$

The end-of-period price is:

$$P_1(MF, AF, e_{1r}) = \beta_0 + \beta_{MF}MF + \beta_{AF}AF + \beta_e e_{1r}, \text{ where:}$$

$$\beta_{MF} = -\left(V_{\varepsilon e} - \hat{V}_{\varepsilon e}\right) \frac{V_i(V_{\varepsilon MP}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon MP} + V_{\varepsilon z}))}{E};$$

$$\beta_{AF} = \left(V_{\varepsilon e} - \hat{V}_{\varepsilon e}\right) \frac{V_i(V_{\varepsilon MF} + V_{\varepsilon z})[V_{\varepsilon MF}V_{\varepsilon MP} + (V_m + V_{\varepsilon e} + V_{\varepsilon z})(V_{\varepsilon MF} + V_{\varepsilon MP})]}{(V_m + V_{\varepsilon e})E};$$

$$\beta_e = \frac{(1 + p_m)V_m}{V_m + V_{\varepsilon e}} > 0; \text{ and}$$

$$E \equiv (V_m + V_{\varepsilon e})^2 V_{\varepsilon MF}^2 + V_i(V_m V_{\varepsilon MF}^2 + V_{\varepsilon e} V_{\varepsilon MF}^2 + (V_{\varepsilon MF} + V_{\varepsilon z})(V_{\varepsilon MP}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon MP} + V_{\varepsilon z})));$$

$$\hat{V}_{\varepsilon e} \equiv \frac{p_m - p_i}{1 + p_i} V_m.$$

The biases introduced by the manager are:

$$b_{MF} = \frac{\beta_{MF} + \beta_{AF}\gamma_{MF}}{c_{MF}} + \varepsilon_{MF};$$

$$b_{MP} = \frac{\beta_{AF}\gamma_{MP}}{c_{MP}} + \varepsilon_{MP}; \text{ and}$$

$$b_e = \frac{\beta_e}{c_e} > 0.$$

Proof: See the appendix.

### III. Equilibrium analysis

In equilibrium the analyst attaches a positive weight to each of the pieces of information she observes –  $MF$ ,  $MP$ , and  $i$  – when forming her forecast. At first glance it might seem surprising that the analyst uses the manager’s public forecast at all, given that she also receives private guidance from him. She does so because the manager’s private communication is biased and the public forecast is valuable in partially extracting that bias.

The end-of-period price in equilibrium is increasing in reported earnings ( $\beta_e > 0$ ). This is because (a) reported earnings are a noisy signal of real earnings and (b) the first and second period real earnings are positively correlated. Since  $\beta_e > 0$ , the manager has an incentive to bias reported earnings upward ( $b_e > 0$ ). Note that the bias is a constant. Consequently, investors can perfectly infer the firm’s accounting earnings from its reported earnings. In our subsequent discussion we will use the term “reported earnings” to mean both reported and accounting earnings.

In contrast to the unambiguously positive effect of reported earnings on price, the directional impact of the manager’s and of the analyst’s publicly disclosed forecasts on price depend on the sign of  $V_{\varepsilon e} - \hat{V}_{\varepsilon e}$ . Consequently, the mean level of bias in the manager’s publicly

disclosed forecast,  $\bar{b}_{MF} = \frac{\beta_{MF} + \beta_{AF}\gamma_{MF}}{c_{MF}}$ , and in his privately communicated forecast,

$\bar{b}_{MP} = \frac{\beta_{AF}\gamma_{MP}}{c_{MP}}$ , also depend on the sign of  $V_{\varepsilon e} - \hat{V}_{\varepsilon e}$ . For brevity, and where it will not cause

confusion, we refer to  $\bar{b}_{MF}$  and  $\bar{b}_{MP}$  as the bias (rather than the mean level of bias) in the manager’s public and private forecasts, respectively.

To gain insights into why the manager's forecast biases can be of either sign, it is important to recognize that there are two types of uncertainties that remain for investors after earnings are reported. The first is uncertainty over the firm's real earnings for the period. The higher is investors' estimate of the period's real earnings, the higher is the end-of-period price. This uncertainty is reflected by the magnitude of  $V_{\varepsilon e}$ . The second is uncertainty over the two components of real earnings,  $i$  and  $m$ . The higher investors' estimate of the persistent component,  $m$ , relative to the transitory component,  $i$ , the greater their estimate for the second period's real earnings and, in turn, the higher is  $P_1$ .

The latter source of uncertainty is at the heart of our model and, as we show below, is what drives our theoretical prediction of a market premium for firms whose earnings exceed analysts' expectations. To focus our analysis on this source of uncertainty we set  $V_{\varepsilon e} = 0$ . (We will examine the case where  $V_{\varepsilon e} > 0$  later.) When  $V_{\varepsilon e} = 0$ , there is no noise in the accounting reporting system and investors are able to perfectly infer real earnings from their knowledge of reported earnings and the equilibrium level of earnings management. The next set of results follow immediately from Proposition 2:

*Corollary 1:* When  $V_{\varepsilon e} = 0$ , equilibrium is characterized by:

$$\beta_{AF} < 0;$$

$$\beta_{MF} > 0;$$

$$\bar{b}_{MF} = \frac{\beta_{MF} + \beta_{AF}\gamma_{MF}}{c_{MF}} > 0; \text{ and}$$

$$\bar{b}_{MP} = \frac{\beta_{AF}\gamma_{MP}}{c_{MP}} < 0.$$

In this setting,  $\beta_{AF} < 0$ ; the lower the analyst's forecast, the higher the end-of-period price. This is because, for a fixed level of reported earnings, a lower analyst forecast implies a lower (higher) expected value for the transitory (persistent) earnings component  $i$  ( $m$ ) and, consequently, a higher expectation for the second period's real earnings. That  $\beta_{AF} < 0$  in equilibrium is consistent with the empirically observed market premium for firms whose earnings exceed analysts' expectations. (See Bartov et al., 2002, and Kasznik and McNichols, 2002.) Holding fixed the period's earnings surprise (realized earnings minus the beginning-of-period earnings forecast), these studies find that firms whose earnings beat the most recent analyst consensus earnings forecast have a higher return over the period than do those firms whose earnings fall short. In our setting, the beginning-of-period analyst earnings expectation is zero (since  $E(m_t) = E(i_t) = 0$ ), as is the beginning-of-period market price. Consequently, the earnings surprise over the period is equal to the reported earnings,  $e_{1r}$ , while the return over the period is equal to the end-of-period price,  $P_1$ . As applied to our setting, the empirically documented market premium implies that, holding  $e_{1r}$  fixed, the lower is  $AF$ , the greater is  $P_1$ , which is what we find.

Bartov et al. (2002) and Kasznik and McNichols (2002) also show that the future earnings of firms that exceed expectations are, on average, higher than those of firms that miss. Our analysis yields the same prediction. In our model the market premium arises precisely because a less favorable analyst forecast causes investors to increase their estimate of the persistent earnings component and, in turn, their expectation of future earnings.

Since, in equilibrium,  $\beta_{AF} < 0$  and the analyst puts positive weight on the manager's privately communicated forecast ( $\gamma_{MP} > 0$ ), the manager has an incentive to privately guide the analyst's forecast downward. The numerator of  $\bar{b}_{MP}$ ,  $\beta_{AF}\gamma_{MP}$ , captures this – it is the amount by which price decreases per unit increase in  $MP$ . Note that the private forecast has an effect on price only because (a) the analyst discloses a forecast of earnings rather than her signal directly and (b) investors do not observe  $MP$ . If they knew  $MP$ , they would be able to infer the analyst's private information from knowledge of the analyst's forecast, making the manager's private communication irrelevant.

Similar reasoning would seem to suggest that the manager should bias his public forecast downward as well, given that the analyst gives it positive weight, too, in determining her own forecast ( $\gamma_{MF} > 0$ ). There is a difference here, however, in that investors publicly observe  $MF$  and can completely undo its effect on the analyst's forecast. In this case the manager's incentive to bias his public forecast does not stem from its direct effect on the analyst's forecast. Rather, the incentive arises from the relation that exists between it and his private forecast to the analyst. These two forecasts are positively correlated because they both include the noise term from the manager's signal,  $\varepsilon_z$ . Consequently, investors use their observation of the manager's public forecast to make inferences about the information that the manager privately communicated to the analyst.

Holding fixed the analyst's forecast and reported earnings, an increase in the manager's public forecast increases investors' estimate of the manager's private disclosure to the analyst. This, in turn, implies a lower inferred value for the analyst's private information,  $i$ , and leads to a higher end-of-period price. This is what gives the manager an incentive to bias his public

forecast upward ( $\bar{b}_{MF} > 0$ ) at the same time as he privately guides the analyst's forecast downward. Contrary to conventional wisdom, effective expectations management is not necessarily characterized by downward *public* guidance of analysts' forecasts.

The next set of results pertain to the equilibrium levels of public and private expectations guidance,  $|\bar{b}_{MF}|$  and  $|\bar{b}_{MP}|$ , respectively. We have:

*Corollary 2:* In equilibrium:

- a. both  $|\bar{b}_{MF}|$  and  $|\bar{b}_{MP}|$  are decreasing in the noise of the private forecast bias,  $V_{\varepsilon MP}$ ; and
- b. when the cost parameters for public and private expectations management,  $c_{MF}$  and  $c_{MP}$ , respectively, are equal,  $|\bar{b}_{MF}| < |\bar{b}_{MP}|$ .

The greater the noise in the manager's private guidance, the less useful will guidance be to the analyst and the less effective will it be in influencing the analyst's earnings forecast. Consequently, the manager will scale back on its use in both the public and private domains. Fixing  $V_{\varepsilon MP}$  and setting the cost parameters,  $c_{MF}$  and  $c_{MP}$  equal, we can directly compare the effectiveness of public and private expectations guidance. As stated in the corollary, the magnitude of the downward private guidance exceeds the magnitude of the upward public bias in equilibrium; in other words, public guidance is less effective than private guidance. The reason is that the latter directly affects the analyst's reported forecast, while the former works indirectly, through its effect on investors' assessment of the level of private guidance being provided to the analyst.

As this discussion makes clear, the manager will find it worthwhile to engage in private expectations management only if he and the analyst share private information (in this case, the privately communicated forecast,  $MP$ ) which investors cannot perfectly infer from the publicly available information. He will find it worthwhile to engage in public expectations management only if his public forecast is informative to investors about the shared private information. The following corollary formalizes the necessary and sufficient conditions for private and public expectations management to exist in equilibrium.

*Corollary 3:* Relaxing the assumption that  $V_{\varepsilon z}, V_{\varepsilon MF}, V_{\varepsilon MP}$  and  $V_{\varepsilon e}$  must be positive and bounded, the manager engages in private expectations management in equilibrium if and only if:

- a. the manager's private information is informative about the period's real earnings ( $V_{\varepsilon z} < \infty$ );
- b. the manager's public forecast does not perfectly reveal his private information ( $V_{\varepsilon MF} > 0$ );
- c. the manager's privately disclosed forecast is informative to the analyst about the period's reported earnings ( $V_{\varepsilon MP} < \infty$ ); and
- d. reported earnings is informative about the period's real earnings ( $V_{\varepsilon e} < \infty$ ).

The manager engages in public expectations management if and only if, in addition to the above three conditions,

- e. the manager's private information is not perfectly informative about the period's reported earnings ( $V_{\varepsilon z} > 0$ ); and
- f. the manager's public forecast is informative about the period's reported earnings ( $V_{\varepsilon MF} < \infty$ ).

Note that there are more conditions necessary for public expectations management to exist than there are for private expectations management. This is not surprising, given that a public

forecast can only be of value to the manager if he has already chosen to privately guide the analyst's expectations.

If  $V_{\varepsilon z}$  were infinite, the manager would not have any private information to share and so the analyst would ignore any private communication between them. If  $V_{\varepsilon MF}$  were equal to zero, the manager's public forecast would reveal all of his information and so there would not be any private information to share with the analyst. If  $V_{\varepsilon MP}$  were infinite, the manager's private forecast would be devoid of any information content. Finally, if  $V_{\varepsilon e}$  were infinite, the analyst's private information,  $i$ , would not be of any value in forecasting the period's earnings. It would not be included in her forecast and her forecast would not have any value to investors after earnings are announced.

If either  $V_{\varepsilon z} = 0$  or  $V_{\varepsilon MF} = \infty$ , then there would be private, but not public, expectations management. If  $V_{\varepsilon MF} = \infty$ , then the public forecast would have no value to investors and there would not be any incentive for the manager to manage that forecast. If  $V_{\varepsilon z} = 0$ , then the manager's public forecast would not be informative about his private communication with the analyst, conditional on the announced earnings. Hence, it would not be of any use to investors in determining the end-of-period price.

Up until this point we have assumed that the noise in the bias of the manager's privately disclosed forecast,  $V_{\varepsilon MP}$ , is exogenously given. Allowing the manager to endogenously choose the level of noise leads to the following result:

*Proposition 3:* Assume that  $V_{\varepsilon e} = 0$ . If the analyst could privately observe the level of noise introduced by the manager into his privately communicated forecast, then the manager would

choose to set  $V_{\varepsilon MP} = 0$  if  $c_{MF} < \frac{(V_m + V_{\varepsilon z})(V_{\varepsilon PMF}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon PMF} + V_{\varepsilon z}))}{V_{\varepsilon MF}((V_{\varepsilon MF} + 2V_{\varepsilon z})(V_m + V_{\varepsilon MF}) + 2V_{\varepsilon z}^2)}$ , and to set  $V_{\varepsilon MP} = \infty$ ,

otherwise. If the manager could publicly commit to the level of noise he introduces, then he would set  $V_{\varepsilon MP} = \infty$ .

Proof: See the appendix.

If the analyst could privately observe the level of noise in the manager's privately communicated forecast, then the manager would set it to zero for values of  $c_{MF}$  sufficiently small. To understand the intuition behind this result, recall that in determining her forecast, the analyst places positive weight on the manager's public and private disclosures,  $MF$  and  $MP$ , respectively. Recall also that the manager has an incentive to positively bias  $MF$  for the purpose of guiding investors' expectations. By setting  $V_{\varepsilon MP} = 0$ , the manager benefits by minimizing the positive weight that the analyst places on his (upwardly biased) public forecast and maximizing the weight placed on his (downwardly biased) private guidance. On the negative side, the cost to the manager of biasing his private forecast is at its highest when there is no noise. If the magnitude of the public forecast bias is sufficiently large (that is, if the cost parameter for the public bias,  $c_{MF}$ , is sufficiently low), then the benefit to the manager would exceed the cost and the manager would choose  $V_{\varepsilon MP} = 0$ . If the cost exceeds the benefit, then the manager would choose  $V_{\varepsilon MP} = \infty$  and the optimal level of private bias would be zero.

Since investors set the post-earnings announcement price rationally, there is no ex-ante benefit to the manager in biasing his forecasts. Therefore, if he could commit, ex-ante, not to engage in expectations management and not incur the cost of biasing, it would be in his interest

to do so. By setting  $V_{\varepsilon MP} = \infty$ , the manager does just that. His private bias becomes useless to the analyst and the public bias is rendered valueless; consequently, it becomes optimal for him to set both biases equal to zero.

We now extend our analysis to the case where there is noise in the accounting reporting system ( $V_{\varepsilon e} > 0$ ). The next set of results follow immediately from Proposition 2:

*Corollary 4:* When  $0 < V_{\varepsilon e} < \hat{V}_{\varepsilon e}$ , equilibrium is characterized by:

- a.  $\beta_{MF} > 0$  and  $\beta_{AF} < 0$ ; and
- b.  $\bar{b}_{MF} > 0$  and  $\bar{b}_{MP} < 0$ ,

where  $\hat{V}_{\varepsilon e} \equiv \frac{P_m - P_i}{1 + p_i} V_m$ . When  $V_{\varepsilon e} > \hat{V}_{\varepsilon e}$ , the inequalities are reversed.

When  $V_{\varepsilon e} > 0$ , the analyst's forecast provides information to investors about the period's real earnings, as a whole, in addition to providing information about the two earnings components. If the noise in the accounting reporting system is sufficiently low ( $V_{\varepsilon e} < \hat{V}_{\varepsilon e}$ ), the nature of equilibrium is identical to that when noise is zero ( $V_{\varepsilon e} = 0$ ). The primary role of the analyst's forecast is to convey information about the current period's earnings components, and the end-of-period price varies inversely with the analyst's forecast, consistent with Bartov et al. (2002) and Kasznik and McNichols (2002). The manager has an incentive to manage his public forecast upward and to privately guide the analyst's forecast downward.

The opposite is true when the reporting system is sufficiently noisy ( $V_{\varepsilon e} > \hat{V}_{\varepsilon e}$ ). In this case, the primary role of the analyst's forecast is to provide investors with information about the

period's total real earnings. As a result, the end-of-period price is an increasing function of the analyst's forecast. This motivates the manager to privately guide the analyst's forecast upward, while biasing his own public forecast downward. These actions have a positive impact on investors' estimate of the analyst's private information and, consequently, on their expectation of the period's real earnings. The market premium for beating analysts' forecasts that Bartov et al. (2002) and Kasznik and McNichols (2002) document is not expected to be present in this case.

The contrasting results for low and high reporting system noise provide an explanation for some of the findings in Das et al. (2011). Their paper empirically examines the relation between earnings and expectations management. They show that in settings where the ability to engage in earnings management is less restricted, the levels of expectations and earnings management move in the same direction cross-sectionally. However, in settings where the use of earnings management is more restricted, they move in opposite directions.

Das et al. (2011) define expectations management as the extent to which analysts' forecasts are guided *downward* (corresponding to  $-\bar{b}_{MP}$  in our model). To be consistent with their observations, then, our model should predict that  $\bar{b}_{MP}$  and  $\bar{b}_e$  move in opposite directions (the same direction) cross-sectionally when earnings management is less (more) restricted. To generate cross-sectional predictions in our model, we fix  $c_{MP} = c_e \equiv c$  and allow  $c$  to vary across firms.

Das et al. (2011) use two measures to proxy for the extent to which earnings management is restricted. The first is the level of net operating assets (they cite prior evidence to argue that the higher the level of a firm's net operating assets, the more constrained is earnings management) and the second is the quarter of the year (they posit that earnings management is

more constrained during the fourth quarter than during interim quarters). Higher net operating assets and the fourth quarter of the year are arguably associated with more variability in accruals than are lower net operating assets and interim quarters. In the context of our model, higher accruals variability translates into lower accounting reporting quality (higher  $V_{\varepsilon e}$ ).

From Proposition 2 and Corollary 4, the level of earnings management,  $\bar{b}_e$ , is positive, while the level of private earnings guidance,  $\bar{b}_{MP}$ , is negative (positive) for  $V_{\varepsilon e} < \hat{V}_{\varepsilon e}$  ( $V_{\varepsilon e} > \hat{V}_{\varepsilon e}$ ). For low  $V_{\varepsilon e}$ , therefore,  $\bar{b}_e$  becomes more positive, while  $\bar{b}_{MP}$  becomes more negative, as the cost parameter,  $c$ , increases. For high  $V_{\varepsilon e}$ ,  $\bar{b}_e$  and  $\bar{b}_{MP}$  both become more positive. Consistent with Das et al. (2011), then, our model predicts that earnings and expectations management will vary inversely (directly) in the cross-section when accounting reporting quality is high (low).

#### **IV. Summary and Conclusions**

The goal of this paper is to provide a theoretical framework for the analysis of expectations management. We begin by presenting necessary conditions for expectations management to be an effective strategy for the manager. Among other conditions, we find that the manager and analyst must share private information, conditional on their publicly disclosed forecasts and the current period's reported earnings.

We continue by deriving and analyzing the optimal levels of both public and private expectations management in a setting where expectations management is effective and earnings management is allowed. Our results suggest that private expectations management plays the primary role in influencing firm price, with public expectations management serving a supplementary role. The manager biases his public forecast in a direction opposite to the private

earnings guidance provided to the analyst, in order to reduce investors' assessment of the magnitude of that private bias.

Our results highlight the important role played by Regulation Fair Disclosure in limiting the level of private as well as public expectations management, and the importance of the cost of public expectations management in determining the manager's incentives to communicate privately with the analyst. Our analysis also shows that the quality of the reporting system plays a crucial role in determining whether there exists a market premium for beating analysts' expectations. As such, it opens the door for more refined tests of the "meet or beat" phenomenon.

## Appendix

### Proof of Proposition 1

We prove that if  $I_M \perp I_A | MF, e_1$  then  $E[P_1(MF, AF, e_1) | I_M] = E[P_1(MF, e_1) | I_M]$ , and condition (5) cannot hold. We use the generic conditional pdf,  $f_{X|Y}(X|Y)$ , to denote the pdf of a random variable  $X$  conditional on  $Y$ , and drop the subscript where it is not confusing. To further simplify the notation, we use the change of variables,  $V \equiv e_1 + e_2$ . If  $I_M \perp I_A | MF, e_1$  we have

$$\begin{aligned}
E[P_1(MF, AF, e_1) | I_M] &= E[E[V | MF, AF, e_1] | I_M] \\
&= \int_{e_1} \int_{AF} \left( \int_V Vf(V | MF, AF, e_1) dV \right) f(AF, e_1 | I_M) dAF de_1 \\
&= \int_{e_1} \int_{AF} \left( \int_V Vf(V | MF, AF, e_1) dV \right) f(AF | MF, e_1) f(e_1 | MF, I_M) dAF de_1 \\
&= \int_{e_1} \left( \int_V \int_{AF} f(V | MF, AF, e_1) f(AF | MF, e_1) dAF dV \right) f(e_1 | MF, I_M) de_1 \\
&= \int_{e_1} \left( \int_V Vf(V | MF, e_1) dV \right) f(e_1 | MF, I_M) de_1 \\
&= E[E[V | MF, e_1] | MF, I_M] \\
&= E[P_1(MF, e_1) | I_M]
\end{aligned}$$

where the third equality makes use of the fact that  $MF \perp AF | I_M$  and  $MF \perp e_1 | I_M$ , and the fact that  $I_M \perp I_A | (MF, e_1)$  implies that  $I_M \perp AF | (MF, e_1)$ . QED.

## Proof of Proposition 2

We begin by taking as given the conjectured forms of  $AF$  and  $P_1$ , and show that they are fulfilled in equilibrium. Using these conjectures, the end-of-period price less the costs of biasing is given by

$$\beta_0 + (\beta_{MF} + \beta_{AF}\gamma_{MF})MF + \beta_{AF}\gamma_{MP}MP + \beta_{AF}(\gamma_0 + \gamma_i i) + \beta_e e_{1r} - \frac{c_{MF}}{2}(b_{MF} - \varepsilon_{MF})^2 - \frac{c_{MP}}{2}(b_{MP} - \varepsilon_{MP})^2 - \frac{c_e}{2}b_e^2 \quad (19)$$

At date 1 the manager chooses  $b_{MF}$  and  $b_{MP}$ , and at date 3 the manager chooses  $b_e$ , in order to maximize the expectation of (19), given his information set at each date and given his conjectures. The first order conditions for the expectation of (19) with respect to  $b_{MF}$ ,  $b_{MP}$ , and  $b_e$  yield:

$$b_{MF} = \frac{\beta_{MF} + \beta_{AF}\gamma_{MF}}{c_{MF}} + \varepsilon_{MF};$$

$$b_{MP} = \frac{\beta_{AF}\gamma_{MP}}{c_{MP}} + \varepsilon_{MP}; \text{ and}$$

$$b_e = \frac{\beta_e}{c_e} > 0.$$

The second order conditions are  $c_{MF} > 0$ ,  $c_{MP} > 0$ ,  $c_e > 0$ , which are satisfied.

We therefore have

$$MF = z_e + \frac{\beta_{MF} + \beta_{AF}\gamma_{MF}}{c_{MF}} + \varepsilon_{MF};$$

$$MP = z_e + \frac{\beta_{AF}\gamma_{MP}}{c_{MP}} + \varepsilon_{MP}; \text{ and}$$

$$e_{1r} = e_1 + \varepsilon_{e1} + \frac{\beta_e}{c_e}.$$

At date 2, the analyst observes the three normally distributed random variables,  $MF$ ,  $MP$ , and  $i$ , and forms expectations about the fourth normally distributed random variable,  $e_{1r}$ . The solution to  $AF(MF, MP, i) = E[e_{1r} | MF, MP, i]$  is

$AF(MF, MP, i) = \gamma_0 + \gamma_{MF}MF + \gamma_{MP}MP + \gamma_i i$ , where

$$\gamma_0 = \frac{\beta_e}{c_e} - \frac{V_m + V_{\varepsilon e}}{D} \left( V_{\varepsilon MP} \frac{\beta_{MF} + \beta_{AF}\gamma_{MF}}{c_{MF}} + V_{\varepsilon MF} \frac{\beta_{AF}\gamma_{MP}}{c_{MP}} \right);$$

$$\gamma_{MF} = \frac{(V_m + V_{\varepsilon e})V_{\varepsilon MP}}{D} > 0;$$

$$\gamma_{MP} = \frac{(V_m + V_{\varepsilon e})V_{\varepsilon MP}}{D} > 0;$$

$$\gamma_i = \frac{V_{\varepsilon MP}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon MP} + V_{\varepsilon z})}{D} > 0; \text{ and}$$

$$D \equiv V_{\varepsilon MF}V_{\varepsilon MP} + (V_{\varepsilon MF} + V_{\varepsilon MP})(V_m + V_{\varepsilon e} + V_{\varepsilon z}).$$

At date 3, investors observe the three normally distributed random variables,  $MF$ ,  $AF$ , and  $e_{1r}$ , and form expectations about a fourth normally distributed random variable,  $e_1 + e_2$ .

The solution to  $P_1(MF, AF, e_{1r}) = E(e_1 + e_2 | MF, AF, e_{1r})$  is

$P_1(MF, AF, e_{1r}) = \beta_0 + \beta_{MF}MF + \beta_{AF}AF + \beta_e e_{1r}$ , where

$$\beta_{MF} = -\left(V_{\varepsilon e} - \hat{V}_{\varepsilon e}\right) \frac{V_i(V_{\varepsilon MP}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon MP} + V_{\varepsilon z}))}{E};$$

$$\beta_{AF} = \left(V_{\varepsilon e} - \hat{V}_{\varepsilon e}\right) \frac{V_i(V_{\varepsilon MF} + V_{\varepsilon z}) \left[ V_{\varepsilon MF}V_{\varepsilon MP} + (V_m + V_{\varepsilon e} + V_{\varepsilon z})(V_{\varepsilon MF} + V_{\varepsilon MP}) \right]}{(V_m + V_{\varepsilon e})E};$$

$$\beta_e = \frac{(1+p_m)V_m}{V_m+V_{\varepsilon e}} > 0; \text{ and}$$

$$E \equiv (V_m + V_{\varepsilon e})^2 V_{\varepsilon MF}^2 + V_i \left( V_m V_{\varepsilon MF}^2 + V_{\varepsilon e} V_{\varepsilon MF}^2 + (V_{\varepsilon MF} + V_{\varepsilon z}) (V_{\varepsilon MP} V_{\varepsilon z} + V_{\varepsilon MF} (V_{\varepsilon MP} + V_{\varepsilon z})) \right);$$

$$\hat{V}_{\varepsilon e} \equiv \frac{p_m - p_i}{1 + p_i} V_m.$$

The intercept,  $\beta_0$ , is given by

$$\beta_0 = \frac{A}{G},$$

where

$$G \equiv V_{\varepsilon MF}^2 \left[ (V_m + V_{\varepsilon e})^2 + V_i (V_m + V_{\varepsilon e} + V_{\varepsilon MP}) \right] + V_i V_{\varepsilon MF} (V_{\varepsilon MF} + 2V_{\varepsilon MP}) V_{\varepsilon z} + V_i (V_{\varepsilon MF} + V_{\varepsilon MP}) V_{\varepsilon z}^2;$$

$$A \equiv - \frac{V_i^2 (V_{\varepsilon e} - \hat{V}_{\varepsilon e})^2 V_{\varepsilon MF}^2 (V_{\varepsilon MF} + V_{\varepsilon z})^2}{G c_{MP}} - \frac{V_{\varepsilon z} (V_{\varepsilon MP} V_{\varepsilon z} + V_{\varepsilon MF} (V_{\varepsilon MP} + V_{\varepsilon z}))}{G c_e c_{MF}}$$

$$- \frac{1}{c_e} \frac{1}{V_m + V_{\varepsilon e}} (1 + p_m) V_m B;$$

$$B \equiv (1 + p_m) V_m (V_m + V_{\varepsilon e}) V_{\varepsilon MF}^2 + V_i V_m V_{\varepsilon MF} (V_{\varepsilon MF} + p_i V_{\varepsilon MF} + p_i V_{\varepsilon MP} - p_m V_{\varepsilon MP}) \\ + V_i (p_i - p_m) V_m (V_{\varepsilon MF} + V_{\varepsilon MP}) V_{\varepsilon z} \\ + V_i (1 + p_i) (V_{\varepsilon MF} + V_{\varepsilon z}) (V_{\varepsilon MF} V_{\varepsilon MP} + (V_{\varepsilon e} + V_{\varepsilon z}) (V_{\varepsilon MF} + V_{\varepsilon MP})) \\ + \frac{c_e c_{MF} V_i^2 (V_{\varepsilon e} - \hat{V}_{\varepsilon e})^2 V_{\varepsilon MF}^2 (V_{\varepsilon MF} + V_{\varepsilon z})^2}{G}.$$

As shown above, the conjectured forms of  $AF$  and  $P_1$  are fulfilled in equilibrium. QED.

### Proof of Proposition 3

At the beginning of the period (before the manager acquires any private information), he chooses  $V_{\varepsilon MP}$  to solve:

$$V_{\varepsilon MP} = \arg \max_{V_{\varepsilon MP}} E[U] \quad (20)$$

The manager's expected utility is given by

$$\begin{aligned} E[U] &= E \left[ P_1 - \frac{c_{MF}}{2} (b_{MF} - \varepsilon_{MF})^2 - \frac{c_{MP}}{2} (b_{MP} - \varepsilon_{MP})^2 - \frac{c_e}{2} b_e^2 \right] \\ &= E[P_1] - \frac{c_{MF}}{2} \left( \frac{\hat{\beta}_{MF} + \hat{\beta}_{AF} \gamma_{MF}(V_{\varepsilon MP})}{c_{MF}} \right)^2 - \frac{c_{MP}}{2} \left( \frac{\hat{\beta}_{AF} \gamma_{MP}(V_{\varepsilon MP})}{c_{MP}} \right)^2 - \frac{c_e}{2} \left( \frac{\hat{\beta}_e}{c_e} \right)^2. \end{aligned}$$

The “^” notation above coefficients indicate that these are the conjectured coefficients that investors use when determining the firm's price at the end of the period. These conjectures are unaffected by the actual choice of  $V_{\varepsilon MP}$ . The analyst, though, observes the manager's choice of  $V_{\varepsilon MP}$ , and therefore, the  $\gamma$ 's in her earning expectation are functions of  $V_{\varepsilon MP}$ .

The first derivative of the manager's expected utility with respect to  $V_{\varepsilon MP}$  is

$$\frac{\partial E[U]}{\partial V_{\varepsilon MP}} = \frac{\partial E[P_1]}{\partial V_{\varepsilon MP}} - \left( \hat{\beta}_{MF} + \hat{\beta}_{AF} \gamma_{MF}(V_{\varepsilon MP}) \right) \hat{\beta}_{AF} \gamma'_{MF}(V_{\varepsilon MP}) - \hat{\beta}_{AF} \gamma_{MP}(V_{\varepsilon MP}) \hat{\beta}_{AF} \gamma'_{MP}(V_{\varepsilon MP}). \quad (21)$$

We next explore the conditions under which  $\frac{\partial E[U]}{\partial V_{\varepsilon MP}} < 0$  (so that the manager chooses

$V_{\varepsilon MP} = 0$ ), and the conditions under which  $\frac{\partial E[U]}{\partial V_{\varepsilon MP}} > 0$  (so that the manager choose  $V_{\varepsilon MP} = \infty$ ).

We start by examining  $E[P_1]$  and  $\frac{\partial E[P_1]}{\partial V_{\varepsilon MP}}$ . From Proposition 2 we have

$$\begin{aligned} E[P_1] &= \hat{\beta}_0 + \hat{\beta}_{MF} E[MF] + \hat{\beta}_{AF} E[AF] + \hat{\beta}_e E[e_{1r}] \\ &= \hat{\beta}_0 + \hat{\beta}_{MF} E \left[ \frac{\hat{\beta}_{MF} + \hat{\beta}_{AF} \gamma_{MF}}{c_{MF}} + z_e + \varepsilon_{MF} \right] + \hat{\beta}_{AF} \frac{\hat{\beta}_e}{c_e} + \hat{\beta}_e E \left[ \frac{\hat{\beta}_e}{c_e} + e_1 + \varepsilon_{e1} \right] \\ &= \hat{\beta}_0 + \hat{\beta}_{MF} \frac{\hat{\beta}_{MF} + \hat{\beta}_{AF} \gamma_{MF}}{c_{MF}} + \hat{\beta}_{AF} \frac{\hat{\beta}_e}{c_e} + \frac{\hat{\beta}_e^2}{c_e}. \end{aligned} \quad (22)$$

For the second equality we make use of the condition that  $E[AF] = \frac{\hat{\beta}_e}{c_e}$  (which we subsequently

verify to be true). For the third equality we make use of the fact that, as the beginning of the

period,  $E[z_e] = E[\varepsilon_{MF}] = E[e_1] = E[\varepsilon_{e1}] = 0$ .

We now show that  $E[AF] = \frac{\hat{\beta}_e}{c_e}$ . Using Proposition 2 and rearranging the expression for

$AF$  we have:<sup>8</sup>

$$\begin{aligned} AF &= \gamma_0 + \gamma_{MF}MF + \gamma_{MP}MP + \gamma_i i \\ &= \gamma_0 + \gamma_{MF} \left( \frac{\hat{\beta}_{MF} + \hat{\beta}_{AF}\gamma_{MF}}{c_{MF}} + z_e + \varepsilon_{MF} \right) + \gamma_{MP} \left( \frac{\hat{\beta}_{AF}\gamma_{MP}}{c_{MP}} + z_e + \varepsilon_{MP} \right) + \gamma_i i \\ &= \frac{\hat{\beta}_e}{c_e} + \frac{(V_m + V_{\varepsilon e})V_{\varepsilon MP}}{D}(z_e + \varepsilon_{MF}) + \frac{(V_m + V_{\varepsilon e})V_{\varepsilon MF}}{D}(z_e + \varepsilon_{MP}) + \frac{V_{\varepsilon MP}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon MP} + V_{\varepsilon z})}{D}i, \end{aligned}$$

where  $D$  is given in Proposition 2. Since at the beginning of the period,

$$E[z_e] = E[\varepsilon_{MF}] = E[\varepsilon_{MP}] = E[i] = 0, \text{ we have } E[AF] = \frac{\hat{\beta}_e}{c_e}.$$

Using (21) and (22), the first derivative of the manager's expected utility becomes

$$\begin{aligned} \frac{\partial E[U]}{\partial V_{\varepsilon MP}} &= \hat{\beta}_{MF} \frac{\hat{\beta}_{AF}}{c_{MF}} \gamma'_{MF}(V_{\varepsilon MP}) - \left( \hat{\beta}_{MF} + \hat{\beta}_{AF}\gamma_{MF}(V_{\varepsilon MP}) \right) \hat{\beta}_{AF}\gamma'_{MF}(V_{\varepsilon MP}) \\ &\quad - \hat{\beta}_{AF}\gamma_{MP}(V_{\varepsilon MP}) \hat{\beta}_{AF}\gamma'_{MP}(V_{\varepsilon MP}). \end{aligned}$$

Employing the expressions for the coefficients given in Proposition 2, and assuming that

$V_{\varepsilon MP} = 0$ , it is straightforward to see that the sign of  $\frac{\partial E[U]}{\partial V_{\varepsilon MP}}$  is identical to the sign of

$$c_{MF} - \frac{(V_m + V_{\varepsilon z})(V_{\varepsilon MP}V_{\varepsilon z} + V_{\varepsilon MF}(V_{\varepsilon MP} + V_{\varepsilon z}))}{V_{\varepsilon MF}((V_{\varepsilon MF} + 2V_{\varepsilon z})(V_m + V_{\varepsilon MF}) + 2V_{\varepsilon z}^2)}. \text{ If the manager could publicly commit to the}$$

<sup>8</sup> For exposition simplicity, we suppress the dependence of  $AF$  on the  $\gamma$ 's in the expression for the analyst's earnings expectation.

level of noise he introduces, then he would set  $V_{\varepsilon MP} = \infty$ . In this case,  $E[P_1] = 0$  independent of the choices of  $V_{\varepsilon MP}$ , and  $V_{\varepsilon MP} = \infty$ , reducing the expected cost of biasing to zero. QED.

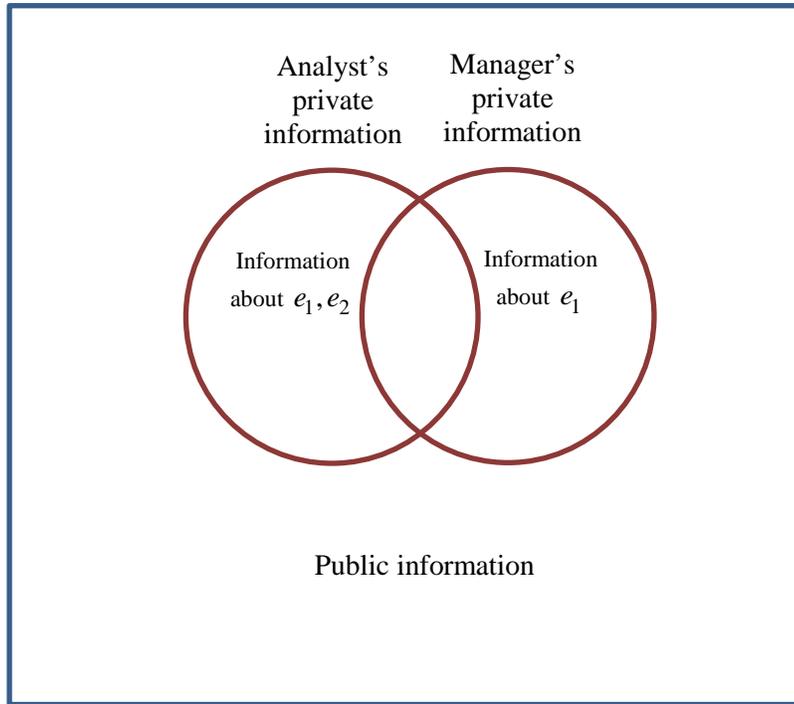
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**Figure 1:** Illustration of the necessary conditions for expectations management to be ex-ante effective