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Time-Series Properties of Earnings and Reporting Strategy of Earnings Surprise

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Abstract

This study examines whether earnings surprise management is related to the time-series property of historical earnings series (i.e., earnings persistence). The findings from my analysis indicate that firms with a higher level of earnings persistence are less likely to manipulate the earnings surprise to achieve meeting or beating earnings expectations (MBE) than firms with a lower level of earnings persistence. Further, I find that, while the market discounts the managed earnings surprise, it is less likely for firms with higher earnings persistence. This suggests that the capital market understands the role of earnings persistence in mitigating the manager's incentive for managing the earnings surprise to attain MBE.

Keywords: Earnings persistence; Earnings surprise management; Meeting or beating earnings expectations; Market efficiency

Introduction

The time-series property of historical earnings series, so-called earnings persistence in the accounting literature, has been a constant topic with respect to its valuation implications for reported earnings. The notion that more persistent earnings innovations are assigned greater value in equity markets is well documented in the literature [1-3]. These studies mainly focus on the firm valuation and market association of earnings with different persistence levels. Since the difference in firm-specific earnings persistence results in different market reactions for reported (managed) earnings, differing levels of earnings persistence would provide managers with differential incentives for subsequent financial reporting. However, how earnings persistence is related to subsequent financial reporting policies is not yet well established. In particular, whether management's strategic behavior of earnings reporting is associated with earnings persistence thus far is uninvestigated. In this study, I argue that the time-series property (the degree of persistence level) of the historical earnings of the firm plays an important role in a firm's decision-making process.

The main question examined in this study is whether earnings surprise (actual earnings – earnings expectation) management is related to earnings persistence. Specifically, this study investigates whether firms with a higher firm-specific earnings persistence level manipulate more or less earnings surprises than do firms with a lower earnings persistence level. Prior studies (e.g Degeorge et al. [4], Graham et al. [5]) document that firm managers have strong incentives to manipulate actual earnings or earnings expectations to achieve meeting/beating earnings expectations (MBE)[1]. Meeting/beating earnings expectations (i.e., reporting non-negative earnings surprise) means that current period earnings is the same as or greater than the most recent market's expectation and considered to be the most common purpose of discretionary earnings or earnings expectations management. The investigation of whether the firm-specific earnings persistence level is related to subsequent MBE strategy sheds light on the earnings and earnings expectations management literature. In addition, I further examine how market responds to managed earnings surprise for the firms with different time-series property of historical earnings. This examination may have important implications for the market efficiency study.

Background and Hypothesis Development

Similar to the valuation implication, more persistent earnings innovations elicit higher market reactions to per unit earnings surprise [2,3]. Earnings with higher earnings persistence have a higher portion of permanent (less transitory) component of earnings while earnings with lower earnings persistence have a lower portion of permanent (more transitory) component of earnings. While many studies [6-8] find that the market partially reflects the time-series properties of earnings, Mendenhall [9] shows that investors recognize firm-specific differences in earnings persistence. This means investors react differently to earnings surprises of firms that have different earnings persistence. Since, differential levels of firm-specific earnings persistence results in differential market responses for reported (managed) earnings, I expect that differential earnings persistence levels would provide managers with differential incentives to strategically report earnings surprises. Specifically, I expect that differences in time-series properties (earnings persistence) can lead to significantly different earnings or earnings expectations management behaviors of managers with the anticipation of market reactions to earnings surprises.

Prior research [10,11] documents that abnormal returns are significantly greater for the firms meeting or beating the market's current expectation rewards managers, particularly for habitual beaters. Consistent with this, Kross et al. [12] find that firms with a consistent MBE record are more likely to guide analyst forecasts downward to maintain the consistency. The above-mentioned studies collectively

[1]The market's recent expectation of earnings is measured as the consensus of the most recent analysts' earnings forecasts.

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suggest that market implications for earnings persistence could cause different earnings reporting policies in terms of MBE. I posit two alternative possible scenarios for the effect of earnings persistence on firms' reporting policies with respect to the MBE strategy. First, if the effect of nonnegative earnings surprise is more permanent for firms with more persistent earnings, they will manage earnings to report the nonnegative surprise because the market reaction to earnings surprise will be higher for those firms. Alternatively, since firms with higher earnings persistence intrinsically have a more stable path of earnings series, they are less concerned about the temporary negative surprise and thus less likely manage earnings or earnings expectations to report positive earnings surprise. I posit my hypothesis in its alternative form:

Firms with higher earnings persistence are less likely to manage the earnings surprise to report MBE than firms with lower earnings persistence.

Research Design and Sample

Empirical model

I first classify the sample into MBE (*DMBE*=1) and non-MBE (*DMBE*=0) groups. In order to examine the effect of persistence levels on MBE likelihood, the *DMBE* is regressed on persistence level of firms and control variables under the logistic distribution assumption. Specifically, I fit the following *Logit* regression model:

$$DMBE = \beta_0 + \beta_1 PERAR + \beta_2 \Delta EPS + \beta_3 STD + \beta_4 LMVE + \beta_5 LMB + \beta_6 AAFNUM + \beta_7 ISSUE + \beta_8 LITIG + \beta_9 REGUL + \varepsilon \quad (1)$$

In the above equation, the choice variable, *DMBE*, is 1 for occurrence of MBE and 0 for non-occurrence of MBE, and *PERAR* represents the time-series parameters (persistence levels) obtained from an autoregressive integrated, and moving average (ARIMA) (1,1,0) model, which will be explained later in detail. In order to consider other factors that could affect MBE likelihood besides the effect of persistence levels, following prior studies, I include various control variables, which are explained in Table 1.

Next I focus on the effect of earnings persistence on the *managed* earnings surprise or MBE. Because earnings surprise management is suspected when a company meets or barely beats the most recent analyst earnings forecast consensus, I classify earnings surprises into two separate groups and created a binary variable, *DMES*. *DMES* equals one if earnings surprise is between 0 and 0.01 (including 0) and zero otherwise (i.e., non-occurrence of managed earnings surprise). Similar to equation (1), I estimate the following logit model.

$$DMES = \beta_0 + \beta_1 PERAR + \beta_2 \Delta EPS + \beta_3 STD + \beta_4 LMVE + \beta_5 LMB + \beta_6 AAFNUM + \beta_7 ISSUE + \beta_8 LITIG + \beta_9 REGUL + \varepsilon \quad (2)$$

The earnings persistence *DMES*variables are the same as those in equation (1).

Sample selection process and descriptive Statistics

Using the earnings surprise (actual earnings number–the mean

Variables	*DMBE*	*DMES*	*ISSUE*	*LITIG*	*REGUL*
Frequency of the variable = 1	0.6655	0.2059	0.4940	0.2693	0.9320

Panel A: The frequency distribution of nonnegative and managed earnings surprises and binary control variables.

Variables	ARIMA (1,1,0) Model: PERAR	ARIMA (0,1,1) Model : PMA = (1- PERMA)
Mean	0.2893	1.3112
Median	0.2845	1.2661
Std Deviation	0.2723	0.3337
Skewness	-0.0549	0.1051
Kurtosis	-0.5229	0.3994

Panel B: Summary statistics of firm-quarter earnings persistence estimates.

Variables	*ΔEPS*	*STD*	*LMVE*	*LMB*	*AAFNUM*
Mean	-0.2668	0.4589	6.6836	0.8069	7.8240
Median	-0.0666	0.2216	6.5738	0.7332	6.0000
Std Dev	11.5441	5.3124	1.8133	0.7887	6.6624
Skewness	33.1443	75.2638	0.3070	0.6672	1.4918
Kurtosis	4995.2218	6222.0118	0.0127	3.2334	2.5265

Panel C: Summary statistics of continuous control variables.

DMBE is 1 for occurrence of MBE and 0 for non-occurrence of MBE.
DMES is 1 for occurrence of managed earnings surprise and 0 for non-occurrence of managed earnings surprise.
PERAR=firm-specific persistence level based on ARIMA (1,1,0).
PMA=firm-specific persistence level based on ARIMA (0,1,1).
ΔEPS=change of EPS.
STD=standard deviation of earnings for previous 12 quarters.
LMVE=log (Market value of equity) at the beginning of the quarter.
LMB=log (market-to-book ratio) at the beginning of the quarter.
AAFNUM=log (#of analysts following).
ISSUE=1 if the number of shares outstanding, adjusted for splits and dividends, increases by more than 10 percent over the previous year, and 0 otherwise.
LITIG=1 if the firm belongs to litigation industry [Biotechnology (Compustat SIC codes 2833-2836, 8731-8734), Computers (3570-3577, 7370-7374), Electronics (3600-3674), Retailing (5200-5961)] and 0 otherwise.
REGUL=1 if the firm belongs to regulatory industry[Telephone (Compustat SIC codes 4812-4813), TV (4833), Cable (4841), Communications (4811-4899), Gas (4922-4924), Electricity (4931), Water (4941), Financial firms (6021-6023, 6035-6036, 6141, 6311, 6321, 6331)] and 0 otherwise.

[2]The ARIMA (1,1,0) process is used, for example, by Kormendi and Lipe [2] and Mendellhall [9] and the ARIMA (0,1,1) process is used in Collins and Kothari [3] and Baber et al. [13].

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value of most recent analyst earnings forecast consensus), where the median value of the most recent analyst earnings forecast consensus, I obtain *DMBE* and *DMES* for each quarter of 1996-2005. First, the earnings surprise sample is classified as the MBE group (nonnegative earnings surprise: *DMBE*=1) if the surprise is 0 or positive and the non-MBE group (negative earnings surprise *DMBE*=0) if the surprise is less than 0. Secondly, for the analysis of MBE which is suspected to be attained by earnings or expectations management, I classified the earnings surprise sample as the managed earnings surprise group (*DMES*=1) if the surprise ranges between 0~0.01 and the non-managed earnings surprise (*DMES*=0) if this number is less than 0 or greater than 0.01. Actual earnings and the most recent analyst forecasts are obtained from the I/B/E/S (the Institutional Brokers' Estimate System) database. Table 1, Panel A presents the frequency distribution of *DMBE* and *DMES*. Of our sample firm-quarters, 67% and 21% are classified as MBE firms (*DMBE*=1) and managed earnings surprise firms (*DMES*=1), respectively.

Firm-specific earnings persistence levels (time-series parameters of earnings) are calculated using earnings data collected from the *Compustat* database. Since it is well known that earnings series follow a non-stationary process, I obtain earnings persistence parameters using ARIMA (1,1,0) and ARIMA (0,1,1) with the adjustment for seasonality[2]. The earnings persistence parameters are estimated by a rolling basis for each quarter for the period beginning with the fourth quarter of 1995 to the third quarter of 2005 using the previous 32 quarter the earnings data for 1988-2005. For example, the first quarter earnings of 1988 to the last quarter earnings of 1995 are used to estimate earnings persistence parameters for the first quarter of 1996. Since the ARIMA model requires a long data history (10-30 periods) to estimate parameter values, I eliminate the observations that lack 24 consecutive differenced earnings observations (i.e., Max:32, Min:25 earnings consecutive series). Figures 1 and 2 depict the frequency distribution for earnings persistence parameters of ARIMA (1,1,0) and ARIMA (0,1,1), respectively. Table 1, Panel B presents the descriptive statistics on persistence parameters. The mean estimated earnings persistence parameter *(PERAR)* from the ARIMA (1,1,0) model is 0.27 while that *(PMA)* from ARIMA (0,1,1) model is 0.33. The results of data analysis for both methods are similar because the distributions of both cases are similar except for that there exist some outliers for ARIMA (0,1,1). Therefore, I report the results only for the ARIMA (1,1,0) model.

Empirical Results

The effect of earnings persistence on MBE (Nonnegative earnings surprise versus Negative Earnings Surprise)

Table 2 reports the results from the logistic regression described in equation (1). The coefficient of earnings persistence *(PERAR)*

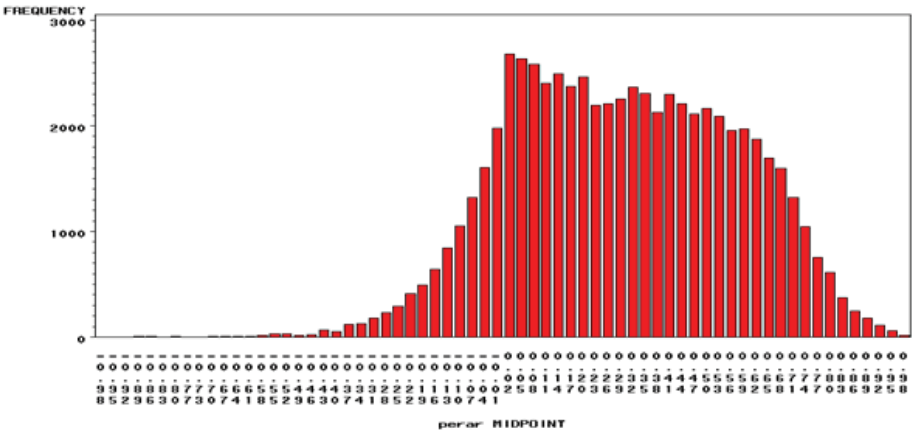

Figure 1: Persistence Parameter based on ARIMA (1,1,0).

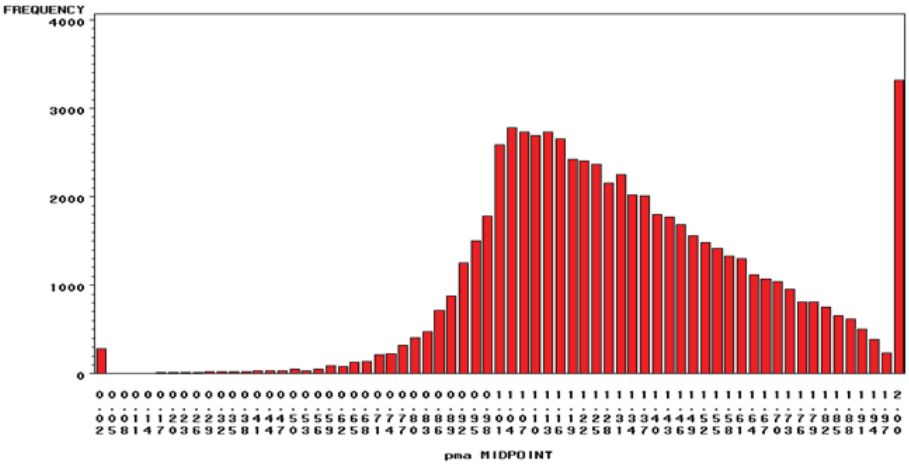

Figure 2: Persistence Parameter based on ARIMA (0,1,1).

is not significant (p-value=0.8744). All the other control variables significantly affect the MBE occurrence except *STD*. These results indicate that the earnings persistence parameter is not significantly related to the occurrence likelihood of MBE. This can be interpreted as indicative that the insignificant effect of earnings persistence *(PERAR)* on MBE occurrence can be explained as a trade-off effect, where firms with higher earnings persistence have a higher probability of MBE due to higher earnings growth while they seldom manage earnings or earnings expectations to accomplish MBE. Consequently, the net effect of earnings persistence on MBE likelihood may result in an insignificant relationship between earnings persistence and MBE. Next, I examine whether firms with higher earnings persistence, than firms with lower earnings persistence, are less likely to manage earnings or earnings expectations in order to accomplish MBE.

The effect of earnings persistence for earnings surprise management

Table 3 presents the results from estimating the logit model in equation (2). The coefficient on *PERAR* is negative (-0.1592) and significant (p-value<0.01). This indicates that firms with higher earnings persistence, than firms with lower earnings persistence, are less likely to manage earnings or earnings expectations in order to accomplish MBE. I interpret this result as indicative that firms with higher earnings persistence may less consider earnings surprise manipulation, because the market may value the higher persistence and punish less their temporary negative surprise. However, since firms with lower earnings persistence are more punished for the missing MBE, firms with lower earnings persistence are more likely to manage earnings or market expectation in order to accomplish MBE.

Extension: Market Response to Earnings Surprises for Differing Earnings Persistence Levels

I further examine how investors respond when the nonnegative earnings surprise is suspected to have been managed to attain MBE or to just reflect a firm's true economic performance shock. The market efficiency theory contends that the capital market only appreciates the MBE that reflects a firm's true economic performance shock. Because management of earnings surprise is suspected when a company meets or barely beats the most recent analyst earnings forecast consensus, the market should depreciate this category of earnings surprise under the assumption of the market efficiency theory. However, the market appreciates the earnings surprise of firms with higher earnings persistence firm due to their higher quality of earnings process. Under such circumstances, how the market differentially interprets the earnings surprise of high earnings persistence firms from that of low earnings persistence firms, when the surprise is zero or barely positive? We examine this question.

In order to test the market reaction to managed versus non-managed earnings surprises for differing levels of earnings persistence, I regress three-day cumulative abnormal returns (CAR) around earnings announcement dates on the earnings surprise and its interactions

Parameter	Estimate	Standard Error	Chi- Square	Pr>ChiSq
Intercept	0.0557	0.0546	1.04	0.3077
PERAR	-0.0067	0.0423	0.02	0.8744
ΔEPS	0.0188	0.0022	75.35	<.0001
STD	0.0005	0.0019	0.07	0.7912
LMVE	0.0467	0.0102	20.96	<.0001
LMB	0.2166	0.0170	162.52	<.0001
AAFNUM	0.0244	0.0025	91.44	<.0001
ISSUE	0.1866	0.0480	15.10	0.0001
LITIG	0.0880	0.0276	10.15	0.0014
REGUL	-0.2664	0.0397	45.09	<.0001
Deviance/DF; Log Likelihood			1.2328;-22242.7020	
# of observation			36094	
# of MMBE; # of NMMBE			24304;11790;	

The choice variable, *DMBE*, is 1 for occurrence of MBE and 0 for non-occurrence of MBE. Other variables are defined in Table 1.

Table 2: Logit model regression of MBE likelihood on persistence levels.

Parameter	Estimate	Standard Error	Chi- Square	Pr>ChiSq
Intercept	-1.4895	0.0637	546.17	<.0001
PERAR	-0.1592	0.0498	10.21	0.0014
ΔEPS	0.0015	0.0010	2.06	0.1514
STD	-0.8058	0.0461	305.72	<.0001
LMVE	-0.0004	0.0115	0.00	0.9695
LMB	0.2823	0.0188	225.00	<.0001
AAFNUM	0.0255	0.0027	92.12	<.0001
ISSUE	0.0687	0.0508	1.82	0.1768
LITIG	0.0480	0.0306	2.46	0.1167
REGUL	-0.3745	0.0546	46.98	<.0001
Deviance/DF; Log Likelihood			0.9860; -17790.0147	
# of observation			36094	
# of MMBE; # of NMMBE			7482; 28612	

The choice variable, *DMES*, is 1 for occurrence of managed earnings surprise and 0 for non-occurrence of managed earnings surprise. Other variables are defined in Table 1.

Table 3: Logit model regression of managed MBE likelihood on persistence levels.

Parameter	Estimate	Standard Error	T- Value	Pr>|t|
Intercept	0.00230	0.00043	5.24	<.0001
SUR	0.00437	0.00178	2.45	0.0143
*SUR*ARRK*	0.02683	0.00916	2.93	0.0034
*SUR*DMES*	- 4.33940	2.40062	-1.81	0.0707
*UR*ARRK*DMES*	7.02374	3.47943	2.02	0.0435
R-Square			0.0570	
# of observation;			36094	

The dependent variable, *CAR*, is the cumulative abnormal return around earnings announcement date. *SUR*=(actual earnings announced–most recent AF consensus prior to earnings announcement date)/pre-released share price. *ARRK* equals 1 when earnings persistence is higher than the sample median (0.285) and 0 when it is lower than the sample median. Other variables are defined in Table 1.

Table 4: Market reaction test for managed earnings surprise and earnings persistence.

with earnings persistence rank and *DMES*. For the proxy for the earnings surprise at the earnings announcement date, I use a variable, [SUR=(actual earnings announced–most recent AF consensus prior to earnings announcement date)/pre-released share price]. Specifically, I estimate the following event-study regression.

$$CAR = \beta_0 + \beta_1 SUR + \beta_2 SUR * ARRK + \beta_3 \text{SUR} * \text{DMES} + \beta_4 \text{SUR} * \text{ARRK} * \text{DMES} + \varepsilon \quad (3)$$

ARRK equals one when earnings persistence is higher than the sample median (0.285) and zero when it is lower than the sample median. As defined before, *DMES* equals one for the managed earnings surprise group and zero for the non-managed earnings surprise group. The interaction terms of surprise with *ARRK* and *DMES* are included in the model in order to explore the associated effect of *SUR* with *ARRK* and *DMES*.

Table 4 reports estimation results of equation (3). The coefficients of all terms are significant. *SUR*ARRK* positively affects the market's response which means that the market appreciates the earnings surprise of firms with higher earnings persistence than that of firms with lower earnings persistence. *SUR*DMES* negatively affects the market's response, which indicates that the market discounts the managed earnings surprise as compared to the non-managed earnings surprise. In other words, the market depreciates the positive earnings surprise attained by manipulation of earnings surprise. More importantly, the coefficient on *SUR*ARRK*DMES* is positive, indicating that the market still places high value on *SUR* of firms with high earnings persistence even when they have barely met or beaten analyst forecasts. This suggests that the market considers MBE of high earnings persistence firms as a reflection of true economic outcome, even when those firms have barely attained it. Overall, the results support that investors can differentiate managed earnings surprise (MBE) from non-managed earnings surprise and that investors understand the manager's incentives of managed earnings surprise depending on firm-specific historical earnings persistence.

Conclusion

I have examined whether earnings surprise management behavior in financial report is related to the time-series property of historical earnings series (earnings persistence). The results indicate that firms with a higher time-series parameter in their earnings process are less likely to manipulate earnings surprise to achieve MBE than those with a lower time-series parameter. Further, I find that the market discounts the managed MBE, particularly for firms with lower earnings persistence. This suggests that investors understand the manager's incentive for manipulating earnings surprises depending on firm-characteristics or information environment of a specific firm. A limitation of this study is that I use the suspect versus non-suspect group analysis. Further research can extend my study to a direct analysis that examines the effect of earnings persistence on actual earnings and expectations management.

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