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Full Length Research Paper

Can earnings' management be a tool to affect the accuracy of earnings' forecasts? Evidence from Taiwan

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This study sets out to investigate the determinants of the accuracy of focusing primarily on earnings management whilst also effectively controlling the two major bias problems – sample-selection bias and self-selection bias – through the econometric model developed specifically for this study. Our results indicate that managers tend to engage in earnings management as a means of improving the apparent accuracy of their forecasting, especially for optimistic forecasters. Furthermore, our analysis, which uses listed firms in Taiwan as the study sample, provides us with a valuable opportunity to observe management disclosure quality from a perspective which differs significantly from that of the prior studies, within which the focus is invariably placed on the more developed markets.

Key words: Earnings management, sample selection bias, self-selection bias.

INTRODUCTION

The issue of 'voluntary management earnings forecasts' (VMEFs) has been one of particular interest to researchers in the field of managerial disclosure policy for a considerable period of time, with some of the prior studies focusing on the reasons why managers decide to disclose private information (Glosten and Milgrom, 1985; Diamond and Verrecchia, 1991; Skinner, 1994; Frankel et al., 1995; Botosan, 1997; Sengupta, 1998; Watson et al., 2002), whilst others investigate the market reaction to VMEFs, or to earnings surprises on announcement dates (Pownall and Waymire, 1989; Skinner, 1994; Kasznik and Lev, 1995; Liu and Ziebart, 1999; Atias et al., 2006).

It does, however, appear that very little focus was placed upon any exploration into the impact of forecasting inaccuracies amongst firms or the widespread use of earnings management as a tool for making such forecasts appear to be more accurate, whilst there also appears to be a distinct lack of discussion on the factors that are likely to affect forecasting accuracy. The primary aim of the present study is therefore to investigate whether managers who issue VMEFs tend to report earnings which essentially lean towards their forecasts in order to reduce the potential costs of inaccurate forecasting.

Within the East Asia region, lower levels of information transparency and disclosure quality are typically found in public corporations, and indeed, Taiwan is no exception (Fan and Wong, 2002). According to Taiwan Stock Exchange Corporation, until 2010, there was less than 40% of securities trading values by institutional investors. Besides, the market analyst industry in Taiwan is still a long way from full development, investors remain heavily reliant upon the forecasts provided by managers. There are, however, inherent difficulties in determining exactly what it is that motivates managers to engage in the disclosure of private information.

The insufficient and incomplete regulatory climate in Taiwan exempts managers from any litigation costs based upon inaccurate forecasting; indeed, no listed firm in Taiwan has yet been sued for inaccurate forecasting. Despite this obvious lack of any comprehensive legal environment, investors can nevertheless use subsequent earnings announcements to assess whether firm managers may have misrepresented their private information, in and can then go on to punish such inaccurate

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forecasting through their effects on the stock prices of such firms. Thus, taking into consideration the potential reaction of investors subsequent to earnings announce - ments, managers still have a major incentive to control the accuracy of their forecasting.

In the present study, we set out to examine those factors potentially affecting forecasting accuracy, with a primary focus on the earnings management activities of firms. More specifically, our analysis focuses on the two potential problems of sample-selection bias and self-selection bias. The first of these, sample-selection bias, occurs when information on forecasting accuracy is missed from some part of the observations. Since VMEFs are not specifically required within the extant regulations, it may well be that the provision (or non-provision) of forecasting by managers is largely dependent upon differences in firm characteristics. Thus, if any analysis of the accuracy of VMEFs is undertaken using only forecasting firms, this could easily induce a potential sample-selection problem.

As regards the second potential problem, self-selection bias, this occurs when managers specifically set out to evaluate the accuracy of their forecasts and choose to adopt methods that will directly affect the outcome. It has already been shown that in order to improve their forecasting accuracy, managers have clear incentives to manipulate their earnings in ways that will make it appear that they have achieved their forecasted goals (Kasznik, 1999; Matsumoto, 2002).

From an examination of French IPO firms, Cormier and Martinez (2006) found that the magnitude of earnings management was much higher amongst forecasting firms than amongst those that did not provide forecasts. They adopted forecasting firms as their sample to test several forecasting factors, such as forecasting deviation, and to determine whether there was evidence of earnings management. Their study adopted the Heckman procedure so as to alleviate the potential problem of sample-selection bias in the earnings management regression.

Kasznik (1999), on the other hand, demonstrated that managers will tend to make income-increasing accounting decisions when they realize that their earnings are going to fall below their management forecasts. Correcting for the potential endogeneity problem, Kasznik went on to argue that an abnormal level of earnings management might well prompt a decision to issue an earnings forecast, whilst also pointing out that both forecasting and earnings management could be simultaneously determined as part of an overall reporting strategy. Kasznik used a dummy variable as a control for whether or not a firm issued a forecast; thus, there could be no problem of sample- selection bias in his sample.

In contrast to the aforementioned studies, in the present study, we specifically examine which factors may affect the accuracy of forecasting by focusing primarily on earnings management activities. Our study differs from that of Kasznik (1999), firstly because our main sample is forecasting firms, and secondly because we take the problems noted above into consideration by developing a two-stage ordinary least squares (2SLS) procedure to simultaneously deal with these potential problems.

To the best of our knowledge, none of the prior studies examining the accuracy of VMEFs has yet set out to simultaneously examine the two potential problems of sample-selection bias and self-selection bias; we therefore contribute to the extant literature by extending the current economic and econometric methodology. The econometric model designed for this study provides simultaneous corrections for both the sample-selection and self-selection biases, thereby filling the current gap in the literature.

After correcting for the two biases, our results indicate that managers can effectively improve the apparent accuracy of their forecasting by manipulating the earnings of the optimistic forecasters. We also find that if we ignore the aforementioned biases, then there is a strong likelihood of reaching erroneous conclusions.

EMPIRICAL METHODS

The primary aim of this study is to investigate whether the accuracy of VMEFs may be affected by earnings management. Since the earnings of firms can be manipulated by firm managers in order to affect the apparent accuracy of their earlier forecasting, the problem of endogenity bias may be found to exist. Furthermore, if the study sample comprises only of those firms that have issued VMEFs, then any attempt to estimate the true relationship between the accuracy of forecasting and earnings management may suffer from sample-selection bias.

In order to detect and correct the two potential sources of bias, we modify the Type-III Tobit model, as proposed by Amemiya (1985), and develop a three-step procedure, which we refer to as a selection correction parametric setting approach. The model is written as follows:

$$Accuracy = z_1\beta_1 + \alpha_1 DAC + \gamma_2 DAC \times a + \gamma_1 a + u_1 \quad (1)$$

$$DAC = z\pi_2 + v_2 = z_1\pi_{21} + z_2\pi_{22} + v_2 \quad (2)$$

$$\Pr(Forecast = 1 \mid Z = z) = \Phi(z\pi_3 + v_3) \quad (3)$$

where Equation (1) is the structural equation; Equation (2) is the reduced form equation; and Equation (3) is the selection equation; *Accuracy* refers to the accuracy of the VMEFs; *z* represents the exogenous variable, which can be decomposed to vectors z_1 and z_2 ; *α* represents the unobserved variable; and *DAC* represents the manipulation of earnings.

Given that the issuance (or non-issuance) of forecasts by a firm is a binary outcome variable, we can use the probit model to estimate the probability; Φ is the cumulative distribution function of the standard normal distribution; and v_3 is the error term. *Accuracy* is observed when firms have issued a forecast (that is, *Forecast* = 1), and *DAC* is the endogenous variable, which is potentially correlated with the unobserved variable *α*.

The key Assumptions include: (i) although (*z* , *DAC*, *Forecast*) is always observed within the population, *Accuracy* is only observed when a firm has issued a forecast; (ii) $v_3 \sim N(0, 1)$; (iii) (u_1, v_2, v_3, α) is zero-mean independent of *z*; (iv) $E(\alpha \mid z, v_2, v_3) = \rho_1 v_2 + \rho_2 v_3$; (v)$E(u_1 \mid z, v_2, v_3) = \zeta_1 v_2 + \zeta_2 v_3$; and (vi) the rank condition is $\pi_{22} \neq 0$.

In Assumption (i), *Accuracy* is the only variable which may not be unobserved due to the potential problem of sample selection. Assumption (ii) is a requirement by the probit model, that the disturbance term (v_3) must have standard normal distribution. Assumption (iii) is fairly standard within the present context. Assumption (iv) allows u_1, v_2 and v_3 to be arbitrarily correlated; thus, both endogeneity bias and sample-selection bias could be present, which implies that the conditional expectation involving the unobservable variable, α , is linear. Assumption (v) relaxes the usual joint normality of (u_1, v_2, v_3) by simply requiring the linearity of a conitional expectation. Assumption (vi) is the standard identification condition from which we can generate a good instrumental variable for *DAC*.

In order to derive an estimation equation, the conditional expection of *Accuracy*, by Assumptions (ii), (iii) and (iv), can be written as:

$$E(Accuracy \mid z, v_2, v_3) = z_1\beta_1 + \alpha_1 DAC + \gamma_1 DAC \times (\rho_1 v_2 + \rho_2 v_3) + \gamma_2(\rho_1 v_2 + \rho_2 v_3) + \zeta_1 v_2 + \zeta_2 v_3 \quad (4)$$

We therefore have:

$$E(Accuracy \mid z, v_2, v_3) = z_1\beta_1 + \alpha_1 DAC + \kappa_1 DAC \times v_2 + \kappa_2 DAC \times v_3 + \omega_1 v_2 + \omega_2 v_3 \quad (5)$$

where $\kappa_1 \equiv \gamma_1\rho_1$; $\kappa_2 \equiv \gamma_1\rho_2$; $\omega_1 \equiv \gamma_2\rho_1 + \zeta_1$; and $\omega_2 \equiv \gamma_2\rho_2 + \zeta_2$.

Since v_2 and v_3 are unobserved, we estimate the residual, $\hat{v}_2$, by regressing *DAC* on *z*, and estimate the residual, $\hat{v}_3$, using a probit regression of Pr(*Forecast* = 1) on *z*.

Through the aforementioned procedure, the potential biases caused by endogenity and sample selection can be simultaneously tested and corrected, whilst the usual t-test can be used to determine the significance of $DAC \times \hat{v}_2, \hat{v}_2$ and $DAC \times \hat{v}_3, \hat{v}_3$. If the t-statistic for $\hat{\kappa}_1$ and/or $\hat{\omega}_1$ is found to be significant, then endogenity bias is present within our model. On the other hand, if the t-statistic is significant for $\hat{\kappa}_2$ and/or $\hat{\omega}_2$, then sample-selection bias is present. Finally, the vector of the exogenous variables, *z*, in Equations (2) and (3) could be the same, whilst the residuals $\hat{v}_3$ already have separate variation from $z\hat{\pi}_3$ as a result of the variation in *Forecast*.

SAMPLE AND EMPIRICAL DESIGN

Sample description

Many different types of earnings forecast are issued by firms, such as sales forecasts, revenue forecasts, earnings per share (EPS) forecasts, and so on. In the present study, we use those firms issuing pre-tax EPS forecasts as our 'forecaster' sample to carry out our empirical analysis of forecasting accuracy within the Taiwan stock market, which includes firms listed on the Taiwan Stock Exchange (TSE) and the GreTai Securities Market (GTSM).

The reporting of annual financial statements in Taiwan covers the period until April of the following year; thus, if firms issue forecasts after the end of year, these could be regarded as advance announcements for the subsequent year. We therefore use only the forecasts issued in the current year as our forecaster sample. All of the data for this study are obtained from the Taiwan Economic Journal (TEJ) database.

Following the exclusion of all firms in the financial sector, and those firms with incomplete financial data and IPO year data, we were left with a total sample of 4,361 firm-year observations, of which 1,520 firm-year observations included forecasts issued during the 1998-2004 period. The occurrences of VMEFs for each year are reported in Table 1.

As shown in Table 1, between 1998 and 2002, forecasters were found to account for more than 46% of the listed firms examined, although the ratio declined slightly in 2001 (about 40%). However, the proportion subsequently fell sharply, to 18.7% in 2003, and 17.2% in 2004, less than half of the 1998-2002 levels. The main reason for this change was the Taiwan Financial Supervisory Commission required more strictly about VMEFs issued by the published firms.

Empirical design

Our empirical model design for the investigation of whether managers issuing VMEFs tend to manipulate their reported earnings towards their forecasts is written as follows:

$$Accuracy = \gamma_0 + \gamma_1 DAC + \gamma_2 DAC \times \hat{v}_2 + \gamma_3 DAC \times \hat{v}_3 + \gamma_4 \hat{v}_2 + \gamma_5 \hat{v}_3 + \gamma_6 ASYM + \gamma_7 Big4 + \gamma_8 HON + \gamma_9 GDN + \gamma_{10} MB + \gamma_{11} FIN + \gamma_{12} AGE + \gamma_{13} IND + \gamma_{14} \ln TA + u_1 \quad (6)$$

$$DAC = \beta_0 + \beta_1 Big4 + \beta_2 FIN + \beta_3 AGE + \beta_4 ROA + \beta_5 CFO + \beta_6 dTAC + \beta_7 INS + \beta_8 IND + \beta_9 BLO + \beta_{10} MB + \beta_{11} \ln TA + \beta_{12} LEV + \sum \phi_i YearDummy_i + v_2 \quad (7)$$

$$\Pr(Forecast = 1) = \Phi(\alpha_0 + \alpha_1 FIN + \alpha_2 Age + \alpha_3 ROA + \alpha_4 GDN + \alpha_5 dTAC + \alpha_6 INS + \alpha_7 IND + \alpha_8 BLO + \alpha_9 MB + \alpha_{10} \ln TA + \alpha_{11} LEV + \alpha_{12} MKT + \sum \theta_i YearDummy_i + v_3) \quad (8)$$

The structural equation, Equation (6), which estimates the relationship between the accuracy of VMEFs and earnings management is our main point of interest. *Accuracy* is measured by the absolute value of the difference between the reported earnings and the last

Table 1. Occurrences of voluntary management earnings forecasts, 1998-2004.

Year	Forecaster	Non-forecaster	Total
1998	194	199	393
1999	202	233	435
2000	248	273	521
2001	249	365	614
2002	324	379	703
2003	148	645	793
2004	155	747	902
Total no.	1,520	2,841	4,361
Percent	34.85	63.15	100.00

management earnings forecast divided by reported earnings. As regards the independent variables, earnings management is the element of primary importance within our analysis. Although there is no perfect way of measuring earnings management, a widely accepted proxy is unexplained accruals, referred to as discretionary accruals (DAC).

We estimate *DAC* as total accruals (TAC) minus non-discretionary accruals (NDAC). Following Dechow et al. (1996), we measure *NDAC* using the modified Jones model for each industry and each year, following a cross-sectional model which uses data on all of the listed firms. Following on from the empirical model developed for this study, we add the selection correction factors ($DAC \times \hat{v}_2,\ DAC \times \hat{v}_3, \hat{v}_2, \hat{v}_3$) and carry out separate t-tests on the significance of those variables in order to test for the endogenity and sample-selection biases. The other control variables are selected on the basis of the prior studies.

The cost associated with inaccurate VMEF are likely asymmetric between optimistic and pessimistic forecasts. Skinner (1994), Skinner and Sloan (2002) indicated that the stock market reaction to negative earnings surprises tends to be large and asymmetric. Thus, managers have strong incentives to avoid negative surprises after optimistic forecasts. We added a dummy variable (ASYM) to control the VMEF is optimistic or pessimistic into the structural equation.

Prior research found that larger auditors are less likely to manipulate earnings management than smaller auditors (DeFond et al. 2002; Ashbaugh et al. 2003). Hartnett (2006) also indicated a negative association between audit firm size and the upward bias of managements' forecasts in Australian IPO firms. Thus, we needed to determine whether the accuracy of VMEF is affected by the audit quality. We include audit firm size as a proxy of audit quality. The dummy variable Big4 is equal 1 if the firm is audited by top 4 larger size audit firms, and 0 otherwise.

Intuitively, long-term earnings will be inherently more difficult to predict (Lee et al., 1993). We therefore calculated the forecast horizon (*HOR*) from the date of the forecast to the end of the year, divided by 365. Since Ruland et al. (1990) indicated that managers are likely to disclose good news to the market, a dummy variable, *GDN*, is added when the current year EPS is found to be better than that in the previous year.

Growth firms face more uncertain business risk than value firms, whilst managers of firms operating in risky environments may also forecast earnings in order to reduce expected litigation costs (Skinner, 1994); thus, we control market uncertainty using the market-to-book ratio (*MB*).

Several of the prior studies indicate that if a firm raises external financing, this increases the incentive for a manager to disclose private information (Glosten and Milgrom, 1985; Diamond and Verrecchia, 1991; Frankel et al., 1995; Botosan, 1997; Sengupta, 1998), we therefore included a dummy variable, *FIN*, to control for those firms which raised external financing in the forecasting year. Nevertheless, since corporate governance is possibly the most important determinant of forecasting accuracy, we use a dummy variable (IND), which indicates whether there are independent directors and supervisors within a firm as a proxy for the governance structure.

Jelic et al. (2001) indicated that the age of a firm is significantly related to forecasting accuracy, whilst Firth and Smith (1992) suggested that since large firms generally raise more funds, this makes it more difficult for managers to monitor the use of these funds, and to predict the future earnings flowing from their deployment. We therefore control for the age of the IPO (*AGE*) and the size (ln*TA*) of the firm.

Both the reduced form equation and the selection equations used in the present study are designed on the basis of numerous prior studies. The variables included are: *ROA*, which is the return on assets, representing operating performance; *MKT* is a dummy variable which is equal to 1 if a firm is in the TSE, otherwise 0; *dTAC* is the proxy for account flexibility, as measured by the difference in TAC between the current year and the previous year; *CFO* refers to the cash from operations divided by the initial total assets used as the means of controlling for operating performance. The Asian financial crisis occurred in 1998 and Taiwan experienced a major recession in 2001 which caused first annual negative growth since 1947. Thus, we include yearly dummies in those reduced form equation and selection equation to control difference yearly event. All of the other variables are the same as in Equation (6).

EMPIRICAL RESULTS

Descriptive statistics

The descriptive statistics of the main variables for sample of firms are presented in Table 2. On average, *DAC* is found to be 0.002, which is induced by the econometrics; however, the forecaster sample is found to have a significantly larger *DAC* than the non-forecaster sample. The forecasters are also found to have higher MB ratios, larger firm size and better performance than non-forecasters. However, forecasters are also found to have fewer independent directors, supervisors and less be audited by Big4. Nevertheless, as regards the IPO age and raises external financing, no significant differences are discernible between forecasters and non- forecasters.

Table 2. Descriptive statistics of the main variables for sample firms.

Variable	Full sample		Forecaster		Non-forecaster		Forecaster – Non-forecaster	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	p-value
DAC	0.002	0.086	0.014	0.078	-0.004	0.089	0.018***	0.000
MB	2.451	2.928	2.760	3.247	2.286	2.728	0.474***	0.000
ln*TA*	15.447	1.186	15.633	1.178	15.348	1.179	0.285***	0.000
AGE	8.931	8.603	9.070	8.326	8.856	8.748	0.214	0.435
ROA	4.068	10.198	5.546	8.703	3.277	10.833	2.268***	0.000
GDN	0.474	0.499	0.492	0.500	0.464	0.499	0.028*	0.076
IND	0.143	0.350	0.082	0.274	0.176	0.381	-0.095***	0.000
FIN	0.083	0.276	0.079	0.270	0.086	0.280	-0.007	0.453
Big4	0.523	0.587	0.523	0.500	0.620	0.485	-0.097***	0.000
ASYM			0.753	0.431				
HON	–		0.79	0.579			–	
Forecast_Error	–		0.58	0.927			–	
No. of Obs.	4,361		1,520		2,841		–	

DAC refers to the discretionary accruals as a proxy for earnings management; *MB* is the market-to-book ratio; ln*TA* is the logarithm of total assets; *AGE* is the age of the IPO in the current year; *ROA* is return on assets; *GDN* is a dummy variable which is equal to 1 if the reported EPS is equal to, or greater than, the reported EPS in the previous year; *IND* a dummy variable which is equal to 1 if there are independent directors and supervisors in a firm, otherwise 0; *BLO* refers to the proportion of shares held by block shareholders; *FIN* is a dummy variable which is equal to 1 if the firm raises external financing, otherwise 0; Big4 is a dummy variable which is equal to 1 if a firm is audited by top 4 large size audit firms, otherwise 0; ASYM is a dummy variable which is equal to 1 if the VMEF optimistic, otherwise 0; *HON* refers to the period from the forecast to the end of year, divided by 365; *Forecast_Error* refers to the difference between the forecasted EPS and the reported EPS. *** indicates significance at the 1% level; ** indicates significance at the 5% level; and * indicates significance at the 10% level.

About half of the forecasters have a better EPS than in the previous year, although they do appear to overestimate their EPS.

Determinants of the accuracy of VMEFs

The primary objective of this study is to determine whether or not the accuracy of VMEFs is affected by earnings management; however, as noted earlier, there is also the possibility that both sample-selection bias and self-selection bias could exist within our model. Therefore, in order to ensure the quality of our estimations, we also adopt well-developed reduced form and selection equation estimations. The results are presented in Table 3.

The second column of Table 3 shows the results, on the selection equation, whilst the last column shows the results on the determinants of earnings management. Both the reduced form equation and the selection equation are found to be statistically significant, with a pseudo-R^2 of 9.80% and an adjusted-R^2 of 52.49%.

The results on the primary objective of the present study, the determination of whether the accuracy of VMEFs is affected by earnings management, are presented in Table 4. As the table shows, there were a total of 1,520 firm-year observations of VMEFs between 1998 and 2004. However, since some of the forecasting biases are too large, those 20 observations with the largest forecasting bias (*Accuracy*) are dropped in order to reduce the effects of outliers; as a result of this process, we were left with a total of 1,500 firm-year forecast observations for subsequent analysis. For comparative purposes, the table displays the results of the determinants of forecasting accuracy from four different approaches, the selection correction parametric setting approach proposed in the presents study, along with the OLS, 2SLS and Heckman two-stage approaches.

The first approach to be examined is OLS, which is directly estimated in Equation (6) whilst ignoring the sample selection equation, the unobservable *α*, and the correction terms ($DAC \times \hat{v}_2, \hat{v}_2, {}_{DAC\times\hat{v}_3}, \hat{v}_3$). The second approach is 2SLS; this takes into consideration DAC which could be manipulated by

Table 3. Probit regression of the issuance/non-issuance of VMEF and the DAC regression.

Variable	Regression model			
	Probit (Forecast = 1)		DAC	
	Coeff.	p-value	Coeff.	p-value
Intercept	-2.134***	0.000	-0.006	0.663
Big4			-0.005**	0.007
FIN	0.014	0.852	-0.005	0.187
AGE	-0.005**	0.088	0.000*	0.076
ROA	0.016***	0.000	0.005***	0.000
CFO			-0.009***	0.000
GDN	0.138*	0.003		
dTAC	-0.061	0.613	0.106***	0.000
INS	0.000	0.827	0.000	0.107
IND	-0.148***	0.039	0.005	0.115
BLO	-0.006***	0.002	0.000	0.155
MB	-0.011	0.184	0.002***	0.000
ln*TA*	0.084***	0.000	-0.002**	0.033
LEV	-0.396**	0.002	0.006	0.143
MKT	0.149***	0.009	–	–
LR stat./F stat.	548.49***	0.000	267.38***	0.000
Pseudo R^2/Adj R^2 (%)	9.80		52.49	

This table presents the results from Equations (7) and (8) on a total sample of 4,361 observations, with the independent variables being defined as follows: Big4 is a dummy variable which is equal to 1 if a firm is audited by top 4 large size audit firms, otherwise 0; *FIN* is a dummy variable which is equal to 1 if the firm raises external financing, otherwise 0; *AGE* refers to the age of the *IPO* in the current year; *ROA* refers to the return on assets; *CFO* refers to the cash from operations divided by sales; *GDN* is a dummy variable which is equal to 1 if the reported EPS is equal to, or greater than, the reported EPS in the previous year; *dTAC* refers to financial flexibility; *INS* refers to the proportion of shares held by insiders; *IND* a dummy variable which is equal to 1 if there are independent directors and supervisors in a firm, otherwise 0; *BLO* is the proportion of shares held by block shareholders; *MB* is the market-to-book ratio; ln*TA* is the logarithm of total assets; *LEV* is the total debt divided by total assets; *MKT* is a dummy variable which is equal to 1 if a firm is in the TSE, otherwise 0; Those yearly dummies are ignore in the table. *** indicates significance at the 1% level; ** indicates significance at the 5% level; and * indicates significance at the 10% level

managers, using the fitted value of Equation (7) within the structure equation, and adjusting for self-selection bias, whilst ignoring the potential problem of sample-selection bias. The third approach is the Heckman two-stage approach, which adjusts for sample-selection bias, whilst ignoring both the potential manipulation of DAC by managers and the unobservable *α*. Finally, we use the selection correction parametric setting approach proposed in this study, following the process outlined in the empirical model developed by this study.

The regressions are found to be statistically significant under each of these four approaches, with most of the variables also being found to have the same sign under all four approaches. However, the selection correction parametric setting approach in column 2 is found to have the largest adjusted R^2, at 7.93%, whilst the AIC value for our approach is the smallest, at 14912.14; that is to say, the approach proposed in our study appears to be the most suitable for our sample of firms.

Next, we use the *t*-test to assess whether both sample-selection and self-selection biases exist within our model. From column 2 of Table 4, variables $DAC \times \hat{v}_3$ and $\hat{v}_2$ are found to be 4.396 and 7.639, with statistical significance, which appear above biases exist in our model. The inverse Mills ratio ($\hat{\lambda}$) in the Heckman two-stage process is found to be -0.257, with statistical significance, which appears to confirm the presence of sample-selection bias.

All aforementioned results indicate the existence of both sample-selection bias and self-selection bias within our model; that is, there appear to be certain unobservable characteristics amongst the forecasting firms which differ from those of the non-forecasting firms.

These results are largely consistent with our prediction, and we find that the selection correction parametric setting approach proposed in this study can correct for both sample-selection bias and self-selection bias, thereby providing better estimates. Under our proposed approach, the coefficient on *DAC* is found to be -10.926, with statistical significance, and consistent with the results reported in the prior studies, which concluded that earnings management potentially plays an extremely

Table 4. Accuracy compensation for VMEF in the structural equation.

Variable	Selection correction		OLS		2SLS		Heckman 2SLS	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Intercept	-0.660	0.689	-1.539	0.278	-1.004	0.540	-1.489	0.294
DAC	-10.926 **	0.015	0.302	0.818	0.120	0.928	-1.836	0.361
DAC × $\hat{v}_2$	-2.826	0.693	–	–	–	–	–	–
DAC × $\hat{v}_3$	4.396 *	0.058	–	–	–	–	–	–
$\hat{v}_2$	7.639 **	0.013	–	–	–	–	–	–
$\hat{v}_3$	-0.349 **	0.245	–	–	–	–	–	–
Big4	0.062	0.758	0.063	0.745	0.045	0.818	0.095	0.635
ASYM	1.515 ***	0.000	1.603 ***	0.000	1.539 ***	0.000	1.603 ***	0.000
HON	1.781 ***	0.000	1.787 ***	0.000	1.808 ***	0.000	1.770 ***	0.000
GDN	-0.394 *	0.074	-0.535 **	0.011	-0.479 **	0.025	-0.551 **	0.009
MB	-0.067 *	0.060	-0.106 ***	0.001	-0.093 **	0.006	-0.109 ***	0.001
FIN	0.037	0.918	0.001	0.998	0.027	0.939	0.010	0.977
AGE	0.022 *	0.089	0.023 *	0.073	0.023 *	0.081	0.025 *	0.060
IND	-0.548	0.157	-0.699 *	0.051	-0.674 *	0.061	-0.609	0.112
ln*TA*	0.059	0.544	0.088	0.342	0.086	0.355	0.069	0.476
$\hat{\lambda}$	–	–	–	–	–	–	-0.257 *	0.092
F-stat./ LR stat.	10.22***	0.000	13.44***	0.000	13.50***	0.000	168.63***	0.000
Adj. R^2 (%)	7.93		7.67		7.24		7.50	
AIC	14912.14		14912.49		14919.33		14915.17	

This table presents the results of the multivariate regressions on forecasting accuracy on a sample of 1,500 observations, with the independent variables being defined as follows: *DAC* are the discretionary accruals as a proxy for earnings management; $\hat{v}_2$ is the residual of reduced form equation; $\hat{v}_3$ is the residual of selection equation; Big4 is a dummy variable which is equal to 1 if a firm is audited by top 4 large size audit firms, otherwise 0; *ASYM* is a dummy variable which is equal to 1 if VMEF is optimistic, otherwise 0; *HON* refers to the period from the forecast to the end of year, divided by 365; *GDN* is a dummy variable which is equal to 1 if the reported EPS is equal to, or greater than, that in the previous year; *MB* is the market-to-book ratio; *FIN* is a dummy variable which is equal to 1 if firm raises external financing, otherwise 0; *AGE* refers to the age of the IPO in the current year; *IND* a dummy variable which is equal to 1 if there are independent directors and supervisors in a firm, otherwise 0; ln*TA* is the logarithm of total assets; and $\hat{\lambda}$ represents the inverse Mills ratio. *** indicates significance at the 1% level; ** indicates significance at the 5% level; and * indicates significance at the 10% level.

important role in improving forecasting accuracy (Kasznik, 1999; Matsumoto, 2002). However, the coefficient of DAC in others model without statistical significance. It is clear that if we do not provide correction for both sample-selection and self-selection biases, there is a distinct possibility of drawing the erroneous conclusion that forecasting accuracy is unaffected by earnings management.

The determinants of forecasting accuracy necessarily include forecasting horizons, firm performance improvement, MB ratio, and IPO age. In the present study, the coefficient on *HON*, at 1.781, is found to be significantly positive, which is consistent with Lee et al. (1993), who demonstrated that it was inherently more difficult to estimate long-run earnings. We also find that firms with better performance than in the previous year (*GDN*) provided more accurate forecasts.

Table 5. Accuracy compensation for VMEF in asymmetrically forecast

Variable	Optimistic sample		Pessimistic sample	
	Coeff.	p-value	Coeff.	p-value
Intercept	-0.418	0.853	0.608 *	0.085
DAC	-13.400 **	0.028	-0.982	0.377
$DAC \times \hat{v}_2$	-4.299	0.765	1.477	0.238
$DAC \times \hat{v}_3$	5.359 *	0.093	-0.690	0.337
$\hat{v}_2$	9.375 **	0.021	1.747 **	0.031
$\hat{v}_3$	-0.309	0.454	0.045	0.541
Big4	0.050	0.848	-0.031	0.531
HON	2.359 ***	0.000	0.140 *	0.060
GDN	-0.400	0.156	0.118 **	0.048
MB	-0.082 *	0.071	-0.004	0.709
FIN	0.178	0.714	0.002	0.979
AGE	0.030 *	0.085	0.002	0.479
IND	-0.655	0.208	-0.141	0.111
ln*TA*	0.116	0.385	-0.030	0.164
Sample size	1130		370	
F-stat.	5.12***	0.000	2.29**	0.006
Adj. R^2 (%)	4.53		4.40	

This table presents the results of the multivariate regressions on forecasting accuracy in asymmetrically forecast, with the independent variables being defined as follows: *DAC* are the discretionary accruals as a proxy for earnings management; $\hat{v}_2$ is the residual of reduced form equation; $\hat{v}_3$ is the residual of selection equation; Big4 is a dummy variable which is equal to 1 if a firm is audited by top 4 large size audit firms, otherwise 0; *HON* refers to the period from the forecast to the end of year, divided by 365; *GDN* is a dummy variable which is equal to 1 if the reported EPS is equal to, or greater than, that in the previous year; *MB* is the market-to-book ratio; *FIN* is a dummy variable which is equal to 1 if firm raises external financing, otherwise 0; *AGE* refers to the age of the IPO in the current year; *IND* a dummy variable which is equal to 1 if there are independent directors and supervisors in a firm, otherwise 0; ln*TA* is the logarithm of total assets. *** indicates significance at the 1% level; ** indicates significance at the 5% level; and * indicates significance at the 10% level.

However, growth firms are also found to provide more accurate forecasting, which is different from prior studies. Besides, the coefficient of ASYM is statistical significance, which appears optimistic forecasters and others also have difference status. Furthermore, we discriminate forecasting firms between optimistic forecasters and pessimistic. Both of these samples estimate by the selection correction parametric setting approach. The result is presented in Table 5.

Column 2 of Table 5 indicates the result of optimistic forecasters. We found that earnings could clearly be manipulated by managers in order to enhance their forecasting accuracy, with such earnings management potentially interacting with the unobservable characteristics. But the situation does not occur in pessimistic forecasters. The other determinants of forecasting accuracy necessarily are similar to prior results.

Conclusions

It is quite common within firms in emerging markets to find lower levels of transparency causing serious information asymmetry. The regulators in Taiwan allow listed firms to issue 'voluntary management earnings forecasts' (VMEFs) based upon the expectation of such information asymmetry being mitigated; however, forecasting accuracy may be manipulated by managers through earnings management. By focusing on listed firms in Taiwan, we are provided with an opportunity to observe the quality of management disclosure in an environment quite different from the more developed markets.

In summary, the larger firm size, higher business risk, superior firms, less independent directors and supervisors, and higher audit quality firms tend to issue earnings forecasts. However, the VMEFs issued by listed firms in Taiwan are found to be both inaccurate and over- optimistic. We found that both long-term forecasts and order IPO age are associated with lower forecasting quality; conversely, higher MB ratio and performance better than prior year firms are also associated with the improved accuracy of VMEFs.

Our empirical results demonstrate that after correcting for both sample-selection bias and self-selection bias, the evidence is consistent with the argument that managers will tend to manipulate their earnings in order to improve their forecasting accuracy, specially on optimistic forecaster casters, and that if researchers ignore these two potential selection bias problems, then this is very likely to give rise to erroneous results and conclusions.

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