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Can a securities law improve investor rationality in processing earnings information?†

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Abstract

In this paper, I propose a general hypothesis that after the enactment of the Sarbanes-Oxley Act (SOA) financial statements convey more accurate and reliable corporate information to investors who in turn reflect such improvements in stock prices and test four practical hypotheses that simultaneously feature the degree of information asymmetry, forecast bias, and investor reaction to biased earnings information. The empirical results unanimously suggest that the post-SOA investors take advantage of the improvement in informational efficiency and accuracy and actively adjust for analyst forecast bias in earnings forecasts. The SOA indeed appears to achieve its primary goal of investor protection.

Keywords: Bounded rationality, fixed effects, forecast bias, informational asymmetry, random effects, Sarbanes-Oxley Act.

1. Introduction

The standard models of *economic man* have been the main tools of analyzing economic phenomena, financial markets, human decision making, and market behaviors and have encountered intense challenges from behavioral sciences including behavioral economics and finance. It is now a norm that human rationality evolves and is bounded. The term, bounded rationality, is first coined by Simon (1955) who argues that the concept of *economic man* should be revised in accordance with information access and processing capabilities of humans and ever-changing economic environments. Simon further states that behavioral models and theories are much more consistent with the observed behaviors of human agents than the economic counterparts of rationality. Human agents seem to be far short of the rational utility optimizer. They are instead adaptors who learn slow and are satisfied with their imperfect choices. Tversky and Kahneman (1974) describe that when human agents face judgment under uncertainty they rely on heuristics and/or fall into trap on biases such as representativeness, availability bias, and anchoring and are liable for errors in prediction or estimation. The framing effect of Tversky and Kahneman (1981) reveals the inconsistency and lack of coherence in human choices. Human agents show the risk-averse preference in

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choices involving gains, while they tend to be risk-taking in the realm of losses. A striking observation is that this shift in preference occurs when they solve a set of identical problems described in different frames. The concepts of loss aversion and asymmetric value function are derived and termed as prospect theory. A long line of similar studies has followed (Thaler and Johnson, 1990; Benartzi and Thaler, 1995; Thaler *et al.*, 1997; Gneezy and Potters, 1997; Barberis *et al.*, 2001; Dacey and Zielonka, 2008; Hens and Vlcek, 2011). This article is a continual effort to test the investor rationality in a regulatory context in which investors are incentivized and better positioned to overcome the bounded rationality, biases, and/or other market imperfections such as information asymmetry (Brunnermeier, 2005). Thus, more informed decisions in line with normative expectationsare possible. In this study, I use the Sarbanes-Oxley Act of 2002 (SOA) as a regulatory context or frame-shifting event of mitigating the problem of information asymmetry between management and public investors and investigate the impact of the SOA on investor perception about the biased earnings information during the earnings announcement period. Unlike the existing studies, present research focuses on behavioral shift in short-run investor reaction to the biased earnings information after the SOA.

2. Informational efficiency and SOA

Suppose that there are three types of market participants including risk-neutral short-run information traders, long-run information traders, noise traders, and market makers. The sole motive of the short-run and long-run information traders is to exploit their superior information about the fundamental value of the stock. Noise traders purchase or sell shares for exogenous reasons. A single competitive risk-neutral market maker observes the aggregate order flow and sets the price. Traders submit their market orders to the market maker in the upcoming trading round taking the price impact of their orders into consideration. The market maker sets the price in the round after observing the aggregate order flow and trades the market clearing quantities. The short-run information traders receive a noisy signal of the upcoming period's public news that contains the short-run information (s) and a noise (e) and the long-run information traders receive a signal of the long-run information about the stock not related to the forthcoming public announcement. This long-run information is dispersed among many traders in the economy. Noise traders do not receive any information about the fundamental value of the stock. Due to the information asymmetry, the short-run information traders trade on (s + e) and try to disguise their trades behind the noise trading. This reduces market liquidity and results in higher price impact. In addition, the short-run information-based trading crowds out some of the long-run information trades. The disguise and crowding-out effects together lead to a reduction in informational efficiency for the value of stock conditional on the market order quantity of all traders (Kyle, 1985; Brunnermeier, 2005).Brunnermeier (2005) numerically shows that the removal of the managerial discretionary disclosure indeed improves informational efficiency in the stock price process by alleviating the effects of disguise and crowding-out. The SOA of 2002 is a revolutionary securities lawwhose purposes contain the discouragement of the conventional discretionary disclosure of management.

The SOA intends to protect investors from inaccurate and unreliable corporate disclosures by limiting the function of independent auditors to the audit services, requiring CEO and CFO to certify the accuracy of the financial statements, and setting up an audit committee with at least one financial expert. Senior management should also adopt a code of ethics and implement a system of compliance. On the other hand, employees should be able to communicate their concerns and complaints about accounting, auditing, or internal control processes in a confidential manner. The SOA applies to all of the publicly traded companies in the U.S. Therefore, the SOA is expected to create a new market system in which financial statements become more credible and convey less biased corporate information. Studies about the economic impact of new securities laws and regulations for enhancing shareholder protection and improving disclosure and transparency in general provide evidence of positive effect of such reforms on the market system and value (Lo, 2003; Jain and Rezaee, 2006; Cohen *et al.*, 2008; Li *et al.*, 2008; Hochberg *et al.*, 2009; Burks, 2011; Singer and You, 2011). Some studies, however, question the intended effect of the SOA.Chhaochharia and Grinstein (2007) study the announcement effect of the new governance system created by the SOA on firm value. Then, two sets of portfolios are constructed to capture the degree of compliance, one containing less compliant firms and the other including more compliant firms. They find that the SOA has overall a positive effect on firm value. The average annual abnormal returns of the portfolios are all positive and at least economically significant. An interesting finding is that less-compliant firms outperform more-compliant firms by a large gap. Another intriguing observation is that this compliance effect is concentrated on the large firms. Zhang (2007) investigates the stock market reaction to the legislative events prior and subsequent to the passage of the SOA. She finds that the cumulative abnormal returns of SOA-complying U.S. and foreign firms around crucial legislative events leading to the SOA are significantly negative, suggesting that the compliance costs of the SOA are greater than the benefits. Although the costs and benefits of the SOA are still on debate in academic and practical arenas, the majority of existing studies reaches a consensus that corporate information is now more credible and accurate than ever before.

2.1. A general hypothesis

Based on theoretical view and empirical evidence, I derive a general hypothesis that the enactment of the SOA creates a new corporate culture where the financial statements convey more accurate and reliable corporate information to investors who in turn reflect such improvements in stock prices. In other words, investors are entrusted with more value-related information after the SOA than before the SOA and information asymmetry between corporate management and public investors significantly narrows. The same holds between corporate management and investment professionals (e.g., financial analysts) and between investment professionals and public investors. Institutional investors and regulators enjoy the same benefit generated by the SOA. Practically speaking, the perceived value relevance of the pre-SOA corporate information is much weaker than that of the post-SOA information. Due to the improved informational efficiency and accuracy after the SOA, financial analysts likely issue less biased forecasts when they predict the future figures of value indicators like earnings. Similarly, investors likely become more active and confident in interpreting corporate information, both direct and indirect, during the post-SOA period. Here, the direct information indicates the one disclosed by corporate management through public announcements and the indirect information is the pieces of information offered by financial analysts mainly through their daily work of earnings forecasts. Investors' active and confident participation in information interpretation implies that they, at least in aggregate, are neither naive followers of financial analysts nor passive takers of the public information any longer as they were during the pre-SOA period.

3. Data and portfolio construction

The sample includes earnings information (both actuals and forecasts) from First Call, the book and market values of equity and the number of shares outstanding from Compustat, and return information from CRSP. The earnings and equity data are quarterly measures. I exclude the firm-quarters whose earnings forecasts are less than three and that have missing values on any of the aforementioned variables. The consequent sample contains the firm-quarters that have a full set of the subsequent variables: quarterly earnings announcement date, quarterly actual and analysts' median forecasted earnings and book-to-market ratio. I use the book and market values of equity at the end of each quarter to compute the book-to-market ratio. Two event windows covering from 30 days prior to the earnings announcement date to one day after the announcement are used to capture the announcement effect of earnings on stock return. The first window includes 29 days until the second day before the earnings announcement and means to encompass the likely information leakage prior to the announcement. The second window starts from one day before the announcement date and ends one day after it, measuring 3-day announcement effect. I use the typical market-model-adjusted abnormal returns (ARs) and the resulting cumulative abnormal returns (CARs) estimated by the EVENTUS program on the daily CRSP returns.

The sample has two distinct time horizons, four quarters before the SOA period and four quarters after the SOA period. The pre-SOA period includes four quarters from December 31, 2000 to September 30, 2001. The post-SOA period covers four quarters of data from September 30, 2002 to June 30, 2003. The SOA period is a buffer period lying between the pre- and post-SOA periods and is singled out of the empirical analysis to clearly distinguish between a period without the SOA influence and a period with it. I do not go further back before the third quarter of 2000 nor further ahead after the third quarter of 2003 to mitigate the confounding effects of other regulatory or market events, for example the regulation Fair Disclosure (FD) of 1999.

To characterize the quarterly observations to the extent of forecasting bias, I rank firms in each quarter based on a standardized forecast error (SFE). SFE equals the actual earnings minus the median earnings forecasts of financial analysts deflated by the standard deviation of analysts' earnings forecasts. I form five bias portfolios ranging from the optimistic portfolio containing firm-quarters of low SFEs to the pessimistic portfolio including firm-quarters of high SFEs. The former represents the bottom 20% of firms each quarter, while the latter stands for the top 20% of firms per quarter with respect to the magnitude of SFE. Note that SFE becomes negative (positive) as financial analysts issue optimistic (pessimistic) forecasts. For the observations in the optimistic portfolio, analysts' earnings forecasts are much greater than actual earnings, and vice versa for those in the pessimistic portfolio. Unlike the classification metric used by Kwag and Shrieves (2006), this classification scheme portrays the bias characteristics of not only financial analysts but also corporate managers.

4. Testable hypotheses

Based on the general hypothesis and the portfolio classification scheme, I develop four testable hypotheses that simultaneously feature the degree of information asymmetry, forecast bias, and investor reaction to biased earnings information. Prior to the enactment of the SOA, public investors are more vulnerable to the biased earnings information due to less reliable and accurate accounting information. Informational inferiority and widespread existence of accounting malpractice force investors to rely more on judgment of financial analysts than on their own when investors face new earnings information. As a result, they are likely to naively follow the expectations of financial analysts about future earnings and stock price. When investors face analysts' optimistic (pessimistic) forecasts carrying negative (positive) earnings information, their reaction tends to mirror the negative (positive) information as it is. Opposite is true after the enactment of the SOA, since informational inferiority and accounting malpractice are less likely. That is, investors do not take the seemingly optimistic (pessimistic) forecasts as face values but actively adjust for the embedded bias in analysts' earnings forecasts by discounting (marking up) negative (positive) earnings information. Two testable hypotheses are developed from this inference.

Hypothesis 1: The pre-SOA CAR is smaller than the post-SOA CAR for the optimistic portfolio.

Hypothesis 2: The pre-SOA CAR is larger than the post-SOA CAR for the pessimistic portfolio.

Resorting to the spirit of Teets (1992), I also use the earnings response coefficient (ERC) to uncover the difference in investor reaction to biased earnings information before and after the enactment of the SOA. The ERC is the coefficient of the earnings model defined as CAR = f (FE) where FE (forecast error) equals actual earnings minus analysts' earnings forecasts. If investors naively follow financial analysts' lead, the ERC will exactly reflect the size and direction of the information contained in FE. In case of optimistic forecasts, FE becomes negative and investor reaction would be also unfavorable at the same magnitude. If FE is positive, investor reaction would be also as pessimistic as financial analysts. The enactment of the SOA changes the situation completely. Now, investors are not innocent believers of earnings information in FE but skeptical about it. The degree of analyst optimism in optimistic forecasts is discounted and less than as it is manifested in the negative FE. Since the ERC measures the sensitivity of CAR to FE, it becomes smaller as the post-SOA FE gets less negative than the pre-SOA FE due to the investor discount on the optimistic forecasts. On the contrary, the pessimistic forecasts are marked up and the resulting FE gets less positive. Investors' shifted perceptions about the size and direction of new earnings information in reaction to optimistic and pessimistic forecasts after the SOA cause the post-SOA ERC to be different from the pre-SOA ERC. Counting on discussion above, the second set of testable hypotheses is formed.

Hypothesis 3: The pre-SOA ERC is larger than the post-SOA ERC for the optimistic portfolio.

Hypothesis 4: The pre-SOA ERC is larger than the post-SOA ERC for the pessimistic portfolio.

5. Empirical evidence

5.1. Mean comparison of the CARs

Hypothesis 1 suggests that the pre-SOA CAR of the optimistic portfolio ($P_{optimistic}$) during the announcement period is smaller than its post-SOA counterpart, since investors are better informed after the SOA and place a discount on the optimistic earnings forecasts. Evidence in Table 5.1 shows that the investor response to optimistic forecasts of analysts for the pre-SOA period is smaller than the investor response for the post-SOA period. The 28-day CAR (CAR_{28-day}) and 3-day CAR (CAR_{3-day}) for the pre-SOA period are all lower (more negative) than those for the post-SOA. The mean CAR_{28-day} and CAR_{3-day} of $P_{optimistic}$ for the pre-SOA period are -0.0169 and -0.0296. The former is significantly smaller than the CAR_{28-day} of 0.012 for the post-SOA period at the one percent significance level. The latter is still algebraically smaller than the post-SOA CAR_{3-day} of -0.0295, but not statistically different at the conventional significance levels.To integrate the effect of information leakage into the announcement effect, I sum the CAR_{28-day} and CAR_{3-day} and mean-test the sums of the two measures between the pre-SOA and post-SOA periods. The sum of the CAR_{28-day} and CAR_{3-day} for the pre-SOA period is -0.0465 and algebraically much smaller than -0.0175, the sum of the post-SOA CAR_{28-day} and CAR_{3-day}. The Bonferroni t-test, Tukey's studentized range test, and Scheffe's test all confirm the significant difference between the two groups.

Table 5.1 Descriptive statistics of variables: Pre-SOA and post-SOA periods

Portfolio	Period	N	Variable	Window	Mean	STD	t Value	Pr > $\|t\|$
$P_{optimistic}$	Pre-SOA	660	CAR_{28-day}	(-30: -2)	-0.0169	0.1769	-2.47	0.0138
			CAR_{3-day}	(-1: +1)	-0.0296	0.0899	-8.45	<.0001
			SFE	29.54 days	-0.0114	0.0591	-4.97	<.0001
	Post-SOA	583	CAR_{28-day}	(-30: -2)	0.0120	0.2649	1.1	0.2718
			CAR_{3-day}	(-1: +1)	-0.0295	0.1028	-6.94	<.0001
			SFE	35.42 days	-0.0757	0.9531	-1.92	0.0554
$P_{pessimistic}$	Pre-SOA	688	CAR_{28-day}	(-30: -2)	0.0079	0.2238	0.94	0.3498
			CAR_{3-day}	(-1: +1)	0.0305	0.0984	5.48	<.0001
			SFE	46.66 days	0.0421	0.7554	1.46	0.1439
	Post-SOA	706	CAR_{28-day}	(-30: -2)	-0.0028	0.1482	-0.51	0.6130
			CAR_{3-day}	(-1: +1)	0.0205	0.0920	8.82	<.0001
			SFE	30.88 days	0.0083	0.0537	4.11	<.0001

Empirical evidence in Table 5.1 also supports Hypothesis 2 that the pre-SOA CAR is larger than the post-SOA CAR for the pessimistic portfolio ($P_{pessimistic}$) due to the investor premium on the pessimistic forecasts of analysts under the assumption of improvement in informational efficiency and accuracy. The pre-SOA CAR_{28-day} and CAR_{3-day} of $P_{pessimistic}$ are 0.0079 and 0.0305. As suggested by Hypothesis 2, they are all higher than the post-SOA CAR_{28-day} and CAR_{3-day} of -0.0028 and 0.0205 respectively. The mean differences are significant at the one and five percent levels. The combined effect of the CAR_{28-day} and CAR_{3-day} also suggests that the pre-SOA period has the higher mean CAR than the post-SOA period. The 31-day CAR is 0.0384 for the pre-SOA against 0.0177 for the post-SOA. It is more than twice the size of the post-SOA CAR and they are economically and statistically apart from each other at the one percent level.

Notice that the signs for the combined means of the CAR_{28-day} and CAR_{3-day} for $P_{optimistic}$ and $P_{pessimistic}$ are consistent with those for the means of the SFEs regardless of the sample periods. The negative unexpected earnings information (i.e., negative SFE) owing to the optimistic earnings forecasts meets the negative investor reaction (i.e., negative CAR), while the positive unexpected earnings information as a result of the pessimistic earnings forecasts leads to the positive investor reaction. It is noteworthy that the mean length between the forecast date and the earnings announcement date ranges from 29.54 days to 46.66 days having a mean value of about 35 days. This indicates that the combined announcement period of 31 days from -30 to +1 well matches with the period for the mean of the SFE. An additional interesting observation is that the standard deviation (STD) of the SFE is asymmetric between the optimistic and pessimistic portfolios. For the pessimistic portfolio, as expected the STD of the SFE declines from 0.7554 to 0.0537 after the SOA, while it increases from 0.0591 to 0.9531 for the optimistic portfolio. The regulatory impact of SOA on the predictive power of financial analysts seems limited.

5.2. Regression analysis

Next, I employ a series of regression analysis to examine the third and fourth hypotheses, Hypotheses 3 and 4. I start with a simple pooled regression and proceed to the panel regression models, both fixed and random effects. To avoid a potential misspecification problem of the classification scheme described in Section 3, I model the two well-recognized risk factors, firm size and book-to-market ratio (BM) in the regression analysis. In the pooled and panel regression analyses, I utilize only two portfolios – the optimistic and pessimistic – since the prime objective of the paper is to measure the investor sensitivity to the changes in earnings information with respect to biasedness in earnings forecasts and doing so attenuates the classification errors.

The results of the models shown in Tables 5.2∼5.4 are somewhat different, but the major conclusions stay constant. The detailed discussions are provided below in the order of the pooled, fixed, and random effects model. Table 5.2 shows the pooled regression results of the $\text{CAR}_{28-\text{day}}$ and $\text{CAR}_{3-\text{day}}$ on the SFE for the pre-SOA period and some control variables such as the natural logarithm of the market value of equity (LMV) and the natural logarithm of the book-to-market ratio (LBM). A dummy variable, D, has a value of one if SFE belongs to the pre-SOA period and zero otherwise. Thus, SFE is a variable that represents the earnings forecast errors occurred in the pre-SOA period and the post-SOA forecast errors are reflected in the variable, D*SFE. The estimated pooled regression model is specified as follows:

$$CAR_{it} = \beta_0 + \beta_1 SFE_{it} + \beta_2 D * SFE_{it} + \beta_3 LMV_{it} + \beta_4 LBM_{it} + e_{it} \qquad (5.1)$$

where i and t indicate the sub-notes for firm i and quarter t and e_{it} is the identically and independently distributed error term for firm i in year t. All other variables are as previously defined.

Table 5.2 Results of pooled regression

Variable	Dependent Variable			
	$\text{CAR}_{28-\text{day}}$		$\text{CAR}_{3-\text{day}}$	
	$\text{P}_{\text{optimistic}}$	$\text{P}_{\text{pessimistic}}$	$\text{P}_{\text{optimistic}}$	$\text{P}_{\text{pessimistic}}$
Intercept	0.0917***	0.1176***	-0.0475***	0.0732***
SFE	-0.0164*	0.0514***	0.1373**	0.0091*
D*SFE	-0.0351	-0.316**	-0.0058	-0.0407
LMV	-0.0149***	-0.0165***	0.0029	-0.0074***
LBM	-0.0100*	-0.0060	0.0030	-0.0082***
Adj R^2	0.0107	0.0380	0.0047	0.0150
F-Value	4.36	14.74	2.46	6.31
Prob > F	0.0016	<.0001	0.0435	<.0001

***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels respectively.

Citing the terms in Hypotheses 3 and 4, β_1 and $\beta_1+\beta_2$ are the earnings response coefficients (ERCs) for the pre-SOA and post-SOA periods. Remind that Hypotheses 3 and 4 propose that the pre-SOA ERC is higher than the post-SOA ERC for both the optimistic and pessimistic portfolios due to the expectation that investors place a premium and a discount on pessimistic and optimistic forecasts correspondingly. The regression estimates of the 28-day CAR (i.e., $\text{CAR}_{28-\text{day}}$) on SFE and other independent variables for the optimistic portfolio in Table 5.2 exhibit that the pre-SOA ERC of -0.0164 is algebraically larger than the post-SOA ERC of -0.0515 which is the sum of the SFE coefficient and the D*SFE coefficient, although they seem not statistically different. But, their economic difference looks large enough to support Hypothesis 3. The absolute size of the negative pre-SOA ERC relative to the negative post-SOA ERC is only 31.84%. The like result is observed for the pessimistic portfolio. The ERC for the pre-SOA period is 0.0514 versus the ERC of -0.2655 (the sum of the SFE and D*SFE coefficients) for the post-SOA and the two are significantly different at the five percent level. As implied in Hypotheses 3 and 4, evidence suggests that investors seem to better adjust for the biased forecasts after the enactment of the SOA. The case of $\text{CAR}_{3-\text{day}}$ weakly verifies this evidence. The pre-SOA ERCs of 0.1373 and 0.0091 for the optimistic and pessimistic portfolios are larger than the corresponding ERCs of 0.1315 (=0.1373-0.0058) and -0.0316 (0.0091-0.0407). Note that only the regression result of $\text{CAR}_{28-\text{day}}$ for the pessimistic portfolio receives the statistical support, although the relative magnitudes of the ERCs are in favor of both Hypothesis 3 and Hypothesis 4 with no exception.

The ordinary least squares (OLS) regression does not effectively handle the problems like autocorrelation and/or heteroscedasticity that panel data is likely to possess and is subject to biases and/or inefficient estimation. To deal with these potential problems of the dataset in place and the limitations of the OLS regression, I reestimate the regression of CAR on the same set of independent variables taking the random effects and fixed effects into account. The random effects and fixed effects models have advantages and disadvantages. Considering the characteristics of the dataset in the current study, the random effects model would be given a preference over the fixed effects model. The dataset contains a large number of cross-sectional units (i.e., thousands of firms) but a small number of time series (i.e., four quarters prior to the SOA and four quarters after the SOA) and the random effects model generates more efficient estimators for such dataset. However, the fixed effects model has its own merits. It can directly correct for the firm- and time-variant feature of the dependent variable, handle the problem of omitted variables, and capture the market-wide effects of the omitted variables. One important pitfall of the fixed effects model is that the cross-sectional fixed effects have no control over unstable omitted variables that vary over time and the time-series fixed effects model is still subject to the industry and firm-specific effects. I report the estimation results of the two models for the purpose of robustness check in Tables 5.3 and 5.4. The estimated models in the order of the random effects and fixed effects are as specified below.

$$CAR_{it} = \beta_0 + \beta_1 SFE_{it} + \beta_2 D * SFE_{it} + \beta_3 LMV_{it} + \beta_4 LBM_{it} + v_i + w_t + e_{it} \tag{5.2}$$

$$\begin{aligned} CAR_{it} = &\beta_0 + \beta_1 SFE_{it} + \beta_2 D * SFE_{it} + \beta_3 LMV_{it} + \beta_4 LBM_{it} \\ &+ Cross\ Sectional\ Fixed\ Effects_i + Time\ Series\ Fixed\ Effects_t + e_{it} \end{aligned} \tag{5.3}$$

where v_i is the cross-sectional random effects, w_t is the time-series random effects, $Cross\ Sectional\ Fixed\ Effects_i$ = a dummy variable for firm i, $Time\ Series\ Fixed\ Effects_t$ = a dummy variable for year t, and other terms are as defined earlier.

Table 5.3 Results of random effects panel regression

Panel A. Firm random effects model

Variable	Dependent Variable			
	CAR_{28-day}		CAR_{3-day}	
	$P_{optimistic}$	$P_{pessimistic}$	$P_{optimistic}$	$P_{pessimistic}$
Intercept	0.0976***	0.1134***	-0.0469***	0.0749***
SFE	-0.0149	0.0516***	0.1281**	0.0089*
D*SFE	-0.0229	-0.1693	-0.0057	-0.0289
LMV	-0.0157***	-0.0161***	0.0028	-0.0076***
LBM	-0.0105*	-0.0086	0.0033	-0.0078**
Adj R^2	0.0100	0.0319	0.0037	0.0115
F-Value	4.1	12.48	2.15	5.06
Prob > F	0.0024	<.0001	0.0715	0.0004

Panel B. Time random effects model

Variable	Dependent Variable			
	CAR_{28-day}		CAR_{3-day}	
	$P_{optimistic}$	$P_{pessimistic}$	$P_{optimistic}$	$P_{pessimistic}$
Intercept	0.0892***	0.1190***	-0.0474***	0.0741***
SFE	-0.0130	0.0526***	0.1373**	0.0093*
D*SFE	-0.0695	-0.2939**	-0.0058	-0.0456
LMV	-0.0145***	-0.0165***	0.0029*	-0.0076***
LBM	-0.0096*	-0.0043	0.0030	-0.0085***
Adj R^2	0.0098	0.0396	0.0046	0.0157
F-Value	4.06	15.35	2.46	6.55
Prob > F	0.0028	<.0001	0.0437	<.0001

***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels respectively.

The data implies that there is no significant variation in major findings among the different regression models. The Panel A of Table 5.3 reports that the panel regression of the CAR_{28-day} and CAR_{3-day} with cross-sectional random effects on SFE and D*SFE produces the pre-SOA ERCs numerically larger than the post-SOA ERCs despite the type of the portfolio. The pre-SOA ERCs of -0.0149 and 0.1281 for $P_{optimistic}$ are less negative and more positive than the post-SOA ERCs of -0.0378 and 0.1124. The optimistic forecasts are more discounted after the SOA. A similar induction is possible for $P_{pessimistic}$, since the pre-SOA ERCs are all positive with the values of 0.0516 and 0.0089 as the post-SOA ERCs are all negative, -0.1177 and -0.02. Unfortunately, however, none of the ERC differences between the two periods is statistically significant. Nevertheless their economic gaps are again noticeable. The time-series random effects model in Panel B of Table 5.3 provides the identical argument. One thing worth mentioning is that the 28-day pre-SOA ERC of 0.0526 is larger than the corresponding ERC of -0.2939 and they are significantly different at the five percent level similar to the pooled regression result. The fixed effects model is an additional confirmation on the above evidence but with no improvement in statistical significance (Table 5.4). The fixed effects model deals well with the situation where the error term and one or more independent variables are correlated. According to the results, this potential complexity does not alter the conclusions.

Table 5.4 Results of fixed effects panel regression

Variable	Dependent Variable			
	CAR_{28-day}		CAR_{3-day}	
	$P_{optimistic}$	$P_{pessimistic}$	$P_{optimistic}$	$P_{pessimistic}$
Intercept	-0.1758	-0.0772	0.3099***	0.1129
SFE	0.0143	0.4936***	-0.0077	0.0330
D*SFE	-0.0137	-0.0558	-0.0014	-0.0670
LMV	0.0261	0.0079	-0.0515***	-0.0145
LBM	0.0070	-0.0292	-0.0166	-0.0229**
Adj R^2	0.1179	0.2761	0.0881	0.2496
F-Value	1.23	1.71	1.17	1.62
Prob > F	0.0042	<.0001	0.0251	<.0001

***, **, and * indicate the statistical significance at the 1%, 5%, and 10% levels respectively.

6. Conclusions

The SOA is the most pathbreaking federal securities law in decades that is intended to revolutionize the corporate accounting practices. The top executives of the corporation are now liable for accounting entrenchment and setting up credible book-keeping system. The non-compliance with the SOA requirements can result in a serious devaluation of the corporation due to the enforced penalties in place. As a consequence, it is expected that the SOA will create a new corporate playing field where the information asymmetry between the top management and the public considerably improves. I propose a general hypothesis that the enactment of the SOA creates a new corporate culture where both financial experts and public investors are less susceptible to forecast bias. Forming two portfolios indicating analyst optimism and pessimism in earnings forecasts, I develop four testable hypotheses stemming from the general hypothesis. The test results unanimously suggest that the post-SOA investors take advantage of the improvement in informational efficiency and accuracy and actively adjust for analyst forecast bias in earnings forecasts. The SOA indeed appears to achieve its primary goal of investor protection.

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