Real Effects of Accounting for Employee Stock Options*

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Abstract

This study uses the real effects theory to investigate the impact of favorable accounting for employee stock options (ESOs) on corporate investment. The theory predicts that the accounting distortion induces overinvestment, and that the removal of this distortion increases firm value by improving investment efficiency. We find that firms overinvested in the period before the required expensing of ESOs at fair value, and that the incremental rate of return on the overinvestment is negative. Cross-sectional evidence on the determinants of abnormal investment is consistent with the real effects theory, after taking into consideration alternative explanations. We also document a positive association between overinvestment and the stock price reaction to an event that took place during the deliberation of SFAS No. 123R, the new accounting rule that eliminated the preferential accounting treatment of ESOs. Taken together, our evidence lends support to the theory that accounting has real effects.

JEL classification: G14; G24; G28; J24; J33; J63; K22; K23; M41

Keywords: Real effects of accounting; Employee stock options; Accounting regulation; Investment; Capital markets

Data Availability: All data are publicly available from the sources identified in the article.

I. Introduction

The expensing of employee stock option (ESO) cost has been a controversial issue. Prior to the Statement of Financial Accounting Standards (SFAS) No. 123R (FASB 2004b), companies were not required to expense the fair value of their ESO grants. As a result, almost all companies reported a zero ESO expense on their income statements. Academics, investors, and regulators expressed concern about the distortions such a "favorable" accounting treatment would cause (e.g., see Cohn 1999; Morgenson 2000; Guay et al. 2003; Hall and Murphy 2003; Cater et al. 2007). In particular, Guay et al. (2003) point out that the absence of ESO expense would result in security mispricing and allow executives to extract excessive compensation if investors and board directors fixate on reported earnings. Hall and Murphy (2003) and Carter et al. (2007) argue that the absence of ESO expense makes the perceived cost of ESOs to executives and directors lower than the economic cost and, hence, too many ESOs are granted to executives and other employees. Prior research, however, has been silent regarding the effect of favorable accounting for ESOs on companies' investment and performance.

In this study, we use the real effects theory of accounting to examine the impact favorable accounting treatment of ESOs has on corporate investment and its associated economic consequences. We use the adverse selection model of Kanodia and Lee (1998) to motivate our hypotheses. They consider a setting in which the future profitability of a firm is only known to its manager, who uses this private information to determine the firm's investment. The manager reports earnings, which is a noisy measure of the firm's cash flow. The capital market observes the firm's investment and earnings, and prices the firm accordingly. The equilibrium expectations in the capital market are such that the manager chooses to overinvest in order to signal the firm's future profitability. However, the manager's behavior is disciplined by the anticipated release of the earnings report. Therefore, the earnings report not only helps prospective shareholders to update their belief about the firm's cash flow, but also alleviates the perverse incentive that the manager faces. As the earnings report becomes more informative about the firm's cash flow, the higher the disciplining effect and, hence, the lower the amount of overinvestment.

Given the insights from Kanodia and Lee (1998), we conjecture that the favorable accounting treatment of ESOs led to overinvestment in the period before SFAS No. 123R. Specifically, before SFAS No. 123R was in effect, most firms reported zero ESO expense under the intrinsic value approach, making earnings less informative about the firm's true economic performance. SFAS No. 123R requires mandatory expensing of ESOs using the fair value approach, so that a firm's earnings and true performance are in better alignment. As a result, the earnings reported under SFAS No. 123R provide a stronger discipline on the manager's incentive to overinvest. We predict, then, that (a) overinvestment is higher in the pre-SFAS No. 123R period than in the post-SFAS No. 123R period, (b) the level of overinvestment in the pre-SFAS No. 123R period varies across firms as a function of the earnings distortion attributed to the absence of ESO expense calculated at fair value, and (c) SFAS No. 123R reduces overinvestment and, hence, improves operating and stock performances.

We test these implications of the real effects theory using a sample of companies with financial statement data from *Compustat*, stock price data from *CRSP*, and CEO compensation and tenure data from *ExecuComp*. We measure corporate investment in two ways: (a) investment in research and development (R&D), and (b) the sum of R&D investment, capital expenditure, and acquisition expenditure net of proceeds from sales of property, plant, and equipment. We use a three-step procedure to estimate the amount of abnormal investment attributed to the favorable accounting treatment of ESOs. First, we utilize data from the post-SFAS No. 123R period (2006 – 2009) to estimate the determinants of investment in the absence of accounting distortion for ESOs.[1] Second, we apply these parameter estimates to compute the expected investment in the pre-SFAS No. 123R period (1994 – 2005). Since the parameters have been estimated using data from the period without the accounting distortion, the estimated investment can be considered the hypothetical amount of investment "as if" there had been no favorable accounting treatment of ESOs in the pre-SFAS No. 123R period. Finally, we subtract "as if" investment from actual investment to calculate abnormal investment, which is our estimate of the distortion in investment attributed to the preferential accounting treatment of ESOs.

In most of the years between 1994 and 2005, we find that average abnormal investments are statistically positive, which is consistent with the favorable accounting for ESOs leading to overinvestment. We find that the estimated incremental rate-of-return on overinvestment is negative over various time horizons, suggesting investment inefficiency. Cross-sectional analysis further shows that the earnings distortion has explanatory power for abnormal investment, over and above alternative explanations advanced in Myers and Majluf (1984), Hirshleifer and Teoh (2003), and Biddle et al. (2009).

Next, we examine the stock price reactions around selected key events leading to the adoption of SFAS No. 123R, and relate the cross-sectional variation in the stock market responses to the amount of abnormal investment. In a sample of overinvested firms, we find a significant and positive market reaction on July 16, 2002, in which the International Accounting Standards Board announced its decision to develop a rule that would require the expensing of the

[1] Throughout this paper, the terms "accounting distortion" and "favorable/preferential accounting treatment" refer to the expensing of ESOs at their intrinsic value, which is usually zero. SFAS No. 123R removes this preferential treatment, but does not completely eliminate all the distortions (e.g., Li and Wong [2005] demonstrate that the mandated fair value computation ignores the dilutive effect of ESOs).

fair value of ESO grants, and former Federal Reserve Board Chairman Alan Greenspan told the Senate Banking Committee that expensing ESOs at fair value would be required. In addition, we document that the stock price response around this date is correlated with the amount of abnormal investment, lending further support to the real effects theory.

This study contributes to the literature in three ways. First, the effects of accounting considerations relating to ESOs have been widely examined (e.g., see Guay et al. 2003; Hall and Murphy 2003; Bens et al. 2002, 2003; Carter and Lynch 2003; Choudhary et al. 2006; Carter et al. 2007; Brown and Lee 2007). However, prior studies are silent regarding the effect on corporate investment of expensing ESO cost at fair value.[2] We fill this void by using the real effects theory to help us understand the impact of the favorable accounting treatment of ESOs on corporate investment. Our results are consistent with this accounting distortion leading to overinvestment in the period prior to SFAS No. 123R. Taken together, our evidence lends support to the real effects theory of accounting: that the accounting methods used by a firm have effects on its investment.

Second, we add to the "recognition versus disclosure" debate. Prior to SFAS No. 123R, companies were required per SFAS No. 123 to disclose in a note the pro-forma earnings as if ESOs were expensed at fair value. For the favorable accounting treatment of ESOs to have real effects, recognition and disclosure must have different impacts. More specifically, if financial statement users place more emphasis on recognized than disclosed amounts (Bernard and Schipper 1994; Libby et al. 2006), the post-SFAS No. 123R earnings report provides a greater disciplining effect that mitigates the overinvement problem. Our empirical results, being

[2] Two prior studies examine the effects of ESO exercises (but not ESO accounting) on corporate investment. Bens et al. (2002) find that companies repurchase their shares to mitigate the adverse effect of anticipated ESO exercises on earnings per share (EPS), thereby leading to underinvestment. Babenko et al. (2010) show that companies allocate more of the proceeds from ESO exercises to investment when external financing costs are high.

consistent with the accounting distortion leading to investment inefficiency, imply that disclosure is not a substitute for recognition. Thus, we add to the empirical evidence of Ahmed et al. (2006), Cotter et al. (2003), Davis-Friday (1999, 2004), and Espahbodi et al. (2002) that disclosure is different from recognition, using a different research design.

Finally, our study is related to the literature on the relation between financial reporting quality and investment efficiency. The existing literature examines three channels by which financial reporting enhances investment efficiency: (a) it reduces underinvestment by mitigating the adverse selection problem between managers and investors when firms need to access the external capital market (Myers and Majluf 1984; Biddle et al. 2009; Balakrishnan et al. 2011); (b) it reduces overinvestment by mitigating the moral hazard problem through improved shareholders' monitoring ability (Bens and Monahan 2004; Biddle et al. 2009; Hope and Thomas 2008); and (c) it improves investment efficiency by providing managers with better information in the absence of the adverse selection and moral hazard problems (Bushman and Smith 2001; McNichols and Stubben 2008).

The first strand of this literature is motivated by Myers and Majluf (1984), which examines a setting in which better-informed managers have the incentive to sell overpriced securities and less-informed investors protect their interests by discounting the firms' shares. As firms refrain from selling stocks at discounted prices, they underinvest, and the underinvestment problem is more severe for financially constrained firms. This study differs from the first strand of the literature in that the adverse selection model of Kanodia and Lee (1998) predicts that because of the disciplining effect of earnings, the higher the earnings quality, the lower the overinvestment. While our empirical results are consistent with Kanodia and Lee (1998) for overinvested firms, we also find some support for the predictions of Myers and Majluf (1984) among underinvested firms. On the other hand, the adverse selection model of Kanodia and Lee (1998), and the moral hazard motivation used in the second strand of this literature, both predict that companies overinvest. The evidence for the real effects theory is obtained after controlling for other governance mechanisms that firms might use to mitigate overinvestment due to the moral hazard problem.

Our study also differs from this literature in that prior studies examine accounting quality in general, but we focus on the accounting treatment of ESOs. Since it is difficult to measure accounting quality, prior studies (e.g., Biddle et al. 2009; Francis et al. 2004) use various proxies. We identify change in accounting quality for ESOs using the mandatory adoption of SFAS No. 123R. Hence, our setting provides a better identification of the underlying construct. Moreover, the change in accounting quality brought by a mandatory change in an accounting rule is likely to be more exogenous than changes in the other accounting quality proxies.

The rest of the paper is organized as follows. Section II summarizes the changes in the accounting treatments of ESOs, reviews the real effects theory of accounting, and develops testable hypotheses. Section III describes the construction of the samples and variables. Section IV examines the effect of the ESO accounting method on real investment. Section V documents the stock price responses to key events during the deliberation of SFAS No. 123R. Section VI concludes.

II. Background and Hypotheses

Accounting for employee stock options

Opinion No. 25 (Accounting Principles Board 1972) valued an ESO grant at its intrinsic value, which is the difference between the market price of the underlying stock and the exercise price of the option. Many companies would report a zero ESO expense by strategically setting the exercise price at the stock's closing price on the grant date. In 1993, the Financial Accounting Standards Board (FASB) issued an exposure draft that would require the expensing of ESOs using a fair value approach (FASB 1993). The fair value of an option is the sum of its intrinsic value and time value, which is positive even for out-of-the-money options. The deliberation of the proposed rule was contentious and, at the end, pressure from the U.S. Congress forced the FASB to back down on the proposal (Dechow, Hutton, and Sloan 1996; Zeff and Dharan 1997). Specifically, the final rule, SFAS No. 123 (FASB 1995), allowed firms to expense ESO costs using either the fair value approach, or the intrinsic value approach with supplementary fair value disclosure. Most companies used the intrinsic value alternative.[3] In March 2003, the FASB revisited the option-expensing issue in the aftermath of the Enron scandal. In December 2004, the FASB finalized SFAS No. 123R (FASB 2004b), which requires companies to use the fair value approach to expense ESO costs, ending the favorable treatment for ESOs.

Real effects theory of accounting

One of the primary objectives of financial reporting is to enhance the efficiency of resource allocation.[4] By exploring the interactions among the real, financial, and information sectors, Kanodia (2007) discusses how the real effects theory of accounting can be used to

[3] A KPMG survey found that under SFAS No. 123 a majority of the U.S. companies granted their ESOs at the money and selected the intrinsic value approach to value the cost of the option grants. Li and Wong (2005) document that only two of their S&P 500 industrial companies chose the fair value approach to expense the cost of ESOs during the period 1996-2001.

[4] The Statement of Financial Accounting Concepts No. 1 states that "[t]he new series of Statements of Financial Accounting Concepts is intended… to provide even handed financial and other information that, together with information from other sources, facilities efficient functioning of capital and other markets and otherwise assists in promoting efficient allocation of scarce resources in the economy."

understand the resource allocation role of accounting and to assess the real effects of alternative accounting and reporting standards.[5]

The real effects theory of accounting argues that the accounting methods used by a firm to measure and report its economic transactions to the capital market have substantial effects on the firm's managerial decisions (Kanodia 2007). Specifically, when the firm engages in real activities, it has to anticipate and take into account in its decisions how these activities are going to be translated into accounting numbers in its reporting practice, and how the capital market will price its stock based on this accounting information. In equilibrium, the firm's stock prices and real decisions are jointly determined. Therefore, the firm's stock price not only reflects the firm's economic activities and their assessed consequences, but it also plays an active role in influencing the firm's decisions.[6] Accounting inevitably has real implications for the firm's economic activities, through its effect on the firm's capital market price.

Kanodia (1980), Prescott and Mehra (1980), and Brock (1982) formulate the real effects approach and their models concern the dynamic simultaneous evolution of stock prices and corporate production-investment decisions.[7] In these models, investors allocate their intertemporal consumption through buying and selling firms' shares in the capital market from time to time. Hence, the interim market valuation of the firm allows its shareholders to enjoy the economic benefits of the firm's activities. In particular, Kanodia (1980) models the interaction between the firm's investment and investor's portfolio choices under an imperfect accounting system. He shows that stock prices and firm investment decisions are determined simultaneously,

[5] Dye (2001) also calls for production-based models of disclosure. He argues that there are both feedback and feedforward effects between a firm's production activities and its stock price, and the interaction between the two can be influenced by a firm's financial accounting and reporting practice.
[6] "[J]ust as prices in static product markets serve as an invisible hand that guides and coordinates producers and consumers, prices in a capital market serve as an invisible hand that guides and coordinates firms' intertemporal choices with the intertemporal choices of individual households." (Kanodia, 2007, page 12)
[7] These models differ in their assumed information structure. Prescott and Mehra (1980) and Brock (1982) assume perfect information, while Kanodia (1980) assumes imperfect information.

and that the equilibrium outcome is dependent on the information structure of the capital market. Since the net benefits of the firm's economic transactions are communicated to the capital market through accounting numbers, accounting information (together with information from other sources) determines the "true" distribution of future stock prices.

The real effects approach not only offers insights into the informational role of accounting and its relation to the efficiency of the capital market, but also provides a framework for evaluating alternative accounting rules. The key message of the real effects theory of accounting is that to understand the effect of a change in accounting and reporting rules, one must take into account the interaction between the real and financial sectors (i.e., corporate production-investment decisions and capital market prices).[8]

This approach has been applied to various accounting measurement and disclosure settings. Kanodia and Lee (1998) explore the real effects role of periodic performance reports. Sapra (2002) investigates the informational effects of mandatory hedge disclosures on risk management. Kanodia et al. (2004) examine the measurement of intangibles, while Kanodia et al. (2005) analyze imprecision in accounting measurements. In all these studies, the firm's real decisions are motivated by the desire to influence its value in the capital market, and the market prices and the equilibrium paths of corporate production-investment decisions are functions of accounting numbers.

Hypothesis development

We apply the real effects theory to examine the implications of the favorable accounting treatment of ESOs for corporate investment. We motivate our hypotheses using the adverse selection model of Kanodia and Lee (1998). In particular, they consider a firm with an

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[8] Another line of literature analyzes the effect of disclosures about a firm's liquidating dividend on market trading behaviors (e.g., price movements and trading volume) using a pure exchange model. See Dye (2001), Verrecchia (2001), and Kanodia (2007) for detailed discussions.

investment opportunity and the profitability of the investment is drawn from a known distribution. The final return of the project is stochastically associated with the investment level and the profitability of the investment. The management acts in the best interests of the current shareholders.

The sequence of events goes as follows. At date zero, the firm's management privately observes the realization of the profitability of the investment and decides on the level of investment, which is publicly observable. At date one, the final return from this investment is realized, and the manager reports earnings, which measures the realized investment return with noise. The current shareholders sell their shares at a competitive market price to prospective shareholders. At date two, the new shareholders consume the final outcome. The informativeness (precision) of earnings is the variance of the noise contained in the earnings report.

Kanodia and Lee (1998) show that in such a setting, the equilibrium expectations in the capital market are such that the management overinvests in order to signal the firm's profitability and influence the prospective shareholders' prior belief about the firm's cash flow and, thus, the market price of the firm's shares. As the earnings report becomes more informative, the degree of overinvestment reduces toward optimality. The reason for the reduction in overinvestment is that the earnings report not only helps prospective shareholders to update their belief about the firm's cash flow, but more importantly, it disciplines management's investment incentives and allows the firm's observable investment to credibly convey to the market the management's private information about the true profitability of the investment.

The intuition behind this result is as follows. In equilibrium, the market perfectly infers the profitability from the firm's investment and forms a prior belief about the firm's final cash flow. Suppose there is no earnings report. At date one, after observing the investment level, the capital market puts all weight on this prior belief in pricing the firm's shares. This provides management a strong incentive to overinvest to induce optimistic beliefs in the market. However, if the firm has to release an earnings report before the market opens, the market price will be a weighted average of the prior belief and the earnings report. Note that reported earnings are determined by the true profitability, not the market-inferred profitability. Therefore, in expectation, low-profitability firm will not be better off by mimicking the investment level of a high-profitability firm. In other words, the anticipation of a future earnings report at the time of making the investment disciplines the manager's incentive to overinvest. The more informative the earnings report is, the more weight is put on the earnings report in pricing the firm, and the stronger disciplinary role the earnings report plays. In turn, the enhanced disciplinary role of earnings shifts the signaling burden away from the firm's investment, thereby reducing its overinvestment.

Anecdotal and empirical evidence suggests that during the period prior to SFAS No. 123R, almost all S&P 500 industrial firms granted ESOs at the money and selected the intrinsic value approach to account for the cost of the ESO grants in computing earnings (Li and Wong 2005). This approach understated the expense of ESOs, making earnings less informative about the firms' true performance. However, SFAS No. 123R requires mandatory expensing of ESOs using the fair value approach, making the earnings report align better with the firms' true performance. As a result, the earnings report after SFAS No. 123R provides a stronger discipline on the manager's investment incentive, thus reduces overinvestment.

Based on the above discussion, we predict that the preferential accounting treatment of ESOs leads to higher overinvestment in the period prior to SFAS No. 123R. The testable hypothesis (in alternative form) is:

H1: The favorable accounting treatment of ESOs induces overinvestment in the period prior to SFAS No. 123R.

We note that prior to SFAS No. 123R, firms were required per SFAS No. 123 to disclose in a note the estimated fair value of ESO grants and pro-forma earnings as if ESOs were expensed at fair value. Hence, investors had access to the disclosed information that could potentially have the same disciplining effect as earnings reported under SFAS No. 123R. In order for SFAS No. 123R to have real effects, disclosure cannot be a substitute for recognition. Hence, we are testing the joint hypotheses that SFAS No. 123R has real effects and that disclosure is different from recognition. Regarding the "disclosure versus recognition" debate, the existing literature generally concludes that amounts disclosed in the notes to the financial statements are measured less reliably than those recognized in the financial statements, because management and auditors place less emphasis on disclosed than recognized amounts (Bernard and Schipper 1994; Libby et al. 2006). Empirical evidence documented by Ahmed et al. (2006), Cotter et al. (2003), Davis-Friday (1999, 2004), and Espahbodi et al. (2002) also indicate that disclosure and recognition are different.

Next we explore the cross-sectional variation in overinvestment across firms in the pre-SFAS No. 123R period. The real effects theory suggests that for a given accounting treatment of ESOs, the degree of overinvestment depends on the disciplining effect of earnings. To the extent that the accounting distortion is attributed to not expensing ESOs at fair value, we expect the overinvestment problem to be more pronounced for firms with high ESO expense (measured at fair value).[9] This leads to the following testable hypothesis:

[9] There are other reasons, rational or behavioural, that firms do not invest at the optimal level, such as contracting costs (Holthausen and Leftwich 1983), earnings fixation (Hand 1990), and investor inattention (Hirshleifer and Teoh 2003). We control for these possibilities in our empirical analysis.

H2: The absolute magnitude of abnormal investment in the pre-SFAS No. 123R period is positively related to the amount of ESO expense computed at fair value.

SFAS No. 123R increases the signaling cost of overinvestment, because the mandatory expensing of ESOs at fair value improves earnings informativeness, thereby providing a stronger discipline on management's overinvestment incentive. In other words, the accounting rules for ESOs have real effects on the firm's investment and firm value. Hence, the mandatory change in the accounting method for ESOs will have a stock price effect, even though it has no direct cash flow implication (e.g., Kanodia 1980). Thus we hypothesize:

H3: The stock market reacts positively to key events during the deliberation of SFAS No. 123R, because the new accounting rule mitigates the overinvestment problem induced by the preferential accounting treatment of ESOs.

H4: The stock price responses to key SFAS No. 123R events are positively associated with the amount of overinvestment.

III. Sample and variable definitions

The initial sample includes all companies, except financial institutions and utilities, in the executive compensation database provided by *ExecuComp*, from 1994 through 2009. We start our sample period in fiscal year 1994 because this is the first year that the *ExecuComp* database has complete data on the S&P 1,500 firms.[10] The database covers about 1,500 companies per year, including those in the S&P 500, S&P Midcap 400, and S&P Smallcap 600. We retrieve financial statement data from *Compustat* and stock price data from *CRSP*.

[10] The *ExecuComp* database has data beginning in 1992, but the database was not fully populated in the first two years.

SFAS No. 123R (FASB 2004) became effective in the first fiscal year beginning after June 15, 2005. Hence, we define the post-SFAS No. 123R period to include fiscal years beginning after June 15, 2005 and up to fiscal year 2009. The pre-SFAS No. 123R period covers the fiscal years 1994 to 2005.

Table 1 reports summary statistics on firm characteristics over the sample period 1994 through 2009. Following prior studies, we set research and development expense to zero if it is missing in *Compustat*, because companies are not required to disclose their R&D expenses if they are immaterial. Research and development expense is on average $130.3 million. Results not tabulated show that 45.55% of the firm-year observations have zero R&D expense and, hence, we will take this fact into account in the subsequent statistical analysis. Average firm total investment (the sum of R&D, capital expenditure, and net acquisition expenditure) is $568.9 million. Mean sales and assets are $5.2 billion and $5.9 billion, respectively. The average book and market values of equity are $2.0 billion and $6.8 billion, respectively.

Table 2, panel A, shows descriptive statistics for the variables used in the subsequent analyses. *R&D* and *INV* are on average 3.9% and 10.0% of assets, respectively. The market-to-book ratio, *MB*, is on average 2.133, and it is calculated as total assets, minus book value of common shares plus market value of common shares, scaled by total assets. Surplus cash, *SURCH*, is net cash flow from operating activities, minus depreciation and amortization plus research and development expense, scaled by total assets; mean *SURCH* is 8.9%. The logarithm of CEO tenure, *LOGTENURE*, is the natural logarithm of the number of years since the CEO first became the CEO of the firm; average *LOGTENURE* is 1.584. Cash compensation, *CASHCOM*, is total current salary and bonus, scaled by total compensation. Mean *CASHCOM* is 38.1%. The logarithm of sales, *LOGSALES*, is on average 7.164. Sales growth, *GROWTH*, averages 8.8% per year. Leverage, *LEV*, is total long-term debt divided by the sum of total long-term debt plus market value of common shares and its averages is 17.8%. Average one-year holding period stock return, *ARET*, is 17.2%, and *STDROA*, the standard deviation of *ROA* in the past five years, is on average 4.8%.

Table 2, panel B, reports the correlation matrix of the variables used in our subsequent regression analyses. As found in prior studies, these variables are correlated with one another at less than the 1% level. The largest correlations are between *MB* and *LEV* (-0.606) and *MB* and *SURCH* (-0.519).

IV. Real effects of accounting for ESOs on R&D investment

In this section, we examine the real effects of accounting for ESOs on corporate investment. First, we estimate the determinants of investment in the absence of favorable accounting for ESOs, using data from the post-SFAS No. 123R period. Second, we apply the estimated equation to calculate the expected values of investment over the pre-SFAS No. 123R period "as if" there were no preferential accounting treatment of ESOs. The prediction error reflects the abnormal amount of investment attributed to the favorable accounting treatment of ESOs. Third, we verify that the abnormal investment estimate indeed captures investment inefficiency by showing that the marginal rate of return on abnormal investment is negative. Finally, we examine the cross-sectional variation in overinvestment to test the real effects theory against alternative explanations.

Corporate investment in the absence of favorable accounting treatment of ESOs

To test whether the preferential accounting treatment of ESOs leads to distortion in investment, we first estimate the levels of investment in the absence of favorable accounting for

ESOs. We take advantage of the post-SFAS No. 123R data to purge the effects of the accounting distortion on investment. Specifically, we estimate the following reduced-form equations as a function of the pre-determined firm characteristics defined above:

$$\begin{aligned} R\&D_t = a_0 &+ a_1 MB_t + a_2 SURCH_t + a_3 LOGTENURE_t + a_4 CASHCOMP_t \\ &+ a_5 LOGSALES_t + a_6 LOGSALES_t^2 + a_7 GROWTH_t + a_8 LEV_t \\ &+ a_9 ARET_t + a_{10} FRISK_t + a_{11} STDROA_t + \varepsilon_t \end{aligned} \tag{1a}$$

$$\begin{aligned} INV_t = b_0 &+ b_1 MB_t + b_2 SURCH_t + b_3 LOGTENURE_t + b_4 CASHCOMP_t \\ &+ b_5 LOGSALES_t + b_6 LOGSALES_t^2 + b_7 GROWTH_t + b_8 LEV_t \\ &+ b_9 ARET_t + b_{10} FRISK_t + b_{11} STDROA_t + \varepsilon_t \end{aligned} \tag{1b}$$

The specifications of the regression models follow the spirit of Servaes (1994), Bhagat and Welch (1995), and Coles et al. (2006). Since there are different ways to calculate investment, we use two definitions of investment: (a) investment in research and development (*R&D*), and (b) the sum of investment in R&D, capital expenditure, and acquisition net of proceeds from sales of property, plant, and equipment (*INV*). The construction of the regression variables are defined in section III and summarized in the appendix.

The market-to-book ratio, *MB*, and surplus cash, *SURCH*, are used to capture the firm's investment opportunities and financing constraints, respectively. The CEO's level of risk aversion is proxied by his/her tenure, *LOGTENURE*, and cash compensation, *CASHCOMP*. We use *LOGSALES* and $LOGSALES^2$ to proxy for firm size, *GROWTH* for growth, and *LEV* for capital structure. *LOGSALES* and *GROWTH* also capture information asymmetries between the firm and its shareholders; small and high-growth firms are usually considered to exhibit higher information asymmetries. Stock return, *ARET*, controls for managerial expectation of future prospects, and time- and firm-specific stock market conditions. *FRISK a*nd *STDROA* capture the riskiness of the firm.

We estimate equation (1) over the post-SFAS No. 123R period (2006-2009) by industry to account for unobservable heterogeneity across industries. We define industries according to the twelve Fama-French industry groups. The regression is estimated using all companies with nonmissing data, including 51 companies that voluntarily chose to expense ESO costs at fair value in the period prior to SFAS No. 123R.[11]

Table 3 reports the means and *t*-statistics of the estimated coefficients across industries. Since 45.55% of the firm-year observations have an immaterial level of R&D (which we set to zero), we estimate the R&D equation using the Tobit method. Column (1) shows that the estimated coefficients on *MB* and *SURCH* are, respectively, 0.001 and 0.186, but only *SURCH* exhibits a significant association with *R&D*. This finding suggests that firms invest more in R&D when they have sufficient cash flows. Consistent with managerial risk aversion, CEO tenure and cash compensation exhibit a negative association with R&D. Companies invest significantly less in R&D if they are large, have high leverage, or experience a high one-year stock return. Column (2) in table 3 reports the results for the *INV* equation. Firms with excess cash (*SURCH*) and high growth rate (*GROWTH*) invest more. Large firms, firms with a high portion of CEO compensation in cash, and firms that experience a high past stock return invest significantly less. In contrast to the *R&D* result, highly leveraged firms invest more. These results, summarized in table 3, are generally consistent with the existing literature.

[11] In our sample, there are 51 non-financial firms, with all the required data, voluntarily started to expense the fair value of their ESO grants in 2002 and 2003. If we exclude these firms from the estimation of equations (1a) and (1b), the results are qualitatively similar to those reported.

Abnormal investment during the pre-SFAS No. 123R period

We use the estimated equations from the last subsection to obtain out-sample predictions of investment during the pre-SFAS No. 123R period (1994 – 2005). Since the parameters of the equation are estimated using data from the post-SFAS No. 123R period (2006-2009), the predicted values reflect the expected values of investment as if there were no favorable accounting treatment of ESOs in the pre-SFAS No. 123R period. We define abnormal investment as the difference between the actual and expected values, and we use it as our proxy for the distortions in corporate investment attributed to the preferential accounting treatment of ESOs in the pre-SFAS No. 123R period. We calculate abnormal *R&D* (*AbnR&D*) and abnormal *INV* (*AbnINV*) as follows:

$$AbnR\&D = R\&D - Expected\ (R\&D) \quad \text{and} \tag{2a}$$

$$AbnINV = INV - Expected\ (INV)\ , \tag{2b}$$

where *Expected(R&D)* is the expected value of R&D investment and *Expected(INV)* is the expected value of investment in R&D plus capital expenditure. Since the R&D equation (1a) is estimated using the Tobit method, we impose a lower bound of zero on *Expected(R&D)*. As a result, about 50% of the predicted values are set to zero. This figure is in line with the untabulated statistic that 45.55% of the firm-year observations reported an immaterial R&D expenditure (which we set to zero).

Table 4 reports summary statistics on our estimates of abnormal investment for each fiscal year from 1994 through 2005. We exclude the companies that voluntarily expensed ESO cost at fair value from this analysis. Panel A shows that mean *AbnR&D* ranges from a high of

0.013 in both 1995 and 1997 to a low of 0.003 in 2002. All annual average *AbnR&D*s are statistically positive at less than the 1% level. Mean *AbnR&D* across all 12 years is 0.009, with a Fama-MacBeth *t*-statistic of 10.75. As the second-to-last column indicates, close to 40% of the firms have a zero *AbnR&D*; this is a relatively large percentage because there are many cases in which both actual R&D and *Expected(R&D)* are equal to zero. On the other hand, around 40% of the *AbnR&D* are positive across the 12 years, which is consistent with overinvestment in R&D during the pre-SFAS No. 123R period (hypothesis H1). However, the last column shows that about 20% of the firms underinvested in R&D, which cannot be explained by the real effects theory of accounting. In subsequent analyses, we will examine the firms with overinvestment problems separately from those with underinvestment problems.

Table 4, panel B summarizes the statistics for abnormal *INV*, *AbnINV*. Annual mean *AbnINV*s are significantly positive from 1994 through 2001, statistically negative in 2002, and indistinguishable from zero from 2003 through 2005. Median *AbnINV* is statistically positive from 1994 through 1999 and in 2001, but turns negative from 2002 through 2005. Over the 12-year period, mean *AbnINV* is 0.015, with a Fama-MacBeth *t*-statistic of 3.79. The percent of positive *AbnINV* is greater than 50% in seven years and drops below 50% in 2000 and 2002–2005. The reduction in overinvestment in the last few years of the pre-SFAS No. 123R period could be attributed to the anticipation effect of the new accounting rule for ESOs. As we will discuss later in section V and show in table 7, nine events occurred in 2002 that led companies and market participants to believe that the FASB would soon mandate expensing the fair value of ESOs.

Effect of overinvestment on future operating performance

We examine whether the overinvestment findings documented in the last subsection are indeed suboptimal by estimating the abnormal investment's marginal rate of return, which is defined as the incremental rate of return on an additional dollar of investment. We regress the firms' future return on assets (*ROA*) on the estimated abnormal investment, along with other variables that capture the firms' normal level of operating performance. The regression models are specified as follows:

$$\begin{aligned} ROA_{t+j} = {} & c_0 + c_1 AbnR\&D_t^+ + c_2 AbnR\&D_t^- + c_3 LAGROA_t \\ & + c_4 STDROA_t + c_5 LOGSALES_t + c_6 MB_t + \varepsilon_t, \; and \end{aligned} \tag{3a}$$

$$\begin{aligned} ROA_{t+j} = {} & d_0 + d_1 AbnINV_t^+ + d_2 AbnINV_t^- + d_3 LAGROA_t \\ & + d_4 STDROA_t + d_5 LOGSALES_t + d_6 MB_t + \varepsilon_t, \end{aligned} \tag{3b}$$

where $ROA_{t,t+j}$ (j = 1, 3, or 5) is the *ROA* next year, average *ROA* over the next three years, or average *ROA* over the next five years. Varying the measurement window of future *ROA* allows us to examine both the short- and long-term impacts of overinvestment on future firm performance, especially given the fact that the performance implications of corporate investment could take a long time to materialize. *ROA* is calculated as operating income before depreciation, scaled by total assets. $AbnR\&D^+$ ($AbnINV^+$) takes the value of *AbnR&D* (*AbnINV*) when *AbnR&D* (*AbnINV*) is positive; zero otherwise. Similarly, $AbnR\&D^-$ ($AbnINV^-$) takes the value of *AbnR&D* (*AbnINV*) when *AbnR&D* (*AbnINV*) is negative; zero otherwise. $AbnR\&D^+$ and $AbnINV^+$ represent the amount of overinvestment in *R&D* and *INV*, respectively. *LAGROA* is past *ROA* averaged over the same horizon as the dependent variable, *STDROA* is the standard deviation of *ROA* for the five years ending with the current year, *LOGSALE* is the logarithm of sales (to control for size effects), and *MB* is the market-to-book ratio (to proxy for growth opportunities and the life cycle of the firm).

Since the control variables account for the normal level of future operating performance, the estimated coefficients on $AbnR\&D^+$ and $AbnINV^+$ capture the incremental rate of return of overinvestment. If our estimate of overinvestment captures suboptimal investment, we expect the estimated coefficients on $AbnR\&D^+$ and $AbnINV^+$ to be negative. Moreover, if $AbnR\&D^-$ and $AbnINV^-$ capture underinvestment, we expect their estimated incremental rates of return to be positive.

Table 5 reports the estimation results. All *t*-statistics are calculated using standard errors clustered by firm and year. We also control for industry fixed effects in the regressions. As expected, columns (1) to (3) show that the estimated coefficient on $AbnR\&D^+$ is negative and significant for future *ROA* measured over three different time horizons. Similarly, columns (4) to (6) report that the estimated coefficient on $AbnINV^+$ is statistically negative for ROA over the next 3 and 5 years. The absolute magnitude of the coefficients increases as the time horizon of future ROA increases from 1 year to 5 years. These results indicate that the abnormal *R&D* and *INV* we estimated in an early subsection have an adverse effect on future firm performance, consistent with them capturing overinvestment. The control variables exhibit the expected associations with future *ROA* (see Bens et al. 2002), and their estimated coefficients are all distinguishable from zero. Hence, the control variables capture the expected level of future *ROA* well, and the estimated coefficients on $AbnR\&D^+$ and $AbnINV^+$ can be interpreted as the incremental returns for an additional dollar of investment. In contrast, the estimated coefficients on $AbnR\&D^-$ are not statistically different from zero, except for the regression reported under column (6). This might indicate that underinvestment tends to be minor or temporary.

Since the incremental rates of return on *AbnR&D*$^{+}$ and *AbnINV*$^{+}$ (our estimates of overinvestment) are negative, it suggests that overinvested companies could improve their future operating performance by reducing their investment (toward the optimal level). This implies that when the preferential accounting treatment of ESOs is removed by the adoption of SFAS No. 123R, firms' investment efficiency and, hence, firm value will improve. We examine this implication later in section V.

Cross-sectional variations in the absolute magnitude of abnormal investments

In a previous subsection, we provide evidence that average corporate investment in the period prior to SFAS No. 123R is higher than what would have been expected under SFAS No. 123R. In this section, we examine the cross-sectional variations in abnormal investments, to test the real effects theory against other explanations for the association between accounting quality and investment efficiency.

The discussion in section II suggests that in the pre-SFAS No. 123R period, overinvestment varies across firms with the informativeness of earnings (hypothesis H2). In particular, more informative (or high-quality) earnings provide a better disciplining effect to mitigate the incentive of management to overinvest. To test this hypothesis, we regress the absolute value of abnormal investment on *ESOEXP*, which is the implied ESO expense disclosed in a financial statement note per SFAS No. 123, scaled by total assets. By using *ESOEXP* to capture the distortion in earnings, we assume that the larger the amount of ESO expenses excluded from the computation of reported earnings, the less informative earnings are for underlying cash flows.

Table 6 summarizes the regression results. The *t*-statistics are computed using standard errors, clustered by firm and year. Columns (1) and (3) show that the estimated coefficients on

ESOEXP are significantly positive, suggesting that the less informative earnings are (i.e., the larger *ESOEXP* is) the larger the magnitude of abnormal investment in either direction. The real effects theory predicts that the favorable accounting for ESOs will lead to overinvestment, but it is silent regarding the effect of earning informativeness on underinvestment. Hence, we examine the effect of earnings informativeness on investment efficiency separately for overinvested and underinvested firms. Columns (2) and (4) report the findings. *OverInv* and *UnderInv* are indicator variables equal to one if a firm's *AbnR&D* (in column 2) or *AbnINV* (in column 4) are positive and negative, respectively, and zero otherwise. The results show that the estimated coefficients on *ESOEXP*×*OverInv* are statistically positive at less than the 1% significance level. In other words, low earnings informativeness (i.e., large *ESOEXP*) is positively associated with overinvestment among overinvested firms, lending support to the real effects theory. Furthermore, the estimated coefficients on *ESOEXP*×*UnderInv* are significant and positive. Although the real effects theory has no prediction for underinvested firms, the latter findings are consistent with higher earnings informativeness mitigating the underinvestment problem as studied by Myers and Majluf (1984).

The above empirical evidence is obtained after controlling for several alternative explanations. First, we rule out the possibility that *ESOEXP* is simply capturing accounting quality in general. Specifically, we include into the regression equation the usual proxy for accounting quality *AQ*, which is based on the accrual quality measure of Dechow and Dichev (2002). Columns (1) and (3) show that *AQ* exhibits the expected negative association with the absolute value of abnormal investment. Moreover, column (2) reports that the estimated coefficient on *AQ*×*OverInv* is indistinguishable from zero and that on *AQ*×*UnderInv* is statistically negative. Hence, accounting quality exhibits no relation to overinvestment in R&D

among overinvested firms, but it reduces underinvestment in R&D among underinvested firms. On the other hand, column (4) indicates that *AQ*×*OverInv* exhibits a statistically negative and *AQ*×*UnderInv* an insignificant association with the absolute value of *AbnINV*. Therefore, accounting quality is negatively associated with overinvestment among overinvested firms, but it exhibits no relation to underinvestment among underinvested firms. In general, the evidence on *AQ* is consistent with, but weaker than, that documented in Biddle et al. (2009).

Second, following Biddle et al. (2009), we control for other governance mechanisms that could be used by firms to resolve investment inefficiency due to moral hazard. Like the real effect theory, the moral hazard theory predicts a negative relation between accounting quality and overinvestment. We include *InvG-Score*, which is Gompers et al. (2003) measure of anti-takeover protection, multiplied by minus one, and *G-Score dummy*, which is an indicator variable equal to one if the firm has a missing G-Score, and zero otherwise. Table 6 shows that *InvG-Score* is not associated with the absolute magnitude of abnormal R&D investment. Contrary to expectation, *InvG-Score* is positively associated with the absolute value of *AbnINV* under columns (3) and (4).

We also consider managerial compensation design as another mechanism for mitigating moral hazard. Following Coles et al. (2006), we include into the regression the logarithm of options vega and delta. *LogVega* is the logarithm of the change in the dollar value of the CEO's stock and option holding for a 1% change in the annualized standard deviation of the firm's stock returns, and *LogDelta* is the logarithm of the change in the dollar value of the CEO's stock and option holding for a 1% change in the stock price. Table 6 indicates that *LogVega* has an insignificant association with the absolute magnitude of abnormal investment. However, *LogDelta* exhibits a negative association in columns (1) and (2); these results are consistent with option delta being used by firms to reduce over- or under-investment due to moral hazard.

Third, we examine earnings fixation (Hand 1990) or investor inattention (Hirshleifer and Teoh 2003) as alternative explanations for our findings. Hirshleifer and Teoh (2003) show that when ESO expenses are only disclosed, the capital market overvalues firms and these firms might issue overpriced equities to finance greater investment. Hence, in the pre-SFAS No. 123R period, the larger the fraction of inattentive investors in the capital markets, the greater the investment. We measure investor sophistication/attention using *ATTN*, which is a factor created from a principal component analysis that equally weights standardized values for the number of analysts following the firm and the percentage of the firm's equity held by institutional investors. Table 6 finds no support that investor sophistication/attention, *ATTN*, leads to overinvestment; the estimated coefficient on *ATTN* under column (2) is actually negative at the 10% level.

Finally, another potential explanation of overinvestment is that firms that anticipate raising additional capital overinvest in order to signal future profitability to influence the perception of the capital markets.[12] We control for this explanation using a proxy for the future issuance of new capital: *FIN* is a factor created from a principal component analysis that equally weights standardized values for the increases in equity and debt capital in year *t+1,* scaled by assets. Table 6 documents a statistically positive coefficient on *FIN*, consistent with the notion that the need to access the capital markets leads to overinvestment.

[12] In contrast, the Kanodia and Lee (1998) model examines managers overinvesting to signal their firms' profitability in order to increase the stock prices of existing shares. Their model does not consider firms raising additional capital by issuing shares.

V. Stock price reactions to events leading to the adoption of SFAS No. 123R

In this section, we test one of the implications of the real effects theory of accounting. The real effects theory predicts that a cosmetic change in an accounting standard that has no direct cash flow implication and provides no new information to the capital market can still generate a stock price reaction if it affects real investment (e.g., Kanodia 2007).[13] According to the real effects theory of accounting, when accounting regulators (e.g., SEC, FASB, IASB) or firms make a move toward recognizing the fair value of ESO grants in their income statement, the capital market will take this move as a commitment to "correcting" the abnormal investment attributed to the accounting distortion. Therefore, the expected improvement in investment efficiency should lead to a positive market reaction at key event dates during the deliberation of the new standard.[14]

We first examine the stock market reactions to key events leading to the adoption of SFAS No. 123R. Next, we test whether overinvestment explains the cross-sectional variation in the market responses, after controlling for other explanations (e.g., contracting cost theory).

Stock price reactions

We estimate the average stock price reactions of the sample firms (as a portfolio) around the dates of key events in the deliberation of SFAS No. 123R, using the following augmented market model:

$$r_t = \alpha + \beta r_{M,t} + \sum_{s=1}^{S} \gamma_s d_{s,t} + \varepsilon_t \ , \qquad (4)$$

[13] Contracting cost consideration has indirect cash flow implications, so it is another reason that cosmetic accounting method changes have a stock price effect (Watts and Zimmerman 1986).
[14] In fact, Aboody et al. (2004) document a positive market reaction around the announcements of firms' voluntary expensing the fair value of ESO grants. However, Aboody et al. (2004) interpret their findings to mean that investors considered ESO expensing to be a signal of high-quality financial reporting.

where r_t is the daily value-weighted portfolio return of our sample firms, $r_{M,t}$ is the daily return on the CRSP value-weighted market index, and $d_{s,t}$ is an indicator variable that takes the value of one on the three trading days centered on an event s (=1,…, S); and zero otherwise. The intercept, α, represents the average stock return across all non-event days for the portfolio of our sample firms, and β is the equity beta of the portfolio with respect to the CRSP value-weighted market index. The coefficient γ_s is the stock price response of the portfolio of sample firms to event s.

Table 7 summarizes and describes the nine key events associated with the deliberation of SFAS No. 123R. Based on information in Schrand (2004) and Cook & Co. (2005), we believe these events might have induced market participants to revise their assessments of whether the proposed standard would be adopted.

Table 8 reports the estimation of equation (6) over the period from June 1, 2001 to June 30, 2005 (T=1,025 trading days). To be included in the computation of portfolio returns, a sample cannot have missing daily stock returns for more than 25 trading days during the estimation period; 1,249 companies meet this requirement.[15] The estimated intercept (the average beta-adjusted abnormal return across all non-event days) is economically zero (even though it is statistically different from zero), and the estimated market beta is close to one, suggesting that the regression captures the data-generating process reasonably well.

Column (1) reports the result for the portfolio of all 1,249 firms. Only event *D3* (July 16, 2002) exhibits a statistically significant market response. In event *D3*, the International Accounting Standards Board (IASB) announced its decision to develop a rule that would require the expensing of the fair value of ESO grants, and former Federal Reserve Board Chairman Alan

[15] Using this portfolio approach, the estimation of equation (6) will not suffer from the cross-correlation problem, as would result from estimating the standard deviation across firms.

Greenspan told the Senate Banking Committee that expensing ESOs at fair value would be required. The IASB's announcement predated the FASB's decision (event *D5*) to reconsider the accounting rule for ESOs and, hence, it potentially affected the market assessment of the probability that the FASB would follow suit (the FASB and IASB had been working toward harmonizing their accounting standards).

Next, we form separate portfolios based on the sign of *AbnR&D* and *AbnINV*; i.e., whether the firms overinvested ($AbnR\&D^+$ and $AbnINV^+$) or underinvested ($AbnR\&D^-$ and $AbnINV^-$). The real effects theory predicts a positive price effect for overinvested firms, because SFAS No. 123R removes the accounting distortion and improves investment efficiency. Columns (2) and (4) in table 8 show that the portfolios of overinvested firms ($AbnR\&D^+$ and $AbnINV^+$) exhibit a positive market reaction to event *D3*. The positive stock price effect is consistent with hypothesis *H3*.

Columns (3) and (5) report the result for the portfolio of underinvested firms. The real effects theory is silent regarding the effect of SFAS No. 123R on underinvested firms. Nevertheless, column (3) indicates that firms underinvested in R&D exhibit a significantly negative market response to event *D5*.

Overinvestment and cross-sectional variation in stock price reactions

In this section, we test whether overinvestment (attributed to accounting distortion related to ESOs) explains the variation across firms in the stock price responses to key events. The real effects theory of accounting predicts that an accounting method change will have a stock price effect if it alters corporate investment.

In particular, we investigate the cross-sectional relation between abnormal returns on each event day and the explanatory variables that capture overinvestment in R&D (estimated in section IV), contracting cost considerations, and other firm-specific characteristics. Besides our main variables of interest, *AbnR&D*$^{+}$ and *AbnINV*$^{+}$, we follow Leftwich (1981), Dechow et al. (1996), and Espahbodi et al. (2002) to select control variables that could explain the variation in stock market responses around the key event dates. In particular, we include surplus cash (*SURCH*) to capture cash constraint, and sales growth (*GROWTH*) to capture investment opportunities. We capture debt-related contracting costs using public debt (*LEVPUB*), private debt (*LEVPRI*), and convertible debt (*LEVCONV*). Data on public debt are from the *FISD* database and convertible debt is from *Compustat*. We compute private debt by subtracting public debt from total debt.[16] We control for firm size using the natural logarithm of sales (*LOGSALES*).

In this analysis, the dependent variable of the cross-sectional model is the estimated coefficient of a time-series regression. Because the time-series coefficients are estimated over the same time period for all sample firms, the residuals in the cross-sectional regression model will be cross-correlated. To obtain correct standard errors, we use the portfolio time-series regression approach of Sefcik and Thompson (1986) to account for cross-correlation, as well as heteroskedasticity, in the cross-sectional regression.

Table 9 reports the estimations of the portfolio time-series regressions over the period from June 1, 2001 to June 30, 2005. To save space, we only report the regression at event *D3*.[17] In the regression for event *D3* (July 16, 2002), which is the same event for which we find a statistically positive market reaction as reported in table 8, the variables that capture

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[16] We do not retrieve private debt data from *DealScan*. This is because private debts are very likely to be renegotiated, and hence their face amounts at issuance do not reflect the actual amount of private debt outstanding.
[17] In other event days, the key variables (*AbnR&D*$^{+}$, *AbnR&D*$^{-}$, *AbnINV*$^{+}$, and *AbnINV*$^{-}$) exhibit insignificant explanatory power for the market reactions. This might be due to the fact that a stock-return-based design lacks power, because market participants continuously update their expectations and therefore it is very difficult to pinpoint and isolate the unexpected information released at particular event dates (Holthausen and Leftwich 1983).

overinvestment, $AbnR\&D^{+}$ and $AbnINV^{+}$, are significantly and positively associated with the stock market response. This finding is consistent with the prediction of the real effects theory (hypothesis *H4*) that the removal of the favorable accounting treatment of ESOs improves investment efficiency more for firms with more severe overinvestment problems. Regarding the variables that capture underinvestment, the estimated coefficient on $AbnR\&D^{-}$ is statistically negative in column (1) and that on $AbnINV^{-}$ is indistinguishable from zero in column (2). The real effects theory of accounting does not predict the effect of SFAS No. 123R on underinvested firms. However, the negative coefficient on $AbnR\&D^{-}$ is consistent with underinvested firms experiencing a positive market response to event *D3*. A possible explanation for the positive market reaction is that a higher earnings quality after SFAS No. 123R helps reduce the underinvestment problem identified by Myers and Majluf (1984).

In column (3), we use *ESOEXP* as a parsimonious measure of the potential investment distortion generated by the favorable accounting treatment of ESOs. It indicates that the larger the implied ESO expense, the larger the stock price reaction, providing supplementary evidence for the results reported in columns (1) and (2).

The contracting costs theory (Watts and Zimmerman 1986) predicts a negative stock price reaction to events presaging the enactment of SFAS No. 123R, because the expensing of ESO costs at fair value lowers reported earnings and book equity, increasing the probability of firms violating earnings-related debt covenants. Consistent with this prediction, table 9 shows the amount of private debt (*LEVPRI*) is significantly and negatively associated with stock price reaction. However, the estimated coefficient on public debt (*LEVPUB*) is insignificant, even though it is more costly to renegotiate public debts than private debts to adjust for the adverse impact of the accounting change (Leftwich 1981).

Finally, high-growth (*GROWTH*), start-up (*STARTUP*), and high-technology (*HITECH*) firms exhibit positive stock price reactions at event *D3*. These findings are inconsistent with the prediction of Espahbodi et al. (2002) that these firms would be adversely affected the most, because they tend to be heavy ESO users and their earnings would be lowered by the expensing of ESOs at fair value. However, the findings are consistent with the real effects theory that heavy ESO users' overinvestment problem will be reduced, as their earnings informativeness is increased by the passage of SFAS No. 123R

VI. Conclusion

This study investigates the effect on corporate investment of requiring the expensing of ESO costs at fair value. Prior to the passage of the new accounting rule, SFAS No. 123R, ESOs were given favorable accounting treatment. The real effects theory of accounting suggests that this accounting distortion should lead to overinvestment. This study provides a comprehensive evaluation of the real effects of accounting for ESO expense at fair value.

We use post-SFAS No. 123R data to estimate the determinants of optimal investment in the absence of the favorable accounting treatment of ESOs. We apply the estimated models to compute the abnormal amount of investment attributed to the accounting distortion in the pre-SFAS No. 123R period. We document evidence consistent with firms overinvesting in the period prior to SFAS No. 123R. Furthermore, we find that firms with overinvestment problems exhibit positive stock price effects at a key event leading to the passage of SFAS No. 123R, and that the amount of overinvestment explains the cross-sectional variation in stock price responses. Together, these results are consistent with the idea that the removal of the ESO accounting distortion by SFAS No. 123R mitigated the overinvestment problem and, hence, the stock market responded positively.

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Appendix

This appendix describes the construction of the variables used in this study. *Compustat* and *ExecuComp* variable names are given in square brackets.

Variable	Definition
R&D	Research and development expense [xrd] scaled by total assets [at].
INV	The sum of research and development expense [xrd], capital expenditure [capx], and acquisition expenditure net of proceeds from sales of property, plant, and equipment, scaled by total assets [at].
AbnR&D	Predicted error of *R&D* by applying the estimated parameters in equation (1a) estimated over the post-SFAS 123R to the pre-SFAS 123R period.
AbnINV	Predicted error of *INV* by applying the estimated parameters in equation (1b) estimated over the post-SFAS 123R to the pre-SFAS 123R period.
MB	Total assets [at] minus book value of common shares [ceq] plus market value of common shares [prcc_f*csho], divided by total assets.
SURCH	Surplus cash calculated as net cash flow from operating activities [oancf] minus depreciation and amortization [dp] plus research and development expense [xrd] scaled by total assets [at].
LOGTENURE	Natural logarithm of number of years since the CEO first became the CEO of the firm.
CASHCOM	Total Current Compensation including salary and bonus [total_curr] scaled by total compensation [tdc1].
LOGSALES	Natural logarithm of sales [sale].
$LOGSALES^2$	Square of *LOGSALES*.
GROWTH	Current year's growth in sales [sale].
LEV	Market leverage calculated as total long-term debt [dltt] divided total long-term debt [dltt] plus market value of common shares [prcc_f*csho].
ARET	One year holding period return on an investment in the firm's common stock.
FRISK	Natural log of variance of daily returns over the whole fiscal year.
ROA	Operating income before depreciation [oibdp] scaled by total assets [at].
STDROA	Standard deviation of *ROA* for the five years ending with the current year.
LAGROA	Past *ROA* averaged over the same horizon as the dependent variables.

(continued…)

Appendix (… continued)

Variable	Definition
ESOEXP	Implied option expense [xintopt] scaled by total assets [at].
AQ	Dechow and Dichev (2002) measure of accounting quality.
OverInv	An indicator variable equals to one if the firm's *AbnR&D* or *AbnInv* is positive, and zero otherwise.
UnderInv	An indicator variable equals to one if the firm's *AbnR&D* or *AbnInv* is negative, and zero otherwise.
FIN	Factor created from a principal component analysis equally weighting standardized values for *ISSUEEQ* and *ISSUEDEBT*. *ISSUEEQ* and *ISSUEDEBT* are the future increase in equity capital and debt capital, respectively, for firm *j* in year *t+1* scaled by assets, 0 otherwise.
ATTN	Factor created from a principal component analysis equally weighting standardized values for institutional ownership and logarithm of one plus analyst following.
LogVega	Logarithm of vega, which is the change in the dollar value of the CEO's stock and option holding for a 1% change in the annualized standard deviation of the firm's stock returns.
LogDelta	Logarithm of delta, which is the change in the dollar value of the CEO's stock and option holding for a 1% change in the stock price.
InvG-Score	Gompers et al. (2003) measure of anti-takeover protection, multiplied by minus one.
G-Score dummy	An indicator variable equals to one if the firm has a missing G-Score, and zero otherwise.
LEVPUB	Total long-term public debt [FISD] divided by total assets [at]
LEVPRI	Total long-term private debt (total log-term debt minus long-term public debt) divided by total assets [at]
LEVCONV	Total convertible public debt [dcvt] divided by the sum of total long-term debt [dltt] and market value of common shares [prcc_f*csho].
STARTUP	An indicator variable equals to one if the firm is listed CRSP after January 1, 1996, and zero otherwise.
HITECH	An indicator variable equals to one if the firm is in the high-tech industries (SIC codes 3570-3579, 3670-3679 and 8730-8734), and zero otherwise.

Table 1
Descriptive statistics for a sample of S&P 1500 firms, 1994 to 2009 (N=14,397)
The initial sample includes all companies, except financial institutions and utilities, in the executive compensation database provide by *ExecuComp*. Firm characteristics and CEO compensation data are from *Compustat* and *ExecuComp*, respectively. Research and development expense is set to zero if it is missing in *Compustat*.

($ millions)	Mean	Std Dev	25%	50%	75%
Research and development (R&D)	130.3	565.7	0.0	5.3	49.7
Capital expenditure (CAPEX)	340.6	1322.9	17.5	55.4	191.5
Net Acquisition expenditure (ACQ)	129.9	788.8	0.0	1.0	46.0
Investment (= R&D + CAPEX + ACQ)	568.9	2009.9	39.7	114.0	367.1
Sales	5196.8	16125.9	445.9	1225.4	3774.7
Assets	5931.1	23447.4	451.3	1221.6	3800.9
Book value of equity	2042.9	6165.5	206.2	524.5	1458.8
Market value of equity	6826.2	21761.8	495.2	1344.6	4200.0

Table 2
Descriptive statistics on the regression variables, 1994 to 2009 (N=14,397)
R&D is research and development expense scaled by total assets and it is set to zero if research and development expense is missing in *Compustat*. *INV* is the sum of research and development expense and capital expenditure, scaled by total assets. Market-to-book ratio, *MB*, is total assets minus book value of common shares plus market value of common shares, scaled by total assets. Surplus cash, *SURCH*, is net cash flow from operating activities minus depreciation and amortization plus research and development expense, scaled by total assets. *LOGTENURE* is the natural logarithm of the number of years since the CEO first becoming the CEO of the firm. Cash compensation, *CASHCOM*, is total current salary and bonus, scaled by total compensation. *LOGSALES* is the natural logarithm of sales. Sales growth, *GROWTH*, is the growth in current year's net sales. *LEV*, leverage, is total long-term debt divided by the sum of total long-term debt and market value of common shares. *ARET* is one-year holding period stock return. *FRISK*, firm risk, is computed as the natural logarithm of the variance of daily stock returns over the fiscal year. *STDROA* is the standard deviation of ROA in the past five years. *ROA*, return on assets, is operating income before depreciation scaled by total assets.

Panel A: Summary statistics

Variable	Mean	Std Dev	25%	50%	75%
R&D	0.039	0.079	0	0.005	0.049
INV	0.100	0.094	0.043	0.077	0.128
MB	2.133	1.943	1.24	1.634	2.363
SURCH	0.089	0.112	0.034	0.08	0.138
LOGTENURE	1.584	0.987	0.948	1.659	2.303
CASHCOM	0.381	0.221	0.204	0.352	0.53
LOGSALES	7.164	1.661	6.1	7.111	8.236
GROWTH	0.088	0.268	-0.005	0.081	0.18
LEV	0.178	0.188	0.017	0.126	0.272
ARET	0.172	0.759	-0.188	0.075	0.364
FRISK	-7.223	0.935	-7.895	-7.266	-6.592
STDROA	0.048	0.063	0.018	0.031	0.056

(continued…)

Table 2 (… continued)

Panel B: Correlation Matrix for the explanatory variables

	LOGTENURE	*CASHCOM*	*LOGSALE*	*MB*	*SURCH*	*LEV*	*ARET*	*FRISK*	*GROWTH*
CASHCOM	0.070***								
LOGSALE	-0.066***	-0.196***							
MB	0.037***	-0.184***	-0.103***						
SURCH	0.027***	-0.152***	-0.041***	0.519***					
LEV	-0.031***	0.081***	0.312***	-0.606***	-0.479***				
ARET	0.019	0.057***	0.021	0.395***	0.154***	-0.174***			
FRISK	0.022***	-0.120***	-0.416***	-0.116***	-0.065***	-0.071***	-0.204***		
GROWTH	0.126***	-0.033***	-0.074***	0.307***	0.119***	-0.154***	0.189***	-0.059***	
STDROA	-0.038***	-0.064***	-0.414***	0.129***	0.091***	-0.217***	-0.050***	0.435***	0.020

*** denotes statistical significance at the 1% level (using a two-tailed test).

Table 3
Regressions of investment on firm characteristics over the post-SFAS No. 123R period, 2006 – 2009
This table summarizes the estimation of the following reduced-form equations:

$$R\&D_t = a_0 + a_1 MB_t + a_2 SURCH_t + a_3 LOGTENURE_t + a_4 CASHCOMP_t + a_5 LOGSALES_t \quad (1a)$$
$$+ a_6 LOGSALES_t^2 + a_7 GROWTH_t + a_8 LEV_t + a_9 ARET_t + a_{10} FRISK_t + a_{11} STDROA_t + \varepsilon_t$$
$$INV_t = b_0 + b_1 MB_t + b_2 SURCH_t + b_3 LOGTENURE_t + b_4 CASHCOMP_t + b_5 LOGSALES_t \quad (1b)$$
$$+ b_6 LOGSALES_t^2 + b_7 GROWTH_t + b_8 LEV_t + b_9 ARET_t + b_{10} FRISK_t + b_{11} STDROA_t + \varepsilon_t$$

R&D is research and development expense, scaled by total assets. *INV* is the sum of research and development expense, capital expenditure, and acquisition expenditure less proceeds from the sale of property, plant, and equipment, scaled by total assets. Market-to-book ratio, *MB*, is total assets minus book value of common shares plus market value of common shares, scaled by total assets. Surplus cash, *SURCH*, is net cash flow from operating activities minus depreciation and amortization plus research and development expense, scaled by total assets. *LOGTENURE* is the natural logarithm of the number of years since the CEO first becoming the CEO of the firm. Cash compensation, *CASHCOM*, is total current salary and bonus, scaled by total compensation. *LOGSALES* is the natural logarithm of sales. *GROWTH* is the percent change in current year's sales. *LEV*, leverage, is total long-term debt divided by the sum of total long-term debt and market value of common shares. *ARET* is one-year holding period stock return. *FRISK* is the natural logarithm of variance of daily returns over the fiscal year. *STDROA* is the standard deviation of ROA for the five years ending with the current year. Equation (1a) is estimated using Tobit and equation (1b) ordinary least squares by industry. The table reports the means and *t*-statistics (in parentheses) of the estimated coefficients across twelve Fama-French industries. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) *R&D*		(2) *INV*	
Intercept	0.189	**	0.257	***
	(3.07)		(4.84)	
MB	0.001		0.003	
	(0.36)		(0.49)	
SURCH	0.186	***	0.168	***
	(4.21)		(3.46)	
LOGTENURE	-0.002	*	0.002	
	(-1.73)		(0.91)	
CASHCOMP	-0.005		-0.021	*
	(-0.47)		(-1.90)	
LOGSALES	-0.046	**	-0.040	***
	(-3.21)		(-3.04)	
LOGSALES^2	0.003	***	0.002	**
	(3.41)		(2.54)	
GROWTH	-0.004		0.088	***
	(-0.37)		(7.59)	
LEV	-0.032	**	0.023	**
	(-2.83)		(2.23)	
ARET	-0.008	**	-0.019	***
	(-2.64)		(-10.99)	
FRISK	0.003		-0.001	
	(1.60)		(-0.32)	
STDROA	-0.073		0.099	
	(-0.73)		(1.53)	
Estimation Method	*TOBIT*		*OLS*	
N	3,690		3,690	
Log Likelihood	289.564		-	
Adjusted R^2	-		0.204	

Table 4
Abnormal investment over the pre-SFAS No. 123R period, 1994 – 2005
This table reports summary statistics on out-sample abnormal *R&D* (*AbnR&D*) and abnormal *INV* (*AbnINV*) over the period from 1994 to 2005. *R&D* is research and development expense, scaled by total assets. *INV* is the sum of research and development expense and capital expenditure, scaled by total assets. Abnormal investment is the difference between the actual value and the expected value in the absence of favorable accounting treatment of ESOs. We obtain the expected values by first estimating equations (1a) and (1b) using data from the post-SFAS No. 123R period (see results in table 3) and then applying the parameter estimates to compute the expected values over the pre-SFAS No. 123R period. The *t*-value for the mean and *p*-value for the median (Wilcoxon rank-sum test) are reported in the table. The Fama-MacBeth *t*-statistic for the overall mean is the time-series mean of the annual averages, divided by the standard error of the time-series.

Fiscal Year	N	Mean	25%	50%	75%	*t*-value	Wilcoxon *p*-value	Percent positive	Percent zero	Percent negative
Panel A: AbnR&D										
1994	685	0.010	0.000	0.000	0.014	6.55	0.000	39.1%	38.8%	22.0%
1995	747	0.013	0.000	0.000	0.019	9.26	0.000	41.5%	39.4%	19.1%
1996	776	0.011	0.000	0.000	0.017	7.95	0.000	40.3%	39.6%	20.1%
1997	819	0.013	0.000	0.000	0.018	8.40	0.000	40.4%	39.2%	20.4%
1998	905	0.011	0.000	0.000	0.016	7.63	0.000	39.7%	38.5%	21.9%
1999	946	0.011	0.000	0.000	0.016	7.84	0.000	40.5%	38.1%	21.5%
2000	934	0.006	0.000	0.000	0.013	4.93	0.000	35.3%	42.0%	22.7%
2001	916	0.006	-0.002	0.000	0.010	4.34	0.000	34.6%	38.9%	26.5%
2002	925	0.003	-0.010	0.000	0.006	2.00	0.718	31.4%	35.5%	33.2%
2003	907	0.009	0.000	0.000	0.015	6.68	0.000	39.9%	37.6%	22.5%
2004	894	0.010	0.000	0.000	0.014	7.81	0.000	39.0%	37.4%	23.6%
2005	842	0.009	0.000	0.000	0.013	6.99	0.000	40.9%	36.3%	22.8%
Fama-MacBeth		0.009				10.75				
Panel B: AbnINV										
1994	685	0.016	-0.035	0.002	0.053	5.345	0.001	50.66%	0.00%	49.34%
1995	747	0.028	-0.028	0.012	0.066	9.245	0.000	56.36%	0.00%	43.64%
1996	776	0.027	-0.027	0.013	0.070	9.025	0.000	56.19%	0.00%	43.81%
1997	819	0.032	-0.028	0.017	0.077	10.349	0.000	59.71%	0.00%	40.29%
1998	905	0.034	-0.026	0.016	0.077	11.367	0.000	59.56%	0.00%	40.44%
1999	946	0.022	-0.038	0.007	0.062	7.734	0.000	53.49%	0.00%	46.51%
2000	934	0.011	-0.048	-0.004	0.048	3.931	0.407	47.22%	0.00%	52.78%
2001	916	0.017	-0.037	0.001	0.055	6.268	0.001	51.31%	0.00%	48.69%
2002	925	-0.005	-0.053	-0.019	0.026	-1.975	0.000	36.00%	0.00%	64.00%
2003	907	-0.002	-0.047	-0.014	0.030	-0.670	0.000	39.25%	0.00%	60.75%
2004	894	-0.002	-0.053	-0.021	0.026	-0.725	0.000	37.02%	0.00%	62.98%
2005	842	0.004	-0.047	-0.016	0.032	1.305	0.001	40.14%	0.00%	59.86%
Fama-MacBeth		0.015				3.79				

Table 5
Regressions of future operating performance on abnormal investment over the pre-SFAS No. 123R period, 1994 – 2005

This table summarizes the regressions of future return on assets (ROA) on the magnitude of abnormal investment and other firm characteristics:

$$ROA_{t+j} = c_0 + c_1 AbnR\&D_t^+ + c_2 AbnR\&D_t^- + c_3 LAGROA_t + c_4 STDROA_t + c_5 LOGSALES_t + c_6 MB_t + \varepsilon_t \quad (3a)$$

$$ROA_{t+j} = c_0 + c_1 AbnINV_t^+ + c_2 AbnINV_t^- + c_3 LAGROA_t + c_4 STDROA_t + c_5 LOGSALES_t + c_6 MB_t + \varepsilon_t \quad (3b)$$

$ROA_{t,t+j}$ is the *ROA* next year, average *ROA* over the next three years, or average *ROA* over the next five years. $AbnR\&D^+$ ($AbnR\&D^-$) takes the value of *AbnR&D* when *AbnR&D* is positive (nonpositive); zero otherwise. *AbnR&D* is the difference between actual R&D and "as if" R&D in the absence of favorable accounting treatment of ESOs. We obtain "as if" R&D by first estimating the R&D investment equation using data from the post-SFAS No. 123R period and then applying the parameter estimates to compute "as if" R&D over the pre-SFAS No. 123R period. $AbnINV^+$ and $AbnINV^-$ are defined in a similar fashion. *LAGROA* is past *ROA* averaged over the same horizon as the dependent variables. *STDROA* is the standard deviation of ROA in the past five years. *LOGSALES* is the natural logarithm of sales. Market-to-book ratio, *MB*, is total assets minus book value of common shares plus market value of common shares, scaled by total assets. The *t*-statistics (in parentheses) are computed using standard errors clustered by firm and year. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

		(1) ROA next year		(2) ROA next 3 years		(3) ROA next 5 years		(4) ROA next year		(5) ROA next 3 years		(6) ROA next 5 years	
Intercept		-0.001		-0.007		-0.019		-0.001		-0.010		-0.025	
		(-0.22)		(-0.96)		(-1.50)		(-0.18)		(-1.23)		(-1.92)	*
$AbnR\&D^+$	–	-0.092	**	-0.288	***	-0.453	***						
		(-2.06)		(-4.19)		(-4.86)							
$AbnR\&D^-$	–	0.094		0.063		-0.046							
		(1.40)		(0.71)		(-0.37)							
$AbnINV^+$	–							0.012		-0.081	***	-0.091	***
								(0.92)		(-3.77)		(-3.59)	
$AbnINV^-$	–							0.036		-0.024		-0.081	**
								(1.06)		(-0.88)		(-2.34)	
LAGROA	+	0.778	***	0.684	***	0.621	***	0.789	***	0.721	***	0.680	***
		(44.45)		(28.21)		(21.54)		(41.30)		(27.61)		(21.45)	
STDROA	–	-0.068	*	-0.129	***	-0.180	***	-0.074	**	-0.135	***	-0.187	**
		(-1.93)		(-2.58)		(-2.57)		(-2.02)		(-2.64)		(-2.56)	
LOGSALES	?	0.003	***	0.005	***	0.007	***	0.003	***	0.005	***	0.007	***
		(5.51)		(4.98)		(4.91)		(5.40)		(5.29)		(5.04)	
MB	+	0.004	***	0.006	***	0.009	***	0.003	***	0.005	**	0.007	***
		(4.06)		(3.30)		(5.23)		(3.42)		(2.54)		(4.23)	
Industry fixed effects		YES		YES		YES		YES		YES		YES	
N		9,090		7,352		5,542		9,090		7,352		5,542	
Adjusted R^2		0.685		0.618		0.593		0.685		0.617		0.591	

Table 6
Cross-sectional variation in the absolute value of abnormal investment in the pre-SFAS No. 123R period, 1994 – 2005
This table summarizes the regressions of the absolute value of abnormal investment on the potential explanatory variables. *AbnR&D* is the predicted error of *R&D* and *AbnINV* is the predicted error of *INV*. *Abs(x)* is the absolute value of *x*. *ESOEXP* is the implied option expense scaled by total assets. *AQ* is the Dechow and Dichev (2002) measure of accounting quality. *OverInv* and *UnderInv* are indicator variables equal to one if *AbnR&D* (in columns 1 and 2) or *AbnINV* (in columns 3 and 4) are positive and negative, respectively, and zero otherwise. *InvG-Score* is Gompers et al. (2003) measure of anti-takeover protection, multiplied by minus one. *G-Score dummy* is an indicator variable equals to one if the firm has a missing G-Score, and zero otherwise. *LogVega* and *LogDelta* are the logarithm of option vega and delta, respectively. *ATTN* is the factor created from a principal component analysis equally weighting standardized values for institutional ownership and logarithm of one plus the number of analysts following. *FIN* is the factor created from a principal component analysis equally weighting standardized values for *ISSUEEQ* and *ISSUEDEBT*. *ISSUEEQ* and *ISSUEDEBT* are the future increase in equity capital and debt capital, respectively, for firm j in year $t+1$ scaled by assets. See the appendix for a detailed description of the construction of these variables. The *t*-statistics (in parentheses) are computed using standard errors clustered by firm and year. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

(continued…)

Table 6 (… continued)

		Abs(AbnR&D)		*Abs(AbnINV)*	
		(1)	(2)	(3)	(4)
Intercept	?	0.027 ***	0.025 ***	0.069 ***	0.064 ***
		(4.13)	(5.32)	(6.75)	(6.39)
ESOEXP	+	0.761 ***		0.298 ***	
		(10.71)		(5.45)	
ESOEXP×OverInv	+		1.169 ***		0.505 ***
			(12.02)		(4.30)
ESOEXP×UnderInv	+		0.816 ***		0.176 ***
			(14.63)		(3.77)
AQ	–	-0.037 ***		-0.048 ***	
		(-4.32)		(-3.48)	
AQ×OverInv	–		-0.018		-0.135 ***
			(-0.91)		(-4.61)
AQ×UnderInv	–		-0.026 **		-0.013
			(-2.49)		(-1.08)
OverInv	+		0.017 ***		0.017 ***
			(7.30)		(6.68)
InvG-Score	–	0.000	0.000	0.001 ***	0.001 ***
		(1.16)	(1.58)	(2.59)	(2.65)
G-Score dummy	?	-0.003	-0.001	-0.001	-0.001
		(-0.96)	(-0.46)	(-0.21)	(-0.19)
LogVega	+	0.000	-0.001	0.000	0.000
		(0.10)	(-1.12)	(-0.14)	(-0.02)
LogDelta	–	-0.001 ***	-0.001 **	0.000	-0.001
		(-2.89)	(-2.54)	(-0.44)	(-0.94)
ATTN	+	0.000	-0.001 *	0.000	0.000
		(-0.44)	(-1.76)	(-0.14)	(-0.04)
FIN	+	0.003 ***	0.003 ***	0.006 ***	0.005 ***
		(4.75)	(5.21)	(5.20)	(4.88)
N		7576	7576	7576	7576
Adjusted R^2		0.263	0.381	0.040	0.114

Table 7
Significant events leading to the passage of SFAS No. 123R
This table summarizes the key events during the deliberation of SFAS No. 123R.

Variable	Date	Event
D1	February 13, 2002	Senators Levin and McCain introduce a bill to force companies to expense options or pay taxes on them.
D2	March 25, 2002	Council of Institutional Investors votes to reverse its stance on options and supports requiring companies to expense them.
D3	July 16, 2002	The International Accounting Standards Board (IASB) announces its decision to develop global option expensing rules. The IASB had previously issued a discussion paper, "Accounting for Share-Based Payment," that proposed requiring recognition of employee stock option expense. According to press accounts, the final rules would follow the recommendations of the initial discussion paper.
		On the same day, Federal Reserve Board Chairman Alan Greenspan tells the Senate Banking Committee that expensing would happen.
D4	August 13, 2002	The Financial Services Forum publishes a list of member firms that will begin expensing options.
D5	September 18, 2002	The Financial Accounting Standards Board (FASB) announces intention to revisit option expensing.
D6	March 12, 2003	FASB announces new options expensing requirement likely effective for 2004.
D7	September 10, 2003	FASB delays timetable on Stock Compensation Project.
D8	March 31, 2004	FASB issues Exposure Draft on share-based payment.
D9	December 16, 2004	FASB issues SFAS No.123R.

Sources: Schrand (2004) and Cook & Co. (2005)

Table 8
Stock price responses around key events during the deliberation of SFAS No. 123R
The table reports average market reactions of a portfolio of the sample firms around key event dates during the deliberation of SFAS No. 123R. The stock price reactions are estimated using an augmented market model over the period from June 1, 2001 to June 30, 2005 (*T*=1,025 trading days). Daily portfolio returns are computed by value weighting the daily returns of the sample firms. To be included into a portfolio, we require each sample firms to have no more that 25 missing daily stock returns during the entire estimation period. *N* is the number of firms in each portfolio. Daily market returns are taken from the CRSP value-weighted market index. *D1* – *D9*, except *D7*, are indicator variables that equal to one over the three trading-day window centered on the corresponding event dates; zero otherwise. *D7* is an indicator variable that equals to minus one over the three trading-day window centered on the corresponding event dates; zero otherwise. Table 7 provides details on these nine events. The *t*-statistics are given in parentheses underneath coefficient estimates. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) All firms	(2) $AbnR\&D^{+}$ firms	(3) $AbnR\&D^{-}$ firms	(4) $AbnINV^{+}$ firms	(5) $AbnINV^{-}$ firms
Intercept	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ***
	(5.69)	(2.97)	(5.86)	(4.34)	(4.58)
Market return	1.049 ***	1.106 ***	0.988 ***	1.055 ***	1.040 ***
	(182.53)	(121.21)	(148.70)	(137.73)	(152.30)
D1	-0.001	-0.002	0.000	-0.001	0.000
	(-0.89)	(-1.14)	(0.10)	(-0.94)	(-0.16)
D2	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.81)	(-0.71)	(-0.41)	(-0.59)	(-0.71)
D3	0.002 *	0.004 *	0.001	0.003 **	0.000
	(1.96)	(1.89)	(0.75)	(2.24)	(0.12)
D4	0.001	-0.001	0.002	0.000	0.002
	(0.52)	(-0.50)	(1.58)	(-0.01)	(1.22)
D5	0.000	0.002	-0.003 *	0.000	-0.001
	(-0.07)	(1.21)	(-1.85)	(0.24)	(-0.65)
D6	0.000	-0.002	0.001	0.001	-0.002
	(-0.20)	(-0.97)	(1.05)	(0.60)	(-1.66)
D7	0.000	0.000	0.000	0.000	0.001
	(0.06)	(-0.01)	(0.12)	(-0.15)	(0.46)
D8	-0.001	0.000	-0.001	-0.001	-0.001
	(-0.58)	(-0.12)	(-0.88)	(-0.39)	(-0.57)
D9	0.000	-0.001	0.000	-0.001	0.001
	(-0.15)	(-0.38)	(0.29)	(-0.42)	(0.51)
Number of firms	1,198	462	736	669	529
Adjusted R^2	0.971	0.936	0.957	0.951	0.950

Table 9

Sefcik and Thompson (1986) portfolio time-series regression of stock price responses for selected key events

The table reports the Sefcik and Thompson (1986) portfolio time-series regression results for a sample of 1,249 firms. The dependent variable is the estimated stock-price reaction on events *D3* (see table 7 for details on this event). *AbnR&D*, the prediction error of R&D, is the difference between actual R&D and "as if" R&D in the absence of the favorable accounting treatment for ESOs. We obtain "as if" R&D by first estimating the investment equation using data from the post-SFAS No. 123R period and then applying the parameter estimates to compute "as if" R&D over the pre-SFAS No. 123R period. $AbnR\&D^{+}$ equals *AbnR&D* if *AbnR&D* is positive, and zero otherwise. $AbnR\&D^{-}$ equals *AbnR&D* if *AbnR&D* is nonpositive, and zero otherwise. The other explanatory variables are computed as the averages of the corresponding variables over the pre-SFAS No. 123R period, 1994 – 2005. *ESOEXP* is the implied option expense scaled by total assets. Surplus cash, *SURCH*, is net cash flow from operating activities minus depreciation and amortization plus research and development expense, scaled by total assets. *LEVPUB*, public debt, is total long-term public debt divided by total assets. *LEVPRI*, private debt, is total long-term private debt divided by the total assets. *LEVCONV*, convertible debt, is total convertible public debt divided by the sum of total long-term debt and market value of common shares. *LOGSALES* is the natural logarithm of sales. Sales growth, *GROWTH*, is the growth in current year's net sales. *STARTUP* is an indicator equals one if the firm is listed on the CRSP after January 1th, 1996. *HITECH* is an indicator equals one if the firm is in the high-tech industries (SIC codes 3570-3579, 3670-3679 and 8730-8734). *t*-statistics are in parentheses underneath coefficient estimates. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

(continued…)

Table 9 (… continued)

		(1)	(2)	(3)
Constant	?	-0.005	0.004	-0.009
		(-0.59)	(0.49)	(-0.98)
AbnR&D⁺	+	0.201***		
		(3.79)		
AbnR&D⁻	–	-0.166***		
		(-3.09)		
AbnINV⁺	+		0.034*	
			(1.67)	
AbnINV⁻	–		0.048	
			(1.62)	
ESOEXP	+			0.264***
				(3.06)
SURCH		0.013	0.025**	0.015
		(1.05)	(1.98)	(1.20)
LEVPUB	–	-0.009	-0.002	0.004
		(-0.46)	(-0.14)	(0.22)
LEVPRI	–	-0.013***	-0.014***	-0.011**
		(-2.84)	(-2.96)	(-2.56)
LEVCONV	–	0.013	0.024	0.022
		(0.67)	(1.08)	(1.04)
LOGSALES	–	0.000	-0.001	0.000
		(0.12)	(-1.03)	(0.51)
GROWTH	–	0.024***	0.021***	0.017***
		(3.92)	(3.57)	(2.76)
STARTUP	–	0.003*	0.004**	0.001
		(1.73)	(1.99)	(0.79)
HITECH	–	0.011*	0.013**	0.010*
		(1.96)	(2.13)	(1.84)
Adjusted R^2		0.140	0.121	0.142