THE ACCOUNTING REVIEW
Vol. 79, No. 2
2004
pp. 251–275

SFAS No. 123 Stock-Based Compensation Expense and Equity Market Values

David Aboody
University of California, Los Angeles

Mary E. Barth
Ron Kasznik
Stanford University

ABSTRACT: This study investigates the relation between share price and stock-based compensation expense that is disclosed but not recognized under SFAS No. 123, after controlling for net income, equity book value, and expected earnings growth. Our instrumental variables approach controls for the mechanical relation between share price and option values. We find that investors view SFAS No. 123 expense as an expense of the firm, and as sufficiently reliable to be reflected in their valuation assessments. Findings based on annual returns indicate SFAS No. 123 expense reflects on a timely basis changes in investor-perceived costs associated with stock-based compensation.

I. INTRODUCTION

The objective of this study is to understand the relation between equity market values and stock-based employee compensation expense that is disclosed, but not recognized in net income, under Statement of Financial Accounting Standards (SFAS) No. 123 (Financial Accounting Standards Board 1995; hereafter "SFAS No. 123 expense"). Accounting for stock-based compensation, particularly employee stock options, has long been a controversial financial reporting issue, generating heated debate among managers, auditors, investors, capital market regulators, and accounting standard setters. The controversy focuses on whether the value of employee stock options is an expense of the firm, and, if it is, whether it can be measured reliably enough for expense recognition. Our findings indicate that investors view SFAS No. 123 expense as an expense of the firm that is measured with sufficient reliability to be reflected in their valuation assessments.

The FASB, among others, believe that the value of stock-based compensation is an expense that should be recognized in net income (FASB 1995). It argues that issuing stock options transfers claims on equity from existing shareholders to employees, diluting existing

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We appreciate the helpful comments and suggestions from workshop participants at Cambridge University, Carnegie Mellon University, Columbia University, The University of New South Wales Australian Graduate School of Management Research Camp, and Stanford Accounting Summer Camp, Bill Beaver, Jules Cassel, Greg Clinch, Ken Peasnell, Stephen Penman, Ken Singleton, Richard Sloan, Michael Williams, and two anonymous reviewers. We also appreciate the research assistance of Hung-Ken Chien and Kazbi Kothavala. We appreciate funding by the GSB Faculty Trust Fellowship, Stanford University Graduate School of Business.

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted March 2003
Accepted September 2003

shareholders' interests. Because employees provide services to the firm, the value of the transferred ownership claims represents a cost of generating earnings.[1] Opponents to recognition argue that stock-based compensation is a transaction among shareholders and, therefore, is not an expense of the firm. They also argue that the value of employee stock options cannot be measured reliably because extant option value estimation technology is not suitable for employee options, the FASB's method of calculating the expense is inappropriate, and estimation of option values requires exercise of substantial management discretion. They also argue that stock options align more closely employees' incentives and those of existing shareholders, resulting in benefits that increase current and future earnings and offset the cost of dilution.

We test the relation between share price and SFAS No. 123 expense, incremental to net income, equity book value, and expected earnings growth. To the extent that benefits associated with option incentive effects are reflected in net income, equity book value, and expected earnings growth, and that investors view SFAS No. 123 expense as an expense of the firm, which measures with sufficient reliability costs associated with stock-based compensation, we predict a negative relation between the expense and share price. Because benefits associated with stock-based compensation likely are reflected in expected earnings growth or net income and equity book value, our tests are not designed to determine the net costs and benefits associated with stock-based compensation. Instead, our objective is to assess the value-relevance of SFAS No. 123 expense. Our tests are joint tests of relevance and reliability. We will detect a significant negative relation between share price and SFAS No. 123 expense only if the expense is relevant to investors and measured with sufficient reliability to be reflected in their valuation assessments.[2]

To obtain data for our tests, we hand collect disclosures relating to stock-based compensation for 1996 through 1998, for a sample of firms in the Standard & Poor's (S&P) 500, S&P 400 mid-capitalization, and S&P 600 small-capitalization indices. Under SFAS No. 123, firms can calculate recognized compensation expense relating to these options based on their grant date fair value or on the difference between the firm's stock price at grant date and the option exercise price, which typically equals zero. If a firm chooses the zero expense alternative, as most firms do, it must disclose *pro forma* net income, i.e., net income under the grant date fair value alternative. We collect *pro forma* net income, option pricing model inputs used by the firm in estimating the value of its granted options, the resulting option fair value, and other items related to the firm's stock options.

Option pricing theory indicates that option values, a primary determinant of SFAS No. 123 expense, are a positive function of the price of the underlying share, even when the option's intrinsic value equals zero. This results in a relation between share price and SFAS No. 123 expense that is unrelated to the hypothesized relation between share price and stock-based compensation expense as a component of net income (hereafter, the "mechanical relation"). Thus, we use an instrumental variables approach to construct our stock-based compensation expense variable. The instruments include option pricing model inputs, vesting period, and number of options granted, all of which are disclosed by firms as inputs to their calculation of stock-based compensation expense, as well as net income, equity

[1] Consistent with this view, Standard & Poor's includes SFAS No. 123 expense in "core earnings," which it introduced as a standard, comparable number that reflects ongoing operating earnings (*BusinessWeek* 2002).

[2] Our tests are based on the assumption that the marginal investor is rational and share prices aggregate investors' consensus beliefs. See Barth et al. (2001) and Holthausen and Watts (2001) for discussion of the assumptions underlying value-relevance research and its interpretation.

book value, and expected earnings growth. The option pricing model inputs used as instruments are expected stock return volatility, expected option life, expected dividend yield, and expected risk-free interest rate.

We find a significant negative relation between our stock-based compensation expense variable and share price. This finding indicates that investors view SFAS No. 123 expense as an expense of the firm, after controlling for benefits associated with options as reflected in net income, equity book value, and expected earnings growth. The negative relation between our stock-based compensation expense variable and share price also indicates that, despite the large amount of discretion managers have with respect to the estimation of SFAS No. 123 expense, it is sufficiently reliably measured to be reflected in investors' valuation assessments.[3] Consistent with the share price findings, we also find a significant negative relation between returns and change in our stock-based compensation expense variable, incremental to net income, change in net income, and change in expected earnings growth. This finding indicates that SFAS No. 123 expense reflects on a timely basis changes in investor-perceived costs associated with stock-based compensation. It also indicates that our share price findings are not attributable to intertemporally constant correlated omitted variables.

Bell et al. (BLMY 2002) investigate the relation between share price and SFAS No. 123 expense. Our findings differ from those of BLMY. After implementing an instrumental variables approach similar to ours and controlling for benefits associated with the options, BLMY find an insignificant relation between share price and their stock-based compensation expense variable for a sample of profitable computer software firms. BLMY conjecture that the difference between their findings and ours most likely is attributable to sample differences. We investigate this conjecture. Consistent with BLMY, we find an insignificant relation between share price and our stock-based compensation expense variable for computer software firms. More importantly, we find that BLMY's inferences are not generalizable to broader samples of firms, including profitable firms in a variety of industries and firms in knowledge-based industries beyond computer software.

The remainder of the paper proceeds as follows. Section II provides the background of financial reporting for stock-based compensation and related prior research. Section III outlines our research design and Section IV describes the data and presents descriptive statistics. Section V presents our findings, Section VI offers additional analyses, and Section VII concludes.

II. BACKGROUND

Accounting for Employee Stock-Based Compensation

Accounting for stock-based compensation is specified in Accounting Principles Board Opinion (APB) No. 25 (APB 1973) and SFAS No. 123. Under APB No. 25, stock-based compensation expense is the difference at the measurement date between the share price and option exercise price, times the number of options. The measurement date is the date at which the exercise price and number of options are known and, thus, for fixed option grants the measurement date is the grant date. Most companies grant employee stock options with a fixed exercise price that equals share price at date of grant. Thus, under APB No. 25 stock-based compensation expense equals zero.

[3] For evidence on the extent to which firms understate SFAS No. 123 expense, see Aboody et al. (2003).

Under SFAS No. 123, stock-based compensation expense is based on option fair values at the measurement date. Option values are calculated using an option pricing model that takes into account the option exercise price, the share price, the option's expected life, expected dividend yield, expected risk-free interest rate, and expected stock price volatility. SFAS No. 123 expense is recognized over the vesting period; as the expense is recognized, so is equity.[4]

Recognizing that extant option pricing models were not designed to value options with terms that typify employee options, SFAS No. 123 specifies modifications to be made. In particular, employee options typically are nontransferable, which results in early exercise (Huddart and Lang 1996). Thus, SFAS No. 123 specifies that the option's expected life is used, rather than its contractual life. Employee options also typically are subject to vesting conditions, and SFAS No. 123 specifies that total stock-based compensation expense only relates to options that ultimately vest. SFAS No. 123 offers firms a choice of how to accomplish this. First, firms can estimate the number of options expected to vest and use that number in calculating the expense. This estimate is updated each period and effects of changes in it are reflected in the period of change's and future periods' expense. Second, firms can calculate the expense based on the total number of options granted, and adjust the expense in subsequent periods as options are forfeited.

SFAS No. 123 permits firms to apply the measurement provisions in APB No. 25 or those in SFAS No. 123. If a firm measures compensation expense under APB No. 25, it must disclose, among other items, *pro forma* net income, which is net income if stock-based compensation expense had been measured under SFAS No. 123. Almost all firms apply the measurement provisions of APB 25. The disclosure of *pro forma* net income permits us to calculate SFAS No. 123 expense. Other required disclosures include number of options granted and exercised, vesting period, estimated fair value of options granted, and inputs to the option fair value calculation, i.e., option exercise price and expected option life, dividend yield, risk-free interest rate, and stock price volatility.

The debate surrounding the issuance of SFAS No. 123 has been one of the most politically controversial in the FASB's history. Opponents argued for footnote disclosure rather than recognition in part because they claimed it was not possible to measure reliably stock-based compensation expense. Their reliability concerns stem from three sources. The first is the questionable applicability to employee stock options of extant option pricing models, including the appropriateness of the commonly used Black-Scholes formula and SFAS No. 123's requirement to use expected option life to take account of nontransferability. The second is SFAS No. 123's expense attribution method, including the choice of how to account for forfeitures and attribution of the expense to the vesting period. The FASB and the International Accounting Standards Board are developing new standards for stock-based compensation and considering how to alleviate reliability concerns arising from these sources. The third is the ability of managers, who actively fought issuance of SFAS No. 123, to exercise their discretion so as to limit the standard's effectiveness (see Aboody et al. 2003). This study's objective is to determine whether the combined effects of these reliability problems are sufficient to render SFAS No. 123 expense valuation irrelevant.

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[4] Under the SFAS No. 123 exposure draft, an intangible asset and equity would be recognized equal to the total value of options granted, with the asset amortized over the vesting period. Under SFAS No. 123, no asset is recognized. Thus, equity and assets would have been higher under the exposure draft approach; the net income effect is the same.

Related Research

After controlling for the mechanical relation between option values and share price, Aboody (1996) finds a significant negative relation between share price and the value of outstanding employee stock options calculated using researcher estimates of inputs to an option pricing model. Because we seek to study the relation between share price and SFAS No. 123 expense, our tests focus on those amounts. Aboody's (1996) evidence indicates that a researcher can reliably estimate the value of outstanding options and that value is reflected in share price. However, only by using amounts disclosed under SFAS No. 123 can we test whether measurement error inherent in the SFAS No. 123 calculation or effects of management discretion exercised in determining the amounts is sufficient to eliminate the value-relevance of SFAS No. 123 expense.

More recently, BLMY investigate the relation between share price and SFAS No. 123 expense, but only for 85 profitable firms in the computer software industry. BLMY document a positive association between share price and SFAS No. 123 expense for these firms. However, BLMY obtain these inferences without controlling for the mechanical relation between share price and option values. After controlling for this mechanical relation, BLMY find a negative, but insignificant relation between share price and their stock-based compensation expense variable. These findings are consistent with SFAS No. 123 expense lacking relevance and reliability and with profitable computer software firms being different from other firms. BLMY conjecture that the second reason is why its findings differ from ours. We investigate this conjecture in Section VI. Consistent with BLMY, in a pooled specification we find an insignificant relation between share price and our stock-based compensation expense variable for profitable computer software firms. However, we find that BLMY's inferences are not generalizable to separate-year estimation or to broader samples of firms, including profitable firms in other industries and firms in knowledge-based industries beyond computer software.[5]

Our study also relates to Hanlon et al. (HRS 2003), who find a significant positive relation between future operating earnings and the Black-Scholes value of stock option grants to the top five executives. HRS interpret this finding as evidence of a net benefit to firms from granting stock options to top executives. As HRS point out, our study differs in that we do not seek to determine the net benefit of stock-based compensation. Also, we focus on the expense associated with options granted to all employees, not only the top five executives, which could affect the net benefit calculus.

III. RESEARCH DESIGN

We focus our tests on the following equation:

$$P_{it} = \sum_{N=1}^{33} \alpha_{0N} IND_{Nit} + \alpha_1 BV_{it} + \alpha_2 NI_{it} + \alpha_3 LTG_{it} + \alpha_4 COMPX_{it} + \varepsilon_{it}. \quad (1)$$

P is share price, BV is equity book value, NI is net income, LTG is mean year-end analyst I/B/E/S earnings growth forecast, and $COMPX$ is net income minus *pro forma* net income disclosed under SFAS No. 123, all measured at fiscal year-end. BV, NI, and $COMPX$ are

[5] Using disclosures in 1996 and not controlling for the mechanical relation between share price and option value, Rees and Stott (1998) find a significant positive relation between SFAS No. 123 expense and share price and returns. Using only 1996 disclosures for firms in seven industries, Chamberlain and Hsieh (1999) find a negative relation.

deflated by number of shares outstanding.[6] IND_N is an indicator variable that equals 1 if the firm is in industry N, and 0 otherwise; i and t denote firms and years. We estimate all equations using robust regression.[7]

Equation (1) is consistent with Ohlson (1995), where *COMPX* is a component of net income.[8] We include *LTG* in Equation (1) because Liu and Ohlson (2000) and Ohlson (2001) show that expected future abnormal earnings are reflected in equity price before they are reflected in equity book value and net income (see also Barth et al. 1998). *LTG* is analysts' forecast of annual growth in operating earnings, which does not include SFAS No. 123 expense, over the firm's next full business cycle, which generally is between three and five years. Thus, *LTG* can capture benefits associated with stock-based compensation not yet reflected in net income, but not the related cost. Also, because SFAS No. 123 expense and growth likely are correlated, omitting *LTG* from (1) could affect our inferences relating to *COMPX* (Skinner 1996). Based on prior research, we predict α_1, α_2, and α_3 are positive. If investors view SFAS No. 123 expense as an expense of the firm, and to the extent that any associated benefits are reflected in net income, equity book value, and expected earnings growth, we predict α_4 is negative.

Option pricing theory indicates that the values of stock options are a positive function of the price of the underlying share, even when the option's intrinsic value equals 0.[9] Thus, there is a mechanical relation between share price and SFAS No. 123 expense (Aboody 1996). Although *P* is share price at fiscal year end and the price affecting the option values comprising *COMPX* is price at the option grant date, the two prices are highly positively correlated.[10] Failure to consider the effects of this correlation could bias upward *COMPX*'s coefficient in Equation (1). Thus, following Aboody (1996), we use an instrumental variables approach to purge *COMPX* of this correlation.

Specifically, we replace *COMPX* in Equation (1) with *COMPX**, which is the predicted value from a regression of *COMPX* on instruments that we expect to be highly correlated with SFAS No. 123 expense, but uncorrelated with the error in Equation (1) that arises because of *COMPX*'s mechanical relation with *P*. Recall from Section II that *COMPX* is based on option value at grant date times the number of options, recognized over the vesting period. Thus, the instruments are the option pricing inputs sample firms use in calculating *COMPX*, i.e., expected stock price volatility, *VOL*, expected option life, *LIFE*, expected risk-free interest rate, *INT*, and expected dividend yield, *DIV*, as well as the number of

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[6] All our inferences are robust to using total assets as an alternative deflator.

[7] The robust regression procedure begins by calculating Cook's D statistic and excluding observations with D > 1. Then, the regression is re-estimated, weights for each observation are calculated based on absolute residuals, and the estimation is repeated using the weighted observations (Berk 1990). Our inferences are unaffected by using ordinary least squares estimation.

[8] Equation (1) does not include in *BV* an adjustment for *COMPX* because SFAS No. 123 expense results in a debit to retained earnings and a credit to "paid in capital-stock options." However, because *COMPX* is net of tax, the debit is smaller than the credit, with the difference recognized as a deferred tax asset. Because the tax provision is not disclosed, we consider the tax effect as a cross-sectional constant embedded in *COMPX*'s coefficient. Our inferences are unaffected if we adjust *BV* for deferred taxes, assuming a 35 percent tax rate. Also, our inferences are unaffected if we adjust *BV* to exclude options, including related tax effects.

[9] This can be seen by taking the derivative of the Black and Scholes (1973) option pricing formula with respect to share price, and setting the exercise price equal to the share price.

[10] Untabulated Pearson (Spearman) correlations between *P* and share price at option grant date, i.e., the option exercise price, for 1998, 1997, and 1996 are 0.78, 0.56, and 0.60 (0.84, 0.70, and 0.64), all of which are significant.

options granted, *OPT_GRANT*, and the percentage of options vesting each year, *VEST*.[11] The instruments also include *BV*, *NI*, *LTG*, and IND_N, the other explanatory variables in Equation (1).[12]

To investigate whether SFAS No. 123 expense reflects on a timely basis changes in investor-perceived costs associated with stock-based compensation, we estimate:

$$RET_{it} = \sum_{N=1}^{33} \gamma_{0N} IND_{Nit} + \gamma_1 NI_{it} + \gamma_2 \Delta NI_{it} + \gamma_3 \Delta LTG_{it} + \gamma_4 \Delta COMPX^*_{it} + \upsilon_{it} \quad (2)$$

where *RET* is annual share return, and Δ denotes annual change. All variables are deflated by share price at the beginning of year *t*.

We estimate all equations separately by year because SFAS No. 123 applies to options granted after December 15, 1995, which results in a phase-in period. That is, in 1996, *COMPX* relates to options granted in 1996, whereas in 1997 (1998) it relates to options granted in 1997 and 1996 (1998, 1997, and 1996). Because *COMPX* aggregates the amortization of the value of options granted in each year, we use the average over time of the instrumental variables.[13]

IV. DATA AND DESCRIPTIVE STATISTICS

We collect data for firms in the S&P 500 index and firms in the S&P mid-capitalization and small-capitalization indices with substantial stock-based compensation plans. To identify firms with substantial plans, we rank firms in the latter two indices based on the ratio of the number of shares reserved for stock options to the number of shares outstanding and select 600 firms with the largest ratios for which 1998 financial statements are available through EDGAR. Combining these firms with the S&P 500 firms results in a sample of 756, 767, and 751 observations in 1998, 1997, and 1996 with data required for our tests.

We hand collect data relating to stock-based compensation from firms' 1998 financial statement footnotes. Specifically, we collect *pro forma* net income, fair value of granted options, option vesting period, and inputs for the option pricing model. When firms disclose ranges of these inputs across multiple option grants within the year, we use the median of the range. We also hand collect the number of options granted, outstanding, and exercisable, and the average exercise price for each category. We obtain other data from Compustat.

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[11] Aboody (1996) uses as instruments the number of options outstanding, granted over the prior ten years. Our more comprehensive set of instruments likely increases the power of our tests (Skinner 1996). Using as instruments firms' option pricing inputs preserves in *COMPX** any effects of management discretion. Also, as Table 1, Panel C indicates, the correlation between price and model inputs, particularly *VOL* and *DIV*, is high, albeit not as high as the correlation between price and option fair value, *FVOPT*, the variable with the potential mechanical relation problem. To the extent these instruments are correlated with the error in Equation (1) arising from *COMPX*'s mechanical relation with *P*, the instrumental variables approach might not eliminate the coefficient bias. Thus, we test whether the error from estimating Equation (1) with *COMPX** is correlated with the instruments (Griliches and Intriligator 1983), and find it is correlated with *VOL*. Our inferences are unaffected if we exclude *VOL* from the set of instruments.

[12] As is standard in instrumental variables estimation, the most efficient estimates are obtained by using as instruments variables intended to capture the endogenous variable, *COMPX*, as well as all other independent variables in the system of equations, i.e., *BV*, *NI*, and *LTG*. Including these other independent variables reflects the notion that share price is the variable we are attempting to remove from *COMPX*. Thus, the first-stage regression needs to include variables that are instruments for share price as well as for *COMPX*. Because Equation (1) posits that *BV*, *NI*, and *LTG* explain share price incremental to *COMPX*, they are likely candidates for instruments, in addition to the variables that capture *COMPX*, i.e., *VOL*, *DIV*, *INT*, *LIFE*, *OPT_GRANT*, and *VEST*.

[13] For 1998 we use the average over 1996 through 1998, for 1997 we use the average over 1996 and 1997, and for 1996 we use the 1996 amounts. Our inferences are unaffected by using the contemporaneous variable amounts.

Table 1 presents the industry composition of the sample in Panel A, descriptive statistics for variables in Panel B, and correlations among the variables in Panel C. Panel A reveals that sample firms represent many industries. Although the distribution differs somewhat from the Compustat population, no single industry represents 10 percent or more of the sample.

Table 1, Panel B, reveals that, on average, sample firms' share price, *P*, substantially exceeds equity book value, *BV*. It also reveals that the mean (median) of SFAS No. 123 expense, *COMPX*, is \$0.11, \$0.09, and \$0.07 (\$0.08, \$0.06, and \$0.04) in 1998, 1997, and 1996. The increase over time is consistent with the phase-in provisions of SFAS No. 123. These amounts are not inconsequential relative to the mean (median) net income, *NI*, of \$1.31, \$1.74, and \$1.87 (\$1.33, \$1.55, and \$1.61). Analyst forecasts of earnings growth, *LTG*, are consistent across years, with mean and median of about 15 percent.

Table 1, Panel B, indicates that the mean (median) number of options granted as a percentage of outstanding shares, *OPT_GRANT*, is approximately 3 percent (2 percent) in each year. Yearly grants of this magnitude can result in substantial share dilution. In 1998, 1997, and 1996, the means (medians) of the fair value of granted options, *FVOPT*, are \$11.37, \$10.06, and \$8.40 (\$10.21, \$8.98, and \$7.34) and mean (median) share prices are \$35.15, \$39.29, and \$35.85 (\$30.00, \$35.00, and \$31.75). Table 1, Panel C, reveals that *P* is significantly positively correlated with *FVOPT* and *COMPX*, but not significantly correlated with *COMPX**. These correlations are consistent with a positive mechanical relation between option value and share price, which the instrumental variables approach effectively mitigates.

V. PRIMARY FINDINGS

Table 2 presents summary statistics from Equation (1) estimated using SFAS No. 123 expense, *COMPX*. We present these findings as a benchmark to assess the effect of the mechanical relation between share price and option values on the relation between share price and SFAS No. 123 expense. As predicted, the coefficients on *BV* and *NI* are significantly positive in all three years, as is the coefficient on *LTG* in 1996 and 1997.[14] However, contrary to predictions, the coefficient on *COMPX* is insignificantly different from 0 in all three years (coefficient (t): 2.90 (0.69), −4.39 (−1.03), and 6.20 (1.24)).[15] These results are inconclusive as to whether investors view SFAS No. 123 expense as a reliably measured expense of the firm. However, the Hausman-Taylor (1981) test rejects the null hypothesis of no correlation between *COMPX* and the error in Equation (1) (p-value < 0.001), indicating the coefficient estimates from this regression likely are biased and inconsistent.

Table 3 presents summary statistics from regressions of *COMPX* on the instrumental variables used to construct *COMPX**. It reveals that the adjusted R^2s are 0.64, 0.60, and 0.57 in 1998, 1997, and 1996, indicating the instruments explain a large portion of the variation in *COMPX*. The coefficients on *VOL*, *OPT_GRANT*, *VEST*, *BV*, *NI*, and *LTG* (*DIV*) generally are significantly positive (negative) as expected; the coefficients on the other instruments are insignificantly different from 0.

Table 4 presents summary statistics from Equation (1) estimated using *COMPX**. It reveals, as expected and consistent with Table 2, that the coefficients on *BV*, *NI*, and *LTG* are significantly positive in all three years. The coefficient magnitudes and significance are

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[14] The term significant refers to statistical significance at the 0.05 level or less based on a one-tailed test for signed predictions and a two-tailed test otherwise. All t-statistics are calculated based on White (1980) standard errors.

[15] Our inferences are unaffected by estimating all valuation equations permitting the coefficient on *NI* to differ for firms with negative *NI*, and to defining *NI* as income before extraordinary items and discontinued operations.

TABLE 1
Industry Classification, Descriptive Statistics, and Correlations

Panel A: Industry Classification

Industry	Frequency in Sample		Frequency in Compustat	
	n	% (1)	% (2)	Ratio of (1) to (2)
Agriculture, Mining	34	4.43	4.06	1.1
Construction	8	1.05	1.15	0.9
Food, Tobacco	22	2.87	2.13	1.4
Textile, Apparel	14	1.83	1.30	1.4
Lumber, Furniture	13	1.69	0.90	1.9
Paper	19	2.48	0.90	2.7
Printing	24	3.13	1.24	2.5
Chemicals	65	8.47	5.39	1.6
Rubber, Plastics	15	1.96	1.52	1.4
Leather, Glass	8	1.05	0.80	1.3
Metal Industries	35	4.56	2.48	1.8
Machinery	49	6.39	5.40	1.2
Electrical Equipment	50	6.52	6.61	1.0
Transportation Equipment	27	3.52	1.68	2.1
Instruments	38	4.95	5.02	1.0
Misc. Manufacturing	9	1.17	1.02	1.1
Transportation Services	17	2.22	2.22	1.0
Communications	12	1.56	4.10	0.4
Utilities	28	3.65	2.88	1.3
Durables—Wholesale	17	2.22	2.32	0.9
Nondurables—Wholesale	12	1.56	1.46	1.1
Retail	19	2.48	1.35	1.9
Apparel Stores	15	1.96	1.05	1.8
Eating and Drinking	12	1.56	1.49	1.0
Misc. Retail	12	1.56	1.80	0.9

(continued on next page)

TABLE 1 (continued)

Panel A: Industry Classification (continued)

Industry	Frequency in Sample n	Frequency in Sample % (1)	Frequency in Compustat % (2)	Ratio of (1) to (2)
Banks	45	5.87	11.54	0.5
Insurance Services	34	4.43	3.16	1.4
Lodging	7	0.91	0.70	1.3
Business Services	43	5.61	13.05	0.4
Entertainment	9	1.17	1.81	0.6
Health Services	12	1.56	1.66	0.9
Other Services	8	1.05	1.89	0.6
Others	35	4.56	5.92	0.8
Total Number of Firms	767	100.00	100.00	

Panel B: Descriptive Statistics

	1998			1997			1996		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
P	35.15	30.00	23.39	39.29	35.00	22.91	35.85	31.75	21.39
BV	12.40	10.52	8.58	13.34	11.13	9.94	13.87	11.21	10.15
NI	1.31	1.33	2.14	1.74	1.55	1.94	1.87	1.61	1.90
LTG	15.22	14.50	6.08	15.25	14.00	6.23	15.28	14.00	6.97
COMPX	0.11	0.08	0.11	0.09	0.06	0.09	0.07	0.04	0.08
VOL	32.59	29.53	13.37	31.68	29.00	13.15	31.61	28.40	13.34
LIFE	5.61	5.33	1.81	5.66	5.25	2.74	5.61	5.10	1.72
INT	5.87	5.87	0.44	6.12	6.15	0.42	6.13	6.13	0.99
DIV	1.32	1.03	1.34	1.32	1.00	1.38	1.40	1.07	1.44
OPT_GRANT	2.75	1.76	3.08	2.82	1.81	3.55	3.13	1.94	3.88
VEST	42.23	33.00	26.52	42.45	33.00	26.79	42.49	33.00	26.78
FVOPT	11.37	10.21	6.86	10.06	8.98	5.97	8.40	7.34	5.13
*COMPX**	0.09	0.08	0.06	0.07	0.06	0.05	0.05	0.04	0.04
N	756			767			751		

(continued on next page)

TABLE 1 (continued)

Panel C: Pearson (Spearman) Correlations in Upper (Lower) Triangle

	P	*BV*	*NI*	*LTG*	*COMPX*	*VOL*	*LIFE*	*INT*	*DIV*	*OPT_GRANT*	*VEST*	*FVOPT*	*COMPX**
P		**0.40**	**0.62**	**−0.21**	**0.41**	**−0.52**	0.06	0.00	**0.35**	**−0.23**	**0.35**	**0.68**	−0.07
BV	**0.37**		**0.49**	**−0.47**	0.01	**−0.39**	**0.07**	−0.03	**0.34**	**−0.20**	**0.17**	**0.33**	0.02
NI	**0.47**	**0.46**		**−0.34**	−0.06	**−0.45**	**0.11**	0.04	**0.34**	**−0.27**	**0.20**	**0.30**	**−0.14**
LTG	**−0.13**	**−0.40**	**−0.22**		**0.33**	**0.59**	**−0.15**	0.03	**−0.63**	**0.37**	**−0.27**	**0.11**	**0.46**
COMPX	**0.16**	−0.03	**−0.09**	**0.34**		**0.39**	**−0.12**	0.02	**−0.36**	**0.63**	−0.06	**0.24**	**0.68**
VOL	**−0.42**	**−0.36**	**−0.34**	**0.57**	**0.46**		**−0.16**	0.02	**−0.70**	**0.50**	**−0.39**	−0.06	**0.55**
LIFE	0.03	0.04	0.05	**−0.11**	**−0.10**	**−0.17**		**0.23**	**0.15**	**−0.19**	**−0.08**	**0.08**	**−0.20**
INT	−0.01	−0.06	0.04	0.03	0.00	0.00	**0.12**		−0.06	−0.02	**−0.09**	0.05	−0.00
DIV	**0.25**	**0.31**	**0.26**	**−0.56**	**−0.32**	**−0.61**	**0.11**	−0.03		**−0.42**	**0.33**	**−0.09**	**−0.49**
OPT_GRANT	**−0.18**	**−0.16**	**−0.27**	**0.31**	**0.62**	**0.52**	**−0.18**	−0.04	**−0.35**		**−0.26**	**−0.11**	**0.78**
VEST	0.20	**0.16**	0.07	**−0.27**	−0.09	**−0.31**	−0.04	−0.10	**0.29**	**−0.20**		**0.07**	**−0.15**
FVOPT	**0.65**	**0.31**	**0.39**	**0.12**	**0.29**	−0.05	**0.15**	**0.10**	−0.05	**−0.10**	**0.18**		**0.08**
*COMPX**	−0.09	0.00	**−0.15**	**0.46**	**0.69**	**0.61**	**−0.19**	−0.02	**−0.44**	**0.90**	**−0.14**	**0.14**	

P is year-end share price. *BV* is year-end equity book value. *NI* is annual net income. *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. *COMPX* is unrecognized stock-based compensation expense, i.e., net income minus the *pro forma* net income disclosed under SFAS No. 123. *BV*, *NI*, and *COMPX* are deflated by number of shares outstanding. *VOL* is expected stock price volatility, expressed in percentage form. *LIFE* is expected option life. *INT* is expected risk-free interest rate, expressed in percentage form. *DIV* is expected dividend yield, expressed in percentage form. *OPT_GRANT* is number of options granted as a percentage of number of shares outstanding. *VEST* is the percentage of options vesting each year. *FVOPT* is the weighted average value of options granted during the year. *VOL*, *LIFE*, *INT*, *DIV*, *OPT_GRANT*, *VEST*, and *FVOPT* are disclosed under SFAS No. 123. $COMPX^*$ is fitted value from a regression of *COMPX* on *VOL*, *LIFE*, *INT*, *DIV*, *OPT_GRANT*, *VEST*, *BV*, *NI*, *LTG*, and IND_N.

Correlations significantly different from 0 at p-values less than 5 percent are in boldface type.

TABLE 2

Summary Statistics from Regressions of Share Price on Book Value of Equity, Net Income, Analyst Earnings Growth Forecast, and SFAS No. 123 Stock-Based Compensation Expense

$$P_{it} = \sum_{N=1}^{33} \alpha_{0N} IND_{Nit} + \alpha_1 BV_{it} + \alpha_2 NI_{it} + \alpha_3 LTG_{it} + \alpha_4 COMPX_{it} + \varepsilon_{it}$$

		1998		1997		1996	
Variable	**Pred**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
BV	+	0.77	10.80	0.75	9.52	0.50	8.30
NI	+	3.80	11.39	6.97	17.16	7.29	19.68
LTG	+	0.07	0.73	0.49	6.14	0.42	5.82
COMPX	−	2.90	0.69	−4.39	−1.03	6.20	1.24
N		756		767		751	
Adj. R^2		0.53		0.71		0.72	

P is year-end share price. *BV* is year-end equity book value. *NI* is net income. *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. *COMPX* is unrecognized stock-based compensation expense, i.e., net income minus *pro forma* net income disclosed under SFAS No. 123. *BV*, *NI*, and *COMPX* are deflated by number of shares outstanding. IND_N equals 1 if the firm is in industry *N* (based on the 33 industries in Table 1, Panel A), and 0 otherwise. *i* and *t* denote firm and years.

Coefficients are estimated using robust regression. The industry-specific intercepts are untabulated. t-statistics are based on White (1980) heteroscedasticity-consistent standard errors.

similar to those in Table 2 (except for the coefficient on *LTG* in 1998), indicating that using *COMPX** in place of *COMPX* has little effect on these variables. However, in striking contrast to Table 2, the coefficient on *COMPX** is negative in all three years, and significantly so in 1998 and 1997 (t = −5.89, −5.09, and −0.84).[16] These findings are consistent with the insignificant coefficients on *COMPX* in Table 2 being attributable to the mechanical relation between share price and option values. More importantly for our research question, the findings indicate that, after controlling for option benefits as reflected in net income, equity book value, and forecasted earnings growth, investors view SFAS No. 123 expense as an expense of the firm. The negative relation between *COMPX** and share price also suggests that SFAS No. 123 expense is measured with sufficient reliability to be associated with investors' firm valuation assessments. We investigate potential bias in the estimated *COMPX** coefficient in Section VI.

Table 5 presents summary statistics from Equation (2), which are consistent with those in Table 4. In particular, as predicted, the coefficient on the change in SFAS No. 123 expense, $\Delta COMPX^*$, is significantly negative in 1998 and 1997 (t = −2.64 and −2.70).[17] Also as predicted, the coefficients on *NI*, ΔNI, and ΔLTG are significantly positive in both years, except for that on ΔLTG in 1998. These findings reveal that increases in SFAS No. 123 expense are associated with decreases in share price, after controlling for net income

[16] We also estimate Equation (1) in a pooled cross-sectional regression with fixed-year and fixed-industry effects. Untabulated results indicate the coefficient on *COMPX** is −24.06 and the t-statistic is −4.47.

[17] Because data necessary to compute *COMPX* for 1995 are not disclosed, we are unable to estimate Equation (2) for 1996. Also, Table 4 reveals that the coefficient on *COMPX** varies across years, suggesting that estimating Equation (2) using $\Delta COMPX^*$ could affect our inferences (Landsman and Magliolo 1988). Thus, we estimate Equation (2) using instead $COMPX^*_t$ and $COMPX^*_{t-1}$. Untabulated findings reveal that our inferences are unaffected. In particular, the coefficients on $COMPX^*_t$ are significantly negative, and that on $COMPX^*_{t-1}$ is significantly positive in the 1998 equation and insignificantly different from 0 in the 1997 equation.

TABLE 3
Summary Statistics from Regressions of SFAS No. 123 Stock-Based Compensation Expense on Instrumental Variables

$$COMPX_{it} = \sum_{N=1}^{33} \theta_{0N} IND_{Nit} + \theta_1 VOL_{it} + \theta_2 LIFE_{it} + \theta_3 INT_{it} + \theta_4 DIV_{it} + \theta_5 OPT\_GRANT_{it} + \theta_6 VEST_{it} + \theta_7 BV_{it} + \theta_8 NI_{it} + \theta_9 LTG_{it} + \tau_{it}$$

		1998		1997		1996	
Variable	**Pred**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
VOL	+	0.09	4.95	0.10	6.19	0.10	7.59
LIFE	+	0.01	0.76	0.01	0.39	−0.01	−2.02
INT	+	0.11	0.54	−0.37	−1.33	0.01	0.16
DIV	−	−0.28	−1.97	−0.28	−2.47	−0.01	−0.03
OPT_GRANT	+	1.43	19.49	1.08	18.04	0.84	15.64
VEST	+	0.02	3.94	0.02	3.58	0.03	6.62
BV	+	0.01	8.75	0.01	6.22	0.01	2.68
NI	+	0.01	1.86	0.01	1.29	0.01	3.75
LTG	+	0.01	5.41	0.01	1.54	−0.01	−0.58
N		756		767		751	
Adj. R^2		0.64		0.60		0.57	

COMPX is unrecognized stock-based compensation expense, i.e., net income minus the *pro forma* net income disclosed under SFAS No. 123. *VOL* is expected stock price volatility. *LIFE* is expected option life. *INT* is expected risk-free interest rate. *DIV* is expected dividend yield. *OPT_GRANT* is number of options granted during the year. *VEST* is the percentage of options vesting each year. *COMPX, VOL, LIFE, INT, DIV, OPT_GRANT*, and *VEST* are disclosed under SFAS No. 123. *BV* is year-end equity book value. *NI* is net income. *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. *COMPX, OPT_GRANT, BV*, and *NI* are deflated by number of shares outstanding at the end of the year. IND_N equals 1 if the firm is in industry *N* (based on the 33 industries in Table 1, Panel A), and 0 otherwise. *i* and *t* denote firm and years.
Coefficients are estimated using robust regression. The industry-specific intercepts are untabulated. t-statistics are based on White (1980) heteroscedasticity-consistent standard errors.

and changes in net income and expected earnings growth. These findings also reveal that SFAS No. 123 expense reflects on a timely basis changes in investor-perceived costs associated with stock-based compensation. They also indicate our Table 4 findings are not attributable to bias caused by intertemporally constant correlated omitted variables.

VI. ADDITIONAL ANALYSES

Comparison with Bell et al. (2002)

After controlling for the mechanical relation between share price and option values, and the benefits associated with option incentive effects, BLMY find an insignificant relation between share price and SFAS No. 123 expense (BLMY, Table 9). BLMY conjecture that the difference between this finding and our finding of a significant negative relation most likely is attributable to sample differences. BLMY's sample comprises 85 profitable computer software firms; our sample comprises firms in many industries that are not necessarily profitable.

We first determine whether our inferences are affected by not focusing only on profitable firms. Table 6, Panel A, presents findings from limiting our sample to firms with positive *NI* and *BV*. It reveals that the coefficients on *COMPX** are significantly negative

TABLE 4
Summary Statistics from Regressions of Share Price on Book Value of Equity, Net Income, Analyst Earnings Growth Forecast, and the SFAS No. 123 Expense Variable Derived from the Instrumental Variable Approach

$$P_{it} = \sum_{N=1}^{33} \alpha_{0N} IND_{Nit} + \alpha_1 BV_{it} + \alpha_2 NI_{it} + \alpha_3 LTG_{it} + \alpha_4 COMPX^*_{it} + \varepsilon_{it}$$

		1998		1997		1996	
Variable	**Pred**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
BV	+	0.91	12.74	0.84	10.98	0.51	8.52
NI	+	3.32	10.01	6.72	17.05	7.25	19.80
LTG	+	0.33	3.44	0.63	7.72	0.47	6.42
*COMPX**	−	−57.54	−5.89	−49.31	−5.09	−10.21	−0.84
N		756		767		751	
Adj. R^2		0.54		0.72		0.72	

P is year-end share price. *BV* is year-end equity book value. *NI* is net income. *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. IND_N equals 1 if the firm is in industry *N* (based on the 33 industries in Table 1, Panel A), and 0 otherwise. *COMPX** is fitted value from a regression of unrecognized stock-based compensation expense, i.e., net income minus *pro forma* net income disclosed under SFAS No. 123, *COMPX*, on *VOL*, expected stock price volatility, *LIFE*, expected option life, *INT*, expected risk-free interest rate, *DIV*, expected dividend yield, *OPT_GRANT*, number of options granted deflated by number of shares outstanding, *VEST*, percentage of options vesting each year, *BV*, *NI*, *LTG*, and IND_N. *BV*, *NI*, and *COMPX** are deflated by number of shares outstanding at the end of the year. *i* and *t* denote firm and years.
Coefficients are estimated using robust regression. The industry-specific intercepts are untabulated. t-statistics are based on White (1980) heteroscedasticity-consistent standard errors.

in 1998 and 1997, as in Table 4, and in 1996 (t = −3.20, −3.54, and −2.57). To facilitate comparison with BLMY, we also present findings from a pooled estimation, in which *COMPX** has a significant negative coefficient (t = −3.91). These findings are inconsistent with lack of profitability driving the inferences in Table 4.

BLMY conjecture that their finding an insignificant relation between share price and SFAS No. 123 expense, after controlling for benefits of stock-based compensation, is specific to knowledge-based firms. Thus, Table 6, Panel B, presents findings using only profitable software firms in our sample (SIC = 737). BLMY's inferences are based on pooling observations across the three years. Findings from the pooled estimation in Table 6, Panel B, reveal the same inferences as in BLMY. In particular, the coefficient on *COMPX** is negative, but insignificantly different from 0 (t = −0.58). These findings indicate that the difference between our findings and BLMY's results from sample, not estimation specification, differences. Panel B also presents findings from separate-year estimations. Although one should interpret these findings cautiously because of the small sample sizes, they reveal *COMPX**'s coefficient differs across years; it is significantly negative in 1998 and 1997, and insignificant in 1996 (t = −1.68, −2.94, and 0.54). Thus, pooling observations across SFAS No. 123 phase-in years can affect inferences.

TABLE 5
Summary Statistics from Regressions of Stock Return on Net Income, Change in Net Income, Change in Analyst Earnings Growth Forecast, and Change in the SFAS No. 123 Expense Variable Derived from the Instrumental Variable Approach

$$RET_{it} = \sum_{N=1}^{33} \gamma_{0N} IND_{Nit} + \gamma_1 NI_{it} + \gamma_2 \Delta NI_{it} + \gamma_3 \Delta LTG_{it} + \gamma_4 \Delta COMPX^*_{it} + \upsilon_{it}$$

		1998		1997	
Variable	**Pred**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
NI	+	0.52	3.23	0.72	4.80
ΔNI	+	0.39	2.37	0.89	4.24
ΔLTG	+	0.04	1.03	0.33	4.19
$\Delta COMPX^*$	−	−13.85	−2.64	−14.95	−2.70
N		748		751	
Adj. R^2		0.23		0.33	

RET is annual stock return. *NI* is net income. *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. IND_N equals 1 if the firm is in industry N (based on the 33 industries in Table 1, Panel A), and 0 otherwise. $COMPX^*$ is fitted value from a regression of unrecognized stock-based compensation expense, i.e., net income minus *pro forma* net income disclosed under SFAS No. 123, *COMPX*, on *VOL*, expected stock price volatility, *LIFE*, expected option life, *INT*, expected risk-free interest rate, *DIV*, expected dividend yield, *OPT_GRANT*, number of options granted deflated by number of shares outstanding, *VEST*, percentage of options vesting each year, *BV*, *NI*, *LTG*, and IND_N. *NI*, and $COMPX^*$ are deflated by market value of equity at the beginning of the year. Δ denotes annual change. i and t denote firm and years.
Coefficients are estimated using robust regression. The industry-specific intercepts are untabulated. t-statistics are based on White (1980) heteroscedasticity-consistent standard errors.

To investigate further BLMY's conjecture relating to knowledge-based firms, Table 6, Panel C, presents findings based on using profitable firms from a broader set of knowledge-based industries.[18] It reveals inferences consistent with Table 4, i.e., the coefficient on $COMPX^*$ is significantly negative in 1998 and 1997 (t = −2.15 and −4.28) and insignificant in 1996 (t = 0.99). It also is significantly negative in the pooled specification (t = −2.31). These findings do not support the conjecture that the relation between SFAS No. 123 expense and share price is insignificant for knowledge-based firms.

BLMY focus on firms in knowledge-based industries because such firms often are heavy users of stock-based compensation. To investigate whether SFAS No. 123 expense has less of a negative relation with share price when stock-based compensation is higher, we estimate Equation (1) using $COMPX^*$ and include its squared term, $COMPX^{*2}$, as an explanatory variable.[19] Consistent with the conjecture, untabulated findings reveal a significant negative relation with $COMPX^*$ for all three years (t = −6.39, −4.03, and −1.86) and a significant positive relation with $COMPX^{*2}$ (t = 4.50, 2.01, and 1.61). To determine whether the incremental valuation effect of $COMPX^*$ is significantly negative even for large stock-based compensation expense, we estimate Equation (1) permitting the coefficient on $COMPX^*$ to vary by deciles of SFAS No. 123 expense. Untabulated findings reveal that,

[18] Following Kasznik and Lev (1995), knowledge-based industries include Drugs (four-digit SIC codes 2833–2836), Computers (3570–3577), Electronics (3600–3674), Software (7370–7379), and R&D Services (8731–8734).

[19] Hanlon et al. (2003) estimate an analogous specification when testing for a nonlinear relation between future operating performance and the value of options granted to the top five executives.

TABLE 6
Summary Statistics from Regressions of Share Price on Book Value of Equity, Net Income, Analyst Earnings Growth Forecast, and the SFAS No. 123 Expense Variable Derived from the Instrumental Variable Approach

		1998		1997		1996		Pooled	
Variable	Pred	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Panel A: Sample Firms with Positive Net Income and Equity Book Value									
BV	+	0.49	5.74	0.42	4.68	0.41	5.81	0.42	8.89
NI	+	9.79	17.30	10.91	21.10	9.31	19.90	9.76	32.90
LTG	+	0.45	3.81	0.66	6.96	0.60	6.71	0.52	9.25
*COMPX**	−	−38.54	−3.20	−36.82	−3.54	−43.13	−2.57	−24.06	−3.91
N		612		664		666		1,942	
Adj. R^2		0.71		0.77		0.78		0.71	
Panel B: Software Firms with Positive Net Income and Equity Book Value									
Intercept	?	3.16	0.51	30.80	1.81	−13.41	−1.39	0.96	0.15
BV	+	1.44	2.07	−1.31	−1.39	1.31	1.74	0.72	1.61
NI	+	14.96	3.67	17.88	3.70	8.35	2.77	13.14	6.93
LTG	+	0.32	1.37	0.44	1.70	1.20	3.05	0.64	3.00
*COMPX**	−	−39.12	−1.68	−126.70	−2.94	21.40	0.54	−9.86	−0.58
N		22		22		26		70	
Adj. R^2		0.79		0.65		0.84		0.62	

(continued on next page)

TABLE 6 (continued)

Panel C: Sample Firms from Knowledge-Based Industries with Positive Net Income and Equity Book Value

BV	+	0.19	3.50	0.17	2.97	0.38	3.11	0.22	3.31
NI	+	24.25	10.46	15.66	11.38	14.07	10.67	14.65	16.03
LTG	+	0.77	2.45	0.44	2.20	0.02	0.10	0.24	1.61
*COMPX**	−	−52.43	−2.15	−31.95	−4.28	12.77	0.99	−19.13	−2.31
N		88		101		109		298	
Adj. R^2		0.76		0.75		0.77		0.69	

P is year-end share price. *BV* is year-end equity book value. *NI* is net income. *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. IND_N equals 1 if the firm is in industry *N* (based on the 33 industries in Table 1, Panel A), and 0 otherwise. *COMPX** is fitted value from a regression of unrecognized stock-based compensation expense, i.e., net income minus *pro forma* net income disclosed under SFAS No. 123, *COMPX*, on *VOL*, expected stock price volatility, *LIFE*, expected option life, *INT*, expected risk-free interest rate, *DIV*, expected dividend yield, *OPT_GRANT*, number of options granted deflated by number of shares outstanding, *VEST*, percentage of options vesting each year, *BV*, *NI*, *LTG*, and IND_N. *BV*, *NI*, and *COMPX** are deflated by number of shares outstanding at the end of the year. *i* and *t* denote firm and years.

Knowledge-based industries include Drugs (Compustat four-digit SIC codes 2833–2836), Computers (3570–3577), Electronics (3600–3674), Software (7370–7379), and R&D Services (8731–8734).

Coefficients are estimated using robust regression. The industry-specific intercepts are untabulated. t-statistics are based on White (1980) heteroscedasticity-consistent standard errors.

consistent with the nonlinear specification, the coefficient on *COMPX** declines in absolute value almost monotonically across deciles in all three years. More importantly, the coefficient is significantly negative for all deciles in 1998 and 1997 and for four deciles in 1996, including the second largest.

Stock-Based Compensation Expense and Expected Earnings Growth

The significant negative coefficient on *COMPX** in Table 4 is consistent with costs associated with stock-based compensation. However, a primary reason firms issue stock options is to align employees' interests with those of shareholders and motivate the employees to work to increase firm value.[20] To the extent there is a relation between stock-based compensation and current and future firm performance, *BV*, *NI*, and, *LTG* in Equation (1) could act as a control for these incentive effects. To determine whether expected earnings growth reflects benefits associated with stock-based compensation, we estimate Equation (1) using *COMPX** and omitting expected earnings growth, *LTG*.[21] To the extent SFAS No. 123 expense reflects not only costs associated with stock-based compensation, but also benefits as reflected in positive valuation effects of expected earnings growth, these positive valuation effects will attenuate the negative relation between SFAS No. 123 expense and share price when the estimation equation excludes *LTG*.[22]

Table 7 presents the findings and reveals, as expected, that the coefficients on *COMPX** are attenuated relative to those in Table 4 (−42.95, −21.05, and 13.72 in Table 7; −57.54, −49.31, and −10.21 in Table 4). Consistent with Table 4, the coefficients are significantly negative for 1998 and 1997 ($t = -5.19$ and -2.39), and insignificant in 1996 ($t = 1.17$). Because SFAS No. 123 expense for 1997 (1998) pertains to option grants no more than two (three) years prior to the date of the valuation equation, these results indicate that a noticeable portion of the benefits associated with stock-based compensation is reflected in net income and equity book value within a few years subsequent to the grant.[23] This also is consistent with SFAS No. 123 expense, which is calculated by amortizing stock-based

[20] Consistent with incentive effects, the extant literature documents an association between executive stock-based compensation and firm performance (e.g., Murphy 1985; Lambert and Larcker 1987; DeFusco et al. 1990; Jensen and Murphy 1990; Lambert et al. 1993; Hanlon et al. 2003). However, recent studies question whether the benefits associated with stock-based compensation are related to incentive effects or to sorting (Lazear 2001) or retention (Oyer 2001; Oyer and Scheafer 2002) effects. We do not examine the nature of benefits associated with stock-based compensation, but presume that any such benefits are reflected in recognized or expected profitability.

[21] Consistent with this, Table 1, Panel C, indicates *COMPX** is significantly positively correlated with *LTG* (Pearson (Spearman) correlation = 0.46 (0.46)). The correlation between *COMPX* and *LTG* also is significantly positive but smaller (0.33 (0.34)). Our inferences in this section are insensitive to using *COMPX* in place of *COMPX**.

[22] Our analyses are not intended to determine whether higher stock-based compensation results in higher expected growth in earnings. Firms with high growth opportunities might grant more stock options to employees. However, establishing that stock-based compensation and the valuation effects of expected earnings growth are positively related lends support to claims that stock-based compensation is associated with an intangible asset. It also lends support to claims that because employees are not obligated to render services, the intangible asset is not recognizable under the FASB's Conceptual Framework because these expected future earnings are not probable future benefits controlled by the firm as a result of past transactions and events (FASB 1995, ¶92–96).

[23] As time lengthens between option grant date and the valuation equation date, more benefits associated with incentive effects of past years' option grants are realized in *NI* and *BV*. Consistent with this, *COMPX**'s coefficient is significantly more negative for 1998 than for 1997 ($t = 1.69$) and 1996 ($t = 2.81$); the coefficient for 1997 is more negative than for 1996, but not significantly so ($t = 1.26$). This coefficient pattern also is consistent with investors gradually incorporating the expense into their valuation assessments subsequent to SFAS No. 123's issuance in 1995.

TABLE 7
Summary Statistics from Regressions of Share Price on Book Value of Equity, Net Income, and the SFAS No. 123 Expense Variable Derived from the Instrumental Variable Approach

$$P_{it} = \sum_{N=1}^{33} \beta_{0N}\, IND_{Nit} + \beta_1 BV_{it} + \beta_2 NI_{it} + \beta_3 COMPX^*_{it} + \kappa_{it}$$

		1998		1997		1996	
Variable	**Pred**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
BV	+	0.81	11.82	0.70	9.73	0.45	7.50
NI	+	3.38	10.19	6.45	15.93	6.84	18.78
*COMPX**	−	−42.95	−5.19	−21.05	−2.39	13.72	1.17
N		756		767		751	
Adj. R^2		0.53		0.70		0.70	

P is year-end share price. *BV* is year-end equity book value. *NI* is net income. IND_N equals 1 if the firm is in industry *N* (based on the 33 industries in Table 1, Panel A), and 0 otherwise. *COMPX** is fitted value from a regression of unrecognized stock-based compensation expense, i.e., net income minus *pro forma* net income disclosed under SFAS No. 123, *COMPX*, on *VOL*, expected stock price volatility, *LIFE*, expected option life, *INT*, expected risk-free interest rate, *DIV*, expected dividend yield, *OPT_GRANT*, number of options granted deflated by number of shares outstanding, *VEST*, percentage of options vesting each year, *BV*, *NI*, *LTG*, and IND_N, where *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. *BV*, *NI*, and *COMPX** are deflated by number of shares outstanding at the end of the year. *i* and *t* denote firm and years.
Coefficients are estimated using robust regression. The industry-specific intercepts are untabulated. t-statistics are based on White (1980) heteroscedasticity-consistent standard errors.

compensation cost over the vesting period, not being grossly mismatched with recognized associated benefits.

Nonlinearity in Option Values

Our primary tests focus on whether *COMPX**'s coefficient is significantly negative. An alternative benchmark is the coefficient on *NI*, although one might expect the coefficient on *COMPX* to be somewhat larger than that on *NI*, which comprises transitory and non-transitory components. Consistent with this, *COMPX**'s coefficients in Table 4 are large relative to those on *NI* (−57.54, −49.31, and −10.21, compared with 3.32, 6.72, and 7.25); untabulated tests reveal the coefficients on *COMPX** and *NI* differ significantly in 1998 and 1997, but not in 1996.[24]

Option pricing formulas are nonlinear in the inputs and *COMPX* is not additive in the number of options granted or vesting period, whereas the instrumental variables specification is linear in the instruments. An instrumental variables approach is necessary because not all inputs necessary to calculate *COMPX* are disclosed, e.g., estimates of the number of options expected to vest, components of *COMPX* attributable to options granted in each year, and any reload options or other changes to outstanding options that affect *COMPX*. However, using a linear specification could result in inefficient or biased estimates of

[24] The increase in *COMPX**'s coefficient from 1996 to 1998 is not consistent with potential mechanical effects of the SFAS No. 123 phase-in, which would result in a decrease. However, it is consistent with benefits of stock-based compensation being reflected in *BV* and *NI* as time increases between grant date and the valuation equation date. Because firms' vesting periods differ, there also can be phase-in effects in the separate-year estimations. Thus, we estimate Equation (1) permitting *COMPX**'s coefficient to vary with *VEST*. Our inferences are unaffected.

*COMPX**'s coefficient, to the extent omitted nonlinear effects are correlated with the explanatory variables.

Thus, we estimate total grant date value of options granted during the year that is not dependent on share price. Specifically, we calculate Black and Scholes (1973) option values, using each firm's disclosed valuation inputs, i.e., *VOL*, *LIFE*, *INT*, and *DIV*, and set share price and exercise price both equal to the sample mean price in each year. For each firm-year we calculate the total grant date option value by multiplying this "equal price" option value by number of options granted during the year. We then estimate Equation (1) using this variable, $GRANT\_VAL^{EP}$, in place of *COMPX*. The advantage of this approach is that it obviates the need for the instrumental variables approach. The disadvantage is that the approach is limited to total grant date option values; we do not have information to reconstruct SFAS No. 123 expense.

Table 8, Panel A, presents the findings. It reveals that, as expected and consistent with Table 4, the coefficients on *BV*, *NI*, and *LTG* are significantly positive in all three years. More importantly, the coefficient on $GRANT\_VAL^{EP}$ is negative in all three years, and significantly so in 1998 and 1997 (t = −5.55 and −3.72; t = −0.01 in 1996). These findings indicate that our primary inferences are not attributable to error induced by the linear instrumental variables equation, and are consistent with the instrumental variables approach controlling for bias induced by the mechanical relation between share price and option values.

The coefficient on $GRANT\_VAL^{EP}$ in Table 8, Panel A, is substantially smaller than that on *COMPX** in Table 4. This finding is consistent with the coefficient on *COMPX** being sensitive to the linearity imposed by the instrumental variables approach. It also is consistent with $GRANT\_VAL^{EP}$ reflecting the total value of options granted during the current year, whereas *COMPX** is based on the sum of total value of options granted over the current and prior years amortized over the options' vesting periods. To distinguish between these explanations, Table 8, Panel B, presents findings from Equation (1) estimated using *GRANT_VAL** in place of $GRANT\_VAL^{EP}$. *GRANT_VAL** is *FVOPT** multiplied by *OPT_GRANT*, where *FVOPT** is the predicted value from a regression of *FVOPT* on *VOL*, *LIFE*, *INT*, *DIV*, *BV*, *NI*, and *LTG*. Thus, the difference between Panels A and B is that we use equal price option values in Panel A and instrumental variables estimated option values in Panel B. The findings in Panel B are similar to those in Panel A, indicating that the linear instrumental variables approach does not drive our findings.

Options Outstanding

If *COMPX** is correlated with the total value of options outstanding, omitting the latter from Equation (1) could bias *COMPX**'s coefficient (Soffer 2000; Li 2003). To investigate this possibility, we include in Equation (1) *OUT_VAL**, which is the total value of options outstanding after removing its mechanical relation with share price using the same approach we use to calculate *GRANT_VAL**. We estimate option values using the Black and Scholes (1973) formula and the firm's disclosed option pricing model inputs and weighted average exercise price of options outstanding.[25] Untabulated findings reveal, as expected, that the coefficients on *OUT_VAL** are significantly negative in all three years (t = −1.71, −2.43, and −4.81). More importantly for our research question, the findings also reveal that our inferences relating to SFAS No. 123 expense are robust to including *OUT_VAL**. The

[25] Firms receive a tax deduction for nonqualified stock options equal to the intrinsic value of the options at exercise date (Soffer 2000). Because *OUT_VAL** includes intrinsic value and time value it likely is positively correlated with intrinsic value. Thus, any expected tax benefit will be reflected in its valuation coefficient.

TABLE 8
Summary Statistics from Regressions of Share Price on Book Value of Equity, Net Income, Analyst Earnings Growth Forecast, and Value of Options Granted, Purged of Its Mechanical Relation with Share Price

Panel A: $P_{it} = \sum_{N=1}^{33} \alpha_{0N} IND_{Nit} + \alpha_1 BV_{it} + \alpha_2 NI_{it} + \alpha_3 LTG_{it} + \alpha_4 GRANT\_VAL^{EP}_{it} + \varepsilon_{it}$

		1998		1997		1996	
Variable	**Pred**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
BV	+	0.79	11.32	0.76	10.08	0.50	8.43
NI	+	3.35	9.90	6.74	16.81	7.25	19.44
LTG	+	0.20	2.25	0.55	6.94	0.44	6.06
$GRANT\_VAL^{EP}$	−	−5.05	−5.55	−4.08	−3.72	−0.01	−0.01
N		756		767		751	
Adj. R^2		0.54		0.71		0.72	

Panel B: $P_{it} = \sum_{N=1}^{33} \alpha_{0N} IND_{Nit} + \alpha_1 BV_{it} + \alpha_2 NI_{it} + \alpha_3 LTG_{it} + \alpha_4 GRANT\_VAL^*_{it} + \varepsilon_{it}$

		1998		1997		1996	
Variable	**Pred**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
BV	+	0.83	11.71	0.78	8.90	0.50	8.24
NI	+	3.50	10.36	7.08	16.59	7.25	19.57
LTG	+	0.20	2.24	0.52	5.48	0.43	5.70
$GRANT\_VAL^*$	−	−8.91	−4.37	−6.08	−2.18	0.57	0.25
N		756		767		751	
Adj. R^2		0.53		0.71		0.72	

(continued on next page)

TABLE 8 (continued)

P is year-end share price. *BV* is year-end equity book value. *NI* is net income. *LTG* is year-end I/B/E/S mean analyst earnings growth forecast. IND_N equals 1 if the firm is in industry *N* (based on the 33 industries in Table 1, Panel A), and 0 otherwise. *i* and *t* denote firm and years.

$GRANT\_VAL^{EP}$ is estimated total grant-date value of options granted during the year that is not dependent on share price. It is measured based on Black and Scholes (1973) option values, using the firm's disclosed valuation inputs, i.e., *VOL*, expected stock price volatility, *LIFE*, expected option life, *INT*, expected risk-free interest rate, and *DIV*, expected dividend yield, while setting share price and exercise price both equal to the sample mean price in each year. Total grant-date option value is then calculated by multiplying this "equal price" option value by number of options granted.

*GRANT_VAL** is *FVOPT** multiplied by *OPT_GRANT*, number of options granted during the year, where *FVOPT** is the predicted value from a regression of *FVOPT*, the fair value of options granted, on *VOL*, *LIFE*, *INT*, *DIV*, *BV*, *NI*, *LTG*, and IND_N.

BV, *NI*, $GRANT\_VAL^{EP}$, and *GRANT_VAL** are deflated by number of shares outstanding at the end of the year.

Coefficients are estimated using robust regression. The industry-specific intercepts are untabulated. t-statistics are based on White (1980) heteroscedasticity-consistent standard errors.

coefficients on *COMPX** are significantly negative in 1998 and 1997, as in Table 4, and in 1996 (t = −4.03, −4.42, and −4.38).[26]

Our estimation equations do not include SFAS No. 123 expense related to options granted prior to SFAS No. 123's effective date. Thus, we permit *COMPX**'s coefficient to differ for firms with exercisable options as a fraction of options outstanding above the sample median. Exercisable options are vested and, thus, likely issued before SFAS No. 123 became effective. To the extent *BV*, *NI*, and *LTG* reflect more of the incentive effects of older options, we predict that *COMPX**'s coefficient is more negative for firms with more exercisable options. Consistent with this, untabulated findings reveal that the incremental coefficient on *COMPX** is negative in 1998 and 1997, and significantly so in 1998 (t = −1.90).

Number of Options Granted as a Choice Variable

If a firm grants a specified dollar value of options, the firm might grant fewer options as its share price rises (Core and Guay 2001). If so, there could be a negative relation between share price and number of options granted that could confound our inferences. Consistent with this possibility, Table 1 reveals that the correlation between share price and number of options granted is significantly negative. However, findings in this section reveal that our inferences are not affected by potential endogeneity between share price and number of options granted.

First, the correlation between stock returns and change in number of options granted is insignificant; Pearson (Spearman) correlation p-values are 0.28 (0.34) for 1998 and 0.40 (0.64) for 1997.[27] These correlations are inconsistent with firms changing number of options granted as share price changes. Second, we estimate Equation (1) including *OPT_GRANT*. Untabulated findings reveal that *COMPX**'s coefficient is negative in all three years (t = −7.69, −9.89, and −4.82). Interestingly, *OPT_GRANT*'s coefficient is positive in all three years, and significantly so in 1998 and 1997, which is inconsistent with firms with higher share prices granting fewer options. Third, we estimate the instrumental variables equation after deflating *COMPX* by *OPT_GRANT*, and omitting *OPT_GRANT* from the set of instruments. We then estimate Equation (1) including *OPT_GRANT* and using this modified *COMPX**. Untabulated findings indicate that the coefficient on the modified *COMPX** is significantly negative in all three years (t = −8.31, −9.82 and −4.38), consistent with our primary findings. The coefficient on *OPT_GRANT* is insignificantly negative in all three years.

VII. SUMMARY AND CONCLUDING REMARKS

This study investigates the relation between share price and stock-based compensation expense that is disclosed, but not recognized in net income, under SFAS No. 123, after controlling for net income, equity book value, and expected earnings growth. We use an instrumental variables approach for our stock-based compensation variable in an attempt to eliminate the mechanical relation between share price and SFAS No. 123 expense attributable to the fact that option values, a primary determinant of SFAS No. 123 expense, are a positive function of the price of the underlying share.

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[26] An alternative approach is to use as the dependent variable the sum of the value of outstanding options and share price. This approach eliminates the concern about the mechanical relation between share price and the value of options outstanding. Untabulated statistics from this specification reveal the same inferences as from Table 4.

[27] Moreover, the correlation between number of options granted and annual returns is small. The Pearson (Spearman) correlation is 0.02 (−0.01) in 1998 and −0.02 (0.03) in 1997; p-values all > 0.70.

Taken together, our findings indicate that investors view stock-based compensation as an expense of the firm, and that SFAS No. 123 expense measures this cost sufficiently reliably to be reflected in their valuation assessments. Moreover, our findings based on annual stock returns indicate that SFAS No. 123 expense reflects on a timely basis changes in investor-perceived costs associated with stock-based compensation. We also find that a noticeable portion of the benefits associated with stock-based compensation is reflected in net income and equity book value within a few years subsequent to grant. Given that the vesting period for sample firms averages less than three years, this finding suggests that recognition of stock-based compensation expense over the vesting period, as required by SFAS No. 123, results in an expense that is not severely mismatched with recognized associated benefits.

Our study is silent on the potential implications of changing the financial reporting of stock-based compensation expense from disclosure in the footnotes to recognition. Expense recognition might provide managers with greater incentives to understate option value estimates thereby increasing their firms' reported profitability. To the extent this is the case, our inferences related to the perceived reliability of disclosed but unrecognized SFAS No. 123 expense may not be generalizable to an expense recognition regime. We leave to standard setters the determination of whether stock-based compensation expense is reliable enough to be recognized in financial statements.

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