

**Persistence of Value Relevance of the Employee Stock Options:  
An Investor Perspective in Biotech Industry**

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**Abstract:**

The employee stock options (ESO) have been a controversial subject in recent years. Firms, in order to attract talented and educated workforce have to reward it adequately so the “talent” stays within the firm and performs, discovers, and invents. This study uses the Ohlson (1995) valuation models to compare the extent to which the APB No. 25 and SFAS No. 123 approaches to accounting for employee stock options reflect the market’s assessment of the effects of employee stock options on firm value. It extends the existing literature by examining whether this association stays constant under different market conditions in highly knowledge intensive biotech industry. We find that for biotech industry abnormal earnings and book values have significant explanatory power in predicting market values. This assessment stays constant under different market conditions but the explanatory power of existing components changes upon introduction of new earnings components in the form of employee stock options. Further, we conclude that the accounting for employee stock option expense (as described under SFAS No. 123) has an incremental explanatory

power as compared to APB No. 25, in explaining future period abnormal earnings and current period market values.

## **Introduction**

The employee stock options (ESO) have been a controversial subject in recent years. Firms, in order to attract talented and educated workforce, have to reward it adequately so the “talent” stays within the firm and performs, discovers, and invents. The new successful product developments often improve the quality of consumers’ lives or benefit them some other ways and, therefore, customers demand it. That in turns causes a gross margin increases which often leads to higher market values of the company stock and the stockholders get rewarded. The new products also benefit the Government because it collects more taxes that can be spent on programs that benefit the society as a whole. In other words, a “virtuous circle” is created and that leads to a win-win situation for all the stakeholders. The question is how to attract the required “talent” that is able and willing to develop the new products and consequently move the company, and often the world, forward. Obviously one way to do so is to reward it handsomely somehow not now but rather in the future when the new product developed by the acquired “brain power” is marketable and starts bringing in incremental revenue which results in earnings increases. One such industry in need of a constant inflow of new talented researchers is the biotech industry. The demand for new potent medicines is rising. There are incurable illnesses that are still waiting for a miracle drug that will cure them and constant viral and bacterial mutations that require development of new antibiotics. In particular the world is waiting for the cure for cancer and there is a need for orphan drugs. On the other side of the spectrum is esthetics. Healthy people are looking for ways to improve their appearance or extend their life span and are willing to spend if they believe that a particular product will help them achieve their goals.

The invention and creativity in biotech industry is laborious and long. Often for years the scientist are working on something promising simply to find out at the end that a governmental agency rejects the product. And even if a firm invents a new and successful drug and gets it approved for human use, they can only patent it for a limited number of years. In those circumstances, how someone can stay motivated and continues on the path of discovery? To keep the inventive spirit going, companies in knowledge intensive industries, such as technology or biotech, entice their employees to perform better by offering them compensation in the form of employee stock options (ESO). Compensating employees with ESOs rather than cash can be attractive to firms, because stock options provide long-term incentives and might reduce the agency problems. The idea behind a stock option is that an employee can purchase a company stock at a lower, preset at the time of the grant, price, and if the employee performs accordingly the company's profits are going to increase in future periods and consequently the stock price is going to rise. Therefore, in the future, the employee can purchase a predetermined number of shares at a lower, set at the time of stock option grant, price and profit by selling the newly acquired shares of company stock at a market price. The accounting for the stock options is controversial. In 1995, the FASB issued Statement of Financial Accounting Standards No. 123, *Accounting for Stock-Based Compensation* (SFAS No. 123). SFAS No. 123 requires firms to *disclose* in footnotes to the financial statements the *pro forma* effects on earnings of employee compensation expense attributable to amortizing the fair value of employee stock options at the grant date. However, SFAS No. 123 does not generally require firms to *recognize* this ESO-related compensation expense in the income statement, although it encourages firms to do so. Instead, SFAS No. 123 permits firms to use Accounting Principles Board Opinion No. 25, *Accounting for Stock Issued to Employees* (APB No. 25), which allows the firm not to recognize employee stock compensation expense if the grant meets two requirements at the grant date: the exercise price and the number of options are fixed, and the exercise price equals or exceeds the stock price. Most companies

have been careful to meet these two requirements, presumably to avoid recognizing stock option-related expense in the income statement.

This study uses the Ohlson (1995) valuation models to compare the extent to which the APB No. 25 and SFAS No. 123 approaches to accounting for employee stock options reflect the market's assessment of the effects of employee stock options on firm value. It extends the existing literature by examining whether this assessment (association between employee stock options and market values of company's stocks) stays constant (persistent) under different market conditions in highly knowledge intensive biotech industry.

### **Literature Review**

Collins et al. (1997) investigate the value-relevance of earnings and book values using a valuation framework provided by Ohlson (1995), which expresses price as a function of both earnings and book value of equity. The research design is an estimate of yearly cross-sectional regressions for a 41-year period spanning 1953 to 1993 and uses  $R^2$  as the primary metric to measure value-relevance. The primary findings of that research are that combined value-relevance of earnings and book values has not declined over that time, but rather increased slightly. The paper also raises a number of questions. Among others it states that the effects of variation in the value-relevance of earnings and book values across industries and changes in industry composition across time have not been fully explored. An extension of this study done by Keener (2011) covers period 1982-2001 and confirms results obtained by Collins et al. (1997) (joint value relevance of earnings and book values has not decreased over the sample period).

Paper by Barth et al. (2000) defines several attributes and several approaches to the value relevance research. According to the researchers, value relevance studies are designed to assess how well accounting amounts reflect information used by investors in valuing a firm by selectively including variables to learn about their valuation characteristics. Further, it provides an insight into issues of

interest to standard setters (i.e. FASB, IASB, and SEC) by operationalizing important dimensions of the Conceptual Framework using well-accepted valuation models. Another attribute of value relevance research is that it aids in establishing of a conservative accounting practices or aids in the process of discovery of how accounting information affects capital formation and allocation. The several approaches to value relevance research, mentioned in the paper, can be categorized by the degree of restrictiveness. First approach is to model reliability to make specific predictions on how reliability affects coefficient estimates. Second approach is to compare the estimated valuation coefficient on the accounting amount being studied with a theoretical benchmark coefficient. Third approach is to compare the estimated valuation coefficient on the accounting amount being studied to that on other amounts already recognized in financial statements. Fourth approach is to interpret a significant coefficient of the predicted sign on the accounting amount being studied as evidence of reliability. A high quality research in this area is going to be in high demand as markets expand, new financial instruments are invented, and standard-setters will be in need of relevant information to guide them in decision-making process and aid them in establishing relevant conceptual frameworks.

The study by Aboody (1996) investigates whether and how investors incorporate the value of a firm's outstanding employee stock options into its stock price and the value-relevance of the FASB's method for calculating compensation expense (valuation implications) over a period 1980-1990. The method used in the paper utilizes a cross-sectional price-level regression and the model includes book value of equity, accounting earnings, and value of employee stock options estimated using modified option pricing model developed by the author. In addition to the primary findings of a negative correlation between the value of outstanding options and a firm's share price, the research also shows that the FASB's method for calculating compensation expense has no explanatory power in the presence of the calculation of the options' value used in the paper. The paper also examines whether the firm size has an effect on employee stock

options. The results show that for small firms there is no significant association between employee stock options value and stock prices, but there is a significant negative association for large firms.

Rees and Stott (1998) examine value relevance of stock-based compensation disclosed in the financial statements as promulgated in SFAS No. 123. They hypothesize that the benefits inherent in employee stock options outweigh their dilutive effect and therefore there should be a significant positive association between the disclosed compensation expense (accounted for using the fair value method) and firm value. To measure this association, they regress annual returns on earnings per share and net-of-tax employee stock option. The research period covers only year 1996, which is the first year of ESO expense disclosure. The result implies that the disclosed employee stock option expense is a value-relevant measure and the incentives derived from employee stock options plans provide value-increasing benefit to the firm. In addition, they find that the positive association between the employee stock option expense and firm values is greater for faster growing firms.

Bell et al. (2002) investigate the valuation implications of employee stock option accounting for profitable computer software firms. The paper compares three methods of accounting for the employee stock options: (1) the Exposure Draft: *Accounting for Stock-Based Compensation* issued in 1993, which would require employers to recognize as an intangible asset the fair value of stock options at the grant date, to amortize this asset, and to record the asset's amortization as employee compensation expense; (2) Accounting Standard No. 123, *Accounting for Stock-Based Compensation* (SFAS No. 123) issued in 1995, which requires firms to disclose, in footnotes to the financial statements, the pro forma effects on earnings of employee compensation expense attributable to amortizing the fair value of employee stock options at the grant date (SFAS No. 123 does not generally require firms to recognize this compensation expense in the income statement); (3) Accounting Principles Board Opinion No. 25, *Accounting for Stock Issued to Employees* issued in 1972, which allows the firm not to recognize

employee stock compensation expense if the grant meets two requirements at the grant date: the exercise price and the number of options are fixed, and the exercise price equals or exceeds the stock price. The research design uses Feltham and Ohlson (1999) valuation model for the sample of 85 profitable computer software firms over a period of 1995-1999. The primary finding of the paper are: (1) positive association between employee stock options expense and equity market value; (2) the market appears to value these firms' employee stock option expense not as an expense but as an intangible asset; (3) the findings also indicate that there is a conflict between the positive manner in which investors value this expense and the negative relation between current employee stock option expense and future abnormal earnings. This conflict calls into question whether investors assess correctly the effect of employee stock option expense on profitable software firm value.

All of the above mentioned studies pertain to value relevance of earnings components. These studies use Ohlson (1995, 1999) models to assess value-relevance of earnings and book values with respect to securities market prices. Study by Bell et al. (2002) uses the abnormal earnings variation of Ohlson model, which utilizes clean surplus accounting in estimating abnormal returns and following Barth et al. (1999) sets the investor required rate of return at 12 percent. Aboody (1996) uses a 10 percent risk-free interest rate in his calculations and states that the results will not be affected by rates up to 20 percent. Most of the studies in that area of research are conducted across all industries under similar market conditions (i.e. the same or approximately the same interest rate). Collins et al. (1997) concludes that the value-relevance of earnings and book values across industries and changes in industry composition across time have not been fully explored and Bell et al. (2002) states in the concluding remarks that more future research is needed to generalize their findings onto other industries.

To the best of our knowledge, no study is done to assess the persistence of the

association between employee stock options and company's stock price. We extend the existing literature by examining whether the association between employee stock options and market values of company's stocks continues to persist under different market conditions in highly knowledge intensive biotech industry.

The research in this paper covers 1995-2005—the period that SFAS No. 123 have been in effect – and it concentrates on biotech industry, which is a very knowledge intensive due to the lengthy and laborious process of new drugs and treatments development; therefore, we expect that the valuation implications of employee stock options during different market conditions will be of interest to investors.

### **Hypothesis Development**

This study uses the equity valuation models that have been used extensively in prior research to examine the value relevance of disclosed accounting numbers. Based on standard assumptions of dividend discount model, the clean surplus relation, and stochastic process for abnormal earnings, Ohlson (1995) derived the following valuation model:

$$P_t = y_t + \alpha_1 x_t^a + \alpha_2 v_t$$

where  $P_t$ , is stock price at time  $t$ ,  $y_t$ , is book value of equity at the end of the year,  $x_t^a$  is abnormal earnings for period  $t$ , and  $v_t$  Includes other non-accounting value-relevant information.

The clean surplus relation is:

$$y_t = y_{t-1} + x_t - d_t$$

where  $y_t$  is the book value of equity at time  $t$ ;  $y_{t-1}$  is the book value of equity at the beginning of period  $t$ ;  $x_t$  are earnings for period  $t$ ; and  $d_t$  are dividends in period  $t$ .

The definition of abnormal earnings is:

$$x_t^a = x_t - (R_f - 1) y_{t-1}$$

where  $R_f$  is one plus the risk-free rate.

The stochastic process assumption for abnormal earning is:

$$x_{t+1}^a = \alpha_1 x_t^a + \alpha_2 v_t + \varepsilon_{t+1}$$

where  $v_t$  is other non accounting value-relevant information.

Barth et al. (1999) use 12 percent interest rate as a proxy for investors' required



return in estimating abnormal earnings, justifying it as a long-term stock market return, but adds that the research inferences are unaffected by assuming alternative values for interest rates. To test the association between value of employee stock options and share prices, Aboody (1996) uses a valuation model similar to Ohlson's, which includes accounting earnings, book value of equity, and dividends. The risk-free interest rate used in the model is 10 percent, but the author states that the results are insensitive to values of between zero and 20 percent. Based on the above discussions, we propose the following hypotheses:

H1(a): The predictive power of book value and abnormal earnings on **future period** abnormal earnings will stay relatively constant for the interest rates between five and twenty percent for employees' stock option valuation according to APB No. 25.

H1(b): The predictive power of book value and abnormal earnings on **current period** market values will stay relatively constant for the interest rates between five and twenty percent for employees' stock option valuation according to APB No. 25.

H2(a): The predictive power of book value and abnormal earnings on **future period** abnormal earnings will stay relatively constant for the interest rates between five and twenty percent for employees' stock option valuation according to SFAS No. 123.

H2(b): The predictive power of book value and abnormal earnings on **current period** market values will stay relatively constant for the interest rates between five and twenty percent for employees' stock option valuation according to SFAS No. 123.

H2(c): The employees' stock option expense (as described under SFAS No. 123) has incremental explanatory power (relevance) in explaining **future period** abnormal earnings and **current period** market values for rates of return between five and twenty percent.

## **Methods**

This research design uses the Ohlson (1995) model and empirical application of that model by Barth et al. (1999), to investigate the market's perception of the economic effect of employee stock options on firm value for biotech industry and tests if these perceptions change under different market conditions. The

coefficients of the independent variables in the forecasting equation (a) determine the independent variables' relative importance in the valuation equation (b). To test investor views of the accounting for employee stock options under APB No. 25 (which allows the firm not to recognize employee stock compensation expense if the grant meets two requirements at the grant date. We estimate, following Bell et al. (2002), the following set of regressions under five different market conditions (the required return requirements of five, ten, twelve, fifteen, and twenty percent):

$$AB\_ERN_{it} = \alpha_0 + \alpha_1 AB\_ERN_{i,t-1} + \alpha_2 BVAL_{i,t-1} + \varepsilon_{it} \quad (1a)$$

$$MVAL_{it} = \beta_0 + \beta_1 AB\_ERN_{i,t} + \beta_2 BVAL_{i,t} + \varepsilon_{it} \quad (1b)$$

where,  $AB\_ERN_{it}$  is abnormal earnings of firm  $i$  in year  $t$  and equals  $NI_{it} - rBVAL_{i,t-1}$ ;  $NI_{it}$  equals income before extraordinary items and discontinued operations for fiscal year  $t$  (Compustat Item #18);  $r$  is the rate of return required by the investors, or a normal return on equity book value (Barth et al. 1999);  $AB\_ERN_{i,t-1}$  is abnormal earnings of firm  $i$  lagged one year;  $BVAL_{i,t}$  is book value of equity of firm  $i$  in a year  $t$  (Compustat #25 \* BKVLPS );  $BVAL_{i,t-1}$  is book value of firm  $i$  lagged one year;  $MVAL_{it}$  is market value of firm  $i$  in a year  $t$  (Compustat Item #25 \* Item #199); and  $\varepsilon_{it}$  is an error term.

The second set of regression models tests the relevance of the SFAS No. 123. SFAS No. 123 requires firms to *disclose* (in footnotes to the financial statements) the *pro forma* effects on earnings of employee compensation expense attributable to amortizing the fair value of employee stock options at the grant date. Following Bell et al. (2002), we exclude employee stock options from book value of common equity (because the dependent variable in the valuation equation is the current market value of common shares outstanding, the related independent variable, book value of common equity, should include only those components of equity that are associated with common shares currently outstanding).

$$AB\_ERN\_IMPL_{it} = \beta_0 + \beta_1 AB\_ERN\_IMPL_{i,t-1} + \beta_2 BVAL\_ADJ_{i,t-1} + \varepsilon_{it} \quad (2a)$$

$$MVAL_{it} = \beta_0 + \beta_1 AB\_ERN\_IMPL_{i,t} + \beta_2 BVAL\_ADJ_{i,t} + \varepsilon_{it} \quad (2b)$$

where,  $MVAL_{it}$  is defined previously;  $AB\_ERN\_IMPL_{it}$  is abnormal earnings of firm  $i$  in a year  $t$  and equals  $NI_{it} - rBVAL_{i,t-1} - IMPY\_OE_{i,t}$ ;  $IMPY\_OE_{i,t}$  is option expense amount (following Choudhary et al. (2009), we use Compustat data base as Item #399 – implied stock option expense – as the required *pro forma* adjustment);  $BVAL\_ADJ_{i,t}$  is adjusted book value and equals  $BVAL_{i,t}$  less  $IMPY\_OE_{i,t}$  accumulated since 1995; and  $\varepsilon_{it}$  is an error term.

Following Bell et al. (2002), to assess whether the market values  $IMPL\_OE$  similarly to other components of earnings, we extend Equations (2a) and (2b) including  $IMPL\_OE$  as an additional independent variable.

$$AB\_ERN\_IMPL_{it} = \alpha_0 + \alpha_1 AB\_ERN\_IMPL_{i,t-1} + \alpha_2 BVAL\_ADJ_{i,t-1} + \alpha_3 IMPY\_OE_{i,t-1} + \varepsilon_{it} \quad (3a)$$

$$MVAL_{it} = b_0 + b_1 AB\_ERN\_IMPL_{i,t} + b_2 BVAL\_ADJ_{i,t} + b_3 IMPY\_OE_{i,t} + e_{it} \quad (3b)$$

If the market values  $IMPL\_OE$  differently from other components of income, then  $\beta_3$  will differ from zero. Similarly, if current  $IMPL\_OE$  forecasts future abnormal earnings differently from other components of income, then  $\alpha_3$  will differ from zero.

Evidence that  $IMPL\_OE$  is value irrelevant would suggest that investors perceive that APB No. 25's method of accounting for employee stock options captures correctly their underlying economic effects on firm value.

### Sample and Data Collection

In 1995, FASB issued SFAS No. 123 which requires firms to disclose the *pro forma* effects on earnings of employee compensation expense attributable to amortizing the fair value of employee stock options. The standard does not

generally require firms to recognize the expense related to the employee compensation, instead it permits firms to use Accounting Principles Board Opinion No. 25 – Accounting for Stock Issued to Employees – which allows the firm not to recognize employee stock compensation expense if the grant, at the grant date, meets two requirements: the exercise price and the number of options are fixed, and the exercise price equals or exceeds the stock price. In 2006 it become mandatory to start expensing options grants; therefore, our sample covers period 1995-2005. The study uses annual financial data for 310 biotech companies available on Compustat database. The initial set obtained from Compustat contained 5,617 firm year observations and the raw variables are: income before extraordinary items (IB, Item #18); book value per share (BKVLPS); common shares outstanding (CSHO, Item #25); price per share (PRCCF, Item #199); implied option expense (XINTOPT, Item #399). All the other variables of interest are constructed using the raw variables' data. After obtaining the data and importing it to a spreadsheet, the data is then sorted by each variable and observations with missing values are removed. Further, the outliers are removed from the data set by applying the following method: for each variable the mean and standard deviations are computed and then an interval of five standard deviations below the mean and five standard deviations above the mean is constructed. Any values for each variable that are below the lower limit are removed and any values that are above the upper limit are also removed. All variables are measured as of fiscal year end and, except for the per share data, are expressed in millions of dollars. The final set contains 956 firm year observations.

## **Results**

Table 1 presents descriptive statistics for each of the variables used in the estimating equations. It reveals that, on average, the market value of equity (MVAL) exceeds the book value of equity (BVAL), indicating that equity book value alone is insufficient to explain equity market value. Table 1 also reveals

that, on average, abnormal earnings are negative. This result is consistent with Barth et al. (1999), who also report negative abnormal earnings across industries and attributes it to cost of capital of less than 12 percent. This result is inconsistent with Bell et al. (2002) because their research is concentrated on profitable technological firms only. Table 1 also reveals that employee option expense adds to already negative abnormal earnings and pushes them even more into the negative territory.

Table 1

Descriptive Statistics for Firm-Year Observations for the Biotech Industry -- Years 1995-2005

Variable	N	Mean	Standard deviation	Quartiles		
				25	50	75
MVAL	868	403.40919	1365.25826	27.07440	109.99597	338.26675
BVAL	856	57.62343	114.43208	1.51375	19.21269	70.54838
BVAL_ADJ	845	38.95910	104.73030	-1.39544	11.61661	55.82110
AB_ERN	774	-27.33412	50.82949	-36.15973	-15.24480	-3.85155
AB_ERN_IN	764	-34.03779	51.57690	-43.42499	-18.76264	-5.77574
IMPL_OE	841	5.43154	9.72602	0.44650	1.83200	6.29500
BV_PS	936	-1.87072	280.50327	0.22250	1.64650	4.27175
CS_O	932	29.09724	52.88785	3.47675	17.63200	36.79925
P_PS	928	142.85936	1172.24362	3.56500	8.65500	24.04425
IB	931	-19.40418	55.40500	-26.92500	-11.26800	-3.39500

MVAL is market value of firm  $i$  in a year  $t$  (Compustat Item #25 \* Item #199); BVAL is book value of equity of firm  $i$  in a year  $t$  (Compustat #25 \* BKVLPS); BVAL\_ADJ is adjusted book value and equals BVAL less IMPY\_OE accumulated since 1995; AB\_ERN is abnormal earnings of firm  $i$  in a year  $t$  and equals  $NI_{it} - rBVAL_{i,t-1}$ ; NI equals net income before extraordinary items and discontinued operations for fiscal year  $t$  (Compustat Item #18);  $r$  is the rate required by the investors, or a normal return on equity book value; IMPY\_ is option expense amount (Compustat Item #399); BV\_PS is book value per share (Compustat BKVLPS); CS\_O is number of common shares outstanding (Compustat Item # 25); P\_PS is price per share (Compustat Item # 199); IB is income before extra ordinary items (Compustat Item # 18).

Table 2 contains Pearson correlations matrix and reveals that most of the variables are highly correlated with each other. In particular the book value (BVAL) and the adjusted for employees' stock option expense book value

(BVAL\_ADJ) are strongly positively correlated with market value (MVAL) and with each other. There is also strong negative correlation between abnormal earnings and book value and between abnormal earnings adjusted for employees' stock option expense and book value, which leads to the conclusion that expensing stock options negatively affects equity; therefore, it indicates that there is a possible transfer of wealth from equity owners to the employees who hold those options. On the other side, the size of the option expense (IMPL\_OE) is strongly positively correlated with book value, which would imply that bigger firms have a larger compensation payout in the form of employees' stock options. Surprisingly there is no correlation between abnormal earnings (AB\_ERN) and market value (MVAL), although there is strong negative correlation between abnormal earnings adjusted for option expense (AB\_ERN\_IMPL) and market value, which should be of no surprise because the negative earnings can't go on indefinitely, and between abnormal earnings (AB\_ERN) and option expense (IMPL\_OE), which follows the same logic.

Table 3, present regression summary statistics corresponding to the abnormal earnings and valuation equations based on APB No. 25 as expressed by equations (1a) and (1b).

Table2  
Pearson Correlations among Independent and Dependent Variables

Variable	MVAL	BVAL	BVAL_ADJ	AB_ERN	AB_ERN_IMPL	IMPL_OE	BV_PS	CS_O	P_PS	IB
MVAL	1									
BVAL	.699 <sup>***</sup>	1								
BVAL_ADJ	.356 <sup>***</sup>	.961 <sup>***</sup>	1							
AB_ERN	.026	-.230 <sup>***</sup>	-.199 <sup>***</sup>	1						
AB_ERN_IM	-.123 <sup>***</sup>	-.362 <sup>***</sup>	-.245 <sup>***</sup>	.987 <sup>***</sup>	1					
IMPL_OE	.546 <sup>***</sup>	.522 <sup>***</sup>	.312 <sup>***</sup>	-.429 <sup>***</sup>	-.580 <sup>***</sup>	1				
BV_PS	.008	.070 <sup>**</sup>	.094 <sup>***</sup>	.104 <sup>***</sup>	.114 <sup>***</sup>	.004	1			
CS_O	.667 <sup>***</sup>	.465 <sup>***</sup>	.328 <sup>***</sup>	-.015	-.232 <sup>***</sup>	.493 <sup>***</sup>	.022	1		
P_PS	-.018	-.071 <sup>**</sup>	-.082 <sup>**</sup>	-.095 <sup>***</sup>	-.091 <sup>**</sup>	-.007	-.184 <sup>***</sup>	-.092 <sup>***</sup>	1	
IB	.136 <sup>***</sup>	-.051	-.032	.972 <sup>***</sup>	.937 <sup>***</sup>	-.309 <sup>***</sup>	.088 <sup>***</sup>	.082 <sup>**</sup>	-.079 <sup>**</sup>	1

\*\*\*, \*\*, \*, significance at .01, .05, and .10 level, respectively.

Panel A of Table 3 reveals that, as predicted, current period abnormal earnings are incrementally informative regarding future abnormal earnings at all levels of the cost of capital (coefficients for both variables are highly significant for all levels of discount rates). Adjusted  $R^2$ s for the annual regressions are consistent with Collins et al. (1999) and they increase with increasing cost of capital. This suggests that the required return plays bigger role as a component of earnings at higher cost of capital and its explanatory power, with respect to market values, increases with more risk-taking. The coefficients on book values are all negative and significant. This is due to the fact that on average earnings are negative and book values are positive. Panel B reveals that abnormal earnings and book values are strong predictors of market values. The coefficients for both variables are positive and highly significant for all levels of required returns. Therefore the conclusion is that under APB No. 25 valuation method assumption the predictive power of abnormal earnings and book values, in respect to market value of the firm, stays relatively constant for the interest rates between 5 and 20 percent, which confirms H1(a) and H1(b).

Table 4 presents regression summary statistics corresponding to the abnormal earnings and valuation equations (2a) and (2b). It contains results of regression of abnormal earnings adjusted for the employees' stock option expense (AB\_ERN\_IMPL) on prior year's expense and adjusted, for the cumulative effect of that expense, book value (BVAL\_ADJ). The adjusted R<sup>2</sup>s increases when compared with results in Table 3.

Table 3  
Regressions of Abnormal Earnings and Equity Market Value Based on APB No. 25

Panel A: Abnormal Earnings Equation

$$AB\_ERN_{it} = \alpha_0 + \alpha_1 AB\_ERN_{i,t-1} + \alpha_2 BVAL_{i,t-1} + \varepsilon_{it}$$

Cost of Capital	N	Int.		AB_ERN			BVAL			Adj. R <sup>2</sup>
		t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	
5%	614	-2.957	0.003	0.501***	15.704	0.000	0.314***	-9.831	0.000	0.381
10%	614	-3.016	0.003	0.479***	15.549	0.000	-0.377***	-12.226	0.000	0.439
12%	614	-3.058	0.002	0.469***	15.455	0.000	-0.400***	-13.173	0.000	0.463
15%	614	-3.136	0.002	0.454***	15.287	0.000	-0.433***	-14.585	0.000	0.499
20%	614	-3.298	0.001	0.428***	14.952	0.000	-0.484***	-16.913	0.000	0.555

Panel B: Valuation Equation

$$MVAL_{it} = \beta_0 + \beta_1 AB\_ERN_{i,t} + \beta_2 BVAL_{i,t} + \varepsilon_{it}$$

5%	763	3.271	0.001	0.122***	4.839	0.000	0.726***	28.688	0.000	0.519
10%	763	3.318	0.001	0.128***	5.002	0.000	0.737***	28.769	0.000	0.520
12%	763	3.333	0.001	0.13***	5.061	0.000	0.741***	28.755	0.000	0.520
15%	763	3.352	0.001	0.134***	5.142	0.000	0.747***	28.696	0.000	0.521
20%	763	3.375	0.001	0.140***	5.260	0.000	0.758***	28.514	0.000	0.522

\*\*\*, \*\*, \*, significance at .01, .05, and .10 level, respectively.

AB\_ERN<sub>it</sub> is abnormal earnings of firm *i* in a year *t* and equals NI<sub>it</sub> - rBVAL<sub>i,t-1</sub>; AB\_ERN<sub>i,t-1</sub> is abnormal earnings of firm *i* lagged one year; BVAL<sub>i,t-1</sub> is book value of firm *i* lagged one year; MVAL<sub>it</sub> is market value of firm *i* in a year *t*; BVAL<sub>i,t</sub> is book value of equity of firm *i* in a year *t*; ε<sub>it</sub> is an error term.

which would imply that inclusion of additional information into the equation improves its predictive power. Panel A reveals that prior period AB\_ERN\_IMPL and BVAL\_ADJ hold, similar to the results in Table 3, relation to the current



period AB\_ERN. In the valuation equation though the coefficients on AB\_ERN\_IMPL become insignificant and there is noticeable drop in adjusted R<sup>2</sup>s. This could be a result of a decreasing level of book value of equity which, according to Collins et al. (1999), induces bias into the valuation equation. Those results confirm H2(a) and partially H2(b).

Table 4  
Regressions of Abnormal Earnings and Equity Market Value Based on SFAS No. 123

Panel A: Abnormal Earnings Equation

$$AB\_ERN\_IMPL_{it} = \alpha_0 + \alpha_1 AB\_ERN\_IMPL_{i,t-1} + \alpha_2 BVAL\_ADJ_{i,t-1} + \varepsilon_{it}$$

Cost of Cap.	N	Int.		AB_ERN_IMPL			BVAL_ADJ			Adj. R <sup>2</sup>
		t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	
5%	601	-4.414	0.000	0.524***	16.777	0.000	-0.330***	-10.555	0.000	0.420
10%	601	-4.513	0.000	0.516***	17.275	0.000	-0.382***	-12.782	0.000	0.480
12%	601	-4.570	0.000	0.512***	17.456	0.000	-0.401***	-13.654	0.000	0.503
15%	601	-4.671	0.000	0.506***	17.710	0.000	-0.427***	-14.942	0.000	0.537
20%	601	-4.873	0.000	0.494***	18.088	0.000	-0.465***	-17.041	0.000	0.589

Panel B: Valuation Equation

$$MVAL_{it} = \beta_0 + \beta_1 AB\_ERN\_IMPL_{i,t} + \beta_2 BVAL\_ADJ_{i,t} + \varepsilon_{it}$$

5%	757	4.020	0.000	-0.010	-0.301	0.763	0.362***	10.531	0.000	0.130
10%	757	3.762	0.000	-0.029	-0.831	0.406	0.357***	10.265	0.000	0.130
12%	757	3.668	0.000	-0.036	-1.028	0.304	0.354***	10.141	0.000	0.131
15%	757	3.536	0.000	-0.046	-1.310	0.191	0.35***	9.942	0.000	0.132
20%	757	3.340	0.001	-0.062*	-1.740	0.082	0.343***	9.593	0.000	0.133

\*\*\*, \*\*, \*, significance at .01, .05, and .10 level, respectively.

; AB\_ERN\_IMPL<sub>it</sub> is abnormal earnings of firm *i* in a year *t* and equals NI<sub>it</sub> – rBVAL<sub>i,t-1</sub> – IMPY\_OE<sub>i,t</sub>; BVAL\_ADJ<sub>i,t</sub> is adjusted book value and equals BVAL<sub>i,t</sub> less IMPY\_OE<sub>i,t</sub> accumulated since 1995; ; MVAL<sub>it</sub> is market value of firm *i* in a year *t*.

Table 5 Panel A presents the results of regressing prior period abnormal earnings, adjusted book values, and employee stock option expense on current period abnormal earnings. All the coefficients are highly significant at all levels of cost of capital. The employee stock option expense has a positive and significant association with abnormal earnings. Also the adjusted R<sup>2</sup> improves slightly for all

levels of interest rates. This suggests that stock option expense has incremental explanatory information in explaining earnings. In Panel B of Table 5 are the results of the valuation equation. Again all the coefficients on all the variables show significant positive association of earnings components with market values. The option expense is significantly positively associated with market values which would imply that market values that earnings component separately and considers it an asset rather than the liability. Those results confirm H2(c).

### **Conclusions and Contributions**

This study uses the Ohlson (1995) valuation models to compare the extent to which the APB No. 25 and SFAS No. 123 approaches to accounting for employee stock options reflect the market's assessment of the effects of employee stock options on firm value in biotech industry. We extend the existing literature by examining whether the association between employee stock options and market values of company's stocks continues to persist under different market conditions in highly knowledge intensive biotech industry.

We find that for biotech industry prior period abnormal earnings and prior period book values each have significant explanatory power in forecasting future abnormal earnings incremental to abnormal earnings. Consistent with these findings, we find that for biotech industry abnormal earnings and book values have significant explanatory power in predicting market values. We also find that the association between employee stock options and market value of company's stocks persist under different market conditions but the explanatory power of existing components changes upon introduction of new earnings components in the form of employee stock options. Further, we conclude that the accounting for employee stock option expense (as described under SFAS No. 123) has an incremental explanatory power (relevance), as compared to APB No. 25, in explaining future period abnormal earnings and current period market values and that power remains relatively constant for rates of return between five and twenty percent. Also it appears that market treats the *disclosed* employee stock option

expense as an asset rather than expense, most likely due to the positive association of that item with future earnings.

As discussed earlier, The standard under study does not generally require firms to recognize the expense related to the employee compensation, instead it permits firms to use Accounting Principles Board Opinion No. 25 – Accounting for Stock Issued to Employees – which allows the firm not to recognize employee stock compensation expense if the grant, at the grant date, meets two requirements. This flexibility can affect the results of our study and should be considered as a limitation of our study.

Our study can provide more insights to accounting standard setting bodies in issuance of their future related accounting standards. Our results, which emphasize on the effects of accounting standards related on employee stock options, have implications for employees, firms, investors and society as whole because accounting standards can influence the performance of the firm and its profitability and its stakeholders.

Table 5

Regressions of Abnormal Earnings and Equity Market Value Based on SFAS No. 123 with Stock-Based Compensation Expenses Included

Panel A: Abnormal Earnings Equation

$$AB\_ERN\_IMPL_{it} = \alpha_0 + \alpha_1 AB\_ERN\_IMPL_{i,t-1} + \alpha_2 BVAL\_ADJ_{i,t-1} + \alpha_3 IMPY\_OE_{i,t-1} + \varepsilon_{it}$$

Cost of Capital	N	Int.		AB_ERN_IMPL			BVAL_ADJ			IMPY_OE			Adj. R <sup>2</sup>
		t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	
5%	601	-5.054	0.000	0.59***	16.297	0.000	-0.368***	-11.206	0.000	0.133***	3.486	0.001	0.430
10%	601	-5.112	0.000	0.582***	16.525	0.000	-0.413***	-13.34	0.000	0.127***	3.445	0.001	0.489
12%	601	-5.148	0.000	0.577***	16.582	0.000	-0.429***	-14.173	0.000	0.123***	3.395	0.001	0.512
15%	601	-5.215	0.000	0.568***	16.634	0.000	-0.451***	-15.404	0.000	0.116***	3.287	0.001	0.544
20%	601	-5.352	0.000	0.551***	16.644	0.000	-0.483***	-17.404	0.000	0.102***	3.025	0.003	0.594

Panel B: Valuation Equation

$$MVAL_{it} = \beta_0 + \beta_1 AB\_ERN\_IMPL_{i,t} + \beta_2 BVAL\_ADJ_{i,t} + \beta_3 IMPY\_OE_{i,t} + \varepsilon_{it}$$

Cost of Capital	N	Int.		AB_ERN_IMPL			BVAL_ADJ			IMPY_OE			Adj. R <sup>2</sup>
		t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	
5%	744	0.401	0.688	0.201***	5.888	0.000	0.221***	7.207	0.000	0.59***	16.345	0.000	0.388
10%	744	0.217	0.828	0.193***	5.523	0.000	0.235***	7.652	0.000	0.587***	16.049	0.000	0.385
12%	744	0.141	0.888	0.19***	5.375	0.000	0.24***	7.794	0.000	0.586***	15.931	0.000	0.384
15%	744	0.028	0.978	0.185***	5.153	0.000	0.246***	7.971	0.000	0.583***	15.758	0.000	0.382
20%	744	-0.156	0.876	0.176***	4.792	0.000	0.254***	8.177	0.000	0.578***	15.483	0.000	0.379

\*\*\*, \*\*, \*, significance at .01, .05, and .10 level, respectively. IMPY\_OE<sub>i,t</sub> is option expense amount (Compustat Item #399 – implied stock option expense – as the required *pro forma* adjustment); All other variables as defined in Table 4.

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