

# CEO Compensation in the Pharmaceutical Industry

George P. Roach  
 Founder  
 Multi Discipline Consultants  
 Alan G. Goedde, Ph.D.  
 Partner and Litigation Consultant  
 Freeman & Mills

*Market value, the number of employees and total return underpin CEO pay in at pharmaceutical companies.*



This article statistically examines the key determinants of compensation for CEO's<sup>1</sup> in the pharmaceutical industry. Size, as measured by the log of the company's market value, provides the most explanatory power in addition to the value of the CEO's holdings in the company and the composition of those holdings. The absolute number of employees provides a better explanation for smaller companies in the industry. An interesting relationship is also uncovered between the

CEO's wealth and the total return of the company, perhaps suggesting that stock options provide some incentive for the CEO to maximize his total wealth by improving the company's market value and the stockholders' total return.

The Conference Board has been tracking correlations between executive compensation and the operating results of publicly held corporations for decades.<sup>2</sup> Their studies have established a strong relationship between the revenues and executive compensation for a long period of time in most industries. This so-called elasticity of compensation to sales has been fairly consistent

over time and even fairly similar between different countries. The slope of the linear model, the compensation elasticity measure, varies within a range of .2 to .4 in most industries. Thus, a 10% increase in sales would be expected to correlate with an increase in compensation of 2% to 4%.

Other authorities like Kevin Murphy have brought to our attention the increasing and increasingly dominant importance of executive stock options to total CEO compensation.<sup>3</sup> His studies have chronicled the dramatic rise significance of stock options in executive compensation and has shown that stock options now account for the majority of executive compensation of most large publicly held corporations.<sup>4</sup> There has been little attention paid to whether these principles apply equally well to smaller corporations and whether other explanatory variables are more suitable for predicting the CEO's total compensation of a smaller corporation. For example, in most industry groups of the Conference Board study, companies with less than \$100 million of revenue are only a small portion of the group. The constant term for many of their equations is at least \$900,000.

This article will first confirm the Conference Board and Murphy's observations with recent data on two groups of diverse large corporations.

**Keywords:** *executive compensation; compensation elasticity; pharmaceutical industry*

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**EXHIBIT 1**  
**Summary of Business Week Data**

	<b>Both Executives</b>	<b>Highest Paid Executive</b>	<b>Second Highest Paid Executive</b>
Total for 342 companies			
2001 salaries and bonus	1.56 billion		
2001 option and stock	4.58 billion		
Total	6.14 billion		
1999-2001 total	16.454 billion		
Average salary	2.13 million	2.36 million	1.90 million
Median salary	1.34 million	1.65 million	1.08 million
Grant date value of options (in million \$s)			
Mean	6.26	10.51	2.01
Median	0.93	2.15	0.44
Total compensation <sup>a</sup> (in million \$s)			
Mean	8.39	12.869	3.91
Median	2.85	4.21	1.87
Ratio of option value / total compensation (%)			
Average	40.2	49.3	31.1
Median	40.8	54.9	29.2

**Source:** *Business Week*. [TAKEN DIRECTLY FROM SOURCE? IF SO, PROVIDE PERMISSION]

a. Including salary, bonus, other compensation and grant date value of options.

Then, these principles will be applied to the pharmaceutical industry. Simple correlation models are applied to the data for 184 publicly held corporations that range in size from \$100,000 to \$49 billion in revenues and whose top executive compensation packages range from \$100,000 to \$40 million per year. The results confirm that the Conference Board and Murphy's main conclusions apply to smaller corporations but suggest that different explanatory variables can be more useful than those for large corporations. Finally, the standard errors of estimate for such models indicate that although the models substantially reduce the prediction error, the models do not yet afford narrow confidence intervals.

### Confirmation in Current Data

*Business Week* compiled a group of publicly held companies in their article of May 6, 2002. The database offers observations on the compensation packages of the top two executives of 342 companies including the grant date value of the stock options as calculated by Execucomp. The

data also offer a comparison of each company's three-year stock price performance and the total amounts paid for CEO compensation. The data are summarized in Exhibit 1.

Exhibit 1 shows that stock options account for more than 50% of the total compensation for more than half of the CEOs with an average of 49%. Regression analysis revealed no correlation between a CEO's compensation and the performance of the stock price of that CEO's company for the three prior years.<sup>5</sup> Added insights include that stock options are a much more significant part of the CEO's compensation than for the next highest paid executive, perhaps suggesting that options are the compensation of choice for CEOs. Finally, the literal value of the stock options granted prior to 2001 of the 675 executives from 342 companies was \$14.3 billion, indicating that the total literal value of all stock options amounts to tens of billions dollars. Also note that the literal value of an executive's stock options exceeds annual total compensation. The ratio of literal option value to annual compensation has an average of 6.2 but a median of 1.5.

**EXHIBIT 2**  
**Summary of The Wall Street Journal Data**

	<b>Market Capitalization</b>	<b>Annual Revenue</b>
Mean (in million \$s)		
Sample of 347	17,782	11,948
Population of 1,455 <sup>a</sup>	7,468	10,296
Median (in million \$s)		
Sample of 347	6,377	6,249
Population of 1,455	2,154	2,412

a. According to our research, there are 1,455 publicly held corporations with revenues exceeding \$1 billion.

**EXHIBIT 3**  
**CEO Compensation for 2001 for The Wall Street Journal Subset (in dollars)**

	<b>Total</b>	<b>Average</b>
Salary	314 million	905,000
Bonus	415 million	1,197,000
Options	2,527 million	7,283,000
Other	482 million	1,388,000
Total	3,739 million	10,773,000

### Confirmation in Other Data

*The Wall Street Journal* published a special section on executive compensation on April 11, 2002. Included in that article was a database of approximately 347 corporations from various industries with revenues in excess of \$1 billion and who had filed their 2002 proxy statements by April 3, 2002. They are not the largest 347 corporations, but they are disproportionately large as shown in Exhibit 2 in a comparison with the 1,455 publicly held corporations that are believed to have revenues in excess of \$1 billion.

*The Wall Street Journal* database offers a different perspective on the value of executive stock options. It provides two statistics: the gains that executives realized in that year by exercising their options, that is, the difference in the total option price and market value of the stock on the date that the options were exercised. Second, it provides the current literal value of the executive stock options. However, neither number includes the value of the stock options on the date that they are granted. Arguably, grant date value is the only gain that is relevant to the calculation of compensation; any change in the value or realization after the grant date would seem to be more related to investment return after they are

granted. For the purpose of comparison, the grant date value of the stock options was also included in the database (as reported to the SEC on the annual proxy statement).

Some companies report the value of the options according to the Black & Scholes method (calculated on the grant date), but many just comply with the alternative SEC disclosure requirement that the options' "value" be calculated by assuming that the underlying common stock appreciates at 5% or 10% per year for the life of the options. The 2001 option program for Marsh & McLennan demonstrates how, in the extreme, this alternative can generate absurd numbers. With a 20-year life, the value of an option per share of \$558 was about six times the market price of the stock on the date of issuance.

Four categories of compensation were established for this analysis:

1. Cash compensation: salary plus bonus and other income
2. Total compensation: cash compensation plus the grant value of options (as reported by the company to the SEC)
3. Cash received: cash compensation plus conversion gains

**EXHIBIT 4**  
**Wall St. Journal Database Summary of Data Fields**

	<b>Low</b>	<b>High</b>	<b>Mean</b>	<b>Median</b>	<b>Standard Deviation</b>	<b>Total</b>
Financial company = 1	0	1	0.16	0	0.37	56
Utility = 1	0	1	0.05	0	0.22	18
New CEO = 1	0	1	0.14	0	0.35	49
Employees	1,900	371,000	42,293	23,100	53,690	14,675,719
2001 salary (\$000s)	0	3,142	905	898	385	314,160
2001 bonus (\$000s)	0	23,000	1,197	661	2,061	415,229
2001 salary and bonus (\$000s)	0	24,000	2,102	1,559	2,196	729,390
Option grant value (\$000s)	1	172,946	7,283	3,132	14,599	2,527,098
Other compensation (\$000s)	0	47,880	1,388	35	3,951	481,689
Total current compensation (\$000s)	1	172,946	10,773	6,203	16,218	3,738,177
Salary (%)	0.00	99.90	20.84	13.89	20.74	
Bonus income (%)	0.00	90.09	14.07	10.24	15.51	
Option grant value (%)	0.01	100.00	53.84	58.36	27.96	
Other compensation (%)	0.00	76.26	11.25	0.77	16.56	
Realized option gains (\$000s)	0	706,077	4,595	0	39,067	1,594,463
Unrealized option gains (\$000s)	0	757,644	21,735	4,683	59,702	7,542,074
Stock ownership value (\$000s)	0	36,073,750	315,161	8,179	2,428,238	109,360,947
Stock ownership (%)	0.000	45.468	1.748	0.137	6.234	
1-year return-company (%)	-96.90	389.50	6.92	3.25	46.58	
5-year return-company (%)	-43.00	87.10	9.53	9.60	14.00	
1-year return-indexed industry (%)	-76.60	348.60	-2.32	-3.80	31.05	
5-year return-indexed industry (%)	-12.90	88.30	9.22	9.45	8.42	
Market capitalization (\$MMs)	23	319,080	17,878	6,361	35,055	6,203,525
Revenues (\$MMs)	1,013	127,018	11,955	6,149	15,524	4,148,534
% held by insiders	0.00	95.00	6.47	1.08	14.22	
Total return-5-year (%)	-97.00	417.20	27.24	18.30	68.65	
Forward P/E (current year)	0.3	204.6	19.4	16.3	16.7	
Return on equity (%)	0.00	859.30	22.71	13.70	66.83	
Return on assets (%)	-83.20	20.60	2.82	2.50	7.43	
Yield	0.04	23.01	2.66	2.23	2.14	
Comp/market	0.00	0.12	0.00	0.00	0.01	1
Comp/rev	0.00002%	1.78793%	0.15502%	0.09573%	0.20003%	1
Cash compensation (\$000s)	0	52,880	3,490	2,129	5,048	1,211,079
Total compensation (\$000s)	1	172,946	10,773	6,203	16,218	3,738,177
Cash receipts (\$000s)	0	706,077	8,085	2,845	39,470	2,805,542
Total wealth in company (\$000s)	101	1,636,667	37,103	14,479	102,750	12,874,715
Log cash compensation	0.000	4.723	3.311	3.328	0.508	
Log total compensation	0.000	5.238	3.774	3.793	0.513	
Log cash receipts	0.000	5.849	3.459	3.454	0.564	
Log total wealth in compensation	2.004	6.214	4.145	4.161	0.605	
Log employees	3.279	5.569	4.385	4.364	0.454	
Log value of stock holdings	0.000	7.557	3.963	3.913	1.025	
Log market capitalization	1.362	5.504	3.792	3.804	0.657	
Log of revenues	3.006	5.104	3.833	3.789	0.450	

**Note:** Variables in bold font are included in the correlation matrix in Exhibit 2.

4. Total wealth: total compensation plus gains from converting options and the literal value of all options granted in prior years

The sample of 347 companies clearly shows the relatively small role that salary and bonuses play in the compensation of a CEO of a major corporation. Exhibit 3 reflects the amounts a group of companies with an aggregate market capitalization of \$6.2 trillion and revenues of \$4.1 trillion spent on CEO compensation in 2001. For each CEO, without giving effect to the relative size, salary and bonus amounted to an average of 35% of total compensation. See Exhibit 4 for the summary statistics of the database.

Some additional fields of data were added to *The Wall Street Journal* database and are based on different assumptions. For example, the two variables covering stock ownership include only the stock that the CEO actually owns, excluding options. The variable of “% held by insiders” does include options in the insiders’ holdings.

Exhibit 5 summarizes the correlation matrix for this subset of companies. Except for cash compensation, the strongest correlation is between the log of compensation and the log of market capitalization. The correlation between the log of compensation and log of revenue is significant but not as large as for market value except for cash compensation, with which the log of revenues has a stronger relationship. In a multiple variable model, three other variables are significant. The percentage of the stock owned by insiders is inversely correlated to compensation for all four definitions of compensation. This could represent the fact that some executives have such a large holding in their companies that they take little or no direct compensation, such as at Berkshire Hathaway where Warren Buffet receives no salary. On the other hand, it could also represent a secondary impact of size: As corporations increase in size, the insiders tend to own a smaller share.<sup>7</sup>

Linear regression generated the following equations:

$$\begin{aligned}
 (1) \quad & \text{Log Tot Comp.} = 2.25 \\
 & \quad (16.2) \\
 & + .408 \text{ Log Mkt Cap.} - .0052 \% \text{ Held} \\
 & \quad (11.4) \quad \quad (-3.1) \\
 & \quad + .158 \text{ New CEO} \\
 & \quad \quad (2.4) \\
 & - .00000004 \text{ Stock Ownership} \\
 & \quad \quad (3.52)
 \end{aligned}$$

$$\begin{aligned}
 R^2(\text{adj.}) &= 32.6\%; \\
 \text{standard error of estimate} &= .4208
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad & \text{Log Cash Recpt} = 1.86 \\
 & \quad (11.6) \\
 & + .38 \text{ Log Rev} - .00318 \% \text{ Held} \\
 & \quad (9.2) \quad \quad (-2.3) \\
 & + .00925 \text{ Ret on Assets} \\
 & \quad (3.7) \\
 & + .186 \text{ Financial Exec} \\
 & \quad (3.7) \\
 & - .00000004 \text{ Stock Ownership} \\
 & \quad (-4.6)
 \end{aligned}$$

$$\begin{aligned}
 R^2(\text{adj.}) &= 29.8\%; \\
 \text{standard error of estimate} &= .3388
 \end{aligned}$$

$$\begin{aligned}
 (3) \quad & \text{Log Tot Wealth} = 2.4 \\
 & \quad (15.3) \\
 & + .461 \text{ Log Mkt Cap} - .0077 \% \text{ Held} \\
 & \quad (9.6) \quad \quad (-5.2) \\
 & + .0019 \text{ Total Return (\%)} \\
 & \quad (4.6) \\
 & - .00000004 \text{ Stock Ownership} \\
 & \quad (-3.7)
 \end{aligned}$$

$$\begin{aligned}
 R^2(\text{adj.}) &= 43\%; \\
 \text{standard error of estimate} &= .4632
 \end{aligned}$$

$$\begin{aligned}
 (4) \quad & \text{Log Cash Comp} = 1.96 \\
 & \quad (12.1) \\
 & + .355 \text{ Log Rev} - .00529 \% \text{ Held} \\
 & \quad (8.4) \quad \quad (-4.0) \\
 & + .0088 \text{ Return on Assets (\%)} \\
 & \quad (3.4) \\
 & + .154 \text{ Financial Company} \\
 & \quad (3.0)
 \end{aligned}$$

$$\begin{aligned}
 R^2(\text{adj.}) &= 25.6\%; \\
 \text{standard error of estimate} &= .3488
 \end{aligned}$$

When cash compensation is added to the literal value of the exercisable and non-exercisable options, a third variable is relevant: the five-year total return of the corporation. This is the only evidence that links a company’s performance and the CEO’s compensation. On the other hand, it makes sense that a cumulative measure of value like the potential options value would be correlated with total company return. Finally, it appears that a CEO’s cash compensation is higher if he works for a financial company.

**EXHIBIT 5**  
**Wall Street Journal Database Correlation Database**

Financial Company = 1	Utility = 1	New CEO = 1	Employees	2001 Salary	2001 Bonus	2001 Salary and Bonus	Option Grant Value	Other Comp.	Total Current Comp.	Realized Option Games	Unrealized Option Gains	Stock Ownership Value	1-Year Return-Co.	5-Year Return-Co.	Market Cap.	Revenues	% Held by Insiders	
Utility = 1	-0.103 5.6%																	
New CEO = 1	-0.020 70.5%	-0.095 7.8%																
Employees	-0.046 39.0%	-0.115 3.2%	0.017 74.7%															
2001 salary	-0.044 41.0%	0.008 88.8%	-0.165 0.2%	0.426 0.0%														
2001 bonus	0.274 0.0%	-0.016 77.0%	-0.078 14.9%	0.303 0.0%	0.269 0.0%													
2001 salary and bonus	0.249 0.0%	-0.013 80.3%	-0.102 5.8%	0.360 0.0%	0.427 0.0%	0.986 0.0%												
Option grant value	-0.012 93.1%	-0.055 30.5%	0.075 16.3%	0.128 1.7%	0.059 27.2%	0.058 28.1%	0.065 22.8%											
Other compensation	0.056 29.5%	-0.002 97.8%	0.028 60.7%	0.173 0.1%	0.268 0.0%	0.260 0.0%	0.291 0.0%	0.176 0.1%										
Total current compensation	0.037 49.1%	-0.052 33.5%	0.061 26.1%	0.206 0.0%	0.177 0.1%	0.249 0.0%	0.265 0.0%	0.952 0.0%	0.441 0.0%									
Realized option gains	0.007 90.3%	-0.024 66.2%	-0.041 45.1%	0.057 29.3%	-0.075 16.5%	0.044 41.9%	0.028 60.6%	0.597 0.0%	0.005 92.9%	0.543 0.0%								
Unrealized option gains	0.039 47.3%	-0.060 26.3%	-0.095 7.9%	0.167 0.2%	0.136 1.1%	0.160 0.3%	0.174 0.1%	0.610 0.0%	0.050 35.3%	0.585 0.0%	0.725 0.0%							
Stock ownership value	0.109 4.2%	-0.030 58.3%	-0.051 33.9%	0.054 32.0%	-0.156 0.4%	-0.029 58.5%	-0.055 30.7%	0.242 0.0%	-0.016 76.5%	0.206 0.0%	0.422 0.0%	0.300 0.0%						
1-year return-company	-0.079 14.5%	-0.066 22.7%	-0.097 7.4%	-0.052 34.0%	-0.009 87.1%	0.056 30.2%	0.051 34.7%	-0.194 0.0%	-0.062 25.9%	-0.181 0.1%	-0.069 20.6%	-0.076 16.1%	-0.054 32.5%					
5-year return-company	0.175 0.2%	0.025 66.1%	-0.024 66.5%	0.096 8.5%	0.045 42.0%	0.215 0.0%	0.206 0.0%	0.173 0.2%	0.082 14.3%	0.201 0.0%	0.149 0.8%	0.315 0.0%	0.133 1.7%	-0.047 40.4%				
Market capitalization	0.090 9.4%	-0.059 27.2%	0.093 8.5%	0.556 0.0%	0.358 0.0%	0.343 0.0%	0.384 0.0%	0.290 0.0%	0.188 0.0%	0.359 0.0%	0.107 4.6%	0.233 0.0%	0.287 1.7%	-0.111 4.1%	0.260 0.0%			
Revenues	0.069 20.2%	0.044 41.4%	0.015 78.6%	0.749 0.0%	0.446 0.0%	0.463 0.0%	0.512 0.0%	0.166 0.0%	0.139 0.9%	0.253 0.0%	0.059 27.0%	0.158 0.3%	0.091 8.9%	-0.091 9.3%	0.136 1.5%	0.718 0.0%		
% held by insiders	-0.023 67.4%	-0.102 5.7%	0.041 44.5%	-0.018 73.3%	-0.121 2.4%	-0.086 10.8%	-0.102 5.7%	-0.104 5.3%	-0.093 8.3%	-0.130 1.5%	-0.023 66.9%	-0.070 19.6%	0.283 0.0%	0.095 8.1%	-0.038 49.6%	-0.052 33.2%	-0.072 17.8%	
Total return-5-year (%)	0.168 0.2%	0.110 4.9%	-0.042 45.2%	0.012 82.9%	0.014 80.0%	0.223 0.0%	0.209 0.0%	0.122 65.9%	0.025 1.1%	0.142 16.7%	0.077 0.0%	0.279 16.3%	0.078 44.0%	0.043 0.0%	0.668 0.0%	0.175 0.2%	0.079 15.7%	
Forward P/E	-0.103 6.4%	-0.124 2.6%	-0.007 90.4%	0.005 92.9%	0.025 64.9%	-0.089 10.8%	-0.080 15.1%	0.051 36.2%	-0.029 60.8%	0.028 61.6%	0.008 88.8%	0.018 74.4%	0.043 43.5%	-0.145 1.0%	0.039 49.6%	0.022 69.7%	-0.010 86.3%	
Return on equity (%)	-0.069 24.5%	-0.041 49.5%	0.074 21.3%	0.027 65.1%	0.053 37.0%	0.048 42.5%	0.054 36.8%	0.013 82.9%	0.062 29.8%	0.033 57.5%	0.007 91.1%	0.133 2.5%	0.001 98.0%	-0.021 72.7%	0.019 76.3%	0.035 55.8%	-0.014 81.5%	
Return on assets (%)	-0.091 9.2%	-0.005 93.0%	-0.124 2.1%	0.017 75.4%	0.059 27.7%	0.092 8.8%	0.096 7.3%	0.077 15.3%	0.081 13.1%	0.102 5.8%	0.138 1.0%	0.157 0.3%	0.075 16.5%	0.122 2.5%	0.301 0.0%	0.199 0.0%	0.023 66.9%	
Cash compensation	0.152 0.4%	-0.007 89.6%	-0.023 67.5%	0.292 0.0%	0.396 0.0%	0.632 0.0%	0.663 0.0%	0.166 0.2%	0.909 0.0%	0.460 0.0%	0.016 76.9%	0.115 3.2%	-0.037 49.7%	-0.026 63.5%	0.148 0.8%	0.315 0.0%	0.332 0.0%	
Total compensation	0.037 49.1%	-0.052 33.5%	0.061 26.1%	0.206 0.0%	0.177 0.1%	0.249 0.0%	0.265 0.0%	0.952 0.0%	0.441 0.0%	1.000 0.0%	0.543 0.0%	0.585 0.0%	0.206 0.1%	-0.181 0.0%	0.201 0.0%	0.359 0.0%	0.253 0.0%	
Cash Receipts	0.026 62.9%	-0.024 65.4%	-0.043 42.4%	0.093 66.6%	-0.023 2.1%	0.124 3.7%	0.112 0.0%	0.612 2.4%	0.121 0.0%	0.596 0.0%	0.992 0.0%	0.733 0.0%	0.413 19.0%	-0.072 0.3%	0.166 0.6%	0.146 6.0%	0.101 48.3%	
Total wealth in company	0.031 56.7%	-0.052 33.3%	-0.061 25.8%	0.151 14.4%	0.079 0.5%	0.149 0.4%	0.154 0.0%	0.732 6.2%	0.100 0.0%	0.704 0.0%	0.887 0.0%	0.949 0.0%	0.367 0.0%	-0.099 7.0%	0.270 0.0%	0.227 0.0%	0.154 0.4%	
Log cash compensation	0.162 0.3%	0.066 21.9%	-0.042 43.1%	0.230 0.0%	0.552 0.0%	0.524 0.0%	0.589 0.0%	-0.104 5.3%	0.488 0.0%	0.105 5.1%	-0.287 0.0%	-0.102 5.7%	-0.283 0.0%	0.084 12.4%	0.150 0.7%	0.203 0.0%	0.286 0.0%	
Log total compensation	0.108 4.5%	-0.005 92.4%	0.105 5.1%	0.276 0.0%	0.432 0.0%	0.369 0.0%	0.422 0.0%	0.582 0.0%	0.356 0.0%	0.667 0.0%	0.191 0.0%	0.350 0.0%	-0.117 0.0%	-0.183 0.1%	0.235 0.0%	0.286 0.0%	0.318 0.0%	
Log cash receipts	0.215 0.0%	0.026 63.2%	-0.110 4.0%	0.256 0.0%	0.473 0.0%	0.497 0.0%	0.550 0.0%	0.242 0.0%	0.408 0.0%	0.391 0.0%	0.337 0.0%	0.357 0.0%	-0.027 61.3%	0.034 53.9%	0.321 0.0%	0.251 0.0%	0.305 0.0%	
Log total wealth	0.152 0.5%	-0.035 51.9%	-0.021 70.1%	0.290 0.0%	0.431 0.0%	0.375 0.0%	0.427 0.0%	0.515 0.0%	0.259 0.0%	0.584 0.0%	0.266 0.0%	0.576 0.0%	-0.107 4.7%	-0.108 4.8%	0.440 0.0%	0.295 0.0%	0.312 0.0%	

(continued)

**EXHIBIT 5**  
**Wall Street Journal Database Correlation Database**

Total Return	5-Year Forward Return (%)	Return on Equity (%)	Return on Assets (%)	Cash Comp.	Total Comp.	Cash Receipts	Total Wealth in Co.	Log Cash Comp.	Log Total Comp.	Log Cash Receipts	Log Total Wealth	Log Employees	Log Stock Holdings	Log Market Cap.	Log Revenues	Stock Own (%)
-0.032																
56.6%																
-0.074	-0.057															
18.3%	32.4%															
-0.008	0.005	0.021														
89.0%	93.7%	72.2%														
-0.025	0.369	-0.155	0.319													
64.2%	0.0%	5.5%	0.0%													
-0.117	0.103	-0.057	0.073	0.106												
2.9%	6.3%	30.5%	22.3%	4.9%												
-0.130	0.142	0.028	0.033	0.102	0.460											
1.5%	1.1%	61.6%	57.5%	5.8%	0.0%											
-0.038	0.089	0.001	0.015	0.150	0.144	0.596										
10.9%	99.3%	80.1%	0.5%	0.7%	0.0%											
-0.070	0.213	0.018	0.083	0.160	0.145	0.704	0.897									
19.5%	0.0%	74.8%	16.3%	0.3%	0.7%	0.0%	0.0%									
-0.166	0.162	-0.083	0.086	0.114	0.638	0.105	-0.203	-0.152								
0.2%	0.3%	13.6%	14.8%	3.4%	0.0%	5.1%	0.0%	0.5%								
-0.254	0.183	0.025	0.093	0.035	0.462	0.667	0.248	0.381	0.578							
0.0%	0.1%	64.8%	11.7%	51.9%	0.0%	0.0%	0.0%	0.0%	0.0%							
-0.192	0.300	-0.061	0.060	0.204	0.558	0.391	0.405	0.397	0.732	0.649						
0.0%	0.0%	26.9%	31.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%						
-0.264	0.401	0.002	0.129	0.141	0.389	0.584	0.313	0.528	0.459	0.829	0.680					
0.0%	0.0%	97.0%	2.9%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%					

(continued)

EXHIBIT 5 (continued)

Financial Company = 1	2001		2001 Employees	2001 Salary	2001 Bonus	Salary and Bonus	Option Grant Value	Other Comp.	Total Current Comp.	Realized Option Games	Unrealized Option Gains	Stock Ownership Value	Total 1-Year Return-Co.	5-Year Return-Co.	Market Cap.	Revenues	% Held by Insiders
	Utility = 1	New CEO = 1															
Log employees	-0.043 42.4%	-0.118 2.7%	0.004 94.6%	0.827 0.0%	0.409 0.0%	0.220 0.0%	0.278 0.0%	0.197 0.0%	0.154 0.4%	0.252 0.0%	0.057 29.2%	0.163 0.2%	0.085 11.5%	-0.076 16.3%	0.110 4.9%	0.484 0.0%	0.649 0.0%
Log stock holdings	0.290 0.0%	-0.100 6.3%	-0.239 0.0%	0.132 1.4%	0.147 0.6%	0.253 0.0%	0.263 0.0%	0.187 0.0%	0.131 0.0%	0.236 0.0%	0.210 0.0%	0.359 0.0%	0.377 0.0%	-0.035 0.0%	0.412 0.0%	0.291 0.0%	0.169 0.2%
Log market capitalization	0.256 0.0%	0.026 62.9%	-0.011 84.3%	0.519 0.0%	0.430 0.0%	0.342 0.0%	0.397 0.0%	0.348 0.0%	0.219 0.0%	0.420 0.0%	0.124 2.1%	0.308 0.0%	0.185 0.1%	-0.240 0.0%	0.469 0.0%	0.680 0.0%	0.622 0.0%
Log revenues	0.104 5.3%	0.093 8.4%	-0.026 63.5%	0.675 0.0%	0.440 0.0%	0.381 0.0%	0.434 0.0%	0.238 0.0%	0.199 0.0%	0.321 0.0%	0.060 0.0%	0.182 0.1%	0.107 4.6%	-0.159 0.3%	0.172 0.2%	0.576 0.0%	0.832 0.0%
Stock own %	0.072 18.1%	-0.062 24.8%	-0.104 5.3%	-0.070 19.1%	-0.185 0.1%	-0.062 24.9%	-0.091 9.2%	0.110 4.1%	-0.045 40.0%	0.075 16.1%	0.270 0.0%	0.196 0.0%	0.482 0.0%	-0.009 87.1%	0.088 11.4%	0.001 98.2%	-0.080 13.5%

Note: Co. = company; Comp. = compensation; Cap. = capitalization.

Two key points remain. First, the statistical fit, as measured by the coefficient of determination, is not particularly impressive and certainly not large enough to make any strong conclusions. More important, the standard error of estimate is high. For a corporation with a market value of \$5 billion, this translates to a standard error of estimate of \$10,420,000. Although this is less than the standard deviation of total compensation (\$16,557,000) and represents an improvement, it does not promote precise predictions.

Overall, this brief analysis would suggest that stock options, although the largest part of the CEO's compensation, may be used more as an incentive than a reward. Note the correlation between five-year performance of the company and the value of the CEO's deferred stock option value. Given the large size of the literal value of the accumulated stock options relative to annual cash compensation, the incentive to maximize wealth may exceed those to maximize compensation.

### Application to the Pharmaceutical Industry

This strong body of supporting theory and empirical evidence is of limited practical use for smaller companies. Is there a floor for CEO compensation, regardless of size? Does the composition of compensation for smaller companies also show a secondary role for salary?

The pharmaceutical industry offers an opportunity to research such questions. Revenues in the industry range from \$100,000 to \$47 billion. The 184 public companies used for this study have market values that range from \$8 million to \$285 billion. Data for compensation were drawn

from each company's most recent proxy statement, as filed with the SEC. Other company financial and operating information was obtained from secondary summaries generated by Hoovers Online. The data categories are defined in Exhibit 6, and the database summary statistics are listed in Exhibit 7.

Some data were excluded, generally on the basis of the unavailability of compatible data. Foreign corporations were excluded for lack of full compensation data. Surprisingly, the data for smaller public companies are as thorough as that for larger companies, and therefore the group of corporations excluded was not disproportionately smaller companies. Finally, note that the data drawn from a company's proxy statement were for the highest paid executive, regardless of title. Thus, the highest paid executive might be either the chairman of the board or the chief executive officer.

Some data are not fully synchronized in time with the compensation decision. Data such as revenues and net income of the company refer to the annual results for the year in which the compensation is awarded. Similarly, the measure of five-year performance of the equity investment is based on a date six months past the end of most companies' fiscal year. However, the company's total market value is based on the option strike price, which should reflect the market value on the date of the options award.

### Valuation of Executive Stock Options

Practically all stock option plans include the following features:

1. ten-year life,



## EXHIBIT 5 (continued)

Return 5-Year (%)	Forward P/E	Return on Equity (%)	Return on Assets (%)	Cash Comp.	Total Comp.	Cash Receipts	Total Wealth in Co.	Log Cash Comp.	Log Total Comp.	Log Cash Receipts	Log Total Wealth	Log Employees	Log Stock Holdings	Log Market Cap.	Log Revenues	Stock Own (%)
-0.038 47.8%	-0.009 87.9%	0.060 28.0%	0.048 42.2%	0.008 88.5%	0.242 0.0%	0.252 0.0%	0.087 10.6%	0.156 0.3%	0.212 0.0%	0.342 0.0%	0.245 0.0%	0.324 0.0%				
0.106 4.8%	0.358 0.0%	0.022 97.5%	0.002 0.0%	0.236 0.0%	0.217 0.0%	0.236 0.0%	0.235 0.0%	0.325 0.0%	0.151 0.5%	0.175 0.1%	0.320 0.0%	0.276 0.0%	0.136 1.1%			
-0.127 1.8%	0.398 0.0%	0.055 32.6%	0.076 20.3%	0.247 0.0%	0.344 0.0%	0.420 0.0%	0.166 0.2%	0.292 0.0%	0.349 0.0%	0.509 0.0%	0.439 0.0%	0.567 0.0%	0.601 0.0%	0.738 0.0%		
-0.091 9.1%	0.119 3.3%	0.038 49.8%	0.007 91.3%	0.030 58.1%	0.345 0.0%	0.321 0.0%	0.104 5.4%	0.179 0.1%	0.326 0.0%	0.424 0.0%	0.340 0.0%	0.408 0.0%	0.779 0.0%	-0.043 42.4%	-0.120 2.5%	
0.208 0.0%	0.037 50.6%	0.085 12.7%	-0.035 55.7%	0.066 22.0%	-0.075 16.4%	7.5% 16.1%	0.257 0.0%	0.228 0.0%	-0.283 0.0%	-0.229 0.0%	-0.109 4.3%	-0.208 0.0%	-0.073 17.8%	0.510 0.0%	0.043 65.3%	0.120 23.8%

## EXHIBIT 6

## Description of Data Categories

CEO	The CEO is defined to be the executive in the corporation with the highest compensation. This person is generally also designated as CEO but in some cases may be designated as the chairman of the board.
Latest 12-months revenue	As of August 2002
Market value	As of August 2002
Five years total % return to shareholders	As of August 2002
Volatility	The average of the monthly volatility listed by the Chicago Mercantile Exchange for the 12 months of 2001
Revenue	As of latest fiscal year by August 2002
Employees	Hoovers data
Net income	Hoovers data
Debits	Annual revenue less net income (many of the smaller companies have small revenues and large losses. "Debits" is meant to reflect the company's operating budget.
Founder	A1" if the biography provided by Hoovers lists the CEO as a founder or cofounder.
New CEO	A1" if the biography provided by Hoovers lists the CEO as having started his position in 2001 or later.
Years	The length of time that the CEO has held his position as CEO according to Hoovers biography.
Age	The age of the CEO according to the Hoovers biography.
% stock board without CEO	The percentage of the company's primary shares held by members of the board and other identified large shareholders except for the CEO. Note that "large shareholders" may include brokerage firms or investment groups. Proxy statement (Board shares can include options outstanding)
% stock board with CEO	The percentage of the company's primary shares held by all members of the board and identified large shareholders. Proxy statement (Board shares can include options outstanding)
Stock of CEO	In thousands from the proxy statement
Including options	The number of options included in stock of CEO. Proxy statement
CEO % stock ownership	Stock of the CEO divided by primary shares outstanding

(continued)

<b>EXHIBIT 6 (continued)</b>	
<b>CEO % share ownership/% ownership of board with CEO</b>	CEO shares owned (stock excluding options) divided by % owned by board of directors including CEO
<b>% stock owned</b>	Percentage of stock (includes options) of CEO represented by options.
<b>CEO % share ownership</b>	Shares of the CEO as a % of primary shares outstanding
Strike value stock	CEO Stock ownership times the strike price of the options
Strike value options	Shares represented by options times the strike price of the options
Options granted	The number of options granted in the most recent compensation package. This includes all options repriced to a lower price and may include a portion of options issued in prior years if it appears that options are not issued every year.
Option life	Per proxy
<b>Salary</b>	In thousands
<b>Bonus</b>	In thousands
<b>Other compensation</b>	Includes payments to pension or matching plans, contributions to living expenses except for new CEOs' relocation costs and includes the issuance of stock at full value
Strike price	The exercise price for the options as shown in the proxy statement. Note that in the case of multiple option issues, the exercise price was calculated on weighted average basis
Strike value of options	The number of options times the strike price
Option value at 5%	The SEC requires corporations to state the value of the options or to show the value of the options that would accrue if the stock appreciates 5% per year or 10% per year over the life of the options
<b>Grant date value of options</b>	Value of options on date of grant as calculated with the Black & Scholes model with CME volatility, no dividends and 10-year life
<b>Total compensation</b>	The sum of salary, bonus, other compensation and options valued at a 26% discount from Black-Scholes value
Salary %	As a percentage of total compensation
Bonus %	As a percentage of total compensation
Option %	As a percentage of total compensation
<b>Value of exercisable options</b>	According to the proxy statement, the literal value of the options that can be exercised within 60 days of the date of the proxy statement
Value of unexercisable options	According to the proxy statement, the literal value of the options that cannot be exercised within 60 days of the date of the proxy statement
<b>Total value of options</b>	Total of exercisable, unexercisable and options just granted
<b>Primary shares at strike price</b>	Primary shares outstanding valued at the strike price of options
<b>CEO \$ holdings</b>	The sum of CEO shares not represented by options times the strike price plus the total value of options
<b>CEO share % \$ holdings</b>	The percentage of CEO \$ holdings represented by CEO shares owned
Compensation/revenue	Compensation divided by the company's revenue
NOTE: Bold variables are in correlation matrix.	

2. four-year vesting schedule,
3. exercisable at 100% of the market price on the date of grant and
4. the options are not transferable.

In his most recent article, Professor Murphy pointed out that executive options are more restricted than normal options on securities and should be discounted in value.<sup>8</sup> Given the restrictions on transferring the options and delayed

<b>EXHIBIT 7</b>						
<b>[NEED CAPTION]</b>						
	<b>Low</b>	<b>High</b>	<b>Average</b>	<b>Median</b>	<b>Standard Deviation</b>	<b>Total</b>
<b>Latest 12 months revenue (\$MMs)</b>	0	49,457	1,243	23	5,620	228,793
<b>5-year total % return to shareholders (%)</b>	-99.16	1033.84	24.58	-37.61	158.04	
CME volatility (%)	14.80	172.50	52.40	52.40	24	
<b>Revenue (\$MMs)</b>	0	47,716	1,202	21	5,448	221,116
<b>Employees</b>	9	101,800	3,608	181	14,515	663,804
<b>Net income (\$MMs)</b>	-250	7,788	193	-9	1,019	35,539
Debits (\$MMs)	-1	40,434	1,009	45	4,473	185,577
Shares (MMs)	5	6,277	158	28	594	29,068
Founder	0,1	0	1	0.18	0.00	0.38 33
<b>New CEO = 1</b>	0,1	0	1	0.17	0.00	0.38 31
Years as CEO	0	24	5.98	5.00	5.56	981
Age	36	81	53	53	7	8971
<b>% stock of board without CEO (%)</b>	-3.37	94.53	29.07	26.17	21.84	
<b>% stock of board with CEO (%)</b>	0.15	99.40	33.89	29.85	22.66	
Shares of CEO (000s)	0	31,645	1,558	818	2,930	286,692
Options included in stock of CEO (000s)	0	6,400	632	414	775	115,047
<b>CEO % stock ownership (%)</b>	0.0	43.2	5.0	2.8	7.23	
<b>CEO % shares own/own of board with CEO (%)</b>	0.00	97.13	10.26	3.32	18.35	1887.51
<b>% stock owned</b>	0.00	100.00	30.01	18.76	32.49	
<b>CEO % share ownership</b>	0.00	38.00	2.51	0.52	6.128	
CEO stock at strike price (\$000s)	0	889,114	20,076	2,392	75,058	3,694,049
Options granted	0	1,450,000	218,376	125,000	256,979	40,181,217
Option life	3	11	10	10	1	
<b>Salary (\$000s)</b>	98	1,517	425	351	255	78,243
<b>Bonus (\$000s)</b>	0	2,781	246	110	425	44,712
<b>Other compensation (\$000s)</b>	0	8,071	251	7	912	46,264
Strike price per share (\$)	0.67	79.93	18.44	9.28	19.33	3,393.03
Strike val options (\$000s)	0	90,635	5,300	1,283	11,641	975,183
Value 5% (\$000s)	0	39,314	2,660	633	5,723	457,519
<b>Grant date value of options (\$000s)</b>	0	34,219	2,261	621	4,558	416,047

*(continued)*

EXHIBIT 7 (continued)

<b>Total compensation (\$000s)</b>	102	36,467	3,181	1,222	5,294	585,266
Salary %	1.36	100.00	33.57	26.44	25.85	
Bonus %	0.00	52.97	9.75	6.19	11.74	
Option %	0.00	97.50	51.23	55.08	30.87	
<b>Value of exercisable options (\$000s)</b>	0	204,677	7,235	1,158	20,594	1,331,298
Value of unexercisable options \$000s	0	42,465	2,251	291	5,030	414,224
<b>Primary shares at strike price (\$000s)</b>	8	284,599	7,650	258	31,667	1,407,658
<b>CEO \$ holding (\$000s)</b>	0	906,794	31,824	7,098	84,662	5,855,618
<b>CEO shares % \$ holdings (%)</b>	0.0	100.0	45.0	40.0	33.71	
<b>Log of revenue</b>	-1.00	4.68	1.35	1.33	1	248.969541
Log of debits	-1.00	4.61	1.80	1.65	1	330.838241
<b>Log of employees</b>	0.95	5.01	2.39	2.26	1	439.041981
<b>Log total compensation</b>	2.01	4.56	3.16	3.09	1	581.754095
<b>Log CEO \$ holdings</b>	0.00	5.96	3.84	3.85	1	707.191511
<b>Log of primary shares at strike</b>	0.88	5.45	2.56	2.41	1	471.495673

NOTE: Variables in bold type are included in correlation matrix.

vesting schedule, it only seems appropriate that they should be discounted. Murphy developed a valuation formula based on the executive's risk preferences and personal financial position that generally results in a substantial discount from the Black-Scholes model.

The appropriate range of discounts was examined by Carl F. Luft, Lawrence M. Levine and Jon Howe<sup>9</sup> in a separate manner, and they concluded that a discount between 22% and 45% would be appropriate for illiquid, publicly traded options. The authors also suggested that the discount for employee stock options should probably be higher.<sup>10</sup>

At the same time, options that qualify as incentive options (under Code Section 422) offer some attractive tax aspects that also should be considered. Rather than pay about 40% of the value of the options in ordinary income tax, the recipient of the options pays no tax until the stock purchased with the stock options is sold. If that stock is sold in a qualifying disposition (generally, dispositions made more than two years after the option grant date and at least one year after exercising the options), the seller pays maximum tax

rates of 20%. Thus, the recipient of stock options enjoys a reduction in tax rates of 2,000 basis points and a deferral of that tax. Assuming a tax deferral of seven years and a discount rate of 8% for a present value of 12%, the executive would save an additional 800 basis points for a total of 2,800 basis points. Therefore, if the stock options should be discounted by 50% to reflect the restrictions on liquidity and marketability, that discount should be offset by 28% for a net discount of 22%.

For the purposes of our study of the pharmaceutical industry, the Black-Scholes model was used to estimate the market value of the options. The model was assumed to accurately reflect the market value for options and was not gauged or adjusted for current prices for options version the estimates of the model. Only a few of the pharmaceutical companies pay dividends, so dividend yields were assumed to be zero for all companies and a risk-free interest rate of 5% was applied as it was the average yield on 10-year government bonds for 2001. Volatilities for 144 of the companies were estimated by calculating the average monthly volatility listed by the Chicago

Mercantile Exchange for 2001. Companies whose volatility was not listed by the Chicago Mercantile Exchange was assumed to be the average of 52.4%.<sup>11</sup> All options were assumed to be exercisable at 100% of market and to be exercisable for 10 years, which is true for more than 95% of the issuers. Finally, the value of the options was set equal to 78% of the Black-Scholes calculation to adjust for illiquidity and lack of marketability.<sup>12</sup>

## Data Constructs

The pharmaceutical industry is unusual because of the large number of companies with small revenues but large losses in net income. There are a significant number of “smaller” companies with negligible revenue but with large market values and large operating budgets. Presumably, such companies are developing or proving up new pharmaceuticals that have not yet reached the market. To account for this unusual profile, we derived a measure of total corporate expenses (or “debits”) by subtracting a company’s net income from its revenues. This was used as an alternative for revenue.<sup>13</sup>

We also generated a data field that compares the stock holdings of the CEO (with and without stock options) with that of the board of directors, senior officers and large holders of stock. The CEO’s holdings are compared to these other holdings to determine how much relative control the CEO might hold over the board of directors.<sup>14</sup>

We added the market value of the CEO’s stock holdings, the grant date value of the options granted in 2001 and the value declared in the proxy statement for the CEO’s exercisable and unexercisable options<sup>15</sup> to determine a variable for the total value of the CEO’s holdings in his<sup>16</sup> company. We derived one further variable out of this calculation, which was to determine the percentage of this value that is represented by the CEO’s stock holdings as a percentage of the value of his option interests and is labeled “Stock %.”

## Results

The correlation matrix in Exhibit 8 summarizes any potentially interesting relationships. The log of market value has the strongest correlation for the larger companies, but the number of employees has the strongest correlation for the smaller companies. Additional explanatory variables include stock ownership of the CEO (as a percentage of total shares) and a dummy variable for whether the executive is new to his position.

See Exhibit 9 for a graph of the relationship between the log of total compensation and the log of market capitalization at strike price. It suggests a linear relationship with possible lower and upper limits on total compensation of \$100,000 and \$10,000,000.

The regression analysis for the three explanatory variables reveals a coefficient of determination or “R Squared” of 71.8% with a standard error of .2718 (expressed as a log of compensation). All of the variables have *t* test values in excess of three, including the constant variable:

$$\begin{aligned}
 (5) \quad & \text{Log of Total Compensation} = 1.74 \\
 & \qquad \qquad \qquad (16.4) \\
 & \qquad \qquad \qquad + .346 \text{ Market Value at Strike} \\
 & \qquad \qquad \qquad \qquad \qquad \qquad (9.6) \\
 & \qquad \qquad \qquad - .263 \text{ Stock \%} + .188 \text{ New CEO} \\
 & \qquad \qquad \qquad \qquad \qquad \qquad (-3.94) \qquad \qquad (3.36) \\
 & \qquad \qquad \qquad + .162 \text{ Log CEO \$ Holdings} \\
 & \qquad \qquad \qquad \qquad \qquad \qquad (3.85)
 \end{aligned}$$

*The pharmaceutical industry is unusual because of the large number of companies with small revenues but large losses in net income.*

The group of pharmaceutical companies was reduced to only those 77 companies whose latest 12-month revenues were less than \$15 million. For this group of smaller companies, the absolute number of employees provided greater explanation than market value did. All variables except the value of CEO holdings were non-log permutations. The following equation generated an adjusted  $R^2$  of 60.6% and a standard error of 998,000:

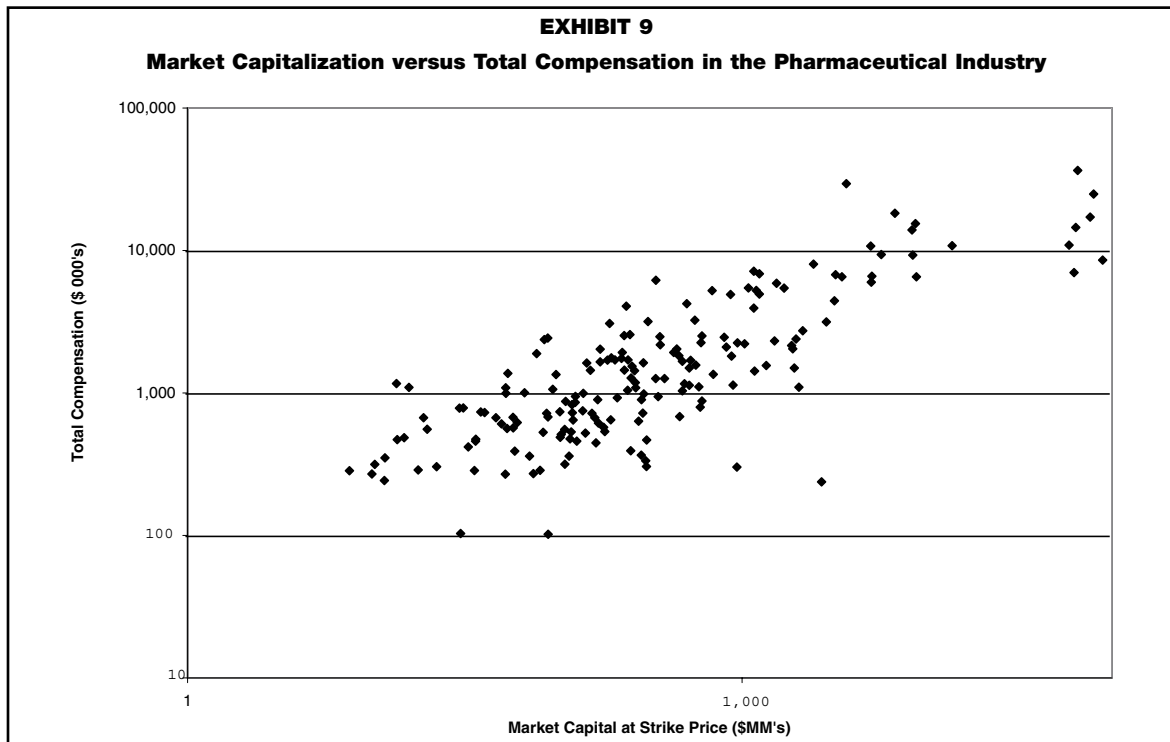
$$\begin{aligned}
 (6) \quad & \text{Total Compensation} = -1,589 \\
 & \qquad \qquad \qquad (-2.41) \\
 & \qquad \qquad \qquad + 8.13 \text{ Employees} + 708 \text{ Log \$ Holdings} \\
 & \qquad \qquad \qquad \qquad \qquad \qquad (8.22) \qquad \qquad (3.56) \\
 & \qquad \qquad \qquad - 898 \text{ Stock \%} \\
 & \qquad \qquad \qquad \qquad \qquad \qquad (-2.5)
 \end{aligned}$$

**EXHIBIT 8**  
**Pharmaceutical Database Correlation Matrix**

	Latest 12 Months Revenue	5-Year Total % Return to Shareholders	Revenue	Employees	Net Income	New CEO = 1	% Stock of Board without CEO	% Stock of Board with CEO
5-year total % return to shareholders	0.04 0.60							
Revenue	1.00 0.00	0.04 0.63						
Employees	0.95 0.00	0.04 0.61	0.94 0.00					
Net income	0.96 0.00	0.04 0.57	0.97 0.00	0.91 0.00				
New CEO = 1	0.08 0.29	-0.16 0.03	0.08 0.26	0.10 0.19	0.10 0.20			
% stock of board without CEO	-0.24 0.00	-0.03 0.73	-0.24 0.00	-0.26 0.00	-0.24 0.00	0.08 0.26		
% stock of board with CEO	-0.28 0.00	-0.06 0.44	-0.28 0.00	-0.29 0.00	-0.28 0.00	0.03 0.68	0.95 0.00	
CEO % stock ownership	-0.14 0.06	-0.11 0.15	-0.14 0.06	-0.14 0.06	-0.13 0.07	-0.17 0.02	-0.06 0.39	0.25 0.00
CEO % share ownership/% ownership of board with CEO	-0.06 0.44	-0.09 0.22	-0.06 0.43	-0.05 0.51	-0.06 0.44	-0.13 0.07	-0.33 0.00	-0.10 0.20
% stock owned	-0.20 0.01	-0.23 0.00	-0.20 0.01	-0.21 0.00	-0.20 0.01	-0.07 0.35	0.10 0.16	0.24 0.00
CEO % share ownership	-0.09 0.24	-0.13 0.09	-0.09 0.24	-0.09 0.21	-0.08 0.27	-0.09 0.20	-0.04 0.56	0.24 0.00
Salary	0.68 0.00	0.21 0.01	0.68 0.00	0.73 0.00	0.66 0.00	-0.09 0.23	-0.29 0.00	-0.33 0.00
Bonus	0.64 0.00	0.19 0.01	0.64 0.00	0.70 0.00	0.63 0.00	-0.04 0.60	-0.22 0.00	-0.26 0.00
Other compensation	0.44 0.00	0.04 0.62	0.45 0.00	0.51 0.00	0.54 0.00	0.02 0.78	-0.08 0.29	-0.11 0.13
Grant date value of options	0.47 0.00	0.30 0.00	0.47 0.00	0.50 0.00	0.45 0.00	0.16 0.03	-0.17 0.02	-0.22 0.00
Total compensation	0.57 0.00	0.29 0.00	0.56 0.00	0.61 0.00	0.56 0.00	0.13 0.08	-0.19 0.01	-0.25 0.00
Value of exercisable options	0.09 0.20	0.36 0.00	0.09 0.22	0.12 0.12	0.07 0.32	-0.13 0.08	-0.07 0.38	-0.08 0.26
Value of total options	0.22 0.00	0.55 0.00	0.22 0.00	0.18 0.01	0.20 0.01	-0.12 0.10	-0.05 0.50	-0.08 0.29
Primary shares at strike price	0.93 0.00	0.08 0.26	0.93 0.00	0.92 0.00	0.97 0.00	0.07 0.35	-0.24 0.00	-0.28 0.00
CEO \$ holdings	0.12 0.11	0.33 0.00	0.12 0.10	0.14 0.07	0.12 0.11	-0.04 0.55	-0.11 0.15	-0.06 0.42
CEO shares % \$ holdings	-0.05 0.54	-0.15 0.05	-0.04 0.57	-0.03 0.70	-0.03 0.71	-0.19 0.01	-0.06 0.45	0.10 0.19
Log of revenues	0.54 0.00	0.32 0.00	0.54 0.00	0.57 0.00	0.53 0.00	-0.03 0.73	-0.13 0.08	-0.14 0.05
Log of employees	0.63 0.00	0.30 0.00	0.64 0.00	0.69 0.00	0.61 0.00	-0.02 0.84	-0.13 0.07	-0.18 0.02
Log total compensation	0.44 0.00	0.38 0.00	0.44 0.00	0.48 0.00	0.42 0.00	0.12 0.11	-0.15 0.05	-0.23 0.00
Log CEO \$ holdings	0.25 0.00	0.45 0.00	0.24 0.00	0.27 0.00	0.23 0.00	-0.18 0.02	-0.14 0.06	-0.10 0.17
Log of primary shares at strike price	0.59 0.00	0.42 0.00	0.59 0.00	0.62 0.00	0.57 0.00	-0.01 0.91	-0.20 0.01	-0.31 0.00

**EXHIBIT 8  
Pharmaceutical Database Correlation Matrix**

Stock Ownership	CEO % Board Stock	CEO % Stock Owned	CEO % Share Ownership	Salary	Bonus	Other Comp.	Grant Date Value of Options	Total Comp.	Value of Exercisable Options	Value of Total Options	Market Cap. at Strike	CEO \$ Holdings	CEO Shares % Holdings	Log Revenues	Log of Employees	Log Total Comp.	Log of CEO \$ Holdings
0.74																	
0.00																	
0.44	0.54																
0.00	0.00																
0.90	0.73	0.60															
0.00	0.00	0.00															
-0.16	-0.07	-0.33	-0.17														
0.03	0.34	0.00	0.02														
-0.19	-0.08	-0.27	-0.14	0.77													
0.01	0.29	0.00	0.06	0.00													
-0.12	-0.04	-0.16	-0.09	0.55	0.46												
0.11	0.58	0.04	0.25	0.00	0.00												
-0.18	-0.11	-0.18	-0.14	0.60	0.60	0.20											
0.01	0.15	0.02	0.07	0.00	0.00	0.01											
-0.20	-0.11	-0.22	-0.15	0.72	0.72	0.41	0.97										
0.01	0.14	0.00	0.04	0.00	0.00	0.00	0.00										
-0.08	-0.06	-0.23	-0.11	0.34	0.36	0.04	0.50	0.48									
0.31	0.44	0.00	0.14	0.00	0.00	0.61	0.00	0.00									
-0.10	-0.10	-0.24	-0.12	0.39	0.28	0.07	0.35	0.36	0.51								
0.19	0.19	0.00	0.11	0.00	0.00	0.37	0.00	0.00	0.00								
-0.15	-0.07	-0.21	-0.10	0.70	0.72	0.59	0.51	0.63	0.14	0.23							
0.04	0.36	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.05	0.00							
0.14	0.27	-0.07	0.03	0.33	0.20	0.05	0.35	0.34	0.21	0.49	0.13						
0.07	0.00	0.36	0.74	0.00	0.01	0.55	0.00	0.00	0.01	0.00	0.07						
0.49	0.62	0.68	0.50	0.02	-0.05	0.03	-0.10	-0.08	-0.22	-0.16	-0.04	0.20					
0.00	0.00	0.00	0.00	0.83	0.53	0.65	0.18	0.27	0.00	0.03	0.60	0.01					
-0.09	-0.02	-0.29	-0.08	0.71	0.61	0.40	0.52	0.60	0.32	0.34	0.55	0.33	0.03				
0.25	0.76	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72				
-0.17	-0.06	-0.31	-0.17	0.81	0.68	0.45	0.60	0.69	0.38	0.36	0.64	0.38	0.01	0.86			
0.02	0.46	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00			
-0.28	-0.21	-0.33	-0.29	0.73	0.62	0.39	0.76	0.81	0.44	0.42	0.48	0.39	-0.18	0.58	0.70		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00		
0.12	0.21	0.06	0.09	0.50	0.38	0.20	0.45	0.48	0.42	0.47	0.27	0.53	0.24	0.45	0.56	0.63	
0.12	0.01	0.43	0.24	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.35	-0.18	-0.32	-0.30	0.79	0.68	0.41	0.68	0.75	0.43	0.48	0.63	0.41	-0.07	0.67	0.81	0.82	0.70
0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00



Neither of these samples showed any significant relationship between compensation and company performance. On the other hand, there was a relationship between company performance and CEO wealth. Using CEO \$ Holdings as a dependent variable, we found that the strongest relationship required a variable for the five-year total return of the company. The best equation was determined to be the following, which has an  $R^2$  of 67.6% and a standard error of .4641:

$$\begin{aligned}
 (7) \quad & \text{Log \$ Holdings} = 2.02 \\
 & \quad \quad \quad (16.65) \\
 & + .608 \text{ Log Mkt at Str} + .708 \text{ Stock \%} \\
 & \quad \quad \quad (14.62) \quad \quad \quad (6.69) \\
 & + .102 \text{ 5 Year Total Return} - .213 \text{ New CEO} \\
 & \quad \quad \quad (4.12) \quad \quad \quad (-2.24)
 \end{aligned}$$

Further research is warranted on this relationship because the most important variable to explain may be the CEO's wealth rather than his income. All of the resulting significant variables and the signs of their coefficients make intuitive sense. A CEO's wealth increases as the market value of his company increases, the total return of the company increases and as his tenure in the company increases. The Stock % variable can be interpreted to indicate that the wealthiest CEOs also have large stock holdings in the company.

## Conclusions

In almost all the regression equations, the log of revenues was significantly correlated to compensation, but its correlation was exceeded by market capitalization. On the other hand, the consistency and significance of some of the explanatory variables for both a broad database like that of *The Wall Street Journal* and the narrower pharmaceutical industry data warrant additional research about the potential relevance of the CEO's stock ownership and total wealth in the company. Equally important is the fact that significant results were found for small publicly held companies, although different explanatory variables were found to be significant. The largest remaining problem, however, is that the standard error of estimate is too large to afford much statistical confidence in making estimates of market compensation.

## Notes

1. See Exhibit 3 for the definition of CEO.
2. Peck, C., Silver, H. M., & Higgs, E. A. (2001). *Top executive compensation in 2000*. New York: The Conference Board.
3. Murphy, K. J. (1999). Executive compensation. In O. Ashenfelter & D. Card (Eds.), *Handbook of labor economics* (Vol. 3, pp.



- 2485-2563). Amsterdam, the Netherlands: North-Holland.),
4. Hall, B. J., & Murphy, K. J. (2001, October). *Stock options for undiversified executives*. [NEED JOURNAL NAME, VOLUME NUMBER, PAGES]
  5. Equally important is that the three-year total compensation is about three times that of total compensation for 2001, suggesting that compensation for 2001 is about average for the last three years. (For the 655 executives for which information is available, total compensation for 2001 was \$5.63 billion and three-year total compensation was \$16.45 billion.)
  6. Grant date value as reported to the SEC. [PLEASE ADD SUPERSCRIPT "6" IN TEXT WHERE IT SHOULD GO]
  7. It is also conceivable that this could tend to confirm the thesis about the abuse of agency duties: that the smaller stake that the board has in the company allows CEOs to obtain higher compensation. At present, there is insufficient evidence to confirm such a sweeping conclusion.
  8. Hall and Murphy (2001).
  9. Luft, C. F., Levine, L. M., & Howe, J. (1998, May/June). Illiquidity considerations in valuing stock options. *Valuation Strategies*, 15-21.
  10. Luft et al. (1998, p. 48).
  11. Note that normally, the volatility factor used in this calculation is a forecast for the stock volatility over the life of the options.
  12. Interestingly, based on this "fixed" approach, the value of the options was estimated to be a total of about 83% of the total values disclosed by the companies in their SEC filings.
  13. The debit variable was modestly more significant than revenue but less significant than market capitalization.
  14. Many of these measures had significant t values and modest correlation but were exceeded in contribution by other variables.
  15. Generally valued at their literal value.
  16. As less than 5% of the CEOs included in this study were female, only the male pronoun can apply. Originally, a dummy variable was included for gender, but because so few CEOs were female, the result would not have been significant and would have missed the bigger point that the key disparity is not in total compensation packages but in the continuing absence of any significant representation of women in that role.

*George P. Roach is the founder of a Dallas litigation consulting and valuation firm, Multi Discipline Consultants, and is a senior adviser to the litigation consulting firm of Freeman & Mills in Los Angeles. His background includes an M.B.A., J.D. and A.B. in economics. See [www.multidisciplineconsultants.com](http://www.multidisciplineconsultants.com) for more information.*

*Alan G. Goedde is a partner and litigation consultant at Freeman & Mills. He has a Ph.D. in economics. See [www.freemanmills.com](http://www.freemanmills.com) for more information.*

