

# Growth through Rigidity: An Explanation for the Rise in CEO Pay\*

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## Abstract

The dramatic rise in CEO compensation during the 1990s and early 2000s is a long-standing puzzle. In this paper, we show that much of the rise can be explained by a tendency of firms to grant the same number of options each year. Number-rigidity implies that the grant-date value of option awards will grow with firm equity returns, which were very high on average during the tech boom. Further, other forms of CEO compensation did not adjust to offset the dramatic growth in the value of option pay. Number-rigidity in options can also explain the increased dispersion in pay, the difference in growth between the US and other countries, and the increased correlation between pay and firm-specific equity returns. We present evidence that number-rigidity arose from a lack of sophistication about option valuation that is akin to money illusion. We show that regulatory changes requiring transparent expensing of the grant-date value of options led to a decline in number-rigidity and helps explain why executive pay increased less with equity returns during the housing boom in the mid-2000s.

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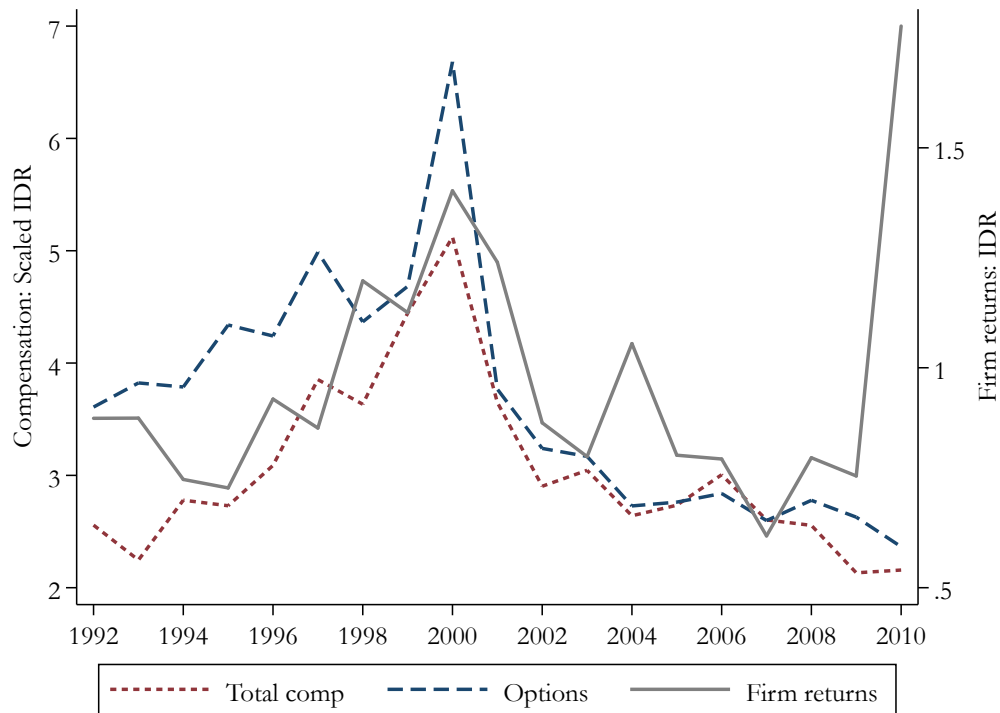
# Online Appendix

## A. Supplementary Exhibits

**Figure A1**

**Dispersion in Compensation and Firm-Specific Returns**

This figure shows the interdecile range (90th percentile minus 10th percentile) in the grant-date values of total compensation relative to the median total compensation in each year. It also shows the interdecile range in the grant-date value of option compensation relative to median option compensation in each year. Finally, it shows the interdecile range in firm-specific returns in each fiscal year. The sample covers CEOs in firms that were ever a part of the S&P 500 from 1992 to 2010.

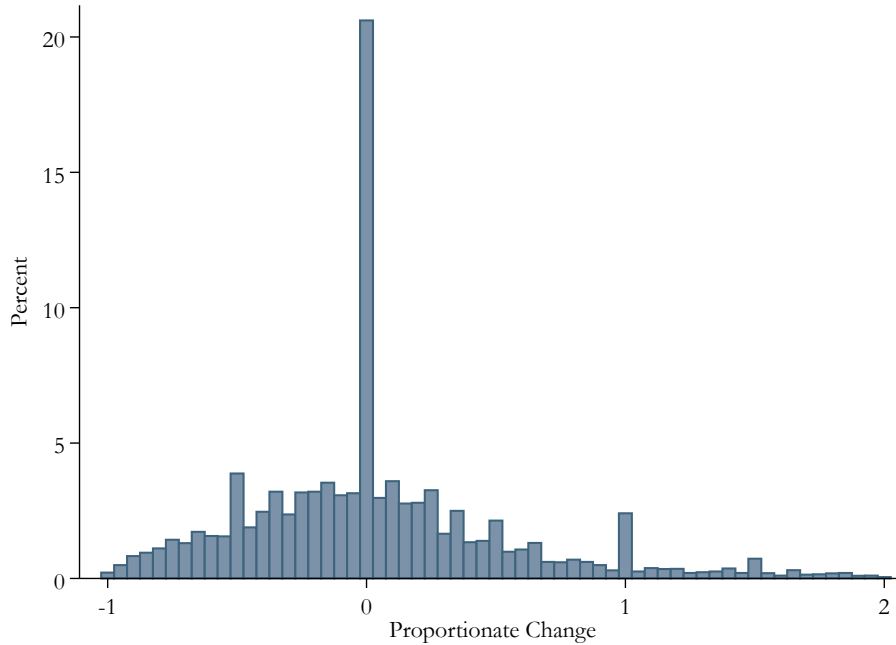


## Figure A2

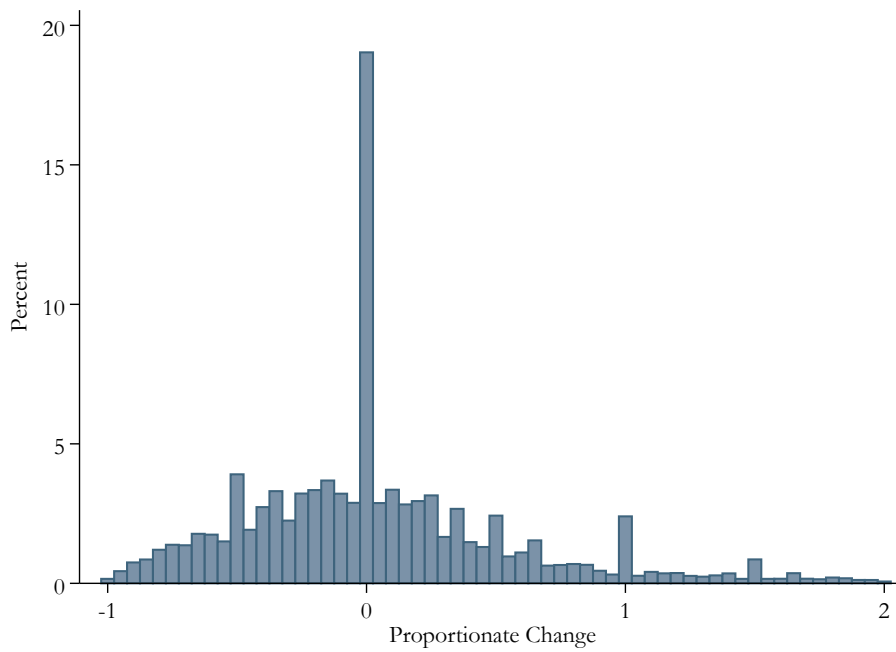
### Number of Options Granted in Extended Samples

Panel A shows the distribution of the proportional change in the number of options granted in the current year relative to the previous year. The sample includes executives who hold the CEO position in the current and previous year in firms that were ever a part of the S&P 1500 from 1992 to 2010. Panel B repeats the exercise but further extends the sample to include all top executives (usually five per firm), as reported in ExecuComp.

**Panel A: S&P 1500 CEOs**



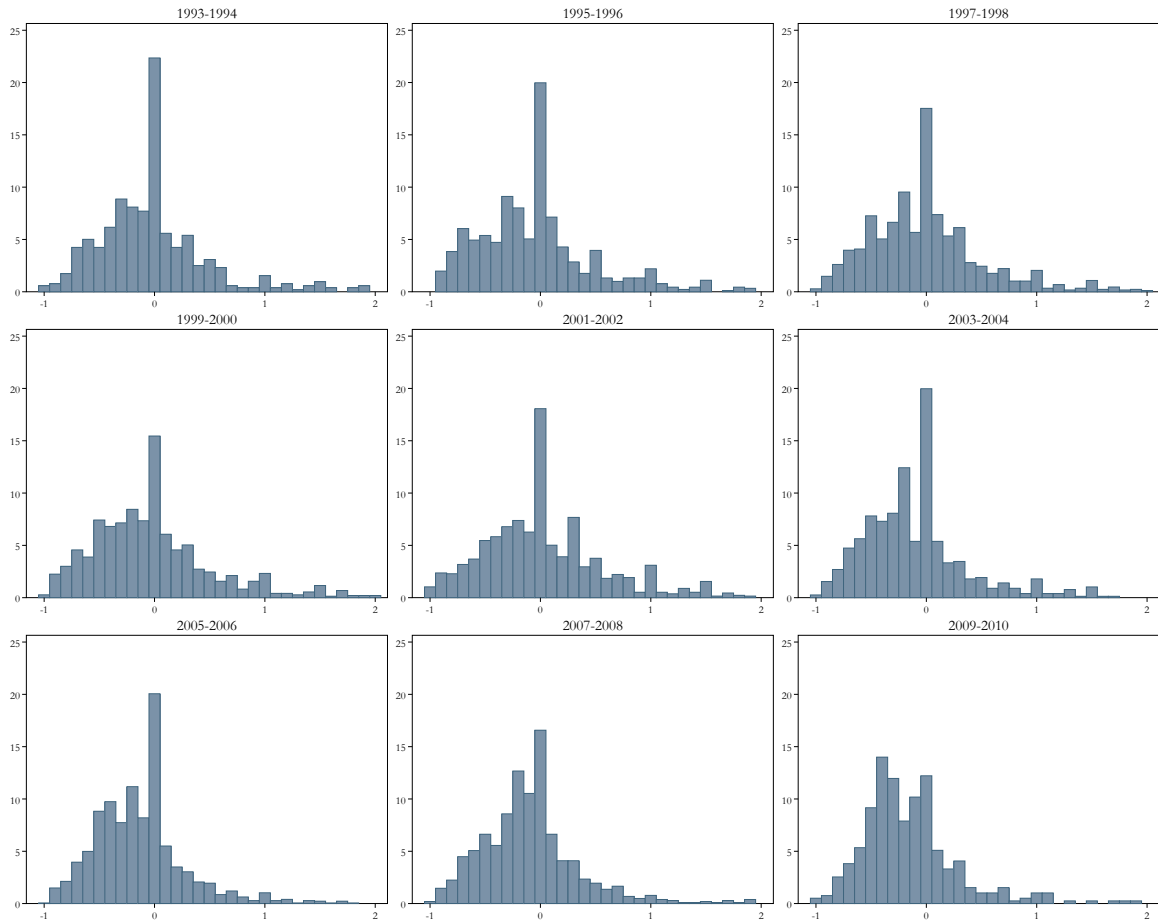
**Panel B: S&P 1500 Top-5 Executives**



**Figure A3**

**Number Change Distribution over Time for High-Return Firm-Years**

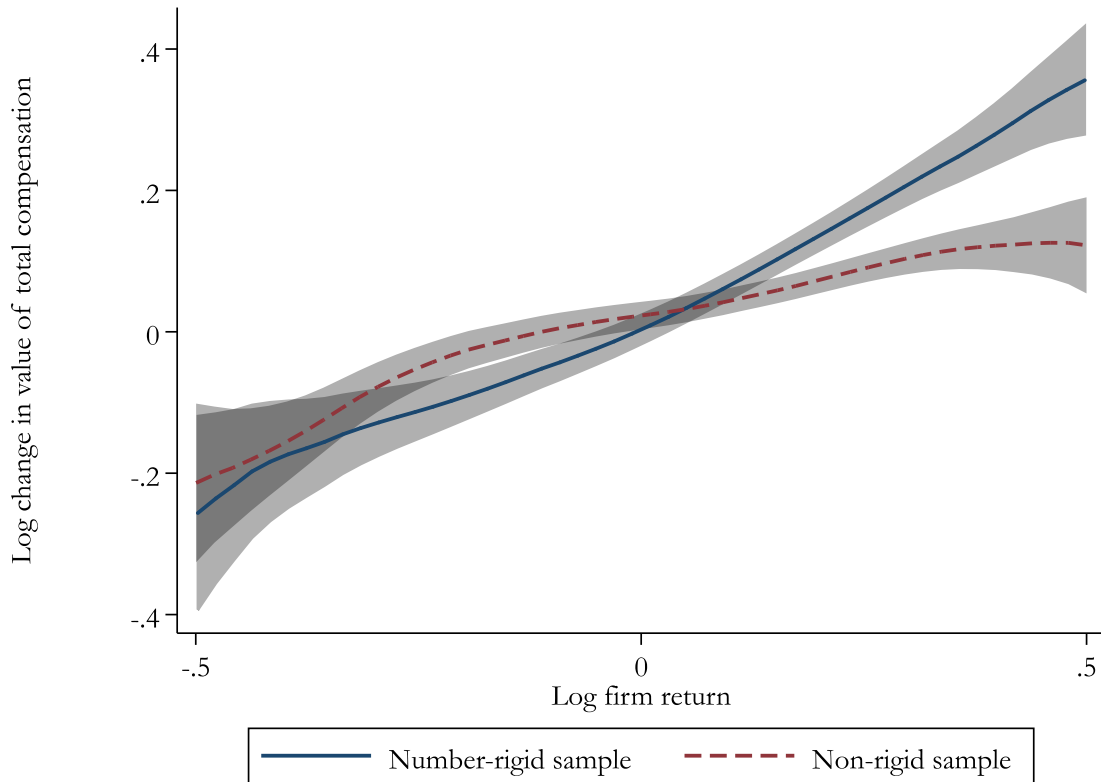
This figure shows how the distribution of the proportional change in the number of options has evolved over time. The figure replicates 4 within two-year intervals, and the sample is restricted to firms with high returns (returns above 25%) in the 12-month period prior to the option grant.



**Figure A4**

**Actual vs. Predicted Total Compensation Growth For Number-Rigid CEOs**

This figure plots changes in the log grant date value of total compensation against the log firm return over the previous 12 months. For the the number-rigid and non-rigid samples, we fit a local linear regression using the Epanichnikov kernel using the rule-of-thumb bandwidth. The sample is limited to executives who hold the CEO position in the current and previous year in firms that were ever a part of the S&P 500 from 1992 to 2010.



**Table A1**  
**Industry Distribution of Rigid and Non-Rigid Firms**

This table reports the industry distribution for number-rigid firms, number-reference firms, and all other firms where options were paid in the current and previous year. A firm-year is categorized as number-rigid (number-reference) if its CEO receives number-rigid (number-reference) option grants in that year. Because the prevalence of number-rigidity has changed over time, we present the summary statistics separately for three cross-sections in 1995, 2000, and 2005. Industries are defined according to the Fama–French 12-industry classification scheme. In the last row, we calculate the percent of firms in each category that operate in “New Economy” sectors. Specifically, new economy firms are defined as companies with primary SIC designations of 3570 (Computer and Office Equipment), 3571 (Electronic Computers), 3572 (Computer Storage Devices), 3576 (Computer Communication Equipment), 3577 (Computer Peripheral Equipment), 3661 (Telephone & Telegraph Apparatus), 3674 (Semiconductor and Related Devices), 4812 (Wireless Telecommunication), 4813 (Telecommunication), 5045 (Computers and Software Wholesalers), 5961 (Electronic Mail-Order Houses), 7370 (Computer Programming, Data Processing), 7371 (Computer Programming Service), 7372 (Prepackaged Software), and 7373 (Computer Integrated Systems Design).

	1995			2000			2005		
	Rigid	Reference	Other	Rigid	Reference	Other	Rigid	Reference	Other
Consumer Non-Durables	6.79	5.62	8.82	8.81	6.44	6.61	4.24	4.62	6.50
Consumer Durables	3.70	3.42	4.52	2.52	2.89	3.46	3.03	3.59	3.42
Manufacturing	22.84	17.60	13.12	16.98	11.56	14.49	12.12	9.74	12.31
Energy	6.17	4.89	5.16	2.52	4.00	4.72	2.42	1.79	4.79
Chemicals	3.09	3.18	5.16	2.52	3.11	3.46	3.64	3.59	3.59
Business Equipment	11.11	16.38	10.11	13.84	19.56	17.17	21.82	24.62	16.75
Telecommunications	0.62	1.96	3.01	1.89	2.44	2.05	0.00	2.05	1.54
Utilities	5.56	5.62	4.73	5.03	4.44	5.83	2.42	2.82	4.27
Shops	17.28	13.20	10.32	11.32	12.00	10.71	12.73	12.82	10.43
Health	5.56	8.31	7.96	11.95	8.89	6.93	10.91	12.05	9.06
Finance	11.11	12.96	15.91	10.06	11.11	14.33	17.58	13.08	15.56
Other	6.17	6.85	11.18	12.58	13.56	10.24	9.09	9.23	11.79
New Economy	7.41	12.71	7.74	10.69	14.67	14.17	15.15	18.46	13.33

**Table A2**  
**Conditions for Spillovers**

Panel A explores how the value of total compensation and option compensation paid by a firm to the CEO changes following turnover events. Observations are at the firm by year level. The sample consists of S&P 500 firm-years (firms ever in the S&P 500 from 1992–2010) in which a turnover event has occurred, i.e., there is a new CEO. The variable Lag Rigid is a dummy equal to one if the firm paid its CEO a number-rigid grant in the previous year. The control group consists of observations in which there is a turnover event that does not follow a number-rigid year.

Panel B tests an SS-style lumpy adjustment model. In previous analysis, we show that number-rigidity corresponds to larger changes in the value of compensation granted on average relative to a control group of non-rigid observations. In a lumpy adjustment model, we would then expect large relative declines in compensation following number-rigidity to offset the increase in pay. This table explores how compensation changes in flexible years (defined as years in which the number of options granted does not equal the number granted in the previous year) following number-rigid years. The control group is flexible years following other flexible years.

Panel C tests whether executives who receive rigid and non-rigid option grants operate in integrated labor markets. The regression tests whether an executive who worked for a number-rigid firm in the past (defined as a firm that granted number-rigid options to any executive in the past 3 years) is more likely to transition to another number-rigid firm relative to an executive who worked in a non-rigid firm in his previous job role. In Panels B and C, to increase estimation power, we use the sample of all S&P 1500 top-executives. In all panels, standard errors are allowed to be clustered within firm.

**Panel A: Rigidity and Compensation Changes Following Turnover**

	Change Total Comp		Change Option Value	
Lag Rigid	-0.0499 (0.0681)	-0.0494 (0.0699)	0.114 (0.0835)	0.114 (0.0861)
Constant	0.159*** (0.0206)	0.159*** (0.0204)	0.189*** (0.0312)	0.189*** (0.0299)
Year FE	No	Yes	No	Yes
R <sup>2</sup>	0.000307	0.0289	0.00195	0.0860
Observations	1392	1392	787	787

**Panel B: Test of SS-Style Lumpy Adjustment Model**

	Change Total Comp		Change Option Value		Change Option Number	
Lag Rigid	0.0377*** (0.00848)	0.0413*** (0.00827)	0.0583*** (0.0140)	0.0720*** (0.0132)	0.0326** (0.0154)	0.0432*** (0.0150)
Constant	0.0955*** (0.00233)	0.0952*** (0.00230)	0.0663*** (0.00401)	0.0652*** (0.00388)	0.238*** (0.00468)	0.237*** (0.00453)
Year FE	No	Yes	No	Yes	No	Yes
R <sup>2</sup>	0.000474	0.0255	0.000465	0.0393	0.000119	0.0290
Observations	63768	63768	63041	63041	63768	63768

**Table A2**  
**(Continued)**

**Panel C: Firm Switching and Rigidity**

	(1)	(2)
	Current Firm Rigid	Current Firm Rigid
Previous Firm Rigid	0.00351 (0.0288)	0.00473 (0.0292)
Year FE	No	Yes
R <sup>2</sup>	0.0000123	0.0170
Observations	1213	1213



**Table A3****Spillovers Calibration Using Alternative Parameter Values**

In this table, we present calibrations of spillover effects in the Gabaix and Landier (2008) model using alternative assumptions regarding parameter values. In all calibrations, we assume that median firm size remains constant over the sample period in order to focus on the fraction of growth in total compensation that can be explained by number-rigid spillovers alone. Gamma  $\gamma$  represents the impact of CEO skill on firm earnings ( $\gamma = 1$  implies constant returns to scale and  $\gamma < 1$  implies decreasing returns to scale).  $\gamma$  is estimated to be equal to one in Gabaix and Landier (2008). Several other papers described in Section 2.3 suggest it may be less than one if the data is estimated over other time periods. Alpha  $\alpha$  describes the distribution of firm size in the right tail and most estimates imply that  $\alpha = 1$ . Beta  $\beta$  is determined such that  $\gamma - \frac{\beta}{\alpha}$  is equal to the relationship between log compensation and log firm size, which is approximately 0.2–0.4 in the data.

**Panel A: Fraction of growth in total compensation from 1992–2002 explained by number-rigid spillovers**

		Beta						
		0.2	0.3	0.4	0.5	0.6	0.7	0.8
Gamma	0.4	0.39						
	0.5	0.25	0.54					
	0.6	0.20	0.31	0.70				
	0.7		0.24	0.38	0.89			
	0.8			0.28	0.46	1.11		
	0.9				0.33	0.54	1.36	
	1.0					0.38	0.63	1.66

**Panel B: Fraction of growth in total compensation from 1992–2010 explained by number-rigid spillovers**

		Beta						
		0.2	0.3	0.4	0.5	0.6	0.7	0.8
Gamma	0.4	0.43						
	0.5	0.26	0.60					
	0.6	0.21	0.34	0.81				
	0.7		0.25	0.42	1.06			
	0.8			0.30	0.51	1.37		
	0.9				0.35	0.61	1.74	
	1.0					0.41	0.72	2.19

**Table A4**  
**Required Expensing**

This table shows how number-rigidity relates to required expensing of option pay without required proxy statement disclosure. The FASB reform requiring expensing was effective for fiscal years ending after June 15, 2006. The SEC reform requiring expensing was effective for fiscal years ending after December 15, 2006. Therefore, firms with fiscal years ending between June 15, 2006 and December 15, 2006 were only required to expense but not disclose for fiscal year 2006. We exploit this time window to examine whether number-rigidity is lower for fiscal years ending between June 15, 2006 and December 15, 2006 than it was for earlier fiscal years. If so, this suggests that required expensing without required disclosure reduces rigidity. The post-period in this analysis is always June 15, 2006 and December 15, 2006. To increase power we lengthen the pre-period across successive columns. In Columns (1)–(2), the pre-period runs from December 15, 2005 to June 15, 2006. In Columns (3)–(4) the pre-period runs from December 15, 2004 to June 15, 2006. In Columns (5)–(6) the pre-period runs from December 15, 2003 to June 15, 2006. Note that the analysis is not within-firm. In Columns (1)–(2) it is not possible to do within-firm analysis because no firm has a fiscal year ending in both the pre- and post-periods. The variable *Post-FAS123r* is an indicator equal to one for fiscal years ending after June 15, 2006. In the even columns, the dependent variable is a number-rigid indicator variable defined as described in Table 2. In the odd columns, the dependent variable is a number-reference indicator variable as described in Table 2. Firm controls include assets, leverage-to-book ratio, return on assets, market-to-book ratio, capital expenditures to lagged PP&E, and firm returns. Industry fixed effects use the Fama–French 49 industry classification. Standard errors are clustered by firm. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

	2005-2006		2004-2006		2003-2006	
	(1) Number Rigid	(2) Number Reference	(3) Number Rigid	(4) Number Reference	(5) Number Rigid	(6) Number Reference
Post-FAS123r	-0.0101 (0.0445)	-0.0457 (0.0536)	-0.0189 (0.0407)	-0.0864* (0.0477)	-0.0229 (0.0382)	-0.0994** (0.0467)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.0695	0.0891	0.0649	0.0727	0.0518	0.0746
Observations	1779	1779	3581	3581	5440	5440

## B. Survey Evidence

The following reports the results of a Towers Perrin CompScan Survey of 130 North American companies with sales averaging just over \$5 billion (US) in 1998.

*Last year, you personally received options to purchase 1,000 shares ... at the stock's then current price of \$50. This year, the share price is up to \$70. How many options should you get (assuming, for the sake of this simple example, that the competitive value of your job hasn't changed from last year to this one)?*

- A) 1,500
- B) 1,000
- C) 715

*If you chose A, you're in the vast majority [ $> 50\%$  of survey respondents] of option recipients who think they should get more, not fewer, options when the price goes up.*

*If you selected B ... you're not expecting a bigger grant, more than the 1,000 options you received last year, but you also can't see why the size should be cut back when the stock has performed well.*

*If you selected C, either your analytic tendencies are dominating or you're thinking chiefly with your corporate hat on ... You may reason that a grant of 715 options would have the same Black-Scholes value as the prior year's grant, because the Black-Scholes value for each option has increased as the stock price went up.*

It is telling that more than half of survey respondents chose option A, which required a raise in the number of options, suggesting both number focus and also a reference point set by last year's number.

An important caveat to this explanation is that the lack of sophistication with regard to option valuation need not be on the part of the CEO or the board. Many firms also grant employee stock option plans or ESOPS to lower-level managers and rank-and-file employees. Anecdotally, many of these employees are unaware or distrustful of option valuation formulas and prefer to count option grants in terms of number. For example, Tower's Perrin actually argues in their 1998 survey that firms may engage in stock splits to manage employee expectations regarding option and share grants:

*"Stock splits also offer an opportunity to readjust grant levels, moving back toward more competitive levels, without jolting employees' perceptions or expectations quite so drastically. For instance, among those companies with fixed guidelines that had a stock split in the past three years, exactly half reported holding the line on the number of shares they granted while the other half increased grant levels proportionately."*

It could be the case that workers below the level of the CEO view compensation through the lens of number-focus and reference points. This could generate rigidity. Then, internal pay equity concerns may cause rigidity to translate up the firm hierarchy to the CEO level.

### C. Reporting Errors Around Splits

One important concern is that the results presented in Section 5.3 may be influenced by reporting errors. For the purposes of our analysis, we assume that, as is required by the SEC, firms report their compensation for the previous fiscal year in terms of the correct units as of the proxy date (SRCDATE in Execucomp). In general, reporting errors would not lead us to over-detect cases where the non-split adjusted number remained fixed. For example, if a CEO was originally granted 100,000 options on July 1, 2000 and there was a 2-for-1 stock split in December 2000, then the firm should report that the CEO received 200,000 on its March 2001 proxy statement. If a firm instead erroneously reported that the CEO received 100,000 options on its proxy statement, we would incorrectly infer that the CEO was originally granted 50,000 options. If the firm held the split-adjusted number fixed by granting the CEO 200,000 options in the following year (July 2001) and there were no further splits, it would appear to us as though the CEO was originally granted 50,000 options in 2000 and 200,000 options in 2001.

Nonetheless, to ensure that such reporting errors are not influencing our results, we take advantage of the fact that firms also must report the stock price as of the grant date in terms of the correct units as of the proxy date. Therefore, if the firm's stock price was 100 on July 1, 2000, it should report a stock price of 50 on its March 2001 proxy statement. If a firm instead erroneously reported a stock price of 100 on its proxy statement, we would incorrectly infer that the options were originally granted at a stock price of 200. To check for such cases, we compare our imputed original stock price with the grant-date stock price from CRSP. If the stock price from CRSP is within 1% of our imputed grant-date stock price, we assume that the firm reported its option grants correctly on its proxy statement. Limiting our split analysis to such cases leaves the results unchanged. We also repeat the same exercise based on the number of options reported in the TNF Insider Filings dataset and again find similar results.