Indexing CEO Equity Compensation to Firm's Cost of Equity Capital

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Abstract:

The value of a company's stock should increase by the firm's cost of equity capital net of dividend yield. We designate option grants (stock grants), where stock price of the firm on the vesting date is smaller than the exercise price (stock price) on the grant date incremented by firm's cost of capital net of dividend yield, as excess compensation. We apply this idea systematically to 19,499 unique grants of equity-based compensation awarded to 1,222 participants who worked as CEOs at 711 firms during 2007-2016. Based on this criterion, of all the stock grants and in-the-money option grants that fully vested in our sample, 35% of them turn out to be excessive. At the firm-year level, 27% of firm years are associated with excess compensation. Excess compensation is correlated with (i) smaller firms, lower market to book firms and firms with poorer governance; (ii) under-investment in PPE, R&D and acquisitions; (iii) restricted payouts to shareholders in terms of dividends and share repurchases; and (iv) lower asset turnover. In around 80% of the firm-years where excess compensation thus computed is involved, the proxy advisor, ISS, does not appear to oppose equity grants where minimum value creation is not achieved by management.

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1.0 Introduction

Whether CEOs are excessively compensated for the shareholder value they add is a subject of intense debate in the practitioner and academic literature (Murphy 1999, Edmans, Gabaix and Jenter 2017). One of the contentious aspects of this debate is the measurement of excess compensation. The most popular way of measuring excess compensation in the academic literature, perhaps driven by the absence of detailed data we use, is to label the residual from a regression of CEO's pay on certain firm attributes as excess pay (see Smith and Watts, 1992; Core, Holthausen and Larcker, 1999; and Murphy, 1999). By definition, half of the firm-year observations in such a sample are assumed to overcompensate the CEO. In this paper, we explore an alternate way of measuring excessive compensation.

Most of the CEO compensation in recent times stems from stock or option grants and exercises. Stewart (1990) and Jensen, Murphy and Wruck (2002) recommend that remuneration committees should consider issuing executive share options with exercise prices that increase with the company's cost of capital. Because such plans are rarely observed in reality, we conduct a thought experiment to assess how many of the option (stock) grants awarded to CEOs are associated with minimum value creation, where the exercise price (grant date stock price) of the option (stock) grants were benchmarked to the firm's own cost of equity capital.

More specifically, the value of a company's stock should increase by the firm's cost of equity capital, net of dividend yield. Therefore, if share-based compensation is intended as an incentive to enhance shareholder value, the exercise price of a CEO's stock option should increment by the same (discount) rate. That is, assuming option grants are intended to incentivize the manager to improve performance, if the stock price and the exercise price on the grant date of

an option is $10, the CEO should ideally earn nothing on the stock option unless shareholders do better than break even on the vesting date of the option. Assume that the total stock return (TSR)[1] on the stock over the three-year period spanning the option grant date and vesting date is 30%. Further assume that the cost of equity capital on the grant date is 11%. Compounded annually, the expected TSR on the stock over the three-year period should be 36.7%. Hence, this grant represents excessive compensation because the CEO has failed to add shareholder value but will still receive an intrinsic value of $3 ($13 stock price - $10 exercise price) per option. The intuition related to restricted stock units (RSUs) is similar. Assume that the same CEO also received RSUs that vest at the end of three years. Although the CEO failed to create incremental shareholder value, he will receive a payout of $13 if he were to sell the restricted stock in the open market on the vesting date. Hence, we label such an RSU grant as excessive compensation on the vesting date.

Focusing on realized, as opposed to ex-ante pay, comes with costs and benefits. On the one hand, ex ante pay, as measured in the literature, rarely accounts for the value of pay to the undiversified CEO, as opposed to the cost of the pay to the firm. This is because ex-ante compensation often fails to fully adjust for (i) the risk of forfeiture of performance-contingent pay; (ii) the inability of the CEO to diversify the risk inherent in the stock; and (iii) the compensation foregone if the options are out of the money. The popularity of such performance-contingent pay has surged since 2006 especially after the financial crisis. However, ex-ante pay would incorrectly label performance-hurdle based compensation and eventually out of the money options as excess pay even if the CEO did not cash out these grants. For instance, the Black Scholes value of an

[1] TSR is the holding period total return which includes share price appreciation and dividends paid. It represents the growth in capital by purchasing a share of the company assuming that the dividends are reinvested whenever they are paid.

option grant that will vest only if the CEO achieves a particular EPS target two years from now would be misclassified as excess compensation in the first two years even if the CEO fails to deliver that EPS number later.

Realized pay is ex-post, by definition. That is, the CEO takes ex-ante positive NPV risky projects that do not pan out ex post. The firm's stock returns suffer as a result of such ex post losses and the CEO has to internalize some of this loss via realized compensation. However, many shareholder advocates, especially after the financial crisis, would consider such a loss to the CEO's wealth as a version of pay that is actually sensitive to realized performance (Murphy 2013). Rather than choose between ex-ante and realized pay, we believe both systems are complementary and could provide useful signals about the CEO's contribution to the firm and his/her compensation for such contribution.

As mentioned, the idea underlying cost of equity indexed stock and option grants is not new to the literature. Our contribution lies in applying this idea systematically to 19,499 unique grants of equity-based compensation awarded to 1,222 participants who worked as CEOs at 711 firms during 2007-2016. To illustrate the magnitude of the effects we find, for in-the-money options and stock grants that have vested at least 50% (100%) in our sample period, 47% (35%) of them are labeled as excessive compensation because the total shareholder return from the grant date to the vesting date is lower than the expected return based on the respective firm's cost of equity capital. When firm-year is the unit of analysis, 27% of firm-years are associated with excessive compensation when benchmarked to their own cost of equity capital.

Moreover, the overlap between excessive compensation, as identified by our indexing method, and residual based excess ex-ante compensation models is small (correlation around 9%),

suggesting that our ex post method can potentially complement the measurement of excess pay on an ex-ante basis.

Firm-years designated as excess equity compensation are associated with higher levels of salary and lower levels of non-equity pay. But these firms are smaller in terms of market value of equity, poorer performers in terms of ROA and industry-adjusted ROA and are associated with lower market-to-book ratios, lower Tobin's q and with CEOs with longer tenures, lower stock ownership, larger boards and fewer outside directors. Excess compensators systematically under-invest and are inefficient. When we look back three years before the option grant or the stock grant was labeled excessive, we find that firms associated with excessive compensation invest less than the average firm in capital expenditure, R&D and acquisitions. Excess compensators are also associated with lower dividend payments, lower share purchases and lower asset turns.

Finally, proxy advisors' recommendations are inconsistent with our measure of excess compensation. In particular, we can document at best a 9% increase in the probability of a negative recommendation on a firm's pay proposal by Institutional Support Services (ISS) when the underlying equity grants are associated with value destruction, defined here as cases where the total shareholder return from the grant date to the vesting date is lower than the expected return based on the cost of equity capital.

Our work can be thought of as an extension of the Ralston Purina case described in Campbell and Wasley (1999) to a large sample of firms and equity grants. Campbell and Wasley (1999) estimate that Ralston's cost of capital was 11.6% per annum, after adjusting for dividends. If Ralston met the lowest of the reasonable targets over the bonus period, by exactly earning its cost of capital in 10 years, the stock price would be $189.92. However, Ralston wrote an incentive plan for 14 top managers that would pay off a large bonus if the stock price for Ralston hit $100

in 10 years. Ralston effectively encouraged its managers to destroy value but still collect a huge payoff. Bettis et al. (2010 and 2018) examine equity awards with performance vesting provisions and generally conclude that the performance vesting provisions specify meaningful performance hurdles and provide significant incentives for executives and such awards are associated with superior operating performance. However, time-based awards, ignored by these papers, constitute around 70% of grants in our sample.

Balachandran and Mohanram (2010) find that CEOs were rewarded with more (ex-ante) pay for earnings growth from investment (which appears to destroy shareholder value) than the more valuable earnings growth from improved profitability. Dittman (2010), however, points out that capital expenditure announcements by firms are associated with positive stock returns. Along those lines, our focus is on evaluating shareholder value added through change in the firm's stock price between the grant date and vesting date of an equity grant as opposed to a decomposition of a firm's earnings growth. In sum, we provide large sample evidence on the implications of applying Jensen, Murphy and Wruck (2004)'s intuition that firms should compensate their senior managers with equity grants whose exercise prices are indexed to their cost of capital.

The remainder of the paper is organized as follows. Section 2 discusses the related literature. Section 3 discusses the sample selection and methodology used to compute the score of excess compensation. Section 4 presents the descriptive statistics. Section 5 examines the determinants and consequences of excess pay. Section 6 concludes.

2.0 Background and Related Literature

2.1 Cost of capital indexed options

Jensen, Murphy and Wruck (2004) argue that traditional option and equity plans typically encourage the manager to ignore the cost of equity capital. As a result, managers would get

rewarded even if they destroyed shareholder value. To illustrate this, consider the case of Ralston Purina, documented by Campbell and Wasley (1999). Ralston Purina wrote a compensation contract in 1986 that a CEO and 13 senior executives would receive $49 million if the stock price closed above $100 in 10 years and stayed at $100 or above for ten consecutive days. The contract did not motivate the CEOs and senior managers to increase shareholder value because the implied rate of return needed to get the stock price to $100 was 58%, whereas the annual cost of capital for Ralston Purina was 11.6%.[2] That is, had the stock price appreciated by just the cost of capital, the stock would have ended at $187 in ten years. This contract implied that managers could destroy $87 of shareholder value and still get huge payoffs from the compensation contract.

Jensen, Murphy and Wruck (2004) narrate a boardroom incident at a Fortune 500 firm where the top-management team of the company informed the board that if it ratified the strategy and the associated incentive plan, the stock price of the firm would rise from its current price of $57 per share to $100 per share in five years. The board and management had already agreed that the cost of equity capital for this company was 15 percent and the company regularly paid an annual dividend of about 2.5 percent per year. Given these assumptions, the breakeven value of the equity in five years that leaves shareholders whole (just earning their cost of equity capital net of dividends) would be $\$102.72 = \$57(1.125)^5$. Hence, if the management's projection of a stock price of $100 in five years were true, shareholders would lose $2.72 per share whereas managers would be compensated $43 per share.

[2] To be clear, the stock price was $63.375 on the grant date and a 58% increase in stock price brings it up to $100. The cost of equity is an annual rate of 11.6%. If this rate is compounded for 10 years, Campbell and Wasley (1999) state that the stock price should be 187, although that stock price should be slightly higher at $190 by our calculations.

In the data, we identify every vested option and stock grant and assume that the strike price of the option or the stock price of the stock grant on the grant date increases by the firm's cost of equity capital net of dividends till the vesting date (the expected stock price). If the stock price of the firm on the vesting date of the option or the stock grant is lower than such an expected stock price, we label that grant as "excess compensation." We measure the amount of excess compensation as (i) the intrinsic value of the option on the vesting date (difference between the stock price on the vesting date – exercise price) times the number of option units vested; and (ii) the stock price at the vesting date times the number of stock units vested.[3] Details related to how our measurement process differs from that used in the prior literature are discussed next.

2.2 Measurement relative to prior literature

While there is a consensus that the level of CEO pay has increased over the last few decades, the question on whether this increase was commensurate with the firms' performance is debatable. This area of research is fraught with concerns related to measurement errors mainly due to the complexity of compensation plans which is further compounded by inadequate disclosure requirements. We focus on the measurement of three specific components in this literature: (i) total pay; (ii) performance pay; and (iii) excess compensation.

[3] To make this concrete, consider a case where we have one unit of restricted stock cliff vesting at end of three years. The grant value of restricted stock is $10 with an 11% cost of equity with no dividend payments. With these parameters, the expected stock price is $13.67. If the actual price is $13, in our view, the CEO has been overpaid. Hence, we define excess compensation as $13. We have heard at least two other perspectives on this measurement problem. First, one could argue that excess compensation is only $3.67 (difference between expected price and stock price on the grant date). We disagree because this perspective assumes that the manager deserves to get $10 or the grant date stock price. The second perspective is that the excess compensation should be $2.09 assuming that the benchmark is not the cost of equity but the risk-free rate. That is, if the risk-free rate were 5%, the expected stock price should have been $11.58 at the end of three years and hence the excess compensation should be $2.09 or ($13.67-$11.58). While there is some merit to benchmarking the stock price to the risk-free rate, we are again unsure why the manager deserves to get $11.58. Moreover, in sensitivity analysis, we benchmark the firm's stock returns to market returns and industry returns instead of the firm's own cost of capital.

2.21 Total pay

The most critical choice researchers face in measuring total pay is whether to use the ex-ante grant-date value for stock and option awards or the ex-post value realized upon vesting of stock awards and upon exercise of option awards. While both are legitimate measures of CEO compensation, many researchers have adopted the ex-ante approach. However, when examining the pay performance sensitivity, Murphy (2013) believes that realized pay is also useful as it reflects the actual value realized by the executive for his current and past performance.

The ex-ante grant date value of equity awards suffers from two measurement issues. First, the underlying assumptions in the Black-Scholes option pricing methodology, used to compute the grant date value of option awards, focus on computing the cost of the option to the firm as opposed to the expected value of the option to the executive. The modified Black Scholes model, as applied in firms' 10-Ks, often assumes that the option is a European option (cannot be exercised before the expiry date), cannot be forfeited and the executive can completely hedge away the risk of the option. None of the above assumptions strictly apply to a CEO holding these options.[4] Second, the grant date value is equal to the discounted expected value on vesting only if there are no performance hurdles and there is no risk of forfeiture either due to non-performance or due to the termination of the CEO's employment before vesting. The increasing use of performance metrics in stock-based compensation in recent times aggravates this measurement error. For example, assume that a CEO gets a stock award worth $1 million, conditional on achieving a stock price appreciation of 10% in one year. If such performance is not achieved, then based on ex-ante compensation measure, one would incorrectly conclude that the executive is not paid according to his performance and hence might consider $1 million as

[4] Some firms use a binomial model since the introduction of FAS 123R to address these issues.

excess pay (or even a portion of it, if firms take the probability of vesting into consideration while computing the grant date fair value). However, the CEO would not have received this pay if the performance goal is not met. Therefore, based on realized pay, the correct conclusion would be that the executive is paid according to his performance.

Realized pay includes the actual earned cash compensation (base salary and cash bonuses), actual payouts of performance shares and performance cash awards and the value of exercised options. While this measure represents the actual amounts received by or paid to the executive, it is contaminated by the executive's subjective timing associated with exercising his/her vested options. If the executive exercises all the options on the date of vesting, then realized pay reflects the true value accrued to the executive for his current and past performance. However, if the executive chooses to exercise the options at a later date, then realized pay could be misleading as it includes the fluctuations in compensation based solely on the investment decisions of the executive.

This subjective bias can be minimized if one could compute the potential value accrued to the executive on the date the option awards *vest*. Firms do not disclose the vesting date value of option awards in their proxy filings. However, they disclose various terms of the option grants and the number of unvested unexercised options outstanding at the end of each year. Based on this information, we approximate the potential value accrued to the executive upon vesting of option awards during each measurement period. Subsequently, we compute the modified value of total realized pay from equity-based awards as a sum of the value of shares

underlying vested stock awards and the potential value accrued upon vesting of option awards. The detailed procedure we use is illustrated in Appendix A1-A3. [5]

2.22 Performance

Defining performance is a crucial choice in examining the link between pay and performance. The most commonly examined measure in the literature is a firm's return on assets (ROA), followed by the return on common stock. The link between pay and performance is influenced by the choice of performance measure. Abowd (1990) finds that the link is much stronger for market measures than for accounting measures. Accounting measures are relatively easier to game than stock return measures. Bennett et.al. (2017) examine a large data set of performance goals employed in executive contracts and find that a disproportionately large number of firms exceed their accounting performance targets such as sales and earnings by a small margin relative to firms that fall short of their targets by a similar margin.

In this paper, we focus on stock returns as the performance measure even if the option or equity grant is tied to the achievement of one or multiple accounting targets for two reasons. First, many, if not most, of these accounting targets in compensation plans are based on non-GAAP numbers that incorporate idiosyncratic firm specific adjustments. Without gathering data on such idiosyncratic adjustments, it can be difficult to assess whether or not the CEO has actually managed to achieve his/her accounting target.[6] Second, stock price on the vesting date provides a natural benchmark relative to the stock price on the date the equity award was granted (or the strike price of the option). Hence, assessing whether the total shareholder return (TSR)

[5] In practice, many companies restrict the exercise of options even after vesting as they are required to retain ownership at a certain level. Lack of machine readable data prevents us from incorporating this feature into our calculations. In this paper, we compute excess compensation on the vesting date of the option or equity grant.
[6] Bennett et al. (2017) rely on COMPUSTAT based numbers of accounting targets, not actual non-GAAP versions of these targets, to assess whether or not CEOs beat these targets by a small margin.

earned over the period spanning the stock/option grant date to the vesting date is higher than the cost of equity capital can also provide insights into whether or not the stock/option grant was value added to shareholders.

2.23 Excess compensation:

We measure excess compensation for each stock and option grant by examining whether the TSR (measured from the grant date to vesting date) was above or below the cost of equity capital (measured on the grant date and compounded for the time-period between grant and vesting dates). In particular, we label the value of a vested stock award on the vesting date and the intrinsic value of the vested option award on vesting date as excess compensation if TSR is below the cost of equity capital (greater detail discussed in section 3.2).

We compare our measure of excess compensation with the ex-ante pay based excess compensation measure used in prior literature (Smith and Watts, 1992; Core, Holthausen and Larcker, 1999; and Murphy, 1999). In these papers, excess compensation is computed as the difference between actual compensation and expected compensation, where expected compensation is estimated by regressing the natural logarithm (ln) of total compensation on proxies of economic determinants of CEO compensation, such as firm size, book to market as a proxy for growth opportunities, stock return and accounting return. Because excess compensation is assessed as a residual, half of the firm-year observations in the sample would be deemed as over-payers. Our method of checking whether every option/stock grant is value-added to the shareholder is potentially a finer approach to measuring excess compensation. Such a refined approach was difficult to implement till recent times because the detailed data required for such calculations has been made available by firms only since fiscal year 2007.

3.0 Data and methodology

3.1 Data

We obtain compensation data from *Incentive Lab*, which provides detailed excerpts of proxy statements (DEF 14A) for the largest 750 firms by market capitalization (includes S&P 500 and a significant portion of S&P 400). Because the set of 750 largest firms changes year to year, *Incentive Lab* augments the sample with backward and forward filling of observations since 1998. The database captures all the important tables from the proxy statements including pay mix, plan details, performance metrics and goals, payout structures, relative award details and peer groups used for relative performance.

We focus on the equity-based grants (stock & options) awarded to CEOs. Our main objective is to identify whether CEOs are being compensated for value creation. To answer this question, we need to identify how many of these equity-based grants actually vested and whether the CEO was able to deliver a higher TSR relative to either the firm's cost of equity capital or market (S&P 500) returns, during the period spanning the grant date and the vest date of the respective grant. We also use value weighted returns at the two-digit SIC level to benchmark TSR to industry returns. We incorporate various features of equity-based grants to estimate their expected vest dates. In particular, *Incentive Lab* provides data on the grant date, the type of award (restricted stock units, options, etc.), vesting type (time or performance), vesting schedule (cliff or ratable), vesting time (start and end of the vesting period), vesting frequency and number of units of the underlying security awarded. We obtain stock price data and split adjustment factors from CRSP and accounting information from COMPUSTAT.

3.2 Methodology

Using participant level data from *Incentive Lab*, we identify all the unique participants and the respective firms (CEO_firms) where they were employed as a CEO at some point during 2007-2016.[7] The equity grants which vested during this period could have been awarded to the participant before 2007 and also before the participant became the CEO (in the case of internal hires). Hence it is imperative that we track these participants over the period 1998-2016[8] during which they were employed as "Named executive officer" (NEO) at the respective CEO_firms. Finally, we obtain grant level information on every grant (both time & performance based) awarded to these participants. In computing our measure of excess compensation, we are only interested in identifying all the grants which were awarded and vested when the participant was the CEO. Hence, we exclude the vested grants awarded to participants by the CEO_firms before they were appointed as CEOs. We also require that the vesting date fall at least six months after the grant date to allow for sufficient time to elapse before we can legitimately assess whether or not the grant is excessive.[9] Once we identify all such vested grants, the next step is to check whether total shareholder returns (TSR) over the duration of these grants (from grant date to vesting date), exceeded the cost of equity capital (expected return) on the grant date compounded for the duration.

The details underlying identification of grants and their terms and the subsequent assessment of whether such grants are value-added are complex. We describe the process we followed in a series of steps: (i) we estimate the expected vest dates and number of units vesting on each such date for every grant in our sample; (ii) we compute the actual vested equity (stock

[7] Certain features of the awards and the actual vesting data are available only after December 2006 when the new format for Def 14A became mandatory. All firms started reporting in the new format since 2007 fiscal year.

[8] Incentive lab provides grant level data only since 1998.

[9] If the vesting date falls before six months, we include the realized value from that option or stock in "other pay."

and options) units each year, (iii) we match the expected number of units vesting in a year to the actual vested units in that year, (iv) we then approximate the value of all the grants flagged as vested[10]; and finally (v) we check whether each vested grant passed the test of TSR exceeding the expected returns. All the grants which did not pass this test have been labelled as "excess compensation." In a single year, we found grants which are labelled as excess compensation and grants that are not. To aggregate such disparate grants back to the firm-year level for analysis later, we compute a single score for each firm-year. In particular, we compute a weighted average of the values of all the vested grants as below.

$$Score = \frac{[Gs(-1)+Gf(+1)]}{Gs+Gf} \qquad (1)$$

where Gs (Gf) is the sum of the intrinsic value of options and the market value of stock grants vested in that year, where for each grant, the TSR from grant date to vesting date was greater (smaller) than or equal to the cost of equity capital on the grant date compounded for the duration of vesting. Each grant labelled as excess compensation is assigned an indicator of +1. Value-added grants are assigned an indicator of -1. The value of $Score$ ranges from -1 to +1 and is increasing in excess compensation. An important point to recognize is that we allow value-added equity grants to offset value-decreasing grants. This offsetting procedure gives the manager the benefit of doubt and reduces the incidence of cases designated as excess compensation. We also compute an alternate measure of the *Score* using S&P 500 returns and industry returns as the performance test instead of relying on the firm's own cost of equity capital.

[10] This step ensures that only "in the money" options get counted as excess compensation. Restricted stock, by definition, is in the money because the exercise price underlying the stock is zero.

3.21 Computing expected vest dates

Our main challenge is to identify all of the individual stock and option grants that have vested in the measurement year. As mentioned before, such links are not readily available. To approximate such links, we find every option or stock grant awarded to a CEO and estimate if and when that grant actually vested.

To estimate the expected vest dates and the number of units vesting on each such date, we make use of the vesting schedules data coded for each grant by *Incentive Lab* as follows:

(i) *Ratable grants*: For grants coded as Ratable awards, the vesting dates are estimated using the time difference (in months) between the field "Vest_start" in *Incentive Lab* and the field "Vest_end" divided by the field, "Vest_freq." For example, if Vest_start=24 months, Vest_end=48 months and Vest_freq = "Year" then 1/3rd of the award is expected to vest after 24 months from the grant date, another 1/3rd after 36 months and the remaining is expected to vest after 48 months from the grant date.

(ii) *Cliff awards*: Grants labeled as cliff awards are expected to vest 100% on the final vesting date, as computed using the Vest_end field.

(iii) We adjust these vesting schedules using the analyst comments (in *Incentive Lab*), a field that captures information from the footnotes of the proxy statements on how much of each grant is expected to vest on a particular vesting date. For the grants with no such information, we assume that equal proportions of the award are scheduled to vest on each expected vest date.

(iv) *Unclear terms*: Finally, for grants with unclear vesting schedules and no information in analyst comments field, we assume a three-year vesting period.

After apportioning each grant over future dates according to the vesting schedule, we treat each grant date and vesting date pair as a separate sub-grant for the purposes of analyses. For example, if a ratable grant has a three-year vesting period with 1/3rd of the grant vesting on each anniversary, we classify each of the three parts as a separate sub-grant. For each of these separate sub-grants, the grant date is the same. However, the vesting dates are different and number of units vesting for each of these individual sub-grants is 1/3rd of the original grant. The sub-grant procedure helps us match expected vest units of stock and option in each expected vest year with the actual vested units in that year as disclosed in the proxy statements. Details related to obtaining data on actual vested equity units are discussed next.

3.22 Actual vested equity units:

3.22.1 Stock Awards: Award Types (RSU, Stock, Phantom stock in Incentive Lab)

The actual vested units for stock awards, classified as RSU, Stock and Phantom Stock in *Incentive Lab*, are directly obtained from the proxy filings as firms are required to report number of shares acquired on vesting in the "Option exercises and stock vested table" of their DEF 14A filings since December 2006. If the number, but not the value, of shares acquired on vesting is missing, then the number of shares acquired on vesting is estimated by dividing the value of shares acquired by the average price at the beginning and end of the respective fiscal year adjusted for stock splits.

3.22.2 Option Awards: Award Types (Option, PhantomOption, ReloadOption, SarCash, SarEquity in Incentive Lab)

Firms do not report the number of options vested in their proxy statements. However, they are required to report the number of un-exercisable un-exercised shares underlying the

option awards every year. The number of un-exercisable un-exercised shares represents the unvested options on each fiscal year end. We use the annual change in the number of unvested options, adjusted for new grants of options, to approximate the actual vested units for option awards using the equation below:

$$Options\ Vested_t = Options\ unvested_{t-1} - Options\ unvested_t + Options\ granted_t \quad (2)$$

3.23 Matching expected vesting units with actual vested units

In this section, we describe how we flag each grant (grant date, vest date pair) as either vested or not. Assuming that the vesting schedules captured by *Incentive Lab* are accurate, all time-based awards could be assumed to vest on the expected vest date, provided the grantee is still employed by the firm (even if he is not the CEO on that date). However, it is difficult to ascertain whether the performance-based awards have actually vested or not because they are contingent on achieving certain performance targets. Because performance is often evaluated using multiple metrics with multiple hurdle rates, it is practically not feasible to flag them as vested or not based on whether the CEO achieved these goals. In order to overcome this problem, we match the expected vest units to the actual vested units using an algorithm described below.

We begin by arranging all the grants expected to vest in a particular year in the order of Time & Cliff, Time & Ratable, Performance & Cliff and Performance & Ratable respectively. That is, we assume that cliff vested time-based grants would vest before ratable time-based grants. Further, time-based grants are assumed to vest ahead of cliff-based performance awards and performance based ratable grants. Within each of these four sub-categories, the grants are further ordered on a first-in-first-out (FIFO) basis based on their grant date. We then compare

each of these grants (ordered as mentioned) to the actual vested units to flag them as either vested or not. For example, assume Award A (Time & Cliff) was granted in 2006, Award B (Time & Ratable) was granted in 2008, Award C (Performance & Cliff) was granted in 2008, and Award D (Performance & Ratable) was granted in 2009. Further, assume that the expected vest year for all these grants is 2010. If Grant A units is less than or equal to the actual vested units in 2010 then Grant A is flagged as vested. If sum of Grant A and Grant B units is less than or equal to the actual vested units in 2010 then Grant B is flagged as vested. If the sum of Grant A, Grant B and Grant C units is less than or equal to the actual vested units in 2010 then Grant C is flagged as vested and so on. We illustrate this procedure in Appendices A1 and A2.

The above strategy works only if the expected vest dates are estimated accurately, which in turn, depends on how accurately *Incentive Lab* captures all the complex features of the grants from the footnotes. This concern is further aggravated by the presence of accelerating provisions which allow for early vesting of certain grants compared to their original schedule on the grant date. To overcome these challenges, we follow a systematic approach to select grants such that the number of units expected to vest from each of these grants adds up to the total actual units of vested stock/options in that particular year.

The selection procedure we use is as follows. First, we classify all of the available grants into six subgroups based on their expected vest dates and type: time-based awards associated with the current year (*current time*), unvested time-based awards associated with previous years (*previous time*), performance-based awards associated with the current year (*current performance*), unvested performance-based awards associated with previous years (*previous performance*), time-based awards associated with future years that were granted in or before the

current year (*future time*), and performance-based awards associated with future years that were granted in or before the current year (*future performance*).[11]

Next, we match the grants from each subgroup to the total actual vested units in the order of *current time*, *previous time*, *current performance*, *previous performance*, *future time*, and *future performance*. The logic behind this ordering is that time-based awards should get filled before performance-based awards as the former will almost certainly vest (as long as the participant remains employed with the firm), and awards expected to vest in future years should only be used if we exhaust the awards expected to vest in current and previous years. Lastly, within each of the subgroups, we apply the FIFO principle and require the awards to be granted earlier to be used first. We illustrate this procedure in Appendix A3.[12]

All the stock numbers in the proxy statements are reported as of the proxy filing date. In order to compare the number of shares underlying the grants with the number of shares actually vested in different years, we adjust the number of shares by the cumulative split adjusted factor on the proxy filing date of respective fiscal years.

3.24 Estimation of value of grants flagged as vested

We now have the list of grants flagged as vested or not for each firm-year-participant. "Stock value" for each stock grant is computed as the number of shares vested multiplied by stock price on the vest date. "Option intrinsic value" for each option grant is computed as number of shares underlying the vested option multiplied by the difference between stock price

[11] All grants which were granted in or before the vest year.

[12] This procedure results in altering the expected vest dates of some grants to the fiscal year end of the year they are finally matched with. However, these changes are few in number. After implementing this procedure, around 75% of the grants retained their original expected vest dates. The vesting date of the remaining 25% of grants are set equal to the fiscal year end of the year they are finally matched with.

on the vest date and the exercise price. If the option intrinsic value is negative (vest date price is less than exercise price) then the value of the vested award is considered to be zero as the option is out-of-money. Because the shares underlying these awards are adjusted using the cumulative split factors, the prices used to compute the stock or option values are also adjusted using the respective cumulative split factors.

3.25 TSR vs expected returns

We estimate cost of equity for each firm on the grant date using the Capital Asset Pricing Model. The risk-free rate used in this model is the 10-year U.S. Treasury bond rate. Equity risk premium is the implied risk premium computed every year using the free cash flow to equity model for the S&P 500 index.[13] The beta for the grant date month is estimated by regressing monthly stock returns of the firm on CRSP value weighted monthly returns. The estimation window used is 60 months with a minimum of 24 months before the grant date month.

Total shareholder returns (TSR) is the buy and hold return computed using monthly total returns from the grant date month to vest date month. For each vested award, if TSR is less than the expected return (measured either by cost of equity or S&P 500 returns or industry returns) and was granted during the tenure of the participant as a CEO, then the "stock value" or "option intrinsic value" is considered as "excess compensation." Expected return is computed by compounding the cost of equity for the period spanning the grant date and the vest date. Alternatively, we estimate expected returns using the buy and hold return for S&P 500 during

[13] Free cash flows to equity (Dividends + Buybacks) for the S&P500 index are assumed to grow at the rate of 4% for the next 5 years and at the risk-free rate thereafter. The average risk-free rate for the period 2007-2016 is 2.69% (4.02% in 2007 to 2.45% in 2016). Average risk premium is 5.47% (4.37% in 2007 to 5.69% in 2016).

this period. As a sensitivity check we also benchmark TSR to industry returns computed as the value weighted returns to stocks in the two-digit SIC code.

3.3 Final sample

To implement the above methodology, we need data on number of shares acquired on vesting for stock grants and the exercise price for option grants. This data was required to be reported in the "Option exercises and stock vested" table of the proxy statements beginning the proxy season of 2007. Hence, we restrict our sample period to fiscal years 2007-2016.

We started with a sample of all the CEOs available on *Incentive Lab* for the period 2007-2016 after excluding the financial sector (SIC2 60-67). We collected the time series data of these CEOs while they were employed (as an NEO) at their respective firms during 1998-2016 from the participant file of *Incentive Lab* database. This was further augmented with the grant level data for stock and option awards granted by each firm to its respective participant every year.

For further computation, we require three important dates: grant date, proxy filing date and final vest date.[14] In order to compare the number of shares underlying various grants on these three dates across years, we require the cumulative split factors on all these dates. We also need the number of shares underlying the awards granted to be non-missing and the availability of stock price information from CRSP on grant date and the final vest date. After imposing the above restrictions and after excluding financial sector firms, we are left with 19,499 unique grants (both stock and option awards) awarded to 1,222 participants who worked as CEOs at 711

[14] All the compensation numbers are taken from proxy statements which report the numbers as on the fiscal year end but are adjusted for stock splits as on the proxy filing date. If we compare two compensation numbers from two different proxy filing dates, then we need to compare them after adjusting with cumulative split factors on the respective filing dates.

firms during 2007-2016. Using these unique grants, we are able to compute our score for excess compensation for 6,015 firm-years.

4.0 Descriptive Statistics

Table 1 presents the descriptive statistics of 19,499 unique grants that were used to compute our score for excess compensation. These are the original grants awarded to the CEOs. Each of these grants were scheduled (expected) to partially or fully vest during the sample period 2007-2016. For example, if a ratable grant has a three-year vesting period with 1/3rd of the grant vesting on each anniversary, then the entire grant (not the three sub-grants) is considered as one unique grant. While we split this grant into sub-grants for implementing our methodology, we present the descriptive statistics at the original grant level to avoid any duplication and confusion.

Panel A & B shows the specific type of grants in our sample. We classify units coded as *restricted stock grants, stock* and *phantom stock* grants in *Incentive Lab* as stock-based awards and *option, phantomoption, reloadoption, sarcash & sarequity* as option-based awards. As shown in panel A, the sample consists mainly of stock-based awards (11,828/19,499 or 60%) with restricted grants (11,231/11,828 or 95% of all stock-based awards) dominating these stock awards. Option based awards contribute 40% of the sample (7,664/19,499) comprising mainly of option grants (98% or 7,573/7,664).

As shown in panel B, out of the total sample, 62% of the grants (12,110/19,499) are associated with a ratable vesting schedule and the remaining 38% of the grants vest as cliff awards. Time based grants account for 70% of the sample (13,595/19,499) while the rest are performance-based grants. Within the category of performance-based grants, a majority pertain

to grants with absolute performance goals (59% or 3,487/(19,499-13,595)), followed by grants with relative performance goals (23% or 1380/(19499-13595). The rest are grants with both absolute & relative performance goals (18%).

Panel C shows the distribution of grants which were both granted and matched with actual vested units while the participant was a CEO. In particular, 10,916 of the universe of 19,499 grants vest either partially or fully in our sample period. Our measure of excess compensation is computed for the vested portions of these 10,916 grants. Because each of these unique grants could have multiple vesting dates (especially in the case of ratable awards), it is not possible to flag them as either completely vested or not. Hence, we compute the percentage of total vested units of these grants that have been labelled as excess compensation. For 46.6% (39.3%) of these grants, more than half of the vested units were labeled as excess compensation using cost of equity capital (S&P 500 Returns) as the performance benchmark. 35.1% (29%) of the fully vested grants are labeled as excess compensation when benchmarked to the firm's own cost of capital (S&P 500 Returns). These frequencies are higher when TSR is benchmarked to industry returns.

Panel D shows the distribution of vested performance-based grants based on the type of performance metric used. Of the 10,916 grants shown in panel C, a vast majority (8,139 or 75%) vest with the passage of time. That is, only 2,777 grants are performance based. Of the 2,744 grants for which performance data is available, 55.6% are associated with only accounting metrics. 22.0% are associated with only stock price metrics (603 grants) and 13.3% are linked with both accounting and stock price metrics (364 grants).

For performance based grants where more than half of the vested units are labelled as excess compensation, 58.1% are associated with only accounting metrics and 22.4% have only

stock price metrics. This statistic suggests that grants with accounting metrics are slightly more likely to be flagged as excess compensation compared to grants linked to stock price metrics.

Beginning Table 2, the analysis shifts to *score*, as defined in (1), computed at the firm-year level. Table 2 presents the distribution of 6,015 firm-years for which we are able to compute our *score* for excess compensation. Recall that the excess compensation *score* is computed at the firm-year level by offsetting value decreasing grants with value added grants vesting that year. As shown in panel A, the Computers and Durable Manufacturing sectors dominate the sample as they account for around 18% each of the firm-years. Panel B shows the year-wise distribution of these firms. The monotonic decrease in the number of firms from 2007 to 2016 occurs because *Incentive Lab* augments the sample of 750 largest firms every year by backward and forward filling of observations since 1998.[15] 1,609 of the total 6,015 firm-years (26.7%) are associated with an excess compensation score greater than zero when benchmarked to firm's own cost of equity capital. That statistic increases to 30.6% when TSR is benchmarked to industry returns. These numbers suggest that for at least a quarter of the sample firm-years, CEOs were compensated with equity although their firms' stock returns were lower than their cost of equity capital or market or industry benchmarks. The excess compensation score increases during the financial crisis by construction as our test of excess compensation is benchmarked to stock return performance of the individual firm. However, the excess compensation score is on the rise again in the recent years (2015 and 2016).

Panel C documents the relation between excess pay computed using ex-ante pay as per extant literature (e.g., Smith and Watts, 1992; Core, Holthausen and Larcker, 1999; and Murphy,

[15] Incentive Lab tracks 750 largest firms. If new firms fall in the list of 750 largest firms in the recent year, then Incentive Lab will include that company in the dataset for the previous years too. Hence the sample in the past is always higher than in the present.

1999) and aggregate dollar amounts of excess compensation computed in the manner described thus far in the paper. As can be seen, the correlation between V_Coe (aggregate dollar amount of all the vested awards in a year where the value of each vested grant takes a positive sign if TSR<COE and negative sign if TSR>=COE) and Res_Total Ex Ante Comp (residual based excess compensation using ex-ante pay using TDC1 in Execucomp) in a year is 8.9%. The correlation between V_Coe and Res_Total Realized Pay (residual based excess compensation using realized pay of TDC2 in Execucomp) is 3.7%.

5.0 Cross Sectional Variation in Excess Compensation

5.1 Economic covariates of excess compensation

In this section, we explore whether excess compensation, based on indexing to cost of equity capital or the market's overall returns, is associated with the firm characteristics that are traditionally explored in the literature (see Murphy 2013). Table 3 provides univariate data comparing firms where excess compensation is involved (*score* defined in section 3.2) relative to firms not associated with excess compensation. Recall from section 3.2 that a positive *score* is associated with excess compensation. To facilitate identification, we define two *score* variables: *score_coe (score_mar)* is the *score* associated with firm-years with excess compensation using cost of equity capital (S&P 500 market returns) as the performance hurdle.

As can be seen from Table 3, the 1,609 firm-years associated with excess equity compensation (*score_coe* > 0) pay higher levels of salary (mean of $984,000 relative to $919,000) compared with the 4,406 firm-years not associated with excess equity compensation. Firm-years with excess equity compensation are also associated with lower non-equity compensation (mean of $1.319 million versus $1.561 million) perhaps because these two forms

of compensation are substitutes for one another. There is no statistical difference in "other pay" (defined as the sum of salary, bonus, other compensation, pensions, non-equity compensation and equity compensation vested within 6 months from the grant date) between firms with positive and non-positive *score*. Firms associated with excess equity compensation are smaller in terms of market value of equity, poorer performers in terms of ROA and industry-adjusted ROA and are associated with higher stock return volatility, lower market-to-book ratios and lower Tobin's q. Proxies for quality of governance are reasonably well behaved in that firm-years with excess equity compensation are associated with (i) lower CEO stock ownership (1.1% vs 1.6%); (ii) a greater proportion of busy directors (29% v/s 27%).

Descriptive data on *score* variable are presented in panel B. The *score* variable is set to range from -1 to +1 by construction. However, the median *score*, in the cross-section, is not zero in two of the three versions of *score*. To account for the non-normal nature of the *score* variable, we model the presence or the absence of a positive *score* as the dependent variable in the logistic regression reported in Table 4. In Table 4, the dependent variable *(score_coe, score_mar, score_ind)* is computed every year and a *score* greater than zero reflects excess compensation. Considering that we have three sets of somewhat different ways of computing the dependent variable *(score_coe, score_mar, score_ind)*, it seems reasonable to interpret results that are consistent across these three measures. Accordingly, we find that excess equity compensation is associated with (i) smaller firms (as indicated by the negative coefficient on log of market Cap); (ii) lower market to book firms (negative coefficient on market to book ratio); and (iii) lower ROA.

The second column of Table 4 corresponding to every dependent variable assesses the correlation between excess compensation and proxies for quality of governance. As can be seen,

excess compensation is found in firm-years where CEOs have longer tenures, lower stock ownership, fewer outside directors, larger boards and greater proportion of busy directors.

5.2. Real actions of firms associated with excess compensation

In this section, we attempt to provide evidence on the real actions of firms associated with excess compensation. We investigate three sets of managerial decisions related to (i) investment; (ii) financing; and (iii) operating. In particular, we attempt to assess why the stock underperformed. As can be seen from Table 5, firm-years associated with excess compensation are associated with systematic under-investment in the last three years, as measured by (i) change in capital expenditure *(ch_capx)*; (ii) change in property plant and equipment balances *(ch_netinv)*; (iii) R&D *(ch_rdcapex)*; and (iv) acquisitions *(ch_acqcapex)*. In particular, when these investment variables are treated as the dependent variable, the coefficient on *score_coe* is consistently negative in columns (1)-(5) implying that under-investment in the past is associated with the excess compensation in the future attributable to lower ex-post performance. Lower investments are predictably associated with lower prior Tobin's q, lower cash balances and poorer ROA in the past.

Consistent with these results, Table 6 reports that firm-years associated with excess compensation are also linked to lower dividend payments, lower share purchases and lower asset turns. In particular, when *ch_divrep* (or the change in dividend payments and stock buybacks over the past three years) is the dependent variable in column 1, the coefficient on *score_coe* is negative. Firms with poorer operating performance and higher leverage also tend to restrict payouts to shareholders. Similarly, when *ch_turn* (or the change in asset turnover defined as sales/average total assets over the last three years) is the dependent variable, the coefficient on *score_coe* is negative in column (2) of Table 6.

In sum, firm-years associated with excess compensation also happen to be firms that have, over the previous three years, i) under-invested in PPE, R&D and acquisitions; (ii) restricted payouts to shareholders in terms of dividends and share repurchases; and (iii) turned their asset base over slower and are hence likely to be inefficient.

5.3 Do proxy advisory votes reflect excess compensation?

Finally, we evaluate whether proxy advisors' recommendations against executive compensation plans are correlated with option and stock grants, where the underlying stock price does not keep pace with the firm's cost of equity capital. Panel A of Table 7 presents descriptive data comparing our *score_coe* and *score_mar* with the recommendations of the Institutional Support Services (ISS) for and against CEO executive compensation plans. Recall that *score_coe* and *score_mar* ranges from -1 to +1 and is increasing in excess compensation. The data on ISS recommendations and voting outcomes come from the ISS Voting Analytics database, which covers Russell 3000 firms. For each firm and each proposal on the agenda, the database provides the ISS recommendation. As can be seen, in the 499 firm-years where the *score_coe* is a +1 (or excess compensation), ISS recommends a "no" vote in 96 cases (96/499 or 19.2% of the time). That is, in around 80% of the cases where excess compensation is involved, ISS does not object to the pay package for the year. On the other end of the spectrum, of the 1,342 firm-years where the *score_coe* for a firm is -1, ISS recommends a "no" vote on CEO executive compensation in 74 cases (74/1342 = 5.5%).

Panel B provides a multivariate version of the data presented in panel A. In particular, the dependent variable is set to one if ISS issues a negative recommendation on a pay proposal in a year. The treatment variable of interest is an indicator variable that is set to one if *score_coe* > *0*. Hence, the treatment variable refers to firm-years where excess compensation, as defined in

this paper, is involved. The key control variables, consistent with prior work (Malenko and Shen. 2016, Ertimur et al. 2013), are (i) Total shareholder return (of prior one year and three years), a variable that ISS says it considers while making its recommendation (see Appendix B for measurement); (ii) dollar value of ex-ante CEO compensation (see Appendix B for measurement); and (iii) percentage change in the growth in the dollar value of the ex-ante CEO compensation. Besides these, we control for the usual firm characteristics such as size, market-to-book ratio, ROA, leverage, and institutional and insider ownership.

As reported in column 1 of Table 7, the coefficient on the indicator variable *score_coe > 0* is 0.091. Because the regression is estimated as a linear probability model, the results in column 1 indicate that the probability of observing a negative ISS recommendation for firms with *score_coe>0* is nine percentage points higher than the firms with *score_coe<=0*. The coefficient shrinks in magnitude when control variables are added to 3.8 percentage points in column 3. Some of this shrinkage is understandable because variables such as TSR are implicitly included in the computation of *score_coe> 0*. Nevertheless, the main takeaway is that ISS does not appear to object to equity grants where minimum value creation, defined as exercise price of option or the stock price on the grant date of the restricted stock, increments by the firm's own cost of equity capital, is not achieved.

6.0 Conclusions

We revive a measure of excess compensation on equity granted to CEOs discussed in the literature. The idea is that the exercise price of an option or the stock price of a stock grant should increase by the firm's cost of equity capital net of dividend yield. If the stock price on the vesting date of the option or the stock grant is smaller than this benchmark price, any unrealized gains on the option and the market value of stock grant on the vesting date are labeled as excess

compensation. Although the idea has conceptual appeal, implementing it in the data presented challenges that have now been mitigated.

We compute excess compensation using 19,499 unique grants of stock and option compensation awarded to 1,222 participants who worked as CEOs at 711 firms during 2007-2016. Depending on the benchmark used (cost of equity capital, market returns, industry returns), anywhere between 29% to 48% of these equity grants represent excess compensation as per our methodology. When the unit of analysis is the firm-year, after allowing for realized value of vested grants that are value-added to offset the realized value of vested grants that are excessive, 27% of firm-years in the sample are associated with excess compensation.

Somewhat predictably, such excess compensation is associated with firm-years with lower prospects, as measured by market to book, lower realized ROA performance, poorer governance measured as larger boards, boards with fewer outsiders, and lower CEO ownership. Firm-years associated with excess compensation are also associated with lower past investments in capex, R&D, acquisitions, lower dividend payouts, share buybacks and lower asset turns. The recommendations of one of the main proxy advisors to institutional investors, Institutional Support Services (ISS), do not appear to object to excess compensation as calculated here. We hope our work is useful in understanding the eternal question related to whether CEOs are overpaid and if yes, how does one measure such overpayment.

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Table 1: Descriptive statistics: Grants

This table presents the distribution of equity grants in our sample. The sample consists of 19,499 unique equity grants awarded to 1,222 CEOs of 711 firms. Part or all of each grant is scheduled to vest during the sample period 2007-2016. Panel A reports the type of equity grants. Panel B reports the distribution of the grants by performance type and vesting schedule. Panel C reports the distribution of vested grants (n = 10,916) labeled as excess compensation. A grant is included in this sample if a part or all of it has vested during the sample period. A vested grant is labeled as excess compensation if total shareholder returns (TSR) is less than the firm's cost of equity capital (COE), both measured over the duration of vesting of the grant. Separate analysis is reported by using an alternate benchmark of S&P 500 returns (S&P500) & value weighted industry returns at 2 digit SIC level (IND). Each of these grants is further classified into 4 buckets (0%, 0-50%, 50-100%, 100%) depending on the portion of the vested grant labelled as excess compensation. All the grants with the entire vested amount labeled as excess compensation are reported under 100%. All the grants with greater than 50% and less than 100% of the vested amount labelled as excess compensation are reported under 50-100%. Panel D reports the classification of performance based vested grants by the type of performance metrics used. This panel also reports the classification for the subsample of performance based vested grants where at least 50% of the vested amounts are labelled as excess compensation.

Panel A: Type of equity grants

Grant type	**N =19499**
Rsu	11231
Option	7573
SarEquity	386
PhantomStock	156
ReloadOption	91
Stock	55
SarCash	7

Panel B: Distribution of grants by performance type and vesting schedule

Performance Type	**Vesting Schedule**		**Total**
	Cliff	**Ratable**	
Abs	2309	1178	3487
AbsRel	903	134	1037
Rel	1186	194	1380
Time	2991	10604	13595
Total	**7389**	**12110**	**19499**

Panel C: Distribution of Excess compensation measures by performance type

Type	N	TSR<COE				TSR<S&P500				TSR<IND			
		0%	0-50%	50-100%	100%	0%	0-50%	50-100%	100%	0%	0-50%	50-100%	100%
Abs	1747	931	75	137	604	1045	94	111	497	842	97	133	675
AbsRel	465	268	9	16	172	274	12	17	162	228	14	13	210
Rel	565	310	16	28	211	347	21	21	176	302	25	16	222
Time	8139	3422	802	1069	2846	4023	812	976	2328	3284	807	1076	2972
	10916[16]			**46.6%**[17]	**35.1%**[18]			**39.3%**	**29.0%**			**48.7%**	**37.4%**

Panel D: Distribution of performance hurdles used for performance based awards

Metric	Vested grants		TSR<COE for >=50% vested grants		TSR<S&P500 for >=50% vested grants		TSR<IND for >=50% vested grants	
	N	%	N	%	N	%	N	%
Accounting	1525	55.6%	669	58.1%	550	56.8%	726	57.9%
Stock price	603	22.0%	258	22.4%	220	22.7%	267	21.3%
other	113	4.1%	38	3.3%	29	3.0%	38	3.0%
Accounting & stock price	364	13.3%	128	11.1%	122	12.6%	163	13.0%
Stock price & other	7	0.3%	4	0.3%	2	0.2%	2	0.2%
Accounting & other	132	4.8%	55	4.8%	46	4.7%	57	4.5%
Total	**2744**[19]		**1152**		**969**		**1253**	

[16] These are the total number of vested grants. A grant is included in this sample if a part or all of it has vested during the sample period.
[17] For 46.6% of the vested grants, more than half of the vested units are labeled as excess compensation using cost of equity capital as the performance benchmark.
[18] For 35.1% of the vested grants, 100% of the vested units are labeled as excess compensation using cost of equity capital as the performance benchmark.
[19] Out of the total number of performance based vested grants (2,777) reported in panel C, data on type of metrics used is available for only 2,744 grants. Panel D reports the statistics of these grants.

Table 2: Descriptive statistics: Firm-year characteristics

This table presents the industry and year wise distribution of 6,015 firm-years for which excess compensation score was computed. The value of *Score_coe*, *Score_mar & Score_ind* (defined in Appendix B) ranges from -1 to +1 and is increasing in excess compensation. *V_Coe (V_mar/V_ind)* is the aggregate dollar amount of all the vested awards in a year where the value of each vested grant takes a positive sign if TSR<COE (S&P500/IND) and negative sign if TSR>=COE (S&P500/IND). This represents the dollar amount of excess compensation received by the CEO in a year from equity grants. The value of vested grants is computed using the stock price on the vesting date.

Panel A: Industry wise distribution[20]

Industry	Total Sample		Score_coe>0		Score_mar>0		Score_ind>0	
	N	%	N	%	N	%	N	%
Agriculture, forestry & fishing	20	0.3	7	0.4	8	0.6	6	0.3
Chemicals	252	4.2	48	3	42	3	65	3.5
Computers	**1089**	**18.1**	**354**	**22**	**279**	**20.2**	**341**	**18.6**
Construction	85	1.4	36	2.2	33	2.4	35	1.9
Durable Manufacturers	1099	18.3	285	17.7	225	16.3	316	17.2
Food & Tobacco	256	4.3	42	2.6	43	3.1	84	4.6
Lumber, Furniture, & Printing	225	3.7	72	4.5	66	4.8	80	4.4
Mining	33	0.5	6	0.4	3	0.2	8	0.4
Miscellaneous	39	0.6	5	0.3	8	0.6	5	0.3
Pharmaceuticals	486	8.1	91	5.7	77	5.6	108	5.9
Refining & Extractive	**362**	**6**	**125**	**7.8**	**113**	**8.2**	**134**	**7.3**
Retail Trade	437	7.3	96	6	88	6.4	112	6.1
Services	**460**	**7.6**	**151**	**9.4**	**130**	**9.4**	**191**	**10.4**
Textiles and Apparel	85	1.4	21	1.3	18	1.3	21	1.1
Transportation	400	6.7	115	7.1	95	6.9	133	7.2
Utilities	502	8.3	107	6.7	112	8.1	134	7.3
Wholesale Trade	185	3.1	48	3	44	3.2	65	3.5
Total	**6015**		**1609**		**1384**		**1838**	

[20] Agriculture, forestry & fishing: 0100–0999; Mining: 1000–1299, 1400–1499; Construction: 1500-1799; Food & Tobacco: 2000–2141; Textiles and Apparel: 2200–2399; Lumber, Furniture, & Printing: 2400–2796; Chemicals: 2800–2824, 2840–2899; Refining & Extractive: 1300–1399, 2900–2999; Durable Manufacturers: 3000–3569, 3580–3669, 3680–3999; Computers: 3570–3579, 3670–3679, 7370–7379; Transportation: 4000–4899; Utilities: 4900–4999; Wholesale: 5000–5199; Retail: 5200–5999; Services: 7000–7369, 7380–9899; Pharmaceuticals: 2830–2836; , 3829–3851; Miscellaneous: 9900–9999

Panel B: Year wise distribution of excess compensation

Fiscal year	Total Sample	V_coe>0		V_mar>0		V_ind>0		Score_coe>0	Score_mar>0	Score_ind>0
	N	N	Mean ('000s)	N	Mean ('000s)	N	Mean ('000s)			
2007	711	129	1303	135	1036	190	1590	0.79	0.80	0.87
2008	678	261	1406	152	1095	203	1370	0.91	0.87	0.86
2009	652	303	1566	114	713	169	1080	0.87	0.79	0.86
2010	630	209	2101	112	1249	186	1830	0.70	0.74	0.79
2011	603	123	1820	108	1581	172	2150	0.67	0.78	0.79
2012	583	126	1608	140	2089	186	2900	0.77	0.81	0.83
2013	565	89	1649	135	1849	181	2980	0.69	0.74	0.81
2014	566	90	2266	160	2687	195	3300	0.68	0.77	0.79
2015	523	115	1943	161	2435	179	2960	0.84	0.85	0.82
2016	504	164	2731	167	2294	177	3620	0.85	0.82	0.84
Total	**6015**	**1609**		**1384**		**1838**				
		26.7%		**23.0%**		**30.6%**				

Table 3: Summary statistics of covariates

This table presents descriptive statistics for the variables used in the subsequent analyses for the two samples segregated based on excess compensation score (*Score_coe*). All the variables are defined in appendix B. The student t-test (Wilcoxon rank-sum test) is used to test the statistical difference between the means (medians). The Pearson Chi-square test is used to test for difference in proportions between the two samples. Absolute values of these statistics are reported in the table. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels, respectively.

Panel A:

	Score_coe<=0			Score_coe>0			|t-test| (means)	|Wilcoxon| (Median)
	N	Mean	Median	N	Mean	Median		
Compensation variables in thousands								
Salary	4406	919	900	1609	984	950	4.94***	5.73***
Bonus	4406	209	0	1609	181	0	0.74	1.59
Othercomp	4406	240	96	1609	234	93	0.33	0.45
Nonequitycomp	4406	1561	1069	1609	1319	927	4.29***	3.94***
Pensionnqdc	4406	593	0	1609	673	0	1.86*	1.59
Other pay	4406	3560	2629	1609	3434	2550	1.28	0.78
Economic characteristics (t-1)								
Market Cap (Mn)	4386	13998	4553	1609	10792	3372	3.92***	8.14***
Total Assets (Mn)	4387	12827	4280	1609	13244	4507	0.52	1.29
Sales (Mn)	4387	10201	3290	1609	10472	3433	0.45	1.18
ROA	4387	0.06	0.06	1609	0.03	0.05	9.06***	10.37***
Industry adj ROA	4387	0.07	0.04	1609	0.04	0.02	7.72***	7.91***
Market to Book	4386	1.54	1.17	1609	1.05	0.83	14.10***	14.28***
Business segments	4370	2.81	2.00	1605	2.83	3.00	0.40	0.43
Book Leverage	4387	0.26	0.24	1609	0.26	0.24	1.19	0.65
Volatility	4385	0.02	0.02	1609	0.03	0.02	11.79***	13.64***
Log of Firm Age	4387	3.34	3.33	1609	3.32	3.26	1.41	1.68*
Tobin's Q	4387	2.01	1.51	1608	1.39	1.10	13.99***	15.02***
Cash /Total Assets	4386	0.15	0.09	1609	0.14	0.09	2.19**	0.58
Non-op income/Total Assets	4387	0.005	0.002	1609	0.006	0.003	1.61	3.12***
CEO characteristics								
CEO tenure	3822	7.48	5.61	1448	7.66	5.91	0.83	3.46***
CEO ownership	3903	0.016	0.004	1471	0.011	0.004	4.12***	2.72***

Board Characteristics (t-1)									
Board Size	3216	9.85	10.00	1177	9.85	10.00	0.01		0.08
Outside directors %	3216	0.81	0.83	1177	0.80	0.83	0.90		1.37
Old directors %	3216	0.24	0.22	1177	0.21	0.20	3.99***		3.62***
Busy directors %	3216	0.27	0.25	1177	0.29	0.27	2.46**		2.38**
Proportions									
Outside Chairman	3216	0.18		1177	0.26			5.58***	
Staggered board	3216	0.42		1177	0.46			2.44**	
Dual Class	3216	0.06		1177	0.06			0.20	

Panel B: Statistics for excess compensation scores

	N	**Mean**	**Std Dev**	**P25**	**P50**	**P75**	**P99**
Score_coe	6015	-0.22	0.74	-1	-0.11	0.16	1
Score_mar	6015	-0.30	0.73	-1	-0.43	0.00	1
Score_Ind	6015	-0.15	0.77	-1	0.00	0.50	1

Panel C[21]: Correlation of excess compensation (V_coe & V_mar) with residual based measures of excess compensation used in prior literature

	Res_Ex Ante Total Comp	**Res_Total Realized Pay**
V_coe	8.9%	3.7%
V_mar	5.4%	2.3%

[21] *V_Coe (V_mar)* is the aggregate dollar amount of all the vested awards in a year where the value of each vested grant takes a positive sign if TSR<COE (S&P500) and negative sign if TSR>=COE (S&P500). This represents the dollar amount of excess compensation received by the CEO in a year from equity grants. Res_Ex Ante Total Comp (Res_Total Realized Pay) is the residual from the regression of total grant year pay (total realized pay) on economic determinants defined in detail in appendix B.

Table 4: Economic characteristics of excess compensation

This table provides maximum likelihood estimates from a logistic regression of excess compensation on economic, CEO & board characteristics. The dependent variable takes the value of 1 if the score of excess compensation is above zero, and 0 otherwise. *Score_coe (score_mar/score_ind)* measures excess compensation using cost of equity capital (S&P 500 returns / value weighted industry returns based on 2 digit SIC) as the performance hurdle. All the independent variables except other Pay (defined in appendix A) are measured at the end of year t-1. Year and Industry fixed effects (based on 2 digit SIC) are included but not reported. t-statistics using robust standard errors that are clustered at firm level are presented in parentheses below coefficient estimates. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels, respectively.

Independent Variables	**Dependent Variable**					
	score_coe>0		*score_mar>0*		*score_ind>0*	
Intercept	-0.312	2.639***	-1.649***	0.278	1.262**	2.879***
	(-0.60)	(2.66)	(-3.17)	(0.32)	(2.28)	(2.81)
Log of Other Pay	0.086*	-0.046	0.010	-0.092	-0.088	-0.206***
	(1.73)	(-0.67)	(0.19)	(-1.38)	(-1.62)	(-2.82)
Log of Market Cap	-0.020	-0.093	0.027	-0.076	0.029	-0.093
	(-0.44)	(-1.49)	(0.63)	(-1.37)	(0.64)	(-1.54)
Log of Firm Age	-0.093	-0.179*	-0.005	-0.036	-0.022	-0.123
	(-1.24)	(-1.69)	(-0.06)	(-0.39)	(-0.29)	(-1.26)
Business segments	-0.012	-0.005	0.001	-0.006	-0.047*	-0.052
	(-0.45)	(-0.16)	(0.06)	(-0.21)	(-1.71)	(-1.61)
Market to Book	-0.458***	-0.472***	-0.376***	-0.303***	-0.432***	-0.346***
	(-8.82)	(-6.91)	(-7.29)	(-4.64)	(-7.76)	(-4.81)
Volatility	-7.564	-3.294	-13.959***	-10.934*	-2.436	0.579
	(-1.55)	(-0.48)	(-2.92)	(-1.70)	(-0.47)	(0.08)
ROA	-2.477***	-1.725*	-2.668***	-2.113**	-2.561***	-1.877*
	(-3.44)	(-1.79)	(-3.80)	(-2.36)	(-3.40)	(-1.93)
Industry adj ROA	1.162**	0.467	1.002*	0.379	0.281	-0.377
	(2.02)	(0.61)	(1.74)	(0.54)	(0.45)	(-0.49)
Log of CEO tenure		0.405***		0.276***		0.226***
		(7.52)		(5.59)		(4.15)

CEO ownership		-9.803***		-4.270***		-5.989***
		(-3.80)		(-2.94)		(-2.62)
log of Board size		0.260		0.546**		0.801***
		(0.87)		(2.13)		(2.74)
Outside directors %		-1.113**		-0.867*		-0.943*
		(-2.18)		(-1.95)		(-1.90)
Old directors %		-0.631*		-0.208		-0.296
		(-1.90)		(-0.72)		(-0.91)
Busy directors %		0.345		0.806***		0.590*
		(1.11)		(2.92)		(1.96)
Outside Chairman		0.212*		0.013		0.194
		(1.93)		(0.11)		(1.55)
Stag board		-0.025		0.013		0.058
		(-0.23)		(0.14)		(0.55)
Dual class		0.030		-0.220		0.143
		(0.12)		(-1.02)		(0.59)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	5973	4266	5973	4288	5945	4266
pseudo R^2	0.102	0.129	0.049	0.057	0.069	0.086

Table 5: Excess compensation and change in investment

This table reports the results of OLS regression of Change in Investment on Excess compensation. The dependent variables are measured as a change in the respective ratios *over the last 3 years*. *Score_coe* measures excess compensation using cost of equity capital as the performance hurdle and ranges from -1 to +1. Variable definitions are in Appendix A. Firm & year fixed effects are included but not reported. t-statistics using robust standard errors and clustered at firm level are presented in parentheses below coefficient estimates. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels, respectively.

Independent Variables	**Dependent Variable**				
	Ch_capx	*Ch_Netinv*	*Ch_Rdcapex*	*Ch_Rdnetinv*	*Ch_Aqccapex*
Intercept	-0.091***	-0.234***	-0.094**	-0.249***	-0.028*
	(-3.41)	(-3.68)	(-2.40)	(-3.25)	(-1.76)
score_coe	**-0.004*** **	**-0.005*** **	**-0.003*** **	**-0.005** **	**-0.008*** **
	(-3.46)	(-2.60)	(-2.58)	(-2.32)	(-3.30)
log of other pay	0.001	0.003	0.000	0.001	0.001
	(0.99)	(0.88)	(0.18)	(0.28)	(0.42)
log of firm age (t-4)	0.028***	0.075***	0.034***	0.086***	0.007**
	(3.32)	(3.99)	(2.75)	(3.73)	(2.29)
Tobin's Q (t-4)	-0.003***	-0.005***	-0.005***	-0.006***	-0.003*
	(-3.59)	(-2.77)	(-4.08)	(-2.90)	(-1.89)
Book Leverage (t-4)	0.028***	0.025	0.030*	0.029	0.003
	(2.98)	(1.26)	(1.68)	(1.02)	(0.37)
Cash/Total Assets (t-4)	0.011	-0.019	-0.003	-0.033	-0.005
	(1.23)	(-1.20)	(-0.16)	(-1.36)	(-0.39)
ROA (t-4)	-0.032***	-0.069***	-0.025	-0.074**	-0.058***
	(-3.42)	(-3.21)	(-1.13)	(-2.54)	(-3.26)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	5962	5962	5962	5962	5962
Adj. R^2	0.142	0.028	0.138	0.037	0.029

Table 6: Excess compensation and change in operating and financing policies

The table shows the results of OLS regression of change in return of capital and asset turnover on Excess compensation. The dependent variables are measured as a change in the respective ratios *over the last 3 years*. *Score_coe* measures excess compensation using cost of equity capital as the performance hurdle and ranges from -1 to +1. Variable definitions are in Appendix A. Firm & year fixed effects are included. t-statistics using robust standard errors and clustered at firm level are presented in parentheses below coefficient estimates. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels, respectively.

Independent Variables	**Dependent Variable**	
	Ch_Divrep	*Ch_Turn*
Intercept	0.546*	-0.372**
	(1.88)	(-2.37)
score_coe	**-0.030****	**-0.013****
	(-2.45)	(-2.38)
log of other pay	-0.008	0.021**
	(-0.54)	(2.30)
log of firm age (t-4)	-0.109	0.072
	(-1.26)	(1.47)
Tobin's Q (t-4)	-0.003	-0.016***
	(-0.36)	(-3.44)
Book Leverage (t-4)	-0.036	0.131*
	(-0.37)	(1.96)
ROA (t-4)	-0.325**	-0.395***
	(-2.40)	(-4.64)
Non-Op Income/Total assets (t-4)	0.686	1.393***
	(0.60)	(2.88)
Firm FE	Yes	Yes
Year FE	Yes	Yes
N	5963	5964
Adj. R^2	0.136	0.206

Table 7: Proxy advisors votes and excess compensation

Panel A reports the descriptive statistics of the comparison of excess compensation score (*Score_coe & Score_mar*) with the recommendations of the Institutional Support Services (ISS) for and against CEO compensation plans. Panel B reports the estimates from a linear probability regression of ISS recommendation on indicator for excess compensation score (*Score_coe>0*). The dependent variable takes the value of 1 if the ISS recommendation is *"Against"* and 0 otherwise. Industry (2 digit SIC) and year fixed effects are included. t-statistics using robust standard errors are presented in parentheses below coefficient estimates. *, **, and *** indicate two-tailed statistical significance at 10, 5, and 1 percent levels, respectively.

Panel A:

		Score_coe			
		-1	**<=0**	**>0**	**1**
ISS Rec	For	1268	2548	732	403
	Against	74	240	146	96
		Score_mar			
		-1	**<=0**	**>0**	**1**
ISS Rec	For	1300	2514	766	469
	Against	90	239	147	89

Panel B:

Independent Variables	*ISS=Against*	*ISS=Against*	*ISS=Against*
Score_coe > 0	**0.091*****	**0.043****	**0.038***
	(4.36)	(2.14)	(1.87)
TSR (-1)		-0.054**	-0.046**
		(-2.39)	(-2.11)
TSR (-3)		-0.372***	-0.375***
		(-6.95)	(-6.87)
Institutional ownership %		0.014	-0.034
		(0.32)	(-0.76)
Insider ownership %		0.395***	0.306***
		(4.65)	(3.66)
CEO total compensation		0.008***	0.014***
		(4.99)	(6.11)
Growth in CEO total compensation		0.040**	0.017
		(2.39)	(0.98)
Proportion of stock based compensation		0.039	0.024
		(1.22)	(0.73)
Log of Market Cap			-0.045***
			(-4.15)
Market to book			0.013***
			(2.85)
ROA			-0.014
			(-0.16)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
N	1671	1671	1671
Adj. R^2	0.042	0.131	0.148

Appendix A1: Illustration of a case of excess compensation and the associated process of matching actual vested equity units with their respective grant dates of such equity units

Comp Name	Participant	CEO	Grant year	Grant date	Award Type	Performance type	Vest schedule	Expected Vest year	Expected Vest date	Expected vest units	Actual Vested units				Matched vested units				Vest date price	Stock Value	Vesting Time	TSR	COE	Comp COE	SP500 Ret	Excess_comp (TSR<COE)	Excess_Comp (TSR<SP500)	Score
											2007	2008	2009	2015	2007	2008	2009	2015										
Sirius XM Radio Inc	James E. Meyer	0	2004	5/5/2004	rsu	Time	Ratable	2004	5/5/2004	400000																		
Sirius XM Radio Inc	James E. Meyer	0	2005	3/11/2005	rsu	Time	Cliff	2005	4/11/2005	100000																		
Sirius XM Radio Inc	James E. Meyer	0	2004	5/5/2004	rsu	Time	Ratable	2005	5/5/2005	400000																		
Sirius XM Radio Inc	James E. Meyer	0	2004	5/5/2004	rsu	Time	Ratable	2006	5/5/2006	400000																		
Sirius XM Radio Inc	James E. Meyer	0	2005	8/9/2005	rsu	Time	Cliff	2006	8/9/2006	48067																		
Sirius XM Radio Inc	James E. Meyer	0	2006	2/1/2006	rsu	Time	Cliff	2007	2/1/2007	70053	**370053**				**70053**													
Sirius XM Radio Inc	James E. Meyer	0	2006	4/16/2006	rsu	Time	Cliff	2007	4/16/2007	300000	**370053**				**300000**													
Sirius XM Radio Inc	James E. Meyer	0	2007	2/1/2007	rsu	Time	Cliff	2008	3/1/2008	125000		**125000**				**125000**												
Sirius XM Radio Inc	James E. Meyer	0	2008	1/23/2008	rsu	Time	Cliff	2009	2/23/2009	178572			**2910872**				**178572**											
Sirius XM Radio Inc	James E. Meyer	0	2009	5/19/2009	rsu	Time	Ratable	2009	5/19/2009	1366150			**2910872**				**1366150**											
Sirius XM Radio Inc	James E. Meyer	0	2009	5/19/2009	rsu	Time	Ratable	2009	11/19/2009	1366150			**2910872**				**1366150**											
Sirius XM Radio Inc	James E. Meyer	1	2013	5/2/2013	rsu	Time	Cliff	2015	11/2/2015	984848				**984848**				**984848**	4.13	4062498	2.5	0.26	0.13	0.37	0.30	4062498	4062498	1
Sirius XM Radio Inc	James E. Meyer	1	2015	8/11/2015	rsu	Time	Cliff	2018	5/11/2018	2564103																		

This example illustrates the mechanism of matching the actual vested shares with the restricted stock grants awarded to the participant, James E. Meyer, of Sirius EM Radio Inc. The participant was employed with the firm from 2004 to 2016 and served as the CEO from 2013 to 2016. During his tenure as the CEO, the participant received *actual vested shares* (984,848) only in the year 2015. These shares could have been granted at any time (in or before 2015) during his employment with the firm. Therefore, we track all the grants awarded to the participant since 2004 and estimate the *expected vest dates* and *expected vest units* on each date using the grant level disclosures in the proxy filings. Next, we tally the *actual vested units* in each year since 2007. For example, there are two grants which were expected to vest in 2007 and the sum of these units (70,053 & 300,000) is equal to the *actual vested number* (370,053). Similarly, we could get the *matched vested units* for other years as shown in the illustration. The actual vested units of 125,000 units in 2008 can be attributed to the 2/1/2007 cliff grant. Analogously, the actual vested units in 2009 of 2,910,872 units is most likely attributable to (i) 1/23/2008 cliff award of 178,572 units; (ii) 5/19/2009 ratable award of 1,366,150 units vesting on 5/19/2009; and (iii) 5/19/2009 ratable award of 1,366,150 units vesting on 11/19/2009. We do not compute an excess compensation score against these three grants because we impose a filter that more than six months must have elapsed between the grant date and the vesting date before we reckon whether or not the grant can be considered as excess compensation. Once the matching process is completed, we estimate excess compensation for the grants which were granted and vested while the participant was the CEO. In this case, we only have one such grant with number of shares equal to 984,848. The *stock value* of this grant is computed as number of shares multiplied

by the *vest date price* of $ 4.13. This is the value that the participant received on vesting ($4.06 million). We then compare the *TSR* over the *vesting time* (Vest date-grant date) of 2.5 years and the expected return computed as the cost of equity capital on the grant date compounded for the vesting time. The TSR of 26% was lower than the expected return of 37% and hence the value received by the participant in this case is considered as *excess compensation.* As an alternate measure we also compare the *TSR* with *S&P 500* returns over the same period. TSR still falls short of S&P 500 return of 30%. Finally, the *score* for this firm-year (2015) is 1 since there is only one grant (with positive excess compensation) in this year.

Appendix A2: Illustration of a case of NO excess compensation and the associated process of matching actual equity units with grant dates of such equity units

Comp Name	Participant	CEO	Grant year	Grant date	Award Type	Performance type	Vest schedule	Expected Vest year	Expected Vest date	Expected vest units	Actual Vested units							Matched vested units							Vest date price	Exercise price	Option Value	Vesting Time	TSR	COE	Comp COE	SP500 Ret	Excess_comp (TSR<COE)	Excess_Comp (TSR<SP500)	Score
											2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011	2012	2013											
National Fuel Gas Co	David F. Smith		2006	5/1/2006	Option	Time	Cliff	2007	5/1/2007	55000	55000							55000							These grants were awarded in the year when the Participant was not the CEO											
National Fuel Gas Co	David F. Smith		2007	12/6/2006	Option	Time	Cliff	2008	12/6/2007	60000		60000							60000																	
National Fuel Gas Co	David F. Smith	1	2008	2/20/2008	Option	Performance	Ratable	2009	2/20/2009	23333			23333							23333						31.84	47.37	0	1.00	-0.28	0.06	0.06	-0.47	0	0	
National Fuel Gas Co	David F. Smith	1	2009	12/22/2008	Option	Performance	Ratable	2010	12/22/2009	50000				73333							50000					50.66	29.88	1039000	1.00	0.61	0.08	0.08	0.24	-1039000	-1039000	
National Fuel Gas Co	David F. Smith	1	2008	2/20/2008	Option	Performance	Ratable	2010	2/20/2010	23333				73333							23333					50.42	47.37	71166	2.00	0.23	0.06	0.13	-0.20	-71166	-71166	-1
National Fuel Gas Co	David F. Smith	1	2010	3/11/2010	Option	Performance	Ratable	2011	12/11/2010	41667					115000							41667				65.53	52.1	559588	0.75	0.35	0.07	0.05	0.14	-559588	-559588	
National Fuel Gas Co	David F. Smith	1	2009	12/22/2008	Option	Performance	Ratable	2011	12/22/2010	50000					115000							50000				64.84	29.88	1748000	2.00	1.16	0.08	0.16	0.40	-1748000	-1748000	
National Fuel Gas Co	David F. Smith	1	2008	2/20/2008	Option	Performance	Ratable	2011	2/20/2011	23333					115000							23333				71.79	47.37	569792	3.00	0.85	0.06	0.19	-0.04	-569792	-569792	-1
National Fuel Gas Co	David F. Smith	1	2010	3/11/2010	Option	Performance	Ratable	2012	12/11/2011	41667						104167							41667			57.78	52.1	236669	1.75	0.17	0.07	0.13	0.14	-236669	-236669	
National Fuel Gas Co	David F. Smith	1	2011	12/20/2010	Option	Time	Ratable	2012	12/20/2011	12500						104167							12500			56.04	63.87	0	1.00	-0.10	0.08	0.08	0.07	0	0	
National Fuel Gas Co	David F. Smith	1	2009	12/22/2008	Option	Performance	Ratable	2012	12/22/2011	50000						104167							50000			55.24	29.88	1268000	3.00	0.88	0.08	0.25	0.40	-1268000	-1268000	-1
National Fuel Gas Co	David F. Smith	1	2012	12/19/2011	Option	Time	Ratable	2013	12/19/2012	13333							54167							13333	Participant was not the CEO in the vesting year 2013										
National Fuel Gas Co	David F. Smith	1	2011	12/20/2010	Option	Time	Ratable	2013	12/20/2012	12500							54167							12500											
National Fuel Gas Co	David F. Smith	1	2010	3/11/2010	Option	Performance	Ratable	2013	12/11/2012	41667							54167							28334											
National Fuel Gas Co	David F. Smith	1	2012	12/19/2011	Option	Time	Ratable	2014	12/19/2013	13333																									
National Fuel Gas Co	David F. Smith		2013	12/19/2012	Option	Time	Ratable	2014	12/19/2013	28432																									
National Fuel Gas Co	David F. Smith	1	2011	12/20/2010	Option	Time	Ratable	2014	12/20/2013	12500																									
National Fuel Gas Co	David F. Smith	1	2012	12/19/2011	Option	Time	Ratable	2015	12/19/2014	13333																									
National Fuel Gas Co	David F. Smith		2013	12/19/2012	Option	Time	Ratable	2015	12/19/2014	28432																									
National Fuel Gas Co	David F. Smith		2013	12/19/2012	Option	Time	Ratable	2016	12/19/2015	28432																									

This example illustrates the mechanism of matching the actual vested shares with option grants awarded to the participant, David F. Smith, of National Fuel Gas Co. The participant served as the CEO from 2008 to 2012. We track all the option grants awarded to the participant since 2006 (grant data is available since 2006) and estimate the *expected vest dates* and *expected vest units* on each date using the grant level disclosures in the proxy filings. Next, we tally the actual vested units in each year from 2007 to 2013 as explained in illustration A1. For example, there are three grants which were expected to vest in 2011 and the sum of these units (41,667, 50,000 & 23,333) is equal to the *actual vested number* (115,000). Similarly, we could get the *matched vested units* for other years as shown in the illustration. Once the matching process is completed, we estimate excess compensation for the grants which were granted and vested while the participant was the CEO. The *option value* of each such grant is computed as number of shares multiplied by the difference between the *vest date price* and the *exercise price*. If the *exercise price* is greater than or equal to the *vest date price*, then the *option value* is taken as zero as these are out-of-money options. We then compare the *TSR* over the *vesting time* (Vest date-grant date) and the expected return computed as the cost of equity capital on the grant date compounded for the vesting time. Since the TSR is higher than the expected returns in 2010, 2011 & 2012, excess compensation is equal to the negative of option value (meaning this is not excess compensation). In 2009, the vested options were out-of-money as on the vest date and hence are assumed to have no

value to the CEO. Therefore, the excess compensation for this year is zero. Finally, the *score* for each firm-year (2010 to 2012) with excess compensation is -1 since the TSR is greater than the expected returns for all the grants that vested in each of these years.

Appendix A3: Illustration of the process of matching actual vested equity with grant dates of equity when the grant and vest terms are unclear

Comp Name	Participant	CEO	Grant year	Grant date	Award Type	Performance type	Vest schedule	Expected Vest year	Expected Vest date	Expected vest units	Selection Order	2008			Final Vest Date
												Actual Vested Units	Matched Units	Cum Matched Units	
Cheniere Energy Inc	Charif Souki	1	2006	1/3/2006	RSU	Time	Ratable	2008	1/3/2008	7955	Current Time	317164	7955	7955	1/3/2008
Cheniere Energy Inc	Charif Souki	1	2007	1/12/2007	RSU	Time	Ratable	2008	1/12/2008	27528	Current Time	317164	27528	35483	1/12/2008
Cheniere Energy Inc	Charif Souki	1	2008	5/9/2008	RSU	Time	Cliff	2008	12/9/2008	15014	Current Time	317164	15014	50497	12/9/2008
Cheniere Energy Inc	Charif Souki	1	2004	1/1/2004	RSU	Time	Ratable	2007	1/1/2007	50961	Previous Time	317164	29477	79974	12/31/2008
Cheniere Energy Inc	Charif Souki	1	2006	1/3/2006	RSU	Time	Ratable	2007	1/3/2007	7955	Previous Time	317164	7955	87929	12/31/2008
Cheniere Energy Inc	Charif Souki	1	2007	5/25/2007	RSU	Performance	Ratable	2008	12/25/2008	100000	Current Performance	317164	100000	187929	12/31/2008
Cheniere Energy Inc	Charif Souki	1	2007	5/25/2007	RSU	Performance	Cliff	2007	12/25/2007	100000	Previous Performance	317164	100000	287929	12/31/2008
Cheniere Energy Inc	Charif Souki	1	2006	1/3/2006	RSU	Time	Ratable	2009	1/3/2009	7955	Future Time	317164	7955	295884	12/31/2008
Cheniere Energy Inc	Charif Souki	1	2007	1/12/2007	RSU	Time	Ratable	2009	1/12/2009	27528	Future Time	**317164**	21280	**317164**	12/31/2008
Cheniere Energy Inc	Charif Souki	1	2008	5/9/2008	RSU	Time	Ratable	2009	1/9/2009	166667	Future Time	317164	0	Did not use	
Cheniere Energy Inc	Charif Souki	1	2007	5/25/2007	RSU	Performance	Ratable	2009	12/25/2009	100000	Future Performance	317164	0		
Cheniere Energy Inc	Charif Souki	1	2007	1/12/2007	RSU	Time	Ratable	2010	1/12/2010	27528	Future Time	317164	0		
Cheniere Energy Inc	Charif Souki	1	2008	5/9/2008	RSU	Time	Ratable	2010	1/9/2010	166667	Future Time	317164	0		
Cheniere Energy Inc	Charif Souki	1	2007	5/25/2007	RSU	Performance	Ratable	2010	12/25/2010	100000	Future Performance	317164	0		
Cheniere Energy Inc	Charif Souki	1	2008	5/9/2008	RSU	Time	Ratable	2011	1/9/2011	166667	Future Time	317164	0		

This example depicts the algorithm used to accommodate cases where we could not perfectly match the expected vesting units with actual vesting units in each year. It illustrates the mechanism of matching the actual vested shares in 2008 with restricted stock grants awarded (in or before 2008) to the participant, Charif Souki, of Cheniere Energy Inc. We estimate the *expected vest dates* and *expected vest units* on each date using the grant level disclosures in the proxy filings. Next, we classify all the available grants into six subgroups based on their *expected vest dates* and *type*: time-based awards associated with the current year (*current time*), unvested time-based awards associated with previous years (*previous time*), performance-based awards associated with the current year (*current performance*), unvested performance-based awards associated with previous years (*previous performance*), time-based awards associated with future years that were granted in or before the current year (*future time*), performance-based awards associated with future years that were granted in or before the current year (*future performance*). Finally, we use grants from each subgroup to fill the total vested amount in the order of *current time*, *previous time*, *current performance*, *previous performance*, *future time*, and *future performance*. In this illustration, the actual vested units in 2008 were 317,164. To fill this number, the algorithm first uses all the *current time* grants (7,955, 27,528 & 15,014), then it uses all the unfilled *previous time* grants (29,477 & 7,955), then uses all the *current performance* grants (100,000), then all the unfilled *previous performance* grants (100,000), and finally uses some of the *future time* grants expected to vest in 2009 (7,955 & 21,280). After identifying the matched vested units, the algorithm assigns the vesting

date as follows. For all the current awards, *final vest date* is equal to the *expected vest date* and for the rest, the *final vest date* is the fiscal year end of the current year. The procedure to estimate excess compensation remains the same as in previous illustrations.

Appendix B: Variable names and definitions

Variables	Formula/Definition
Compensation	
Score_coe	Score=([Gs(-1)+Gf(+1)])/(Gs+Gf) , where Gs=Sum of the value of all equity grants (stock & options) vested in that year, where, for each grant the total shareholder return from grant date to vesting date was greater than or equal to the cost of equity capital on the grant date compounded for the duration of vesting. Gf =Sum of the value of all equity grants (stock & options) vested in that year, where, for each grant the total shareholder return from grant date to vesting date was less than the cost of equity capital on the grant date compounded for the duration of vesting. The value of Score ranges from -1 to +1, positive score indicating Excess compensation.
Score_mar	Score=([Gs(-1)+Gf(+1)])/(Gs+Gf) , where Gs=Sum of the value of all equity grants (stock & options) vested in that year, where, for each grant the total shareholder return from grant date to vesting date was greater than or equal to the S&P 500 market return during the same period. Gf =Sum of the value of all equity grants (stock & options) vested in that year, where, for each grant the total shareholder return from grant date to vesting date was less than the S&P 500 market return during the same period. The value of Score ranges from -1 to +1, positive score indicating Excess compensation.
Score_ind	Score=([Gs(-1)+Gf(+1)])/(Gs+Gf) , where Gs=Sum of the value of all equity grants (stock & options) vested in that year, where, for each grant the total shareholder return from grant date to vesting date was greater than or equal to value weighted industry return (based on 2 digit SIC) during the same period. Gf =Sum of the value of all equity grants (stock & options) vested in that year, where, for each grant the total shareholder return from grant date to vesting date was less than the value weighted industry return during the same period. The value of Score ranges from -1 to +1, positive score indicating Excess compensation.
Other pay (in $ thousand)	Sum of Salary, Bonus, Othercomp, Nonequitycomp, Pensionnqdc and any equity awards that vested within 6 months from the grant date.
Res_total comp (in $ thousand)	Residual from regressing total compensation (TDC1) on economic determinants of compensation (CEO tenure, sales, S&P 500 index, Market to Book, Returns, & ROA). TDC1 is salary, bonus, long-term incentive plan payouts, the value of restricted stock grants, the value of options granted during the year, and any other annual pay for the CEO in year t.

Res_total pay	Residual from regressing total compensation (TDC2) on economic determinants of compensation (CEO tenure, sales, S&P 500 index, Market to Book, Returns, & ROA). TDC2 is salary, bonus, long-term incentive plan payouts, the value of restricted stock grants vested, the proceeds from options exercised during the year, and any other annual pay for the CEO in year t.
CEO characteristics	
CEO tenure	Number of years the CEO has been in office at the firm.
CEO ownership	Aggregate number of shares owned by the CEO divided by total number of shares outstanding.
Governance Characteristics	
Board Size	Number of directors
Outside directors %	Number of outside directors/board size
Old directors %	Number of directors above 69 years of age/board size
Busy directors %	Number of directors on boards of atleast 2 firms/board size
Outside Chairman	Indicator=1 if the chairman is an independent director,0 otherwise
Staggered board	Indicator=1 if the firm has a staggered board, 0 otherwise
Dual Class	Indicator=1 if the firm has dual class stock, 0 otherwise
Firm Characteristics	
Market Cap (in $ million)	Market value of equity
Total Assets (in $ million)	AT
Sales (in $ million)	SALE
ROA	IB/AVG_AT
Industry Adj ROA	Firm ROA - Industry median ROA
Market to Book	Market value of equity/AT
Business segments	Number of Business segments
Book Leverage	DLTT/AT
Volatility	Standard deviation of past 1 year daily returns with minimum of 25 obs required
Firm Age	No. of years in Compustat
Tobin's Q	(ME+PSTK+DLTT+DLC-TXDITC)/ATTM1
Cash/Total Assets	CHE/AT
Non-op income/Total Assets	NOPI/AVG_AT
Investment, financing & operating variables	
Capx	$CAPX/AT_{t-1}$. Missing Capx is set to zero
Rdcapex	$(CAPX+XRD)/AT_{t-1}$. Missing Rdcapex is set to zero
Netinv	$(PPENT-PPENT_{t-1})/AT_{t-1}$.Missing Netinv is set to zero
Rdnetinv	$(XRD+NETINV)/AT_{t-1}$.Missing Rdnetinv is set to zero
Aqccapex	$(AQC+CAPX)/AT_{t-1}$.Missing Aqccapex is set to zero
Ch_Capx	$Capx_t$-$Capx_{t-3}$
Ch_Rdcapex	$Rdcapex_t$-$Rdcapex_{t-3}$
Ch_Netinv	$Netinv_t$- $Netinv_{t-3}$
Ch_Rdnetinv	$Rdnetinv_t$- $Rdnetinv_{t-3}$
Ch_Aqccapex	$Aqccapex_t$- $Aqccapex_{t-3}$

Divrep	DVPSX_F+(PRSTKC/CSHO)
Ch_Divrep	$Divrep_t$- $Divrep_{t-3}$
Turn	SALE/AT(avg)
Ch_Turn	$Turn_t$-$Turn_{t-3}$
Variables for Table 7	
TSR (1)	One-year TSR, defined as the one-year percentage change in the adjusted close price multiplied by the total return factor.
TSR (3)	Three-year TSR, defined as the annualized three-year percentage change in the adjusted close price multiplied by the total return factor.
Institutional ownership %	Total institutional ownership in fraction of shares outstanding (Instown_Perc from Thomson Reuters 13F).
Insider ownership %	The estimated fraction of shares held by top management and directors, as reported in the firm's most recent proxy statement (InsidersPctg from GMI Ratings).
CEO total compensation (in $ million)	The total compensation of the CEO (variable CEOTotSumComp from GMI Ratings) as reported in the company's proxy statement. It equals the aggregate total dollar value of each form of compensation quantified in the summary compensation table, including base salary, bonus, stock awards, option awards, non-equity incentive plan, change in pension value and nonqualified deferred compensation, and all other compensation.
Growth in total compensation	Defined as (CEO Total Compensation in year t - CEO Total Compensation in year t-1)/CEO Total Compensation in year t-1
Proportion of stock-based compensation	The sum of stock and option awards divided by CEO total compensation: (CEOOptionAwards + CEOStockAwards)/CEOTotSumComp from GMI Ratings.