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ESSAYS ON DIVIDEND EQUIVALENT RIGHTS AND CEO COMPENSATION

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

Department of Finance

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ABSTRACT

This dissertation studies a little-known executive compensation device called dividend equivalent rights (DERs). DERs entitle an executive to receive dividends, known as dividend equivalents (DEs), on unearned performance-based stocks and options.

In the first essay we do empirical studies on the market reaction of news about DERs and the incentives that DERs can bring. We find that about 22% of S&P500 firms allow for these payments and about 10% actually make such payments. While investors react negatively to announcements of DE payments, DERs can be beneficial to shareholders by inducing a company to disgorge unproductive cash. If a firm allows DEs to be paid on the CEO's unearned shares it is four times more likely to be a dividend payer and for firms already paying dividends, dividend payments are larger if DEs are allowed.

In the second essay we estimate the value of dividend equivalents that are granted on an executive's unvested stock options. We examine how much the dividend equivalents are worth to the executive and how costly they are to the company. We find that the dividend equivalents that are paid to the executive in cash are more valuable to the executive than the ones paid out in firm shares. This preference is stronger when the executive is more risk averse. We also find that the executive's non-option wealth allocation, dividend payout level, the length of the options' vesting period and the percentage of options that are granted with DERs are important factors that can affect the subjective value of the dividend equivalents.

CHAPTER 1. DIVIDENDS ON UNEARNED SHARES AND CORPORATE PAYOUT POLICY: AN ANALYSIS OF DIVIDEND EQUIVALENT RIGHTS

1.1 Introduction

This paper examines a widely used but little-known executive compensation instrument called the dividend equivalent right (DER). DERs entitle executives to receive dividends on shares covered by their performance-based equity awards – shares they may not own and, in fact, may never own. Those dividends are referred to as dividend equivalents (DEs) and the underlying shares that are not yet owned by the executives are referred to as unearned shares. Paying dividends to an executive on shares he does not own seems counterintuitive because dividends, by definition, are a portion of the firm's assets paid to the owners of a corporation. If the executive does not own the shares, how could he claim dividends on those shares, and how does the firm justify dividend payments on those shares? Serious questions obviously arise as to whether these payments are opaque forms of compensation.

The amount of dividend equivalents paid to an executive is a function of two variables, the size of the dividends paid to shareholders and the number of shares covered by the executive's equity awards. Therefore not only is the executive able receive dividends on shares he does not own, but he is also able to determine the amount of dividend equivalents he will receive because he can influence the per share dividend declaration. A potential agency problem arises – could it be that the executive manipulates the firm's corporate dividend policy to increase his own wealth? The unique aspect of dividend equivalent rights is that the executive does not actually own the shares. He may own them at some time in the future if performance conditions are met. The dividends on shares owned by the executives are relatively transparent. But the DE payments are often poorly disclosed and firms' policies regarding DEs in most cases are not transparent. This

instrument is not widely known. There has been very little academic research on DEs, and they are not commonly mentioned in trade publications.

The facts that DE payments are poorly disclosed and that firms' policies regarding DEs in most cases are obscure seem to suggest that DERs are tools to help executives extract rents from shareholders without much public attention. However the potential agency problem described above may be only half of the story and the negative half to boot. There is a positive side to this instrument. DERs have great potential to reduce another agency problem. For example, executive stock options as a widely used form of compensation suffer from the criticism that they potentially discourage firms from paying dividends or paying dividends of the optimal size. There is both empirical and anecdotal evidence supporting that non-dividend protected executive stock options are associated with lower dividends (Lambert *et al.* 1989; Fenn & Liang 2001; Verizon 2003). By paying lower dividends, executives can hoard cash or engage in empire-building by investing in inferior or, at best, value-neutral assets. Because dividend equivalents can only be paid to executives when common dividends are paid to shareholders, granting DERs to executives on their unearned shares can encourage firms with unproductive cash to disgorge it by initiating dividends or by paying higher dividends to shareholders.

DERs are granted on the underlying shares of executives' incentive equity awards. These shares are either time-vested, performance-vested, or a combination of both. DERs granted on time-vested shares such as time-vested restricted stock or units should not necessarily be viewed in the same manner as those on unearned shares. A holder of time-based restricted stock or units will eventually own the shares as long as he stays employed by the firm. Although there is the possibility that the holder will leave the firm and forfeit the shares or be fired, the condition that must be met to own the shares is not terribly onerous. It is almost a sure thing that those shares

will become owned by the executive. They are just less illiquid because the executive cannot sell them. Thus we can view the time-vested restricted stock or units as owned shares by the executive.

DERs granted on performance–based shares, however, may send up a red flag. Shares that are subject to performance hurdles are earned by the executives only when specified performance goals have been achieved. Before the performance goals have been met, the shares are unearned shares. If the performance goals are missed the shares will never be earned. One form of performance-based shares mainly includes unvested performance-vested restricted stock or units and unearned performance shares. Another form includes shares underlying stock options because options may expire unexercised.

DERs granted with unearned shares not only give executives the right to receive dividends in advance of full ownership of the shares but also to receive dividends on shares that they may never own. One may suspect that DERs paid on unearned shares are rare cases featuring little-known firms paying their CEOs stealthily. Surprisingly, the practice is not rare, even for large and well-known U.S. firms. This study finds that 10 percent of S&P500 firms are making such DE payments each year and more than 20 percent of S&P500 firms allow for this practice.

The primary objectives of this study are to examine the market reaction to disclosures regarding DERs and to determine if DERs have the potential to induce firms to pay dividends or to pay higher dividends. The incentives, either good or bad, are becoming increasingly important due to the emphasis on performance-based compensation. A growing portion of stocks paid to executives are contingent upon performance, suggesting an increasing portion of unearned shares in executives' compensation portfolios. Starting in 2006, COMPUSTAT began reporting senior executives' unearned share holdings. The data show that the aggregate value of the unearned shares held by executives of all S&P500 firms is comparable to that of the restricted stocks. Thus,

a study of DERs is an important contribution to understanding executive compensation, incentives, and corporate dividend policy.

This study contributes to the literature in the following aspects: First, to our knowledge, this is the first empirical study on CEOs' dividend equivalent income from their unearned equity awards. The approach we take is also somewhat different from traditional studies. We dispose of the groupings commonly used to categorize CEOs' equity awards. Instead, to better capture the risks assumed by the awards, we classify shares as "earned" and "unearned." Second, we contribute to the literature on corporate disclosures by examining the question of how investors feel about this form of compensation. Third, the study contributes to the discussion on firms' dividend payout policies. We show that in addition to the commonly acknowledged factors, dividend equivalents can influence a firm's choice concerning dividend payout levels and make them rise to more appropriate levels, given their cash holdings and investment opportunities.

The rest of the paper proceeds as follows: Section 1.2 reviews the literature, Section 1.3 describes the test design and the sample, Section 1.4 discusses the main results, and Section 1.5 discusses an endogeneity issue and provides robustness tests. Section 1.6 presents summary and conclusions.

1.2 Related Literature

There has been little research on DERs or DEs, but of course, considerable research on executive compensation and incentives. The origin of that research is undoubtedly the classic Jensen and Meckling model (Jensen & Meckling 1976), which introduced the concept of agency costs as an economic consequence of the separation of ownership and management. Optimal compensation contrasts reduce agency costs by aligning managerial interests with shareholders' interests at minimal costs (Murphy 1999).

Executives' equity-based compensation is found to be a natural solution in reducing agency costs – when a CEO becomes a large shareholder of the firm, his wealth is greatly dependent on the firm's stock return performances, and thus he will have an incentive to take actions that increase firm value and consequently shareholders' wealth the most. The literature has documented examples of how properly arranged equity-based pay increases interest alignment. For example, Jensen and Murphy (1990) find that stock ownership works best to provide managerial incentive to CEOs. Matsunaga and Park's (2001) results show that performance bonuses encourage managers to meet analyst earnings forecasts.

Dividend equivalents could arise from optimal contracts if they can incent desirable activities such as increasing dividend payout, which may be the most relevant in this context. Empirical evidence has shown that the absence of dividend protection on executive stock options (i.e. no DERs granted with options) is associated with a decrease in corporate dividends (Lambert *et al.* 1989; Arnold & Gillenkirch 2005). These findings are bolstered by explicit declarations by shareholders such as those by shareholders of Verizon who expressed concerns that a lack of dividend protection on options "may discourage executives from increasing dividends" (Verizon 2003). DERs granted with options and other equity-based awards may have a positive effect on firms' dividend payout in many ways – encouraging dividend initiation, encouraging dividend increases, and discouraging dividend cuts.

The managerial power theory argues that the assumption that the board of directors acts in the best interests of shareholders is questionable. Indeed, empirical evidence suggests that boards are not completely independent. CEOs have control over the process through which directors are elected or removed from the board, and thus directors are often not willing to take positions against CEOs. Extant literature has documented a large set of examples showing that equity-based

compensation fails to reduce the agency problems. Executive stock options may be the most extensively studied compensation tool, but they are not the only ones with flaws. Equity-based compensation and its complicated terms may have assisted managerial rent seeking rather than preventing it: A study by Yermack (1997) shows that the timing of CEO stock option grants is opportune, because the grants are followed by favorable news announcements that cause abnormal positive returns. Aboody and Kasznik (2000) find that firms with fixed option award schedules tend to have abnormally low analyst earnings forecasts and stock returns prior to option award grants, indicating that managers delay good news and rush forward bad news before option award grants to maximize the value of their stock option compensation. Callaghan, Saly and Subramaniam (2004) find that option re-pricing tends to follow bad news or lead good news. Brooks, Chance and Cline (2012) find that executives' timing of the exercise of options is associated with the use of inside information. Chance, Kumar and Todd's work (2000) shows modest evidence that executive stock option re-pricing is abused by companies and often follows poor firm-specific performance not related to the market.

The debate between the two schools of executive compensation theory may have aided the revolution of compensation package designs. The decades from 1980-2000 features rapid growth in executive compensation as well as increasing attention to executive compensation from academics (Murphy 1999). In 1993 the U.S. Congress passed the law to eliminate the tax-deductibility of non-performance based executive compensation above $1 million (IRS 1993).[1] As a result, most companies began to substantially increase their use of options. Stock options

[1]Section 162(m) of the Internal Revenue Code of 1986 was amended and passed into law in 1993. It disallows a federal income tax deduction of public firms for executive compensation paid the CEO or any of the four most highly compensated executive officers in excess of $1 million in any taxable year. The rule does not apply to the "qualified performance-based compensation". The "qualified performance-based compensation" and the related material terms such as performance goals have to be approved by stock holders (IRS 2014).

had an advantage over other performance-based compensations because they did not have to be expensed until they were exercised. Thus granting options did not result in a hit on firm earnings. The attractiveness of stock options started to fade when the FASB passed the modified FAS123 rule in December 2004 and required that they should be expensed as of the grant date (FASB 2004). Stock options continue to be used, but the expensing requirement has apparently shifted their used toward other performance-based equity compensation.

Different types of equity-based awards and the variation in their vesting provisions provide a large family of compensation instruments for scholars to investigate. Although many large U.S. firms pay dividends and their CEOs typically hold large amounts of firm equity, studies on CEOs' dividend income are limited and results are mixed. Zhang (2012) finds that dividend payments on CEOs' unvested restricted stocks (referred to as dividend protection on unvested restricted stocks) can provide dividend incentives and the market reacts positively towards such news. In contrast, Minnick and Rosenthal's (2010) study shows that firms that pay dividends on CEOs' restricted stocks tend to have bad corporate governance. Shareholders of those firms are at a loss since firms suffer from inferior operating performance following the payments. Their evidence supports the managerial power theory that managers are able to influence their own compensation packages and extract rent (Bebchuk & Fried 2004). Elsila (2013) documents a substitution effect between CEOs' cash compensation and dividend income in that CEOs' lack of dividend protection on their stock options tends to be offset by a premium in cash compensation.

Although this paper also examines CEOs' dividend income, it has two major characteristics that differentiate itself from other related studies. For one, it focuses on a dividend-related executive compensation tool, dividend equivalent rights, whereas the existing literature studies dividend income in general. Following the terminology that firms use in their annual proxy

statements, we refer to the benefit that gives the holder the right to receive dividend equivalents as a dividend equivalent right (DER), and the cash amount or stock, or share units equivalent in value to the dividend paid on a share of common stock as dividend equivalents (DEs). The key difference between common dividends and DEs is that the underlying shares of the former are real shares. They are registered, existing shares that are held by shareholders, some of whom could be executives. The shares underlying DEs are not technically real shares in that they have not been issued and in fact, may never be issued.

The other characteristic that distinguishes this study from others is the way in which shares underlying equity awards are classified. We do not use the traditional classifications to categorize underlying shares based on the standard names of equity-based awards such as restricted shares, performance shares, or options. Instead, we categorize the shares covered by equity awards by whether CEOs need to perform to earn them. According to this classification, shares are either earned or unearned. Earned shares are subject only to time-based restrictions, that is, restrictions lapse over time as long as the award holder stays employed by the firm. The majority of restricted stock or units belong to this category. On the other hand, unearned shares are subject to performance-based restrictions, though they could also have time-based restrictions.[2] For example, newly granted performance shares and unvested performance-vested restricted stock or units are both classified as unearned shares. Shares covered by executive stock options are also considered unearned shares, because no new shares are created prior to exercise and the shares are

[2]Technically all performance-based restrictions include time-based restrictions. Performance goals are set for a period of time. Thus, an executive might need to achieve a 10% increase in sales over the following fiscal year. Except for the last instant before that fiscal year ends, the performance goal has a time restriction. What we refer to as pure time restrictions, however, are merely related the passage of time and not to any performance goal. More details about performance stocks are contained in Appendix A.

clearly earned only if the stock price is higher than the exercise price, which is clearly a performance criterion.

The choice of classifying the equity awards in this paper has a great impact on the sample structure and the way the empirical results are interpreted. The categorization is inspired by the observation that both parties – firms and shareholders – are concerned about CEOs' rights associated with their unearned shares. For example, we find that firms classify shares as either earned and unearned shares in their disclosures when explaining shareholders' rights on the equity awards (Alcoa 2009; Fedex 2010; Mead Westvaco Coporation 2011). An excellent example to address shareholders' concerns over CEOs' unearned shares is Shareowner Proposal No.5 in GE's 2005 proxy statement, in which the GE's shareholders urged the firm to eliminate dividend equivalents on CEOs' unearned shares (GE 2005).

In practice the classification of earned and unearned shares has advantages over the traditional classification in at least two ways. First, the classification of earned and unearned shares indicates the sensitivity of the value of the equity awards to performance and the extent to which the award is risky. Differentiating the risks of equity awards is important because the spirit of using performance-based pay is to increase the sensitivity of executive compensation to firm performance – either the accounting performance, or the stock return performance, or both.[3] At the time of grant, performance-based equity awards are supposed to be fully risky. Managers have to pass certain performance hurdles to earn the awards. Therefore unearned shares are much riskier than earned shares. The traditional classification uses the terms "restricted stocks" or "performance stocks" to differentiate the underlying shares, but these terms provide little information regarding the risks assumed in those equity awards. In fact, these terms may be

[3]The sensitivity of managerial wealth to firm performance is referred to as "Delta", and the sensitivity of managerial wealth to stock price volatility is referred to as "Vega" (Johnson & Tian 2000).

misleading in indicating the level of risk. For example, a share of restricted stock may be time-vested or performance-vested. The former is the traditional type, of which the vesting restrictions lapse over a few years. The award holder enjoys all benefits as a shareholder except for the right to sell it. The only risk factor assumed is that the award holder may leave the firm before the share vests. Even in that case, the award holder may still be able to receive the partial or full value of the stock. The latter type of restricted stock will vest only if certain performance goals are achieved and is, thus, much riskier. A share of performance-vested restricted stock behaves similarly to a share of performance stock, whose holder faces considerable risk of not receiving the share if the preset objectives are not achieved. The bookkeeping methods of the two types of restricted stocks are different. A share of time-vested restricted stocks is a real share of stock and is kept in the award holder's account after being granted while a share of performance-vested restricted stock is often granted in the form of units with no actual share created. The share of stock covered by the units is issued when the award is earned. The traditional means of classifying equity awards is unable to capture any of these differences.

Second, the classification method used in this paper allows us to include more types of executive compensation tools in the sample, especially those that are widely used in firms but somewhat less discussed in the literature. Performance stock or units, phantom stock or units, and restricted stock units are not as popular topics as executive stock options and restricted stocks. Data availability may have caused academia's disregard of these types of awards. Furthermore, these awards were not widely granted in the 1990s to the early 2000s when the rapid growth of executive stock option grants grasped the attention of academic researchers. However, their use since that time has become more prevalent. The ExecuComp database has begun reporting unearned performance stock data as of 2006. According to the data, S&P500 firms are granting

performance stocks in comparable amounts with restricted stocks. Moreover, the potential dividend income from CEOs' performance stocks is comparable to that from CEOs' restricted stocks. The analysis of CEOs' dividend income from equity-based awards will be biased if compensation tools such as performance stocks are excluded from the sample.

Understanding the risks assumed in the equity awards is important in exploring the characteristics of CEOs' dividend income. If dividends are paid on CEOs' earned shares such as most restricted stocks, firms could be using this policy to increase CEOs' income with less public scrutiny, thereby making dividend rights be a form of stealth income.[4] On the other hand, if dividends are paid on CEOs' unearned shares, we will be concerned about the effectiveness of performance-based awards. As mentioned in earlier discussion, the dividend income from unearned shares is not sensitive to performance and the disclosures of DEs are not as transparent as CEOs' other income sources such as cash and stock options, with possible consequences including overestimating the values of the performance awards and underestimating the overall sensitivity of performance-based awards to firm/CEO performance.

The strength of the link between our classification of earned and unearned shares to performance provides convenience in relating the results in this paper to studies on the effectiveness of performance-based compensation, which has become distinct from its close relative – equity-based pay. Both performance-based compensation and non-performance based compensation have become new dimensions for categorizing executive compensation tools. Performance-based vesting provisions or conditions are embraced by both shareholders and policy makers alike. Performance-based equity awards and compensation awards with performance-based vesting provision account for an increasing portion of executive compensation (Deloitte

[4]Firms are required to disclose dividends paid on top-paying executives' restricted stocks in the footnote of Summary Executive Compensation Table.

2005; Kanter & Frederic W. Cook & Co. 2005; Bettis *et al*. 2010). In the early 2000s a growing number of firms adopted performance-based vesting provisions when granting stock option awards (Kanter & Frederic W. Cook & Co. 2005). During the same time period, around the early 2000s, firms reduced conventional options because of the expensing issue of options. Restricted stock or units grants were becoming the first choice of equity-based compensation among the U.S. public firms. Meanwhile, equity awards with performance-based vesting provisions such as performance-vested stock options were also becoming popular (Deloitte 2005). Efforts are exerted by the policy makers and institutions to promote performance-based compensation (IRS 1993). The ISS 2007 US Proxy Voting Guidelines Summary recommends that shareholders vote for proposals of using equity awards that are contingent on achievement of performance goals (FED 2010).

1.3 Hypothesis Development and Data

1.3.1 Hypothesis Development

Dividend equivalents fit the managerial power theory in at least two aspects: First, the lack of transparency in DER disclosures is suspicious. Second, although DEs are generally granted with firms' long term incentive awards with performance hurdles, DEs usually are not performance-based.[5] The joint effect of the two aspects is that DEs are paid to managers without shareholders' recognition. When shareholders do find about the DE payments, some have taken action.[6] These actions would seem incomprehensible if such DER practices are beneficial to the firm.

[5]There are indeed some DERs that are performance-based. They are not included in our sample.

[6]GE's 2006 proxy statement presented a few shareholders' proposals that were submitted for a vote (GE) The proposals and board's comments on Shareowner Proposal No.5 – Eliminate Dividend Equivalents – revealed two different opinions about DERs: The shareholders urged GE to stop paying DERs on senior executives' unearned performance shares and unvested restricted shares. The reason, as indicated in the proposal, was that DER grants during the performance period went against the purpose of granting performance shares – aligning the interests of shareholders and executives and making compensation contingent on the achievement of firm's performance

In keeping with conventional approach in scientific testing, we hypothesize that there is no reaction by shareholders upon learning of the existence of DERs:

Hypothesis 1: There is no market reaction when firms disclose that DEs are granted on CEOs' unearned shares.

A positive market reaction suggests that shareholders recognize the benefits of DERs. A negative market reaction suggests that shareholders view DERs as a significant cost with no net benefits. Of course, no significant market reaction suggests that DERs are meaningless or there are no net benefits or net cost.

Optimal contract theory argues that the board of directors negotiates on the shareholders' behalf with managers and achieves agreement with management that can maximize the shareholders' utility. The managerial power theory argues that the agency problem also exists between the board of directors and the shareholders. While some negotiation can take place, management is still able to influence its own pay arrangement and the final agreement is sub-optimal for shareholders. Therefore, it should be the case that CEO pay will be less sensitive to performance in firms in which managers are relatively more powerful. This argument provides a clue to assess the value of DEs. Intuitively, all else equal, CEO pay in DER firms is less sensitive to performance compared to CEO pay in non-DER firms. Performance awards such as

objectives. The board of directors, however, believed the firm's DER policy is beneficial and recommended that investors vote against the proposal.

Shareowner Proposal No.5 was much of a shareholders' response to the *Wall Street Journal* (WSJ) (**Any citation must have a date) article "Extra Pay: Many CEOs Receive Dividends on 'Phantom' Stock", which appeared on May 4th, 2006 ("(2006)"). The article talked about the usage of DERs in a few well-known U.S. companies including GE. The information contained in the article stirred anxiety among investors of GE stock. It was disclosed that the CEO of GE received more than $1 million dividend / dividend equivalents on unearned restricted shares and performance shares.

An interesting finding in the board of GE's comments to the Shareowner Proposal No.5 is that the board disclosed that starting from September of 2006, which was four months after the WSJ article appeared, the CEO of GE no longer receives DE payment on his performance share units, but accumulates DERs on these units. Meanwhile the board recommended that the shareholders vote against this proposal since the board believed that GE's executive compensation package was effective. The fact that the WSJ article and the change in GE's DER policy coincide seems to deliver a subtle message – GE's DE payments on CEO's unearned shares were considered inappropriate.

performance shares, performance-based stock options, and restricted stocks are supposed to be fully risky and dependent upon CEO performance. Since the CEOs in the DER sample firms receive dividends on unearned performance awards, part of the value of their performance awards, the value of the DEs, is taken out and delivered to the CEOs at essentially no risk. Therefore the value corresponding to DEs has become independent of performance, and the CEO pay in DER firms has become less sensitive to performance. Therefore we hypothesize that DER grants are related to powerful CEOs.

Hypothesis 2: DERs granted on unearned shares are associated with firms with relatively powerful CEOs and firms with relatively weak boards.

We also construct hypotheses according to predictions of the optimal contracting theory that DEs have positive effect on firms' dividend payout levels. Although we take no position on whether dividends are inherently good or bad, it is widely acknowledged that companies that accumulate unproductive cash should be paying dividends or higher dividends. Thus, DERs can be useful in inducing firms to disgorge unproductive cash.

Hypothesis 3a: Firms that make or allow DE payments on CEOs unearned shares are more likely to pay dividends.

Hypothesis 3b: Dividend-paying firms that also make or allow DE payments on CEOs unearned shares have higher dividend yields.

1.3.2 Data

To build the data base, we start with the S&P 500 firms from 1993 to 2012. DER data are manually collected from the firms' publicly available proxy statements. To be included in the sample, the company must meet six basic criteria: (1) it must be an S&P 500 constituent for at least three fiscal years, (2) it must be covered by both the ExecuComp database and the

COMPUSTAT data base, (3) it must have at least five consecutive years' proxy statements available in the EDGAR (SEC) database, (4) it must be a non-financial, non-utility, non-communication and non-transportation company[7], (5) the firm-year observation must not have a stock split or special dividend events, and (6) a firm's policy regarding DE payments must be identifiable.

The SEC began publishing proxy statements available beginning in 1994. Because proxy statements are generally filed in anticipation of a vote at the annual meeting, most companies file proxy statements between January and March. For these firms, the executive compensation details provided in a proxy statement in a given year are for the previous year. Therefore our sample period starts one year prior, 1993. Information on the existence of DERs is manually collected from the publicly available proxy statements. Table 1.1 summarizes the sample selection process. The final sample has 5442 firm-year observations, of which 3825 observations are firm-years that in which the companies have paid out common dividends.

Table 1.1. Sample Selection Process

Criteria	**Firm-year Observations**
ExecuComp S&P 500 firm-year observations with CEOANN='CEO' and CUSIP identifiers	8,426
Less: Financial (SIC code 6000-6999), utility communication and transportation companies (SIC code 4000-4999)	1,203
	7,223
Less: Observations that either DER policies cannot be identified, no proxy statement is available or necessary values are missing	1,713
	5,510

[7]Here we use a company's SIC code to identify its industry. Financial companies have SIC codes between 6000 and 6999. Utility, communication and transportation companies have SIC codes between 4000 and 4999.

Later in the analysis we use Fama and French 10-industry classification to create dummy variables for fixed effect regressions. According to the Fama and French 10-industry classification, SIC codes above correspond to three categories: Telephone and Television Transmission, Utilities and Other (including Finance, Business Services, Mines, Construction, etc.). Two categories-Telephone and Television Transmission, and Utilities are completed dropped from the sample. The category "Other" is kept because firms in this category except for those Finance firms are included in the sample. Thus in the regression analysis we have sample firms from eight industries.

(Table 1.1 continued)

Criteria	Firm-year Observations
Less: Observations that have missing values or special dividends	68
Firm-year observations included in the sample	5,442
Firm-year observations in which common dividends are paid	3,825
Firm-year observations in which common dividends are not paid	1,617

For subsequent analysis, we use a number of financial variables that capture firms' dividend policies, financial information and governance characteristics, and CEO characteristics and compensation. These variables are described in Appendix B.

Annual financial data are from the COMPUSTAT database. The industry definitions are obtained from Professor Kenneth French's web site.[8] We divide all firms into ten industries according to their four-digit SIC Codes. We manually collect data from the firm's financial statements (10-K, 10-Q, and DEF 14A) if there are missing values in the firms' accounting variables. Executive compensation data are from COMPUSTAT's ExecuComp data base. Characteristics of boards of directors are from the RiskMetrics (ISS) dataset.

The dividend equivalents data are hand collected from the companies' proxy statements that are available on the U.S. Securities and Exchange Commission (SEC) web site.[9] We collect four types of information for each firm-year observation: the types of equity awards granted, the vesting conditions of the equity awards (performance-based, time-based, etc.), the performance period (if available)[10], and methods of DE payment (cash, additional shares, etc.). The types of awards granted include restricted stock or units, performance stock or units, stock options, etc.

[8]http://mb.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_48_ind_port.html

[9]http://www.sec.gov/edgar.shtml

[10]See Appendix A for more information about the performance period.

The majority of the observations in the sample are DERs granted with performance stock or units and performance-vested restricted stock or units. Vesting conditions are disclosed when awards are granted and when they are delivered. The most important information we obtain from the vesting conditions is whether the awards vest contingent upon the achievement of any performance goals. The performance period is a time interval during which the firm or CEOs' performance is measured. A typical performance-stock grant has a performance period of three to five years. Dividend equivalents can be paid out in cash or in additional shares or units of equivalent value with common dividends. Payments of cash and additional shares can be paid when the dividends on the firm's common shares are paid out or are accrued in a separate account under the equity award holders' name. When a firm grants performance-based awards, the firm may specify a minimum, target, and maximum number of shares to be earned.[11] The amount of shares that are eventually earned by the CEO may be anywhere between a minimum and a maximum. Cash DEs are typically paid on the target number of shares. In cases where DEs are accrued on such awards, firms may allow DEs to be accrued on the target or the earned number of shares.[12] We do not differentiate among the various situations in which dividend equivalents are paid. As long as a

[11]For example, Marathon Oil Corporation ((Marathon 2003)) granted two performance share awards to the CEO in 2003. The performance periods were three years and two years. The firm disclosed that "Vesting of these performance shares is based entirely on the achievement of pre-established performance measures related to corporate performance with payouts varying from 0% to 200% of target based on actual performance." Dividends were paid on the target number of performance shares. See
http://www.sec.gov/Archives/edgar/data/101778/000119312504036497/ddef14a.htm

[12]An interesting question about the DEs accrued on performance-based awards is what happens to them if the underlying awards are not earned by the executives? The disclosures about how firms treat the DEs accrued on the forfeited performance-based awards are very limited, especially before the late 2000s. The limited information suggests different situations: if the DEs in the form of cash or shares are delivered to the executives before the underlying awards are forfeited, firms do not recoup those DEs. If the DEs are accrued and kept in a separate account, they may be subject to the same performance conditions as the underlying awards, or they may be not. In the former case the DEs will be forfeited when the underlying awards are forfeited, while in the latter case the DEs will still be delivered to the executives. The disclosures suggest that the latter case was true to the majority of the firms in the 1990s, while the former case has become more common after the late 2000s.

CEO is entitled to receive dividend equivalents, instantly or on a deferred basis, on shares that he or she has not yet earned we count those dividend equivalents as dividend equivalents on the CEO's unearned shares. To simplify, the phrase "DER policy" in this paper denotes only the existence of a firm's policy that allows for DE payments on CEOs' unearned shares. Having such as policy does not mean that DEs are actually paid. Therefore we distinguish between firms that have DER policies and the subset of those firms that actually make DE payments.

The SEC web site is the most important source for us to obtain firms' proxy statements. These proxy statements are filed with the SEC periodically and then mailed to the stockholders. In their proxy statements, firms disclose executive compensation and board compensation for the three most recent fiscal years. The SEC does not require firms to disclose the value of DEs paid, but they do require that firms disclose whether DEs are paid on shares covered by long term incentive awards in the footnotes of the Summary Compensation Table. We collect information from proxy statements and identify firms' DER policies and DE payments in a retrospective manner.

For example, a firm disclosed in its 1997 proxy statement that its long-term incentive plan that came into effect in 1990 allowed DE payments on executives' unearned shares, and this disclosure is the earliest acknowledgement of the firms' DER policy. We then classified the firm as a DER-policy firm from 1993 to 1997. After 1997 the firm will still be a DER-policy firm if no changes are made to its DER policy. A firm is classified as a DER-payment firm in a particular fiscal year if any of its proxy statements indicate that a DE payment on the CEO's unearned shares was made in that year. Detailed executive compensation information such as the usage of DERs is usually not in the firm's annual report or quarterly report. The proxy statements are the main, if not only, source of information about DERs. Therefore, we assume that the market learns about

the DER usage information from the proxy statements, and the day on which the proxy statement is filed to SEC is the event day of DER disclosure.

The quality of disclosure in firms' proxy statements is less than ideal under certain circumstances. For example,

- Prior to 1994 when proxy statements were generally not available in the EDGAR database,
- when a firm fails to disclose on-going DE payments since it is not required by the SEC,
- during years in which dividends are not paid firms might not disclose their DER policy, and
- when firms disclose that DEs are paid but omit details such as the instruments on which DEs are paid, the form of payment, size of payment, vesting conditions, etc.

Table 1.2 summarizes the distribution of sample firms by time and industry. Panel A and Panel B present the distribution of sample firms over the sample period from 1993 to 2012, which is referred to as the Full Sample. Panel A summarizes the sample firms by time. In a typical year there are 272 distinct firms in the sample, 22% of which allow for the payments of dividend equivalents on CEOs' unearned equity awards. Ten percent of the sample firms make payment of dividend equivalents on at least one type of the CEOs' unearned equity awards. Both the number of DER-policy firms and the percentage of DER-policy firms monotonically increase from 1993 to 2007 and then drop slightly afterwards. DER-payment firms show similar patterns.[13] Panel B of Table 1.2 presents the distribution of sample firms across industries. Using the Fama and French

[13]Note that the set of DER-policy firms is a larger set than the set of DER-payment firms. If a firm's proxy statements indicate that it allowed DE payments to be made on CEO's unearned shares in year *t* or DE payments were made on the CEO's unearned shares in year *t*, then it is classified as a DER-policy firm starting from year *t*. The firm will still be a DER-policy firm in the following years until the firm announces a suspension of the policy. A firm is classified as a DER-payment firm in year *t* if its disclosures indicate that DER-payments on CEO's unearned shares were made in year *t*. Thus, the sample of DER-payment firms is a subset of the set of DER-policy firms.

10-industry classification, the high-tech industry has the smallest portion of DER-policy firms and the shops industry has the smallest portion of DER-payment firms. Panel C presents two sub samples – the Average Year Sample and the First Year Sample. The two sub-samples are discussed in Section 1.4.5 in more details. In short, the Average Year Sample selects one year that most closely represents the firm's average year. The First Year sample selects the first year the firm appeared in the overall sample. There is no obvious pattern in the number of DER-policy firms and the percentage of DER-policy firms in the Average Year Sample. The average percentage of DER-policy firm in the Average Year Sample is 29%, slightly higher than that of the full sample, while the percentage of DER-payment firms is much higher than that of the full sample. The First Year Sample shows a similar pattern with the Average Year Sample.

Table 1.2. Sample Characteristics

Panel A. Full Sample, firm-year observations by time					
Fiscal Year	**# of Sample Firms**	**# of DER-policy firms**	**% of DER-policy firms**	**# of DER-payment firms**	**% of DER-payment firms**
1993	204	20	10%	12	6%
1994	219	27	12%	15	7%
1995	227	28	12%	16	7%
1996	247	38	15%	19	8%
1997	253	40	16%	19	8%
1998	253	43	17%	20	8%
1999	257	45	18%	20	8%
2000	264	48	18%	21	8%
2001	265	51	19%	24	9%
2002	281	56	20%	23	8%
2003	287	64	22%	25	9%
2004	289	72	25%	29	10%
2005	293	81	28%	35	12%
2006	295	90	31%	39	13%
2007	299	93	31%	39	13%
2008	301	92	31%	40	13%
2009	303	89	29%	41	14%
2010	305	89	29%	41	13%
2011	305	88	29%	42	14%
2012	295	70	24%	27	9%
Total	5,442	1,224	22%	547	10%

(Table 1.2 Panel A continued)

Panel A. Full Sample, firm-year observations by time					
Fiscal Year	**# of Sample Firms**	**# of DER-policy firms**	**% of DER-policy firms**	**# of DER-payment firms**	**% of DER-payment firms**
Average	272.1	61	22%	27	10%

Notes: This panel summarizes the sample firms over the sample period from 1993 to 2012. The columns contain the fiscal years, the number of firms that are included in the sample each year, the number of firms that have a policy allowing for dividend equivalent payments on their CEOs' unearned shares (DER-policy firms), the percentage of DER-policy firms each year, the number of firms that make actual dividend equivalent payments each year (DER-payment firms), and the percentage of DER-payment firms each year, respectively.

Panel B. Full Sample, firm-year observation by industry					
Industry	**# of Sample Firms**	**# of DER-policy firms**	**% of DER-policy firms**	**# of DER-payment firms**	**% of DER-payment firms**
Non-Durables	51	19	37%	6	12%
Durables	8	2	25%	3	38%
Manufacture	96	35	36%	18	19%
Energy	43	11	26%	4	9%
High-Tech	92	21	23%	7	8%
Shops	57	19	33%	4	7%
Health	43	12	28%	5	12%
Other	36	12	33%	6	17%
Total	426	131	31%	53	12%
Average	53.3	16.4	30%	6.6	15%

Notes: This panel summarizes the sample firms across industries. We use the Fama-French 10-industry classification and divide the entire sample into ten industries based on firms' SIC codes (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_10_ind_port.html). We exclude financial (SIC code 6000-6999) companies in the sample selection process. We also excluded utility, communication and transportation (SIC Code 4000-4999) companies. According to the Fama and French 10-industry classification, those SIC codes correspond to three categories: Telephone and Television Transmission, Utilities and Other (including Finance, Business Services, Mines, Construction, etc.). Two categories-Telephone and Television Transmission, and Utilities are completely dropped from the sample. The category "Other" is kept because firms in this category except for those Finance firms are included in the sample. Thus eight industry categories are left in our sample.

Panel C. Average Year Sample, firm-year observations by time					
Fiscal Year	**# of Sample Firms**	**# of DER-policy Firms**	**% of DER-policy Firms**	**# of DER-payment firms**	**% of DER-payment firms**
1993	13	3	23%	2	15%
1994	22	3	14%	1	5%
1995	25	2	8%	1	4%
1996	16	4	25%	0	0%
1997	20	5	25%	1	5%
1998	12	1	8%	0	0%
1999	12	2	17%	0	0%

(Table 1.2 Panel C continued)

Panel C. Average Year Sample, firm-year observations by time					
Fiscal Year	**# of Sample Firms**	**# of DER-policy Firms**	**% of DER-policy Firms**	**# of DER-payment firms**	**% of DER-payment firms**
2000	18	5	28%	18	100%
2001	24	5	21%	24	100%
2002	17	2	12%	17	100%
2003	21	6	29%	21	100%
2004	35	10	29%	35	100%
2005	26	12	46%	26	100%
2006	28	9	32%	28	100%
2007	27	9	33%	27	100%
2008	10	4	40%	10	100%
2009	25	11	44%	25	100%
2010	23	15	65%	23	100%
2011	24	12	50%	24	100%
2012	22	9	41%	22	100%
Average	21	6.45	29%	15.25	66%

Notes: This panel summarizes the Average Year Sample. The Average Year Sample contains data for a year chosen as each firm's "average year." For example, if we find that a firm remains a DER-policy firm for more than two consecutive years, we then average the firm's MEDecile (their decile of market value of equity) and V/A (market/book) over that period and choose the firm-year observation that has the closest values of these measures to the average values. This observation becomes the firm's average-year observation in the DER-policy Average Year sample. Similarly, if the firm stays in the non-DER policy firm sample for a few years, we choose its average-year observation in the Non-DER policy average year sample in a similar way. The sample is summarized in the same fashion with Panel A.

Panel D. First Year Sample, firm-year observations by time					
Fiscal Year	**# of Sample Firms**	**# of DER-policy Firms**	**% of DER-policy Firms**	**# of DER-payment firms**	**% of DER-payment firms**
1993	204	20	10%	12	6%
1994	23	10	43%	4	17%
1995	10	3	30%	0	0%
1996	31	11	35%	4	13%
1997	11	4	36%	1	9%
1998	5	4	80%	2	40%
1999	8	2	25%	1	13%
2000	11	3	27%	11	100%
2001	8	5	63%	8	100%
2002	14	7	50%	14	100%
2003	11	8	73%	11	100%
2004	10	8	80%	10	100%
2005	14	9	64%	14	100%
2006	15	12	80%	15	100%

(Table 1.2 Panel D continued)

Panel D. First Year Sample, firm-year observations by time					
Fiscal Year	**# of Sample Firms**	**# of DER-policy Firms**	**% of DER-policy Firms**	**# of DER-payment firms**	**% of DER-payment firms**
2007	13	9	69%	13	100%
2008	10	4	40%	10	100%
2009	4	2	50%	4	100%
2010	4	3	75%	4	100%
2011	7	4	57%	7	100%
2012	7	3	43%	7	100%
Average	21	6.55	52%	7.6	70%

Notes: This panel summarizes the First-Year Sample. The First-Year Sample contains the observations in which firms become a DER-policy firm or a non-DER policy firm for the first time. The sample is summarized in the same fashion with Panel A.

Table 1.3 summarizes the basic descriptive statistics of the variables used in this study. Descriptions of the variables are in Appendix B. It is shown in the table that on average a non-DER policy firm pays out 1.77% of its total assets while a DER-policy firm pays out 2.34% and a DER-payment firm pays out 2.84%. DER-policy and DER-payment firms tend to have larger total assets but their market cap is not different from others. Non-DER policy firms tend to have higher percentage of CEO ownership of shares than DER-policy firms. CEOs of DER-policy firms and DER-payment firms appear to have higher unearned performance stock holdings. Further and more rigorous analyses of the differences in these samples will be provided in the following section.

Table 1.3. Univariate Statistics

	Non-DER policy			**DER-policy**			**Non-DER payment**			**DER-payment**	
	Mean	**STD**		**Mean**	**STD**		**Mean**	**STD**		**Mean**	**STD**
Payout measures:											
DIV/ASSETS	1.77	3.17		2.34	2.88		1.80	3.13		2.84	2.85
DIV/OPERATING INCOME	9.55	17.94		15.50	47.14		10.24	28.34		16.61	16.74
DIV/EBIT	11.33	116.00		20.21	32.44		11.91	108.28		25.72	68.39
DIV/NI	20.32	237.91		32.44	115.30		21.55	222.24		36.17	158.14

(Table 1.3 continued)

	Non-DER policy			DER-policy			Non-DER payment			DER-payment	
	Mean	**STD**		**Mean**	**STD**		**Mean**	**STD**		**Mean**	**STD**
Dividend yield	6.70	22.74		13.79	40.94		7.72	28.33		13.29	24.65
Repurchase payout ratio	4.04	8.72		4.45	7.08		4.19	8.64		3.70	5.52
DIVDUM	0.68	0.47		0.84	0.37		0.69	0.46		0.97	0.17
Accounting variables:											
A	14,681.73	34,152.34		23,891.62	66,538.28		14,536.99	41,276.14		25,607.03	58,725.37
MEDecile	7.39	1.44		7.71	1.31		7.41	1.45		7.93	1.04
V/A	2.50	2.44		2.36	1.69		2.53	2.39		1.96	0.91
dA/A	0.10	0.20		0.07	0.16		0.09	0.20		0.06	0.14
E/A	0.17	0.08		0.18	0.09		0.17	0.09		0.17	0.07
FCF/A	0.11	0.09		0.12	0.09		0.11	0.10		0.12	0.08
ROA	0.07	0.13		0.08	0.08		0.07	0.13		0.07	0.06
LEV	0.06	0.25		0.08	0.21		0.06	0.25		0.11	0.19
Market-to-book Ratio	2.46	2.31		2.34	1.63		2.48	2.28		2.00	0.96
Corporate governance measures:											
E-index	2.43	1.38		2.65	1.48		2.47	1.39		2.59	1.48
Interlock	0.03	0.19		0.04	0.18		0.03	0.18		0.04	0.21
Dualrole	0.36	0.48		0.49	0.50		0.38	0.49		0.52	0.50
Boardsize	10.19	2.47		10.93	2.18		10.26	2.44		11.27	2.06
CEO characteristics and compensation:											
Tenure	7.31	6.68		6.68	5.61		7.20	6.57		6.92	5.37
New CEO	0.11	0.32		0.12	0.32		0.12	0.32		0.10	0.30
Totcomp	6.20	14.71		5.87	8.13		6.20	14.12		5.41	5.20
Cashcomp	1.76	2.42		1.81	1.37		1.75	2.29		2.01	1.43

Notes: Descriptions of the variables are in Appendix B.

1.4 Results

1.4.1 Determinants of DER Policy and DE Payments

We use a logistic regression to examine the characteristics of firms that have DER policies and those that make DE payments. All of our statistical evidence seems to suggest that firms' DER policies and DE payments have strong bonds with the agency problems residing in the executive compensation design process. The data shows that indeed DER policies and DE

payments tend to exist in firms with powerful CEOs. We use a Logistic regression to characterize firms that have DER-policies and DER-payments. Policies regarding dividend equivalents and policies regarding dividend payout are naturally bonded: DE payments on CEOs' unearned shares may provide dividend incentives; meanwhile, high dividend yield firms tend to design and disclose policies regarding DE payments. We use a dividend-payer sample to deal with this endogeneity problem. By comparing the DER-policy firms and non-DER policy firms in the dividend payer sample, we determine the firm characteristics that are related to DER policies, conditioned on the fact that all firms are dividend payers.[14]

Larger firms tend to have more complicated compensation tools such as performance-based equity awards and dividend equivalents so we include an explanatory variable *MEDecile* to measure firm size. Dividend equivalent rights are discussed in firms' Long Term Incentive Plans (LTIP) and may be related to firms' long term performance goals. Therefore, we include variables commonly used in firm performance studies as explanatory variables. Elsila (2013)'s study suggests that CEOs' dividend income from unvested restricted stocks may substitute for CEOs' cash compensation. We also include CEOs' cash compensation and total compensation to control for possible substitution effects between DE payments and cash compensation. We use CEO tenure, the length of time that the person has been the CEO and a new CEO indicator to identify a recently appointed CEO. *CEO age* was originally used to describe the CEO but was dropped because it co-varies with time fixed effects.

The literature documents the crucial role of board structure in corporate governance. We also include variables to capture this effect. In 1992, the SEC increased disclosure requirements when insiders serve on compensation committees to encourage more independent director

[14]A related but interesting question is whether the potential for making DE payments could induce a firm to be a dividend payer when it otherwise would not. Later we will address that question and account for the endogeneity.

involvement in the process of establishing executive compensation packages. Researchers find little evidence showing that CEOs receive premium pay when insiders are members of the compensation committee (Anderson & Bizjak 2003) but the sensitivity of CEO compensation to firm performance favors CEOs when insiders are on the compensation committee. We use the variable *Interlock* to indicate whether the CEO is also on the compensation committee. Firms' leadership structures as a dimension of corporate governance is also related to this issue. Goyal and Park (2002) find that when the CEO and chairman duties are vested in the same individual it is more difficult to dismiss an ineffective CEO. The variable *Dualrole* is used to indicate this characteristic. Studies show that small boards are more effective in monitoring managers and can result in better corporate governance (Yermack 1996), so we include the variable *board size* as a corporate governance measure.

The response variables in the logistic regressions are two dummy variables. *DER_POLICY* indicates whether a firm has DER policy, and *DER_PAYMENT* indicate whether a firm makes actual DE payments. The results are summarized in Table 1.4.

DER-policy firms can be characterized as large, high dividend-yield firms. There is some modest evidence that they pay CEOs relatively less than their peers and have powerful CEOs and weak boards. DER-payment firms show similar characteristics. The fitted coefficient of Interlock CEO is positive and significant at 10%, which means that when a CEO is on the compensation committee and is involved in the compensation decision making process, the firm has higher odds of being a DER-policy firm, or a DER-payment firm, at least to a modest level of significance.

Table 1.4. Regression Analysis of the Characteristics of DER-policy firms and DER-payment firms

	(1)		(2)		(3)		(4)		(5)		(6)	
	DER_POLICY		DER_PAYMENT		DER_POLICY		DER_PAYMENT		DER_POLICY		DER_PAYMENT	
Intercept	-4.1709		-4.7534		-3.6715		-5.7330		3.4832		-4.8403	
MEDecile	0.1371	***	0.2692	***	0.1871	***	0.3149	***	0.1192	**	0.2778	***
ROA	-0.5362		1.6956		0.0083		0.8961		-0.6352		0.7169	
Leverage	0.3670		0.3392		0.4282		0.3981		0.2348		0.1192	
Market-to-book Ratio	-0.0121		-0.3493	***	-0.0860	*	-0.3155	***	-0.0837	**	-0.4291	***
Dividend yield	0.0230	*	0.0584	**	0.0280	*	0.0570	**	0.0563	**	0.0981	***
Tenure	-0.0104	**	0.0050		-0.0149	*	0.0096		-0.0141	*	0.0102	
New CEO	-0.0490		-0.1254		-0.0448		-0.1041		-0.0511		-0.0836	
Cashcomp	0.0038		-0.0210		-0.0201		-0.0315		-0.0110		-0.0319	
Totcomp	-0.0000	*	0.0000		-0.0000	*	-0.0000	*	-0.0000	*	-0.0000	
Interlock	0.2104	*	0.0015	*								
Dualrole					0.0449		0.2290	*				
Board Size									0.0353	*	0.0236	
Year Fixed Effect	Yes		Yes		Yes		Yes		Yes		Yes	
Industry Fixed Effect	Yes		Yes		Yes		Yes		Yes		Yes	
% Concordant	65.1		62.8		63.9		66		60.4		64.2	

*** (**) {*} significant at the 1% (5%) {10%} significance level for a two-tailed test.

Notes: The response variable for regression (1), (3), and (5) is DER_POLICY. The response variable for regression (2), (4), and (6) is DER_PAYMENT. Variable definitions are in Appendix B. The number of observations in all cases is 2,870.

CEOs' preferences to receive dividends on their unearned shares may be explained by their risk-averse behavior. Performance awards such as performance shares, performance-based stock options, and restricted stocks are supposed to be fully risky and dependent on CEO performance. When a CEO is allowed to receive dividends on his or her unearned performance awards, part of the performance awards' value (the value of the DEs) is taken out and delivered to the CEOs at no risk.[15] Therefore the value corresponding to DEs is independent of performance, and the overall sensitivity of CEO pay to performance decreases. In extreme cases when the performance goals are very unlikely to be achieved and the performance-based awards are to be forfeited, the DERs on the shares covered by those awards will be quite comforting to the CEOs. Consistent with the predictions of the managerial power theory, we find modest evidence that dividend equivalent payments on CEOs' unearned shares and policies that allow such payments tend to exist in firms with weak corporate governance.

1.4.2 Market Reaction Towards News of DER Policy and DE Payments

In this section we examine how the stock market reacts to two types of first time disclosures about DER usage. In the first type of disclosure, a company announces that it has been paying, is paying, or is planning to pay DEs on CEO's unearned shares – positive disclosures. This type of disclosure may or may not be followed by disclosures of actual DE payouts. In the second type of disclosure, a company announces that it has never paid, no longer pays, or will not pay DEs on CEO's unearned shares – whether associated with either existing awards or newly issued awards. The second type of disclosure is referred to as negative disclosures. Negative disclosures can be preceded, or even be followed by actual DE payments. For instance, assume a company paid DEs

[15]Even though many firms defer the payment of DEs instead of paying cash immediately, the DEs are still considered "safe" to CEOs. They will receive them after a few years. The risks involved in those DEs are not comparable to that of performance-based equity awards to which the DERs were originally attached.

in the years prior to 2006 and the company's fiscal year end is December. In the company's 2006 proxy statement, the company announced that it would not pay DEs on any unearned performance-based stock awards that were granted in or after 2006. This would be a negative disclosure. However, holders of awards that were granted prior to 2006 are still entitled to DEs. Considering the fact that the most commonly seen performance period length is three years, it is possible that the firm still makes positive disclosures in year 2007 and 2008 for stock awards with DERs granted in 2005.

The event dates are the filing dates of proxy statements. These dates are available on the SEC web site. The event period starts five days prior to the event date and lasts until one day after the event date. We use the Fama and French three-factor model to estimate abnormal returns. The sample has 93 positive disclosures and 179 negative disclosures.

Results are summarized in Table 1.5. We show that, on average, a first-time positive disclosure generates a significant and negative stock market reaction, while a first-time negative disclosure has a significant, positive market reaction at the 5% level. The cumulative average return from day - 5 to day 1 is -0.70% for positive disclosures and 0.77% for negative disclosures. Overall the results indicate that the market does not favor positive disclosures and embraces negative disclosures. Thus it appears that shareholders do not favor DERs.

Table 1.5. Event Study Results

Panel A	Initial disclosure of DER grants on unearned shares			
		Observations	Mean CAR (day -5 to day +1)	
Fama-French Three Factor Model		93	-0.70%	**
Panel B	Initial disclosure of no DER grants on unearned shares			
		Observations	Mean CAR (day -5 to day +1)	
Fama-French Three Factor Model		179	0.77%	**

*** (**) {*} significant at the 1% (5%) {10%} significance level for a two-tailed test.

1.4.3 Long-term Stock Performance

In this section we study how the stock market reacts to the grant of DERs on CEOs' unearned performance-based shares over the long term. We use Fama and French's three-factor model (Fama & French 1993) and firms' monthly returns to assess long-term stock performance. The sample we use in the OLS regressions is different from the event study sample. During the sample period from 1993 to 2011, there are 298 disclosures from 35 firms about actual DE payments on CEOs' unearned shares. We incorporate the Fama-French factors, as well as measures of corporate governance and an indicator for whether the firm is a dividend payer and whether the firm pays DEs. We also use an indicator for whether the firm is in the S&P 500 in 1993.

The regression results are summarized in Table 1.6. The p-values are based on standard errors robust to heteroskedasticity. The results show that on average firms that pay DEs to CEOs underperform the market by 0.53% each month. This result is very significant at levels below 0.0001.

The result is robust after controlling for variables that may be related to the firm's DER usage. E-index is the Entrenchment index (Bebchuk *et al.* 2009), which is the number of key anti-takeover provisions that firms adopt. It purports to measure the quality of firms' corporate governance. A dummy variable is used to indicate whether the firm is paying a dividend. An indicator for firms that belong to the S&P 500 in both 1994 and 2011 is used to correct the survival bias in the sample since the sample firms consist of only S&P 500 firms. E-index is not significant in the regression, but the dividend dummy and the 1994 S&P 500 firm dummy are significant in explaining the firm's abnormal returns. After controlling for other effects, the indicator for DER-paying firms is still significant. The magnitudes of the coefficients vary slightly but are all

negative. The long-term stock return regression results are consistent with the event study results. DER-paying firms underperform the market in the long term.

Table 1.6. Regression Estimates of Stock Performance as a Function of Executives' Dividend Income on Unearned Shares

	Estimate		**Estimate**		**Estimate**		**Estimate**		**Estimate**	
Intercept	0.59	***	0.62	***	0.62	***	1.36	***	1.29	***
Market excess return	1.04	***	1.04	***	1.01	***	1.04	***	1.04	***
HML	0.37	***	0.37	***	0.41	***	0.37	***	0.37	***
SMB	0.06	***	0.06	***	0.01		0.06	***	0.06	***
E-index					-0.03					
DIVDUM							-0.99	***		
SP500_93									-0.81	***
DER_PAYMENT			-0.53	***	-0.37	**	-0.3	**	-0.41	**
Adjusted R-square	0.1973		0.1974		0.1978		0.1989		0.1981	

*** (**) {*} significant at the 1% (5%) {10%} significance level for a two-tailed test.

Notes: Ordinary least squares regression of sample companies' annual stock returns. The sample includes S&P 500 firms between 1993 and 2011. The dependent variable is the raw monthly stock return minus the risk-free rate. The principal explanatory variable is an indicator for whether the company pays dividends on executives' unearned shares (mainly unearned performance shares, unearned performance share units and shares covered by unexercised stock options). Other explanatory variables include the Fama and French factors: market excess return, HML, and SMB (Fama & French 1993). Explanatory variables also include the Bebchuck Entrenchment index, a dummy variable for firms that pay dividends, and a dummy variable for firms that were in the S&P500 in 1993. Standard errors are robust to heteroskedasticity.

1.4.4 DER Policy and the Propensity to Pay

We want to disentangle the association between firms' DER policies and dividend payout policies. DER policy can affect a firm's dividend payout in many ways: Consistent with the managerial power theory (Bebchuk & Fried 2003), managers can influence the board to adopt DER policies that can benefit themselves by increasing managers' dividend income on shares they may or may not own. The board can also adopt DER polices to compensate managers for losses in the value of their stock options or other equity award holdings when dividends are paid.

Because managerial compensation is insulated from losses due to dividends, managers to whom DERs are granted will not shy away from paying dividends. According to this view, dividend equivalents may motivate CEOs to increase dividends rather than to invest in inferior projects. This possibility is consistent with optimal contracting theory (Murphy 1999). Both of the competing theories suggest that DER-policy firms and DER-payment firms are associated with higher dividend payouts than other firms. We construct statistical tests to assess this argument in two ways. First, we test whether DER-policy firms and DER-payment firms are more likely to be dividend payers. Second, given that DER-policy firms and DER-payment firms are paying dividends, we examine whether they are more likely to pay higher dividends.

We use logistic regression to examine how the existence of a DER policy is related to the likelihood that a firm pays dividends. There is an obvious endogeneity problem. Firms that make policies regarding dividends are most likely to be dividend payers. The link between the DER policy and dividend payments is naturally strong. The question we are interested in is: could it be that DER policies can make firms be dividend payer when they otherwise would not? To answer that question we need to control for the factors that are associated with firms' decisions to pay out dividends.

The literature shows that dividend payers are characterized as large, profitable, lacking in sufficient investment opportunities, and having large free cash flows (Fama & French 2001). Following the literature, we include variables such as firms' size, profitability, investment opportunity, and free cash flow to control for these characteristics. We use the indicator *DER_POLICY* to measure whether a firm has a policy to pay DEs on the CEO's unearned shares. We use a pooled logistic regression instead of year-by-year regressions since the pooled regression has higher power. The regression equation is as follows:

$$logit\ (Divdum) = intercept\ +\ \beta_0 DER_{POLICY} + \sum \beta_i X_i + \sum \gamma_j Y_j + \varepsilon$$

where $Divdum$ is a categorical variable indicating whether a firm pays a common dividend in a fiscal year with 1 indicating that the firm paid a dividend in a particular year and 0 that it did not. We fit the model on the probability of having "1" as the outcome. DER_POLICY is the primary variable of interest. It is an indicator that takes a value of 1 if the firm allows DE payments on CEO's unearned shares and takes a value of 0 otherwise. Xs are the control variables which include: *MEDecile*, *V/A*, *dA/A*, *E/A*, *FCF/A*, *LEV*, and *ROA*. *MEDecile* is the NYSE firm size decile, that is, the largest decile of NYSE firms that have the same or smaller market capitalization. This measure is not affected by overall firm size growth over time and is thus more robust in capturing cross-firm size variation. Firms' investment opportunities are measured by the growth rate of firm assets dA/A and the market-to-book ratio V/A. FCF/A measures firms' free cash flow. It is operating income before taxes minus interest expense, scaled by total assets. LEV is the firm's financial leverage. *ROA* is the firm's return on assets. Ys are dummies for industries, fiscal years and firms. All observations are firm-year observations. All variables are defined with details in Appendix B.

Observations from the same industry are correlated. This is also true for observations from the same fiscal year, or from the same firm. For example, a firm may become a dividend payer because its competitors are all dividend payers – peer pressure exists inside the industry. In the example, the industry-related effect clearly associates with the response variable – whether the firm is a dividend payer, it may also be associated with other variables that have impacts on the firm's dividend policy. Firm size for instance may be industry-related. Some industries have high research and development costs such that large firms have a better chance of survival. We need

to control for these unobserved effects residing in different industries, time periods and firms that may be correlated with the response variable or other explanatory variables.

The unobserved effects that are controlled by using dummy variables, of which firm dummies are also used to address the lack of variation problem (i.e. multi-collinearity) that exists in the panel data. It is widely known that firms' dividends are smooth because firms are reluctant to actively modify their dividend policy. Thus, the time variation in firms' dividend payouts is limited. This problem is more pronounced in the regression described here in which the response variable to describe firms' dividend policy is an indicator. Neither will the value of the response variable change as long as a firm remains a dividend payer or remains a non-dividend payer, nor will it reflect the changes in amount of dividends paid. The key explanatory variable *DER_POLICY* suffers from a similar problem. Once a firm discloses that it allows DEs to be paid on unearned shares, the value of the variable will not change unless the firm makes a change to its DER policies. Lack of variation in variables may cause the statistical results to be unreliable – the significant effects shown in the regression results may be exaggerated due to similar data entries. We use fixed effects models, two subsamples, and mixed effect models to control for the unobserved effects and to deal with lack of variation problem.

We have to decide whether the unobserved effects that reside in different industries, fiscal years, and firms are fixed or random. There is an important difference between fixed effects and random effects: for fixed effects, data are collected from all the values/levels of the effect, while for random effects the values/levels are a random subset of the entire population of values/levels of the effect. Industry is no doubt a fixed effect. We classify all U.S. firms into a total of ten industries. This is an experimental design process. Two industries were excluded in the data collection step due to various reasons. The eight industry categories left in the sample are all the

values/levels available for the industry effect. They are not randomly selected from a population of industries. Fiscal year effect and firm effect are more difficult to decide. They have been treated as fixed effects in the literature. But they can be treated as random effects too. In fact they behave more like random effects. We have data spanning twenty years which is a short period in the history of corporate firms. The choice of the twenty years is due to the data availability. It is not a result of any experimental design. Thus the twenty years can be seen as a random selection of years from the history of corporate firms. The firm effect is also more appropriately treated as a fixed effect than a random effect. The sample firms are selected from the entire population of firms through a "random" selection process.[16]

Table 1.7 summarizes the logistic regression results. We first fit models that treat industry, fiscal year and firm as fixed effects. The related models are referred to as "all fixed effect models." We then fit models that consider industry and fiscal year as fixed effects and consider firm as a random effect. At last we fit models that consider industry as a fixed effect and consider both fiscal year and firm as random effects. The models that include both fixed effects and random effects are referred to as "mixed effect models". Panel A contains results of all fixed effect models. Panel B and Panel C summarize mixed effect models.

Table 1.7. Results of Logistic Regressions to Determine the Effect of DER Policy on Whether a Firm Pays Dividends

Panel A. All Fixed Effect Models

	Firm Fixed Effects		**Average Year Sample**		**First Year Sample**	
Intercept	14.8083		-4.9563	**	6.7413	
MEDecile	0.5623	***	0.7389	***	0.6589	***
V/A	-0.3825	**	-0.6315	**	-0.5438	**
dA/A	-0.8804		-3.2899	**	-5.4178	***

[16]The sampling process is not purely random since we do have a few selection criteria such as S&P firms, Compustat database coverage, etc. But the sample is supposed to be a good representative of the firm population. This is consistent with the purpose of the random sampling process.

(Table 1.7 Panel A continued)

	Firm Fixed Effects		**Average Year Sample**		**First Year Sample**	
E/A	2.9916		1.0123		1.6668	
FCF/A	2.6152		2.6992		2.0184	
LEV	-2.968	***	1.6673	**	0.3677	
ROA	-2.1328	*	8.1778	**	7.8409	
DER_POLICY	1.3926	**	0.8425	**	1.0300	**
Fixed Effects:						
Industry	YES		YES		YES	
Time	YES		YES		YES	
Firm	YES		-		-	
Odds Ratio of DER_POLICY	4.025		2.322		2.801	
# of Observations	5,442		420		420	
% Concordant	99.2		88.9		94.2	
# of Pairs	6,185,025		37,539		38,475	
Hosmer and Lemeshow Goodness-of-Fit Test P-value	<0.0001		0.5766		0.1666	

Panel B. Mixed Effect Models with Time Fixed Effects

	IND Structure		**AR(1) Structure**		**CS Structure**	
Intercept	-4.0052	***	0.1184		-0.3326	
MEDecile	0.6090	***	0.0836	***	0.1403	**
V/A	-0.3081	***	-0.0122	**	-0.0663	**
dA/A	-2.4764	***	-0.1381	**	-0.2977	**
E/A	-0.9627		-0.6106		-0.0983	
FCF/A	4.3819	**	0.2654		0.4940	
LEV	1.0310	*	-0.1398		-0.6869	**
ROA	3.3133	**	-0.0211		0.0054	
DER_POLICY	0.7691	**	0.1274	*	0.2395	*
Fixed Effects:						
Industry	YES		YES		YES	
Time	YES		YES		YES	
Random Effect:						
Firm	YES		YES		YES	

(Table 1.7 Panel B continued)

	IND Structure		**AR(1) Structure**		**CS Structure**	
Odds Ratio of DER_POLICY	2.1578		1.1359		1.2706	
# of Observation	5442		5442		5442	
QIC (the lower the better)	4789		5622		5709	
QICu (the lower the better)	4579		5499		5447	

Panel C. Mixed Effect Models with Time Random Effects

	ARMA(1,1) Structure		**AR(1) Structure**		**TOEP(3) Structure**		**VC Structure**	
Intercept	-0.3226		-0.3080		-2.1673	***	-4.1525	***
MEDecile	0.0812	***	0.0822	***	0.3580	***	0.5842	***
V/A	-0.0083		-0.0085		-0.1369	***	-0.2895	***
dA/A	-0.1290	*	-0.1440	**	-0.6776	***	-2.1348	***
E/A	-0.3657		-0.5401		-1.0954	**	0.3525	
FCF/A	0.1101		0.2266		1.5127	**	3.3386	**
LEV	-0.1433		-0.1148		0.5056	**	1.1280	**
ROA	-0.0015		0.0163		0.4542	**	3.2030	**
DER_POLICY	0.1544	**	0.1454	*	0.5115	***	0.6846	***
Fixed Effect:								
Industry	YES		YES		YES		YES	
Random Effects:								
Time	YES		YES		YES		YES	
Firm	YES		YES		YES		YES	
Odds Ratio of DER_POLICY	1.1670		1.1565		1.6678		1.9830	
-2 Res Log Pseudo-Likelihood	15430		15527		19672		31564	
Gener. Chi-Square / DF	0.94		0.94		0.60		2.23	

*** (**) {*} significant at the 1% (5%) {10%} significance level for a two-tailed test.

Notes: DIVDUM indicates whether a firm pays dividend in a year. Fiscal Years, Industry, and Firm Fixed Effects are dummies. Details and descriptions of all other variables are in Appendix A. Construction of the Average Year Sample was previously described in detail, but it generally reflects the firm observations from the most typical year. The First Year Sample is constructed by choosing the first year observation when the firm starts to pay DEs, or when the firm stops paying DEs. To be included in the full sample, the

(Table 1.7 Panel C continued)
firm-year observations must have positive net income and positive earnings before interest and taxes. The response variables are described in Appendix B.

Panel A summarizes all fixed effect models in which industry, firm and fiscal year are all considered as fixed effects. In the first column of Panel A, we control for the firm fixed effects by fitting each firm with its own intercepts. The second and third columns summarize the regression results using the two subsamples which include only industry and fiscal year fixed effects. The regression using subsamples does not include the firm effect. The first column contains the fitted coefficients using the entire sample of 5,442 firm-year observations. The indicator, *DER_POLICY*, is positively associated with dividend payout probability. The effect is significant at the 5% level, implying a strong association between a firm's DER policy and the likelihood of having a successful outcome (i.e. the firm pays dividend). The odds ratio is 4.025, meaning that all other things equal, a DER-policy firm is four times more likely to be a dividend payer than a non-DER policy firm. Larger firm are also more likely to be dividend payers while firms with more investment opportunities are less likely to be dividend payers (Fama & French 2001). As expected, the fitted coefficient of firm size (*MEDecile*) is positive and significant, while the fitted coefficient of investment (*V/A*) is negative and significant. The model has a concordant percentage of 99.2%, suggesting that it has strong power in predicting the outcomes.[17]

The Average Year subsample contains 420 firm-year observations. Each firm has at most two observations included in this sample. The idea is to select one observation to represent a firm's "average year" – the year in which the firm' size and investment opportunities are the closest to its typical year. For each firm, we first separate observations into two groups: one for the years

[17]We use SAS software to perform the logistic regression. SAS reports the "percentage concordant" in the output by default. SAS pairs all observations with different response variables. In this case, that is all possible combinations of a DER-policy firm and a non-DER policy firm. A pair is concordant if the observation with the larger predicted value also has the larger actual value.

during which its *DER_POLICY* takes a value of one and one for the years during which it *DER_POLICY* takes a value of zero.[18] We then we calculate the average values of the variables *MEDecile* and *V/A* for both groups.[19] From each group the observation in the year when the values of *MEDecile* and *V/A* are closest to the mean is chosen to be included in the Average Year sample.

The other subsample, the First Year subsample, also contains 420 firm-year observations. For each firm, we chose the observation(s) from the first year that the variable *DER_POLICY* takes a value of one and the first year that the variable takes a value of zero.

The results in the second and third columns show that the fitted coefficients of *DER_POLICY* are positive and significant at the 5% level, confirming that there is a positive association between the policy allowing for DE payments on unearned shares and the dividend payout probability.

The estimated coefficients in the fixed effects model reflect within-firm variation while those in the two regressions using subsamples reflect cross-sectional variation; thus the estimated coefficients and their interpretations in the fixed effects model and the two subsample regressions are different. In the fixed effects model the coefficients of leverage (*LEV*) and return on assets (*ROA*) are negative and significant, while in the subsamples the two coefficients are positive and significant. For instance, the fixed effects model shows that both financial leverage and return on assets are negatively associated with dividend payout probability. These results show how dividend policy is affected by changes in financial standing within a firm: according to the pecking

[18]Some firms have never made any changes to their DER policies over the entire sample period. For these firms, only one observation will be chosen to be included in the Average Year sample. For those who do change their policies, two observations will be chosen, with one from the years when the firms allow for DE payments and one from the years when the firms do not allow for DE payments.

[19]This is true for the majority of the sample firms. Thus at least two variables are needed to determine an "average year". When using *MEDecile* and *dA/A* to construct the sample, the results still hold.

order theory (Myers & Majluf 1984), when a firm's internal cash reserve is exhausted the firm tends to choose debt financing over equity financing to fund projects. Thus an increase in debt holding implies either a shortage of cash, upcoming investment opportunities, or both. It is therefore reasonable for the firm to cut back its dividends. An increase in *ROA* may suggest that the firm is in a stage of active investment and may result in fewer or no dividends. The regressions using the Average Year sample shows that both financial leverage and return on assets are positively associated with dividend payout probability. Those results are consistent with the cross-sectional patterns that more profitable firms are more likely to payout dividends.

We report the P-value of the Hosmer and Lemeshow Goodness-of-Fit Test in Panel A. According to the P-values of the test, the model reported in the first column does not appear to be a very good fit, while the other two models fit the data quite well. The poor goodness of fit problem in the all fixed effect model indicates that better models are needed to describe the variations in the data.

Panel B summarizes results of a generalized linear mixed model with correlations between observations. This model considers industry and fiscal year as fixed effects and consider firms as random blocks. All observations of the same block are correlated and the standard errors of the explanatory variables are adjusted for this "within block" correlation. We assume three different within subject covariance structures: independent structure (IND), auto regressive order 1 structure (AR(1)), and compound symmetry structure (CS).[20] QIC and QICu statistics are measures of

[20]The correlation structures are represented in the matrix form:

Independence structure (IND):

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

It has constant covariance. Between two different elements the correlation is zero.

Compound Symmetry structure (CS):

model fit. For both statistics, a lower value means a better model fit. The results show that the estimated coefficients of *DER_POLICY* are positive. In the model that uses the independent structure (the IND model) the estimated coefficient of *DER_POLICY* is significant at 0.05, while in the models that use AR(1) structure and compound symmetry structure the estimated coefficient is significant at 0.10. The estimated coefficients of the control variables vary across the models too. The coefficients of the control variables in the AR(1) model and the ones in the CS model are consistent except that the leverage variable *LEV*'s coefficient is negatively significant at 0.05 in the CS model but it is not significant in the AR(1) model. In the IND model the estimated coefficient of *LEV* is positive at 0.10. From the AR(1) model and CS model to the IND model there are another two dramatic changes – the non-significant coefficients of free cash flow (*FCF/A*) and return on assets (*ROA*) become positive and significant at 0.05. Both the QIC and QICu statistics are the lowest for the IND model which shows that it works the best in accounting for the variation in our data.

Panel C of Table 1.7 summarizes the results of a generalized linear mixed model which treats industry as a fixed effect and treats both fiscal year and firm as random effects. This model also considers firms as random blocks and allows observations of the same block to be correlated with each other. We consider four correlation structures for this model: First-order autoregressive

$$\begin{bmatrix} 1 & \rho & \rho \\ \rho & 1 & \rho \\ \rho & \rho & 1 \end{bmatrix}$$

It has homogenous variances and homogenous correlations between elements.

Auto-regressive structure with order 1 (AR(1)):

$$\begin{bmatrix} 1 & \rho & \rho^2 \\ \rho & 1 & \rho \\ \rho^2 & \rho & 1 \end{bmatrix}$$

It has homogenous variances. The correlation between any two elements is ρ for adjacent elements, ρ^2 for elements that are separated by a third one, and so on. The value of ρ is between -1 and 1.

moving-average structure (ARMA(1,1)), first-order autoregressive structure (AR(1)), Toeplitz structure with three bands (TOEP(3)), and variance components structure (VC).[21] We report the "-2 Res Log Pseudo-Likelihood" statistics and the "Gener. Chi-Square / DF" statistics, both of which measure model fit. For the former, a lower value means a better model fit. It is used to compare different models that use the same sample. For the latter, a value close to 1 means the variability in the data has been properly modeled and there is no residual over-dispersion. All four sets of results show that the estimated coefficients of the variable *DER_POLICY* are positive. In the ARMA(1,1) model the estimated coefficient is significant at 0.05, in the AR(1) model it is significant at 0.10, and in both the TOEP(3) model and the VC model it is significant at 0.0001. The estimated coefficients of the control variables are different across the four sets of results. The ARMA(1,1) and AR(1) models share similar correlation structures and hence yield similar coefficient estimates and significant levels. Both of them show that the estimated coefficient of the variable *MEDecile* is positive and is significant at 0.0001, and the estimated coefficient of the

[21]The correlation structures are represented in the matrix form:

First order autoregressive moving-average structure (ARMA(1,1)):

$$\begin{bmatrix} 1 & \varphi\rho & \varphi\rho^2 \\ \varphi\rho & 1 & \varphi\rho \\ \varphi\rho^2 & \varphi\rho & 1 \end{bmatrix}$$

It has homogenous variances. The correlation between two elements is $\varphi\rho$ for adjacent elements, $\varphi\rho^2$ for elements separated by a third, and so on. The autoregressive parameter ρ and the moving average parameter φ have values between -1 and 1.

Toeplitz structure with three bands (TOEP(3)):

$$\begin{bmatrix} 1 & \rho_1 & \rho_2 \\ \rho_1 & 1 & \rho_1 \\ \rho_2 & \rho_1 & 1 \end{bmatrix}$$

It has homogenous variances and heterogeneous correlations between elements. Across pairs of adjacent elements the correlation between two adjacent elements are homogeneous.

Variance component structure (VC):

$$\begin{bmatrix} \sigma_A^2 & 0 & 0 \\ \rho & \sigma_B^2 & 0 \\ 0 & 0 & \sigma_C^2 \end{bmatrix}$$

It assumes the heterogeneous variance. The correlation between two different elements is zero.

variable *dA/A* is negative. Both of them have no over-dispersion in residuals and the ARMA(1,1) model has slightly better model fit.

1.4.5 DE Payments and Firms' Dividend Payout Ratios

In this section we examine whether a DER-policy firm that already pays dividends tends to pay higher dividends. Using a subsample that contains all the firm-year observations in which common dividends are paid out, we show that the DER measure *DER_PAYMENT* is positively associated with dividend payout ratios. We use four measures of dividend payout ratios: (1) common dividends over total assets; (2) common dividends over operating income; (3) common dividends over earnings before interests and taxes; (4) common dividends over net income.[22] Results are summarized in Table 1.8.

Panel A summarizes the results of OLS regressions using 3,576 firm-year observations, all of which are dividend-paying observations. In fact in our sample there are 3,825 dividend-paying observations, but 249 observations are dropped due to negative values of net income and earnings before interests and taxes. Panel B summarizes the results using dividend-paying observations with those observations from 2007 and 2008 excluded. The financial market underwent a structural change during 2007 and 2008. Due to the financial crisis many firms suffered from liquidity shocks and cut dividends. In order to address this issue, we drop the observations from those two years and rerun robustness tests. After 403 observations from those two years are removed there are 3,173 observations left. Panel C summarizes the results using the Average Year subsample and Panel D summarizes the First Year subsample.

[22]We also tried the ratio of common dividends over stock price (i.e. dividend yield) to measure the dividend payout level. The results show a positive association between the variable DER-payment and dividend yield which is consistent with the results tabulated in Table 1.8. The dividend yield measure is very sensitive to changes in stock price and thus the related results are dropped from the table.

Table 1.8. Regressions of Dividend Payout Ratios on DER_PAYMENT

Panel A. Full Sample

	(1) DIV/ASSETS		(2) DIV/OPERATING INCOME		(3) DIV/EBIT		(4) DIV/NI	
Intercept	0.3131		24.9629	**	-16.3929		46.5177	
MEDecile	-0.0778		-1.0000	**	5.7867	*	-1.9631	
V/A	-0.0913	**	-0.0836		-0.8763		2.9223	
dA/A	-2.2374	***	-9.2471	***	-15.2068		-25.6409	**
E/A	-0.9259		-117.3736	***	-142.9457		234.2169	**
FCF/A	3.6967	**	10.9319		-19.9588		18.6542	
LEV	1.7369	***	8.9213	***	19.7892		-15.4646	
ROA	14.5100	***	127.3851	***	182.0294	**	-894.7231	***
DER_PAYMENT	0.2498	*	2.7407	**	4.3419		-5.1802	
Time Fixed Effects	YES		YES		YES		YES	
Industry Fixed Effects	YES		YES		YES		YES	
Firm Fixed Effects	YES		YES		YES		YES	
R-square	0.594		0.438		0.103		0.253	
# of Obs.	3,576		3,576		3,576		3,576	

Panel B. 2007-2008 excluded

	(1) DIV/ASSETS		(2) DIV/OPERATING INCOME		(3) DIV/EBIT		(4) DIV/NI	
Intercept	0.5925		26.9612	**	-16.8325		47.2540	
MEDecile	-0.0918	*	-1.1467	**	5.9430	*	-1.7865	
V/A	-0.0101		0.1795		-1.2830		4.4855	*
dA/A	-1.8610	***	-9.2758	***	-18.0525		-21.3913	
E/A	-3.6923	***	-133.8110	***	-182.6396		278.2247	**
FCF/A	3.0836	**	7.6265		-13.9914		-8.9971	
LEV	1.4068	***	8.9755	**	24.0716		-23.6127	
ROA	17.6734	***	154.0566	***	248.5842	**	-1,015.1286	***
DER_PAYMENT	0.2167	*	2.7355	**	4.4579		-6.8009	
Time Fixed Effects	YES		YES		YES		YES	
Industry Fixed Effects	YES		YES		YES		YES	
Firm Fixed Effects	YES		YES		YES		YES	
R-square	0.625		0.410		0.115		0.214	

(Table 1.8 Panel B continued)

	(1) DIV/ASSETS		(2) DIV/OPERATING INCOME		(3) DIV/EBIT		(4) DIV/NI	
# of Obs.	3,173		3,173		3,173		3,173	

Panel C. Average Year Sample

	(1) DIV/ASSETS		(2) DIV/OPERATING INCOME		(3) DIV/EBIT		(4) DIV/NI	
Intercept	-0.8751		29.4791	**	80.4344	**	91.0167	**
MEDecile	0.1561		-0.4151		-3.9565		-1.5906	
V/A	0.7207	**	6.3556	**	15.5302	**	12.7463	**
dA/A	-3.5010	**	-19.2108	**	-53.2085	*	-66.3917	**
E/A	-6.9204		-224.4051	***	668.8276	***	189.5135	**
FCF/A	5.3510		-68.7988	***	-329.1501	**	49.6066	
LEV	2.1739	**	24.0850	**	89.4578	***	26.0719	*
ROA	31.0648	***	397.0748	***	1357.0191	***	-616.7027	***
DER_PAYMENT	0.4574		5.2971	**	14.6121	*	4.3529	
Time Fixed Effects	YES		YES		YES		YES	
Industry Fixed Effects	YES		YES		YES		YES	
Firm Fixed Effects	NO		NO		NO		NO	
R-square	0.601		0.429		0.423		0.304	
# of Obs.	266		266		266		266	

Panel D. First Year Sample

	(1) DIV/ASSETS		(2) DIV/OPERATING INCOME		(3) DIV/EBIT		(4) DIV/NI	
Intercept	0.9428		37.3946	*	59.4846		176.4069	
MEDecile	0.0663		0.0920		0.6190		5.9704	
V/A	-0.5582		0.1041		5.9123		3.1890	
dA/A	-13.4995	***	-72.0780	***	-103.4831	**	-19.1852	
E/A	0.6635		-198.7298	**	-345.4167	**	266.1726	
FCF/A	4.7469		5.9983		-59.5497		76.0215	
LEV	0.8257		15.7518		43.0288	*	-47.5298	
ROA	46.7933	***	368.5348	***	507.0020	***	-706.0455	
DER_PAYMENT	1.1018		7.4384		12.4749		115.8653	**
Time Fixed Effects	YES		YES		YES		YES	

(Table 1.8 Panel D continued)

	(1) DIV/ASSETS		(2) DIV/OPERATING INCOME		(3) DIV/EBIT		(4) DIV/NI	
Industry Fixed Effects	YES		YES		YES		YES	
Firm Fixed Effects	NO		NO		NO		NO	
R-square	0.458		0.352		0.262		0.053	
# of Obs.	267		267		267		267	

*** (**) {*} significant at the 1% (5%) {10%} significance level for a two-tailed test.

Notes: The regressions in Panel A use the full sample, the regressions in Panel B use the sample with observations from the year 2007 and 2008 excluded, the regressions in Panel C use the Average Year subsample, and the regressions in Panel D use the First Year subsample. Construction of the Average Year Sample was previously described in detail, but it generally reflects the firm observations from the most typical years. The First Year Sample is constructed by choosing the first year observation when the firm starts to pay DEs, or when the firm stops paying DEs. To be included in the full sample, the firm-year observations must have positive net income and positive earnings before interests and taxes. The response variables are described in Appendix B.

For the four samples, the regression results are generally consistent. As shown in Panel A, the estimated coefficients of the indicator *DER_PAYMENT* are positive and significant when *DIV/ASSET* and *DIV/OPERATING INCOME* are used as proxies for dividend payout ratios. The estimated coefficient of *DER_PAYMENT* in regression (1) is positive, suggesting that firms that make DE payments on CEOs' unearned shares have higher dividend payout ratios than firms that do not make DE payments. The mean difference in dividend payout ratios is 0.2498 (percent). The mean estimated coefficient of the variable *DIV/ASSETS* is around three percent. Considering this fact, the effect of *DER_PAYMENT* is also economically significant. The results are robust when 2007 and 2008 observations are deleted (Panel B). When using *DIV/EBIT* and *DIV/NI* as proxies for dividend payout ratios, the variable *DER_PAYMENT* is insignificant. This is true for the results in both Panel A and Panel B.

The regressions using the Average Year sample show that *DER_PAYMENT* has a positive and significant effect on dividend payout ratios when *DIV/OPERATING INCOME* and *DIV/EBIT*

are used as proxies; however, the effect is not significant when using the measures *DIV/ASSETS* and *DIV/NI*. Regressions using the First Year sample show that the effect of *DER_PAYMENT* is positive and significant only when *DIV/NI* is used as the measure of dividend payout ratio. The First Year sample suffers from a selection bias because the majority of the sample comes from the year 1993. Thus the results may not be as reliable as the ones derived from the other three samples. Overall the results are consistent with the argument that firms that pay dividend equivalents to CEOs on their unearned shares tend to pay higher dividends.

The alternative way in which firms return cash to shareholders is through repurchases. We use total repurchase expenses divided by total assets to measure repurchases. While the variable *DER_PAYMENT* has a strongly positive effect on firms' dividend payout ratios, its impact on firms' repurchase payout is minimal. As shown in Table 1.9, the variable *DER_PAYMENT* has no significant effect on repurchase payout ratios.

Table 1.9. Impact of DE Payments on Repurchases

	Full Sample		**2007-2008 Excluded**		**Average Year Sample**		**First Year Sample**	
Intercept	5.9092		6.7516	**	-3.1383		-0.3441	
MEDecile	-0.4176	**	-0.3122	**	-0.2692		-0.4473	
V/A	1.0901	***	0.8261	***	-0.5919		0.0953	
dA/A	-12.5728	***	0.2281	***	-14.139	***	-8.3036	**
E/A	9.4699	**	7.4222	**	27.0064	**	38.4909	***
FCF/A	2.9350		4.7405		17.0502	**	9.2428	
LEV	14.2301	***	3.1006	**	4.8423	**	4.5227	**
ROA	22.0115	***	10.7849	***	31.7336	**	2.8467	
DER_PAYMENT	0.0636		0.1019		0.6133		0.6993	
Time Fixed Effects	Yes		Yes		Yes		Yes	
Industry Fixed Effects	Yes		Yes		Yes		Yes	
Firm Fixed Effects	Yes		Yes		-		-	
R-Square	0.451		0.511		0.507		0.483	

(Table 1.9 continued)

	Full Sample		2007-2008 Excluded		Average Year Sample		First Year Sample	
# of Obs.	3,825		3,393		283		269	

*** (**) {*} significant at the 1% (5%) {10%} significance level for a two-tailed test.
Notes: The regressions in this table use the full sample, the sample with observations from the year 2007 and 2008 excluded, the Average Year subsample, and the First Year subsample. The response variable is the repurchase payout ratio measured by repurchase expenses divided by total assets. Variable descriptions are in Appendix B.

1.5 Endogeneity Issues between Dividend Policies and DER Policies

In Section 1.4 we reported that firms that allow for dividend equivalent payments on their CEOs' unearned shares are more likely to be dividend payers and that firms that pay out dividend equivalents on their CEOs' unearned shares tend to pay higher dividends. The results jointly indicate that the policy to pay dividend equivalent on CEOs' unearned shares is positively associated with dividend payouts. The causal relationship, however, is difficult to prove because both the dividend policies and the policies regarding dividend equivalent rights are firms' endogenous choices. The strong association between the two can be explained in multiple ways. First, the dividend equivalent right policies lead to changes in dividend policies; for instance, the extra dividend income on unearned shares can encourage a CEO to push to increase dividends. Another possibility is that the dividend policies lead to changes in the dividend equivalent right polices. For instance, if a firm is currently paying dividends, it is more likely to make policies related to dividends such as a policy to allow executives to receive dividends on their unearned shares. Lastly, some unobserved events can lead to changes in both kinds of policies so that both policies are strongly correlated but no causal relationship exists between the two. To disentangle this endogeneity problem we use three approaches: the lagged variable approach, the matched-sample approach and the exogenous shock approach.

1.5.1 Lagged Variable Approach

Time order is an important criterion for causal relationships. If two events are strongly associated, the event that takes place at an earlier time is more likely to be the cause, and the event that takes places at a later time is more likely to be the result. In this spirit we use lagged values of the variable *DER_POLICY* and rerun the tests described in Section 1.4.4. The effect of a dividend equivalent policy that was established at earlier years on the current year dividend policy can provide support to the argument that the dividend equivalent policy can lead to changes in a firm's dividend policy. The results are summarized in Table 1.10.

Table 1.10. Lagged Value Approach

	DIVDUM		**DIVDUM**		**DIVDUM**		**DIVDUM**	
Intercept	14.8083		-3.9420	**	-3.8664	**	-2.7981	**
MEDecile	0.5623	***	0.5849	***	0.5633	***	0.4524	**
V/A	-0.3825	**	-0.3618	**	-0.3233	**	-0.2459	**
dA/A	-0.8804		-0.4057		-0.7114		-0.4938	
E/A	2.9916		4.6488	*	5.2913	*	2.8853	
FCF/A	2.6152		1.0926		0.4396		1.6413	
LEV	-2.968	***	-3.7375	***	-3.5220	***	-2.7943	**
ROA	-2.1328	*	-4.1274	**	-3.8432	**	-3.5494	**
DER_POLICY	1.3926	**						
One year lag DER_POLICY			1.5696	***				
Two year lag DER_POLICY					1.6347	**		
Three year lag DER_POLICY							0.8326	*
Time Fixed Effects	YES		YES		YES		YES	
Industry Fixed Effects	YES		YES		YES		YES	
Firm Fixed Effects	YES		YES		YES		YES	
Odds Ratio of DER_POLICY	4.025		10.472		11.975		5.353	
# of Observation	5,442		5,135		4,826		4,524	
% Concordant	99.2		99.3		99.3		99.3	
# of Pairs	6,185,025		5,465,274		4,786,122		4,169,915	

*** (**) {*} significant at the 1% (5%) {10%} significance level for a two-tailed test.

(Table 1.10 continued)
Notes: The response variable is DIVDUM. It indicates whether a firm pays dividend in a year. The key variables are DER_POLICY, one year lag DER_POLICY, two year lag DER_POLICY and three year lag DER_POLICY. Other variables are described in Appendix B.

The results in the Table 1.10 show that a DER policy can affect a firm's dividend-paying likelihood for up to three years. The one-year lagged *DER_POLICY* and the two-year lagged *DER_PAYMENT* have positive and significant effects on the probability for a firm to be a dividend payer. The effects are significant at the 5% level. The three-year lagged *DER_PAYMENT* also has a positive effect with a significance level of 10%.

1.5.2 Matched Sample Approach

In order to disentangle the possible confounding effects of DER-policy and a high likelihood of paying dividends, we use a matched-sample approach. Suppose we have two firms whose characteristics suggest that they are equally likely to be dividend payers or non-dividend payers, but neither firm is currently paying a common dividend. In other words, the two firms are similar in the dimensions commonly associated with dividend policy. One of the firms then initiates a DER policy and the other does not. The two firms thus start to diverge on only one dimension, DER policy. If at a later date, their dividend policies also become different from each other, this change is likely due to the only difference between them, their DER policies. In this spirit we form a matched sample as described below.

We first form a pool of treatment firms, which are essentially firms that initiate a DER policy and meet other specifications. A treatment firm has to meet the following criteria: (1) in year t, the firm does not pay dividends but it initiates a policy allowing for DE payments on its CEO's unearned shares. The year t is then the DER policy initiation year for the treatment firm.

It can be any year between 1994 and 2010.[23] (2) the firm keeps its DER policy in the year t+1 and the year t+2 so that the policy is persistent for at least three years, (3) the firm has no special events like a stock split or special dividends during the entire sample period from 1993 to 2012, (4) the firm is not a recurring dividend payer. Recurring dividends are cases where otherwise dividend-paying firms omit dividends but then resume paying them, which can be due to any of a number of reasons. We have 25 treatment firms and 476 corresponding firm-year observations.

We then choose control firms for each treatment firm in the treatment firm's policy initiation year t. The criteria used to select a control firm are: (1) in year t, the firm does not pay dividends and does not allow for DE payments on its CEO's unearned shares, (2) the firm does not allow for DE payments on its CEO's unearned shares in the year t+1 and the year t+2, (3) the firm has no special events like a stock split or special dividends during the entire sample period from 1993 to 2012, (4) the firm is not a recurring dividend payer, (5) the firm has a dividend propensity score greater than that of the treatment firm and the difference between the two firms' scores is less or equal to 0.05.[24] The propensity scores are the fitted dividend payout probabilities.[25]

We are able to find qualified control firms for 24 out of the 25 treatment firms. Thus we have 24 one-to-*n* matched groups, with each group containing one treatment firm and $n \geq 1$ control firms. The average value of *n* is 20. Within each group, the treatment firm and the *n* control firms

[23]Note this is not the sample period used in the rest of the paper. The sample period starts in 1993. For many firms, the year 1993 is the first year for them to have DER policies. If those firms are included they will dominant the treatment firms. Thus the year 1993 is excluded in this step. The years 2011 and 2012 are excluded because we require at least two years after the DER policy initiation years to identify dividend policy changes.

[24]This requirement is related to the second explanation of the different patterns in deviations. If a treatment firm has a higher fitted dividend probability than its control firm, then any difference in the deviation we observe can be attributed to the effect of the treatment and the effect of the fitted dividend probability. The requirement can facilitate the separation of the effects.

[25]The regression equation is:

$$logit(DIVDUM) = intercept + \sum \beta_i X_i + \sum \beta_j Y_j + \varepsilon$$

have approximately the same likelihood of being a dividend payer (or non-dividend payer). The treatment firm becomes a DER policy holder in a certain year during the sample period while the control firms remain non-policy holders. We first take the treatment firm's DER policy initiation year as the time of origin. We then observe and compare how the dividend policies of the treatment firm and those of the control firms change in the following years. Because the 24 treatment firms initiated their DER policy in different years, this comparison is not affected by the economic cycles or other time-related macro-economic factors. The dividend payout propensity scores capture the factors that contribute to firms' dividend policy decisions except for their DER policies. Because we use the propensity scores to match the treatment firm and matched firms, the only difference between the treatment firm and the control firms is that the treatment firm has a DER policy while the control firms do not. The patterns shown in firms' dividend policy changes after the DER policy initiation year thus are likely to be driven by DER policy only.

We summarize the results of the 24 matched groups in Figure 1.1. Plot A (Propensity Scores") shows the changes in the average propensity scores before and after the time of matching. On the horizontal axis are the years relative to the treatment firms' DER policy initiation years, where year 0 is the time of the DER policy initiation. It is shown that, by design, the average propensity scores of the control firms are slightly higher than those of the treatment firms from year -2 to year 0. After the policy initiation year, the two curves stay close to each other and are almost parallel over time, indicating that the treatment firms (the DER-policy firms) and control firms (the Non-DER policy firms) continue to share a similar likelihood of being a dividend payer after the treatment firms' DER policy initiation year.

Plot B ("Deviations") shows the changes in the treatment firms and control firms' dividend policies. The regression results from Section 1.4.4 show that the average propensity score of all

sample firms is 0.7. This means that a firm with a propensity score greater than 0.7 is more likely to be a dividend payer than an average sample firm. We then define this firm as an expected dividend payer. If the firm indeed is a dividend payer then the deviation between the expectation and the reality is 0. Otherwise the deviation is -1. Similarly, if a firm's propensity score is below 0.7 it is expected not to be a dividend payer. If the firm indeed is not a dividend payer then the deviation is 0. Otherwise the deviation is +1.[26] We then calculate the group average deviation value for the treatment firms and control firms, and plot the average deviation against time. It is shown that at the time when the treatment firms and control firms are matched up, the average deviation values for both groups are below zero.[27] The average deviation of the treatment firms increases over time but the mean deviation for the control firms is fairly stable at around -0.5. Seven years after matching up, the gap between the two means is as wide as 0.3. At that time most of the treatment firms have initiated dividends, but their control firms remain non-payers.[28]

[26]The deviation values can be summarized in the table below:

	Expected dividend payer	Expected non-dividend payer
Actual dividend payer	0	1
Actual non-dividend payer	-1	0

[27]A treatment firm and its control firms are all non-dividend payers when they are matched up. But they may be expected payers. For those that are non-dividend payers but are expected to pay dividends, the deviation values are -1. For those that are non-dividend payers and are expected to be non-payers, the deviation values are 0. Thus, when the two types of firms are pooled, the average deviation is below 0.

[28]The left ends of the two lines on the Deviations plot are close to zero. This is because most treatment firms and control firms have fitted dividend payout probabilities below 0.7. They were predicted to be non-payers and were indeed not paying dividends. The mean deviation is thus close to zero.

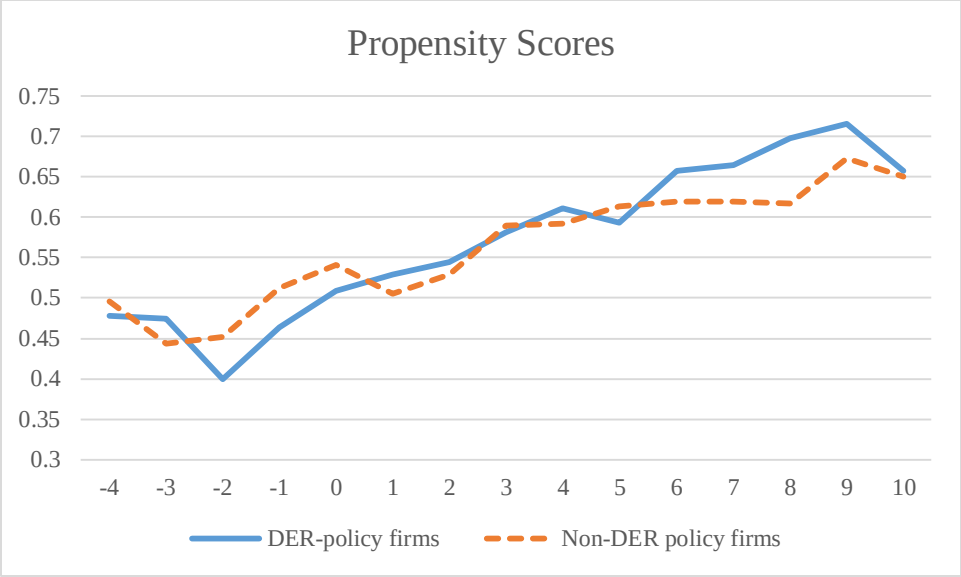
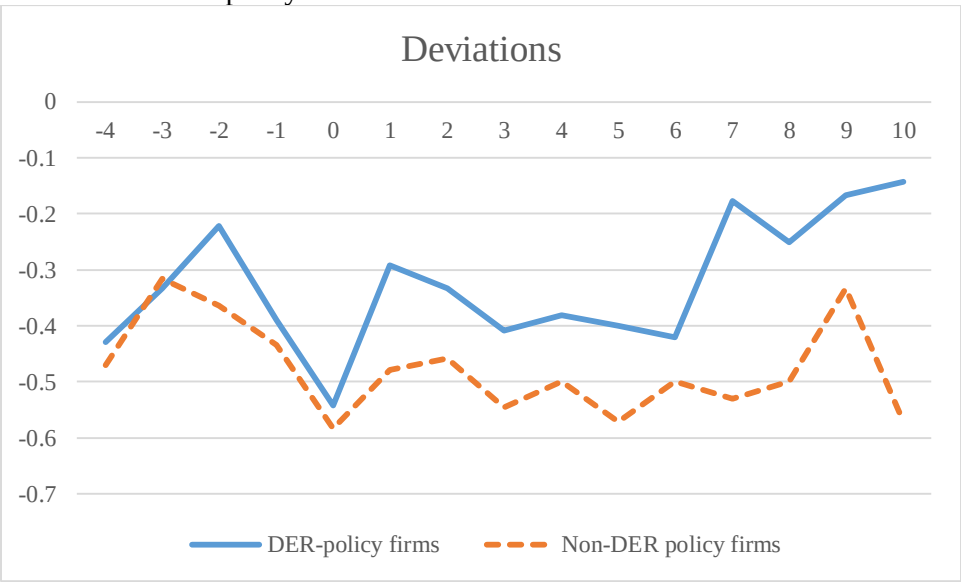


Figure 1.1. Comparison of Mean Deviations of Fitted Dividend Payout Probability-Matched Samples

Plot A. Propensity Scores. On the horizontal axis is the number of years before or after the DER policy initiation year for the treatment firms. On the vertical axis are the average propensity scores for the DER-policy firms and non-DER policy firms.



Plot B. Deviations.

On the horizontal axis are the numbers of years before or after the DER policy initiation year for the treatment firms. On the vertical axis are the average deviation for the DER-policy firms and non-DER policy firms.

The trend of the mean deviations and the fitted probabilities provide some insights about the mechanism of firms' dividend payout policies and their DER policies. At the time when a

treatment firm and its control firms are paired up, the control firms have the same estimated propensity to pay dividends, if not higher. As time goes by, however, the treatment firm tends to become a dividend payer while its control firm tends to remain a non-payer. This evidence supports the notion that DER policy does provide an incentive for expected dividend payers to become actual dividend payers. This result does not, however, rule out the possibility that the CEO anticipates the future dividend payout and influences the board to make self-serving DER policies in the future. It is likely that an insider like the CEO who holds sufficient proprietary information has a very good expectation of any upcoming dividend initiation.

1.5.3 2003 Dividend Tax Reform as an Exogenous Shock

On May 23th, 2003, the U. S. Congress passed the Jobs and Growth Tax Relief Reconciliation Act of 2003. The act was signed into law a few days later on May 28th, 2003. The act contains tax cuts that President George W. Bush proposed, including reducing the top marginal dividend tax rate from 38.6% to 15% (Brown *et al.* 2003). In the US, a firm's earnings are first taxed at the corporate tax rate. Then, when a portion of earnings is distributed to shareholders in the form of dividends, the shareholders also have to pay taxes at their personal tax rates, leading to the well-known problem of "double taxation" of dividends. President Bush proposed elimination of the dividend tax, for it is "not fair to double-tax by taxing the shareholder on the same profits" (The White House 2003). Although the 2003 dividend tax cut did not put an end to double taxation, it effectively reduced the top marginal dividend tax rate from 38.6 percent to 15 percent.

The large dividend tax rate reduction enacted in 2003 greatly influenced corporate payout policies among U.S. firms. Companies whose executives had high ownership increased dividends, suggesting a relationship between executive holdings and payout policy (Brown *et al.* 2003).

Chetty and Saez's findings show that more firms initiated regular dividend payouts, dividend-paying firms increased their regular dividend payouts, and special dividends increased as well (Chetty & Saez 2005). Their findings also show that responses to the tax cut were strongest in firms in which executives had high share holdings and low options holdings and in firms whose shareholders had strong preferences for dividends.

The 2003 tax cut provides a unique laboratory to disentangle the endogeneity between dividend policy and policies regarding DERs. The 2003 dividend tax cut as an external shock is unlikely to be anticipated by firms, therefore we would not expect firms to modify their dividend policies in 2002 in anticipation of the tax cut in 2003. Other corporate polices such as the ones regarding DERs are not likely to be affected, at least not in the short run.

Let us start by distinguishing between a firm's optimal payout level and its payout policy. The optimal payout level is determined by the firm's cash flow in relation to its investment opportunities. Its dividend policy, however, may be to pay higher or lower dividends than the optimum, resulting from a clientele effect. Thus, its dividend policy will reflect the needs of its investors. A tightly held firm with many shareholders in high tax brackets will tend to pay relatively low dividends. A firm held by many pension plans is likely to pay relatively high dividends. Tax rates are clearly a factor in the shareholders' desire for dividends. And from our previously reported results, the existence of a DER policy can motivate a firm to pay dividends or higher dividends.

A reduction in individual dividend tax rates should not affect a firm's investment opportunities or fundamentals.[29] Therefore the tax cut should not change the optimal dividend payout level of the firm, but it can affect the firm's dividend policy because the Board of Directors

[29]A change in the corporate tax rate, however, will affect firms' fundamentals. During the 2003 dividend tax cut period, no policy regarding corporate tax rates was made.

is under pressure from shareholders who benefit from the dividend tax cut and either now want dividends or want higher dividends. The Board's decision on whether to keep the current dividend policy depends on whether the firm has achieved the optimal dividend payout level. The Board is presumably aware of the best dividend policy for the firm since it possesses the necessary information. If the Board has been effectively incentivized to pay dividends at the optimal level then it will stay with the current dividend policy. But if the incentives are not strong enough, it is likely that the firm's dividend payouts are below the optimum. Thus, pressure from the shareholders may provide the incentive to initiate dividends or to increase dividends if they are already being paid. We hypothesize that the existence of DER policies can effectively establish a firm's dividend policy such that personal tax cuts on dividend income provide an insufficient incentive to initiate or increase dividends. Conversely, firms without DER policies are more likely to initiate or increase dividends.

Following other researchers (Zhang 2012), we use a difference-in-difference approach to show how a firm's response toward the 2003 dividend tax cut is influenced by its DER practices. A firm's response is measured by the changes in its dividend policies around the dividend tax cut, such as an initiation of regular dividend payouts. The effect of DER practices can be shown by comparing and contrasting firms' responses between DER-payment firms and non-DER payment firms, and between DER-policy firms and non-DER policy firms.

The empirical tests are carried out as follows. The sample includes 320 firms that have no missing values over the sample period of 2002-2004.[30] The dividend tax cut was signed into law in 2003, thus the year 2002 is taken as the "pre-tax cut year" and 2004 is the "post-tax cut year". Each firm is independently classified three times: by the values changes in its DER-payment

[30]We require that firms have no missing values for the variables DIVDUM, DERolicy, and DER_payment. The sample firms should be covered by COMPUSTAT database.

indicator, by the value changes in its DER-policy indicator and by its dividend payment indicator. Each classification process puts a firm into one of four sub-categories. For example, for each sample firm the indicator DER-payment takes a value of 0 or 1 in any given year. Since only 2002 and 2004 are of interest, there are four combinations of year and DER-payment value, making four sub-categories: DER payer, DER terminator, DER initiator, and Non-DER payer. If a firm is a DER-payment firm in both 2002 and 2004 then it is a DER payer. If it is a DER-payment firm in 2002 but not in 2004, then it is a terminator. If it is a DER-payment firm in 2004 but not in 2002, then it is a DER initiator. If it is not a DER-payment firm in either 2002 or 2004 then it is a non-DER payer. Panel A of Table 1.11 provides a detailed description of each classification process and the number of firms that fall in the sub-categories.

Table 1.11. 2003 Dividend Tax Reform as an Exogenous Shock

Panel A. Sample Breakdown, Years 2002-2004

Category	**Description**	**# of firms**
Policy firm	All time DER policy holder during 2002-2004	55
Policy terminator	Ceased DER policy in 2003 or 2004	0
Policy initiator	Initiated DER policy in 2003 or 2004	18
Non-policy firm	All time non-DER policy holder during 2002-2004	247
Total # of sample firms		320
DE payer	All time DE payer during 2002-2004	21
DE terminator	Ceased DE payments in 2003 or 2004	3
DE initiator	Initiated DE payments in 2003 or 2004	11
Non-DE payer	All time non-DE payer during 2002-2004	285
Total # of sample firms		320
DIV payer	All time dividend payer during 2002-2004	185
DIV terminator	Ceased dividend payments in 2003 or 2004	6
DIV initiator	Initiated dividend payment in 2003 or 2004	25
Non-DIV payer	All-time non-dividend payer during 2002-2004	104
Total # of sample firms		320

Notes: The dividend tax reform legislation was in 2003. There are 320 sample firms that have complete data spanning 2002-2004. The sample firms are classified in three dimensions: their DER policy changes over the three years, their DE payment activities over the three years, and their dividend payout activities over the three years. In each dimension the firms can be classified into either one of the four categories. The first column features the categories, the second column contains the explanation of each category and the third column contains the number of sample firms that have fallen into each category.

Panel B. Two-way Tables and Fisher's Exact Test Results

DER policy					
DIVIDEND	Policy initiator	Non-policy firm	Policy firm	Policy terminator	Row Total
DIV initiator	1 (1.41)	22 (19.30)	2 (4.30)	0 (0)	25
Non-DIV payer	4 (5.85)	93 (80.28)	7 (17.88)	0 (0)	104
DIV payer	13 (10.41)	127 (142.80)	45 (31.80)	0 (0)	185
DIV terminator	0 (0.15)	5 (4.63)	1 (1.03)	0 (0)	6
Col Total	18	247	55	0	320
Fisher's Exact test P-value: 0.0020					

DE payments					
DIVIDEND	DE initiator	Non-DE payer	DE payer	DE terminator	Row Total
DIV initiator	1 (0.86)	24 (22.27)	0 (1.64)	0 (0.23)	25
Non-DIV payer	0 (3.58)	103 (92.63)	0 (6.83)	1 (0.98)	104
DIV payer	10 (6.36)	152 (164.77)	21 (12.14)	2 (1.73)	185
DIV terminator	0 (0.21)	6 (5.34)	0 (0.39)	0 (0.06)	6
Column Total	11	285	21	3	320
Fisher's Exact test P-value: 0.0004					

Notes: The two-way tables above summarize the sample distribution: dividend payout activities by DER policy changes, and dividend payout activities by DE payment activities. Categories are defined in Panel A. Results of the Fisher Exact tests are displayed below each table.

The two-way table in Panel B shows the distribution of firms according to their dividend policy changes, represented by the rows, and their DER activity changes, represented by the columns. Let us focus on DER policy, the upper half of the table. We find 18 firms that initiated DER policies, of which one initiated regular dividends, four were non-dividend payers, 13 paid dividends both years, and none terminated dividends. We find 247 firms that had no DER policy in either year, of which 22 initiated regular dividends, 93 paid no dividends, 127 paid dividends both years, and five terminated dividends. We find 55 firms that had DER policies in both years,

of which two initiated dividends, seven paid no dividends in either year, 45 paid dividends in both years and one terminated dividends. We find no firm that terminated a DER policy.

The Fisher Exact Test reveals that how a firm changes its dividend policy during the tax reform period is influenced by its DER policies. The null hypothesis of the Fisher Exact Test is that the proportions of the variable represented by rows are independent of the proportions of the variable represented by columns. In the context of our study, the null hypothesis is that the proportions of dividend initiators, non-dividend payers, dividend payers and dividend terminators in the sample are independent of the proportions of policy initiators, non-policy firms, policy firms, and policy terminators. We calculate the expected values under the null hypothesis and shown them in the parenthesis on the bottom of each cell.[31] The Fisher Exact test shows that the null hypothesis is rejected and thus the variable represented by the columns is not independent of the variable represented by the rows, further confirming that firms' dividend policies and DER policies are not independent. [32]

Note that 22 non-DER policy holders initiated dividend payments during the tax reform period, while only two policy holders initiated dividend payments during that period. That is nine percent of non-policy holders versus four percent of policy holders.[33] If DER policies and dividend payments are independent of each other, it would be expected that there would be 19

[31]For example, the cell in the upper left corner of the table is for the firms that are both dividend initiators and DER policy initiators. The actual value is one and the expected value is 1.41. The expected value is calculated as follows: the expected proportions of firms that are both dividend initiators and DER policy initiators is the product of the proportion of dividend initiators and the proportions of DER policy initiators, thus is (25/320)*(18/320)=0.0044. The expected number of firms is thus 320*0.0044=1.41.

[32]Unlike many other studies involving independence tests, we do not use the Chi-square test. Chi-square estimates are not reliable when there are many expected cell frequencies less than five, which is the case in the two-way tables in Table 11.

[33]There are a total of 247 non-policy holders, which is shown in the bottom row. 22 of them initiated dividend payment during the tax reform. That is, 22/247=8.91%. There are a total of 55 DER policy holders and only two of them initiated dividend payments during the tax reform. The percentage is thus 2/55=3.63%.

non-policy holders who initiated dividend payments and four policy holders who initiated dividend payments.[34] Both numbers deviate somewhat from their actual values. A greater than expected number of non-policy holders initiated dividends, while a lower than expected number of policy holders initiated dividends.

The tax reform act as an external policy change is believed to have provided firms with incentives to increase dividend payout levels so that their shareholders can benefit from lower taxes on dividends. Thus, if a firm were not yet a dividend payer, it might initiate dividend payments. A firm initiating dividends would do so with caution, however, in that it implicitly committed to being a dividend payer for at least a moderately long period. A firm would weigh the benefits of pleasing the shareholders and the costs of a long-term commitment before making the decision to initiate dividends or to remain a non-payer.

Therefore the tax reform could have different effects on non-dividend payers. For some non-dividend payers the decision to initiate dividends as a result of the tax law change was the proper one. Those firms would likely be characterized as having a combination of sufficient cash flows to support future dividend payments and insufficient investment opportunities to require internal funding. Prior to the tax reduction, the absence of a DER policy did not provide sufficient incentives to pay dividends, and the managers were probably sensitive to the fact that their shareholders would pay a high tax rate on income that is already doubly taxed. With the reduction in the personal tax rate on dividends, they were probably induced to become dividend payers. Then, at the margin the dividend tax cut pushed them to become dividend payers.

For firms that already had DER policies, all but three did not modify their dividend policies during the tax reform – two initiated dividends and one terminated the payment of dividends. For

[34]The expected frequency is calculated as (25/320)*(247/320)*320=19.30; (25/320)*(55/320)*320=4.30.

dividend payers and non-payers, the current status was optimal for most firms in this category. If a DER policy holder fit the profile of a dividend payer, it was very likely that the DER policy had already provided incentives to initiate dividends. If a DER policy holder were better off remaining a non-dividend payer, then having a DER policy did not incentivize it to be a dividend payer, and the incentives that the tax dividend cut could provide were probably not sufficient. Therefore we observe few dividend initiation events in the DER policy holder category.

Another message delivered by the deviations in the cells lies in the dividend payers. 104 firms are classified as dividend payers during the tax reform. 13 of them are initiated DER policy, 127 firms did not have DER policy, 45 firms had DER policy and none of them terminated DER policy.

Among these dividend payers, the groups that have the largest deviations between the actual number of firms and expected number of firms are the non-policy firms and policy firms. There were fewer than expected non-policy firms paying dividends during the dividend tax reform period, while more than expected policy firms paid dividends during that period. The non-dividend payers show somewhat symmetric patterns with the dividend payers. More than expected non-policy firms were non-dividend payers during the dividend tax reform while fewer than expected policy firms were dividend payers. The patterns in the dividend payers and non-dividend payers both deliver the same message, which is that DER policy firms are more likely to be dividend payers.[35]

The distribution in the lower half of the table titled "DE payments" is consistent with the results based on "DER policy" in the upper half of the table. The Fisher Exact Test reveals that how a firm changes its dividend policy during the tax reform period is related to its DE payments.

[35]The dividend terminators were only six firms. The numbers in all the four cells are too small to draw firm conclusions.

The two sets of results using the DER policy measure and the actual payment measure are consistent with the hypothesis that allowing for DE payments or making DE payments on CEOs' unearned shares encourages firms to pay dividends.

1.6 Conclusion and Extension

This paper studies the incentives that dividend equivalent rights (DERs) on unearned shares provide to CEOs. The results indicate that dividend equivalent rights on CEOs' unearned shares, although not well received by the market, can provide dividend incentives to CEOs. Firms that have policies allowing DE payments on CEOs' unearned shares are more likely to be dividend payers, and firms that make actual DE payments tend to pay higher dividends. The results are robust to various measures for dividend payout level. To address the endogeneity between firms' dividend policies and DER policies we use lagged variables, matched-samples, and the 2003 tax reform as an exogenous shock for empirical tests. The evidence is consistent with the notion that DERs can lead to higher dividend payout levels.

CHAPTER 2. VALUATING DIVIDEND EQUIVALENTS USING A UTILITY-BASED EXECUTIVE STOCK OPTION PRICING MODEL IN A BINOMIAL FRAMEWORK

2.1 Introduction

As discussed in Chapter 1, dividend equivalents entitle executives to receive dividends on shares covered by their performance-based equity awards, which are referred to as "unearned shares." From 1993 to 2012 around 22 percent of S&P500 firms allow for dividend equivalents to be granted on CEOs' unearned shares. Different performance-based awards underlying dividend equivalents form a large family – executive stock options, stock appreciation rights, performance stock or units, performance-based restricted stock or units. The variation in the underlying awards provides the scholars a rich pool of research topics. In contrast to their extensive usage and the large research potential they provide, dividend equivalents are poorly documented in the literature. In Chapter 1 we examine how dividend equivalents affect firms' corporate payout policy. We find that dividend equivalents granted on CEOs' unearned shares can encourage firms to increase their dividend payout level, and thus can be beneficial to firms and shareholders. Our study is the first empirical analysis of this widely used executive compensation tool. Many issues and questions remained unanswered.

In our previous study we examined the incentives that dividend equivalents can provide. We argue that dividend equivalents can encourage firms to disgorge excessive cash, and thus they can be a very useful tool to reduce one type of agency problem. We are aware of the benefits of this executive compensation tool. But this is only the "demand side" of the story. We are still interested in the "supply side" of the story – How costly is this tool? How should we valuate this tool? Is the benefit worth the cost? This essay aims to answer these questions.

In the context of executive compensation, certain instruments are granted to an executive by the firm. We can consider this process as a transaction. One agent pays the other for the services the he can provide. The deal is made based on mutual agreement. Both sides of the transaction – the firm and the executive – are important when evaluating the compensation instruments. To fully understand the value of a compensation instrument, we have to know its value to each side of the transaction. We need to find out how much the instrument is worth to the firm – the "company cost" –, and how much the instrument is worth to the executive – the "executive's subjective value".

Intuitively the valuation of dividend equivalents is influenced by the underlying instruments. We choose dividend equivalents granted on executive stock options as the object. Our choice is based on two reasons: Firstly, dividend equivalents granted on executive stock option awards have been popular. In 1993 more than one fourth of dividend equivalents were granted with executive stock options. Secondly, we need a reliable model to evaluate the dividend equivalents and the option pricing literature provides us with a large set of executive option pricing models to select from. We adopt a utility-based executive stock option pricing model (Hall & Murphy 2002) for its simple and flexible model framework and rich intuition.

We want to show the effect of payment methods on the value and the cost of dividend equivalents. The two most commonly used payment methods are an instant cash payment and payment made in shares of stock. We show that the dividend equivalents for the two payment methods are equally costly to firms but are valued differently by executives. In all cases a risk-averse executive assigns a higher value to dividend equivalents if they are paid in cash than if they are reinvested in shares of stock. We also show that the costs of dividend equivalents to firms are always higher or equal to an executive's subjective value of dividend equivalents. We also

examine the effects of factors such as the executive's degree of risk aversion, the executive's asset allocation, the length of the option vesting period, and the dividend payout level.

2.2 Literature Review

2.2.1 Dividend Protection on Stock Options

Our study is related to the line of research on dividend protection of stock options. Most over-the-counter options offer dividend protection (Geske *et al.* 1983). This protection can be made by reducing the strike price by the amount of dividend, by offering cash equivalent to the product of the dividend and the number of shares covered by the options, or by accumulating the dividends until the options are exercised.

Executive stock options are usually not dividend-protected, and expected dividend payouts reduce the value of executive stock options (Murphy 1999; Arnold & Gillenkirch 2005; Zhang 2012) just as they would with ordinary call options. Empirical evidence has shown that the absence of dividend protection on executive stock options is associated with a decrease in corporate dividends (Lambert *et al*. 1989; Arnold & Gillenkirch 2005), while dividend protection on executives' restricted stocks and options can increase corporate dividend payouts (Zhang 2012). In contrast to the rich empirical results on dividend protection is the lack of theory regarding this matter. Dividend protection on options can reduce or even eliminate early exercise. To avoid confounding dividend protection with other factors related to prevention of early exercise, researchers usually assume no dividend protection in their executive option pricing models.

In practice, dividend protection on executive stock options is not common. Murphy (1999) documents that only seven out of a sample of 618 executive stock option grants in US firms are dividend protected. Zhang (2012) reports that less than one percent of US large firms have dividend protection on executives' stock options. Dividend protection on executive stock options,

however, is more popular in European firms than in US firms. Arnold et al (2005) documents that around one-third of executive stock option grants in Germany are dividend-protected. It is not clearly stated, but we infer that none of those studies consider dividend equivalents granted on executive stock options a form of dividend protection.[36] But dividend equivalents granted on executive stock options should be considered as a form of dividend protection – both paying dividend equivalents to executives and reducing the strike price can adjust for the decrease in the underlying stock price due to dividends. According to our data, in 1993 more than five percent of US large firms allow for dividend equivalents on stock options.

As is mentioned above, the payment of dividend equivalents on executive stock option awards are made in two general forms: cash and share of stock. The actual payment forms can have more variations. For example, the firm can deliver cash or shares instantly to the executive, or the firm can hold the cash or shares until certain conditions are met – either the vesting period is over or the executive exercise the options.

The different forms of dividend protection on executive stock option awards vary among firms. Some firms allow executives to receive dividend equivalents on their options up to certain years. For instance, United Technologies Corp. allows executives to receive cash dividends on their executive stock options for seven years (UTC 1996). Some other firms allow executives to receive dividend equivalents on a portion of their option holdings.

Most firms require vesting periods on executive stock option grants. Executives cannot exercise options before they are vested. Vesting schedules may be different among firms. Both the vesting conditions and length of vesting periods vary. Some firms prohibit executives from immediately selling shares after they obtain them by exercising executive stock options. Those

[36]In fact, none of those studies mention dividend equivalents.

firms do not issue common stocks to their executives when the latter exercise their executive stock options. Instead, they either issue stock units or restricted stocks to them.

2.2.2 Stock Option Pricing Models

Employee stock options differ from listed options in many ways: (1) Listed options can be traded on in the market freely before they expire. Employee stock options are not transferable and are usually subject to a vesting period during which they are not exercisable. Thus, employee stock options are considerably less liquid than listed options. (2) A holder of American-style listed options can exercise the options any time prior to expiration date. A holder of European-style listed options can exercise only on the date of expiration. For employee stock options, the decision to exercise is influenced by more factors, one of which being the employment status of the option holder. If the employee leaves the company, he would ordinarily exercise all vested in-the-money options immediately. All unvested options and out-of-money options would be forfeited. (3) When a holder of listed options exercises his shares, he buys the shares that are covered by the options from the option seller, or technically the exchange clearinghouse. However when an option holder exercises his employee stock options, he buys shares that are newly issued by the company. Although the number of newly issued stocks is typically very small compared to the number of shares of existing stocks, if the issuance of employee stock options is not anticipated by the market, a dilution effect may occur.[37]

The features of employee stock options that are mentioned above make it difficult to calculate the value of these options. In 1995, the Financial Accounting Standards Board (FASB)

[37]Cash settled options such as Stock Appreciation Rights (SARs) resemble employee stock options in that holders of SARs benefit from an increase in stock price. SARs differ from options in that when the holder exercises the SARs he does not have to purchase any stocks to receive the proceedings. The holder receives cash equivalent to the increase in stock price. The proceedings are expenses to the company. But since no new stocks are created when the holder exercises his SARs, thus there is no dilution effect.

released Statement No. 123 (FASB 1995), Accounting for Stock-based Compensation, in which the FASB suggested, but did not require, companies to use a fair-value method in valuing employee stock options. The Black-Scholes-Merton option pricing model (Black & Scholes 1973; Merton 1976) and the Cox, Ross, and Rubinstein (Cox *et al.* 1979) binomial model are cited in FAS 123 as acceptable fair-value methods (FASB 1995). The Black-Scholes-Merton (BSM) model assumes that no taxes or transaction costs exist, the stock pays no dividends and no early exercise of options is allowed. To apply the BSM model to employee stock options some assumptions need to be relaxed or modified. For an example, to account for the dividends, assume a fixed proportion of stock price is paid out as dividends regularly (dividend yield), then include the dividend yield in the expression of the stock price at a given time. For another, both the BSM and the binomial model can use the estimated life of the option as the time to maturity and adjusting the option value to allow for the possibility of the employee separating from the company when the option is unvested. A number of empirical studies use the Black-Scholes-Merton model to value employee stock options (Foster *et al.* 1993; Yermack 1995; Hull & White 2004). Carpenter (1998), Hull and White (2004) discuss a few issues in the practice of applying the Black-Scholes-Merton model to employee stock options and present alternative approaches to address these issues. FAS 123 does not provide a way to estimate the life of an employee stock option. Theoretically the life of an employee stock option consists of a vesting period and a period during which the option is exercisable. In reality the life of the employee option is shorter if any one of the two events occurs: (1) the employee leaves the company prior to the option expiration; or (2) the employee decides to exercise early. To estimate the life of employee stock options, Hull and White suggest using the employee turnover rate to incorporate the possibility of event (1). To

access the possibility of event (2) they assume the employee will exercise early if the stock price is a certain multiple of the exercise price.

Arnold and Gillenkirch (2005) propose a two – period model to analyze how dividend protection on executive stock options can affect a firm's dividend payout policy. The paper does not provide an executive stock option pricing model, but it recognizes that there are different ways of dividend protection and provides some insight in how to design dividend protection. The model assumes an all-equity financed firm, a perfect capital market and information asymmetry between the shareholders and the manager, specifically that managers have inside information. At time t = 0 the representative manager is granted European call options on the firm's stock that expire at time t = 2. The manager makes the investment and payout decision at time t = 1 of whether to distribute cash flow to shareholders or to reinvest in projects. The model takes into consideration three ways of dividend protection: adding compounded dividends to the stock price at t = 2, subtracting compounded dividends from the exercise price at t = 2, and increasing the number of shares per option by the number of additional shares the manager could have bought if he could receive dividends on his executive stock options. The third way of dividend protection mentioned is so called "Opération Blanche". It is equivalent to compounding dividends with the issuing firm's realized return during the option holding period and add the value to the stock price when the options are exercised. Arnold and Gillenkirch find that when there is no information asymmetry and "Opération Blanche" is adopted in executive stock option grants, managers and shareholders can reach an agreement on firm value (Arnold & Gillenkirch 2005).

Hall and Murphy's utility-based executive option pricing model (Hall & Murphy 2002) shows that executive stock options are "overpriced" using the Black-Scholes formula. The main problems are: first, executive stock options are not as liquid as over-the-counter stock options.

They cannot be sold or transferred freely. Furthermore, executives cannot hedge their position to offset the illiquidity of their options. Second, they are generally not dividend-protected. Few companies allow any forms of dividend protection on executive stock options. The subjective value of executive stock options (to the executives) and the cost of executive stock options (to the firm) should be distinguished. Hall and Murphy's model plays an important role in our research. By a few modifications, their model can be adapted and used to account for the variations in forms of dividend protection discussed above.

2.3 The Model

Consistent with Hall and Murphy's executive option pricing model, we assume the options are non-tradable and the representative executive is undiversified and risk-averse. We believe these assumptions capture real world situations. We assume one percent of executive stock options are granted with dividend equivalents during their vesting period. We define the value of a dividend equivalent to an executive as the amount of cash compensation invested at the risk-free rate for which the executive would exchange the dividend equivalents. In other words, the utility of the cash compensation and the dividend equivalents is the same. We define the cost of the dividend equivalents on executive stock options to be the present value of all dividend equivalents paid to the executive during the vesting period.

We construct a utility-based binomial executive stock option pricing model similar to the one in Hall and Murphy (2002). Assume a firm has one representative executive whose preferences are defined by a power utility function,

$$U(W) = \frac{W^{1-\rho}}{1-\rho}, \qquad \rho \neq 1$$

where ρ is the executive's constant relative risk aversion and W is the executive's total wealth.

We start with a multi-period model: day 0, day 1,…, until day T, all of which are ex-dividend dates. On day 0, the representative executive has non-firm-related wealth of c (cash compensation), and is granted m shares of the firm's stock and n at-the-money options that each covers one share of the firm's stock. The stock price at time 0 is S. The strike price of the options is K. From day 0 to day T is the vesting period during which dividend equivalents are paid out, and the executive is not allowed to exercise the options. The executive is relatively undiversified. During the vesting period, he invests all his non-firm related wealth in risk-free bonds.

The path of the stock price from day 0 to day T can be represented by a binomial tree with T steps. Let i denote the steps (days) and j denote the number of up movements of the stock price. Each node on the binomial tree is denoted by $S(i,j)$ where $i = 0, 1, 2$ and $j = 0, \ldots, i$. Suppose at each node the stock price is expected to go up by a factor u with a probability of p, or to go down by a factor of d with a probability of $(1-p)$. On day i there are i possible states. The stock price and the options' intrinsic value depend on which state is realized. On each day the states are indexed by js. On the binomial tree each state is represented by one node. The stock price on day i in state j is:

$$S(i,j) = Su^j d^{i-j},$$

where $i = 0, 1, T$ and $j = 0, \ldots, i$.

The probability of reaching state j on day i is:

$$p(i,j) = \binom{i}{j} p^j (1-p)^{i-j}$$

Below is an example of the distribution of stock price after two steps:

$$S(2,j) = \begin{cases} u^2 S \; with \; probability \;\; p^2, j = 2 \\ udS \;\; with \; probability \;\; 2p(1-p), j = 1 \\ d^2 S \; with \; probability \;\; (1-p)^2, j = 0 \end{cases}$$

As is shown in the example, if the stock price increases in both of the two steps, the realized state is the state (2,2), the stock price in state (2,2) is u^2S, and the probability to reach the state is p^2. If the stock price increases in one step and decreases in one step then the realized state is the state (2,1) with stock price udS and probability $2p(1-p)$. If the stock price decreases in both steps, then the realized state is the state (2,0) with stock price d^2S and probability $(1-p)^2$.

The option's value on day T in state j is $X(T,j) = max(0,\ S(T,j) - K),\ j = 0,\ldots,T$.

During the vesting period the executive receives dividend equivalents on some of his stock options. Letting DE denote the accumulated dividend equivalents, the executive's wealth on day T in state j is given by:

$$W(T,j) \equiv C\left(1+r_f\right)^T + mS(T,j) + \sum_{i=1}^{T} mDiv(1+r_f)^{T-i} + nX(T,j) + DE(T,j)$$

where r_f denotes the risk-free rate at which the cash compensation was invested, and Div is the dividends paid on each share of common stock. The executive's expected utility at time T is:

$$\begin{aligned} E\left(U(W_T)\right) &= \sum_{j=0}^{T} U\left(W(T,j)\right) prob(T,j) \\ &= \sum_{j=0}^{T} \left(\frac{\binom{T}{j} p^j (1-p)^{T-j}}{1-\rho} \right. \\ &\quad \times \left(C\left(1+r_f\right)^T + mS(T,j) + \sum_{i=1}^{T} mDiv\left(1+r_f\right)^{T-i} + nX(T,j) \right. \\ &\quad \left. \left. + DE(T,j) \right)^{1-\rho} \right) \end{aligned} \tag{1}$$

If the executive was awarded cash compensation of $C + V$, m shares of firm stocks, and n stock options, his wealth on day T in state j is given by:

$$W^V(T,j) \equiv (C+V)\left(1+r_f\right)^T + mS(T,j) + \sum_{i=1}^{T} mDiv(1+r_f)^{T-i} + nX(T,j)$$

If the executive is granted cash compensation of value V, m shares of firm stocks, n stock options and no dividend equivalents, the executive's expected utility at time T is:

$$\begin{aligned} E\left(U(W_T^V)\right) &= \sum_{j=0}^{T} U\left(W^V(T,j)\right) prob(T,j) \\ &= \sum_{j=0}^{T} \left(\frac{\binom{T}{j} p^j (1-p)^{T-j}}{1-\rho} \right. \\ &\quad \times \left((C+V)\left(1+r_f\right)^T + mS(T,j) + \sum_{i=1}^{T} mDiv\left(1+r_f\right)^{T-i} \right. \\ &\quad \left. \left. + nX(T,j) \right)^{1-\rho} \right) \end{aligned} \tag{2}$$

V is the equivalent value of the stock options perceived by the executive at time $t = 0$. The numerical solution of V can be obtained by solving:

$$E\left(U(W_T)\right) = E\left(U(W_T^V)\right)$$

2.4 Payment Forms of Dividend Equivalents

On day i the firm pays dividend of Div on each share of the firm's common stock. We assume that dividend equivalents are paid on one percent of the executive stock options at the same time. We consider two ways of payments – instant cash paid to the executive when dividends are

paid to common stock holders, and shares granted to the executive that have the same value as the dividend equivalents.

2.4.1 Instant Cash Payment

This is the simplest case. Cash dividends paid to the executive can be considered as complementary cash compensation that is paid on day i and will be reinvested at the risk-free rate. The cumulated dividend equivalents on day T is not dependent on the realized state. Rather it is only dependent on the amount of dividend equivalents that have been paid out, the risk-free rate and the length of time during which the cash dividend equivalents are reinvested. Assume the portion of options that are covered by dividend equivalent rights is q, then the cumulated dividend equivalents on day T is:

$$DE(T,j) = DE(T) = \sum_{i=1}^{T} nqDiv\left(1+r_f\right)^{T-i}.$$

Note that the first dividend equivalents are paid on day 1.

The executive's expected utility functions (1) can be rewritten as:

$$\begin{aligned} E\left(U(W_T)\right) &= \sum_{j=0}^{T} U\left(W_{T,j}\right) prob(T,j) \\ &= \sum_{j=0}^{T} \left(\frac{\binom{T}{j} p^j (1-p)^{T-j}}{1-\rho} \right. \\ &\quad \times \left(C\left(1+r_f\right)^T + mS(T,j) + \sum_{i=1}^{T} mDiv\left(1+r_f\right)^{T-i} + nX(T,j) \right. \\ &\quad \left. \left. + \sum_{i=1}^{T} nqDiv\left(1+r_f\right)^{T-i} \right)^{1-\rho} \right) \end{aligned} \tag{3}$$

The equation above shows that the subjective value of cash dividend equivalents is a function of a series of variables: the length of the vesting period, the realized state at the end of the vesting period, the probability for the stock price to go up, the risk-free rate, the non-firm-related wealth, the amount of the stock holdings, the amount of option holdings, the ending value of firm shares and stock options, and the dividends. Of those variables, only the ending value of the shares and the options are stochastic. Since on each day the stock price is associated with only one realized state, the ending values of firm shares and stock options are determined by the realized state at the end of the vesting period. The binomial tree shows that there can be multiple paths to achieve a certain realized state.[38] However the path will not affect the result.

The numerical solution of V can be found by equating the expected utility functions (3) and (2), and solving for V.

2.4.2 Dividend Equivalents Reinvested in Firm Shares

Sometimes a firm does not pay cash dividend equivalents, but rather grants a number of shares to the executives. Let us refer to these shares as stock dividend equivalents in order to show that they are granted in lieu of cash dividend equivalents. The total value of the stock dividend equivalents equals the total cash value of the dividend equivalents to which the executive is entitled.

The number of stock dividend equivalents earned by the executive on day i is thus the cash value of the dividend equivalents divided by the stock price on that day. Assume the portion of options that are covered by dividend equivalent rights is q and the realized state on day i is state j, then the number of stock dividend equivalents earned by the executive $M(i,j)$ is:

[38]For example, from S(0,0) to S(2,1), there are two possible paths: S(0,0) to S(1,1) to S(2,1), and S(0,0) to S(1,0) to S(2,1).

$$M(i,j) = \frac{nqDiv}{S(i,j)}.$$

Note that $M(i,j)$ is a function of the executive's stock option holding, the portion of options covered by dividend equivalent rights, the dividend per share, and the stock price on day i in state j.

On each ex-dividend day other than day 0 there are multiple possible states. Since the number of stock dividend equivalents granted on each ex-dividend day is related to the realized stock price on that day, the cumulated number of stock dividend equivalents during the vesting period is thus a function of the path of the firm's stock price. The total number of possible paths for the stock price from day 0 to day T is 2^T. Assume that before the underlying options vest, the stock dividend equivalents cannot be traded.[39] Let k denotes the kth path, then the cumulated number of stock dividend equivalents is:

$$\sum_{i=0}^{T} M_k\big(i, j\,(k)\big)$$

and the cumulated value of stock dividend equivalents for the kth path is:

$$DE_k\big(T, j(k)\big) = \left(\sum_{i=1}^{T} M_k\big(i, j(k)\big)\right) \cdot S\big(T, j(k)\big)$$

where $j(k)$ shows the fact that the realized state on each ex-dividend day is path-specific.

The probability that the kth path is the realized path for the stock price is:

$$prob(k) = p^{j(k)}(1-p)^{T-j(k)}.$$

The executive's expected utility functions (1) can be rewritten as:

[39]For instance, the firm requires the stock dividend equivalents to be kept in a separate account and delivered to the executive when the option awards vest.

$$E\big(U(W_T)\big) = \sum_{k=1}^{2^T} U_k\big(W_{T,j}\big) prob(k)$$

$$= \sum_{j=0}^{T} \Bigg(p^{j(k)} (1-p)^{T-j(k)}$$

$$\times \Bigg(C\big(1+r_f\big)^T + mS\big(T, j(k)\big) + \sum_{i=1}^{T} mDiv\big(1+r_f\big)^{T-i} + nX\big(T, j(k)\big)$$

$$+ \Bigg(\sum_{i=1}^{T} M_k\big(i, j(k)\big) \Bigg) \cdot S\big(T, j(k)\big) \Bigg)^{1-\rho} \Bigg)$$

(4)

The numerical solution of V can be found by equating expected utility functions (4) and (2) and solving for V.

Awarding shares of firm stocks as a means of dividend protection on executive stock options and other unearned/unvested stocks (units) is gaining popularity among US firms. Intuitively it provides more incentives to executives than cash dividends do because the value of dividend equivalents is bonded to the firm stock price.

We have incorporated two types of dividend equivalent payments into the expected utility-binomial framework. In the following sections we will first choose a set of input variables that can capture the executive compensation among the U.S. firms, the market condition and firm characteristics, the executives' preferences and the features of dividend equivalent payments on executive compensation awards, then we will continue to conduct a numerical analysis to examine the model and valuate dividend equivalents granted on executive stock options.

2.5 Input Variables

The utility-based binomial model has fourteen variables from five categories: one category includes variables that are related to the representative executive's company; another category includes variables related to the underlying options; another one includes variables related to the stock market, another one includes variables associated with the representative executive, and another includes variables specific to the simulation process.

2.5.1 Firm-specific Variables

Stock price: Both Hall and Murphy and Chance and Yang assume the stock price to be $30. We follow them and also assume the stock price of the representative firm to be $30.

Dividend per share: The empirical data show that dividend protection of executive stock options is not common and almost all studies documented in the executive stock option literature assume no dividend protection. Dividend protection on executive stock options can trigger early exercise. The assumption of no dividends is thus made when other factors that can contribute to early exercise are examined (Chance & Yang 2005). Though dividend protection on executive stock options is rarely documented in the literature, it may not be as rare as scholars have believed. Dividend protection on executive stock options can be realized by issuing dividend equivalents on executive stock option awards. As shown in Chapter 1, during the sample period of 1993 to 2012, twenty-two percent of S&P500 firms have a policy to grant dividend equivalents on their CEOs' performance-based equity awards. Figure 2.1 shows that in 1993, in more than one fifth of the firms that grant dividend equivalents the underlying are executive stock options. In the analysis it is assumed that five percent of the executive stock options are granted with dividend equivalents. Dividend equivalents are issued at the same time when common dividends are paid out. The dividend equivalents paid on one share of underlying stock match the dividends paid on one share

of common stock. Over the period from 1993 to 2012 a typical S&P 500 firm that makes regular dividend payments paid $1.10 on each share of its common stock. The first quartile, median and third quartile are $0.45, $0.90, and $1.48 respectively. At the end of 2012 a typical S&P500 firm that makes regular dividend payments paid $1.33 dividends per share. The first quartile, median and third quartile are $0.60, $1.10, and $1.79 respectively. Our analysis assumes that the representative firm pays quarterly dividends of $0.50 per share. We also examine the dividend per share of $0.20 and $1.00.

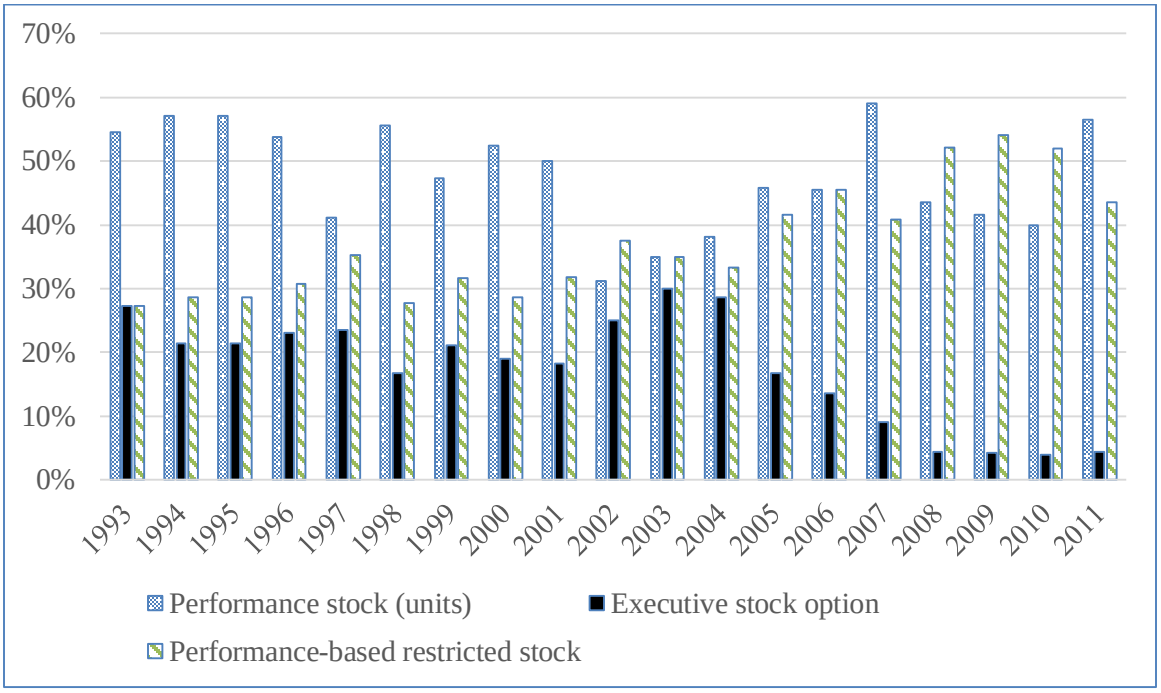


Figure 2.1. Dividend Equivalents Grants by Underlying Awards

Notes: The sample period is from 1993 to 2011. The dividend equivalent granted are classified by underlying awards – performance stock and units, executive stock options and performance-based restricted stock and units.

Volatility: Following Chance and Yang we use 50% as the volatility when calculating the up-factor *u* and the down-factor *d*.

Beta: In our previous study on dividend equivalents, we chose S&P500 component firms as our sample firms. Intuitively larger firms have greater co-movements with the market. The beta of the market portfolio is 1; we thus assume the representative firm's beta is 1.

2.5.2 Option-related Variables

Exercise price: Most grants are awarded at-the-money. Thus, we set the exercise price equal to the current stock price.

Vesting period: In the analysis we examine the effect of the length of the vesting period. We assume no changes are made on the original vesting period once the stock option awards are granted. During the vesting period the representative executive cannot exercise the stock options covered by the awards, and no accelerated vesting conditions are allowed. Hall and Murphy assume vesting period of 2, 3, and 4 years. In my analysis the original vesting period of 1, 2, 3 and 4 years are all considered. Since the representative firm pays quarterly dividends, the numbers of steps used in the analysis are then 4, 8, 12, and 16.

2.5.3 Market-related Variables

Risk-free rate: We calculate the average monthly risk free rate and multiply by three to get the estimated average quarterly risk free rate. The average quarterly risk free rate from 1993 to 2012 is around 0.985 percent.

Market risk premium: We calculate the average market risk premium and multiply by three as the estimated average quarterly market risk premium. The quarterly average market risk premium from 1993 to 2012 is about 1.6 percent.

2.5.4 Representative Executive-related Variables

Number of options granted: From 1993 to 2012 the CEOs from the S&P500 firms receive an average of 266,905.0485 shares of stock options. We round up this number to 267,000 shares.

Usage of DERs on options: The percentage of the options that are granted with DERs. We assume five percent of the executive's stock option awards are granted with DERs during the vesting period. We also did analysis when the percentage of options that granted with DERs is 2 percent, 10 percent or 20 percent.

Non-option wealth: During the period from 1993 to 2012, the average reported annual compensation of the CEOs from S&P500 firms is $11.05 million.[40] We use $11 million in the analysis. We also examine non-option wealth of $9 million and $13 million.

Initial asset allocation: At the time when the stock option awards are granted, the representative executive has 267,000 stock options that have intrinsic value of zero. The executive is assumed to have non-option related wealth that comes from his cash compensation and stock awards. The initial asset allocation refers to the percentages of the executive's stock awards. The initial asset allocation of 0%, 33%, 50%, 67% and 100% are considered in the analysis. We assume no rebalancing between cash, firm stocks, and options during the vesting period. Table 2.1 summarizes the implied wealth distribution among cash and stocks when different asset allocation percentages are used.

Risk aversion: Hall and Murphy assume the relative risk aversion coefficient to be 2 and 3. Chance and Yang also make the same assumption. We use 3 as the relative risk aversion in the analysis. We also do the analysis when the relative risk aversion is 2 or 4.

[40]The S&P500 CEO compensation data is obtained from the ExecuComp database. The sample firms include all the firms that have SPCODE = "SP". The sample period is from 1993 to 2012. The data item is the total compensation reported by firm (TOTAL_SEC).

Table 2.1. Initial Asset Allocation

Initial asset allocation (%)	# of stocks	Cash compensation ($)	# of shares underlying options	# of stocks granted with dividend equivalents				Non-option wealth ($)
				Percentage of stocks underlying options that are granted with Des				
				2%	5%	10%	20%	
0	0	11,000,000	267,000	5,340	13,350	26,700	53,400	11,000,000
33	121,000	7,370,000	267,000	5,340	13,350	26,700	53,400	11,000,000
50	183,333	5,500,000	267,000	5,340	13,350	26,700	53,400	11,000,000
67	245,667	3,630,000	267,000	5,340	13,350	26,700	53,400	11,000,000
100	366,667	0	267,000	5,340	13,350	26,700	53,400	11,000,000

Notes: This table illustrate the representative executive's asset allocation strategy. The initial asset allocation percentages show how much of his non-option related wealth is invested in firm shares. The rest of non-option wealth is cash compensation and is invested in risk-free bonds. 267,000 at-the-money stock options are granted to the executive, and some of them are granted with dividend equivalents. The stock price is $30. The total non-option related wealth is $11 million.

2.5.5 Model-related Variables

Number of time periods: We assume the length of the vesting period to be 1, 2, 3, and 4 years. The dividends are issued each quarter, thus the related time periods are 4, 8, 12, and 16 quarters.

The accuracy of the simulation results: We use the iterating method to find the numeric dollar values and dollar costs. We use iterations to find the numeric subjective value V of dividend equivalents. For example, when dividend equivalents are paid out in cash, we first calculate the expected utility of the executive when he receives dividend equivalents in equation (3), then we assign a small positive threshold value as the lower bound of the subjective value V, plug the threshold value into equation (2) and compare the result with the expected utility value obtained from equation (3). If it is lower than the expected utility value obtained from equation (3), we add one dollar to the threshold and redo the calculation until the result of equation (2) exceeds the expected utility value in equation (3). In each step, the value of the lower bound is increase by one dollar. The value that makes the result of equation (2) greater than the expected utility from equation (3) is the higher bound of V. The difference between the lower bound and the higher bound is one dollar.

2.6 Simulation Results

We perform simulations under various scenarios and compare the results in this section. The scenarios are described by the combinations of the variables listed above. We consider two types of dividend equivalents granted with executive stock options: cash dividend equivalents and dividend equivalents reinvested in firm shares. The results of the two types of dividend equivalents are summarized in two panels of each table, respectively. The simulation results are presented in the following order: Section 2.6.1 summarizes the subjective values and costs of cash dividend

equivalents given different combinations of initial asset allocation percentages and vesting periods. Section 2.6.2, Section 2.6.3, Section 2.6.4 and Section 2.6.5 discuss the effect of the representative executive's relative risk aversion, his non-option wealth, the amount of dividend equivalents paid on each underlying shares, and the length of the vesting period, given different combinations of initial asset allocations and usage of DERs on options, respectively. Section 2.6.6 is a case study of an S&P500 firm that granted dividend equivalents on its CEO' stock options.

2.6.1 Value and Cost of Dividend Equivalents

In this section we examine the subjective value of dividend equivalents to the representative executive and the cost of them to the firm. The results are summarized in Table 2.2. We allow the asset allocation and the usage of DERs on options to change. Panel A contains the results when the dividend equivalents are paid out in cash, while Panel B contains the results when the dividend equivalents are reinvested in firm shares.

Table 2.2. Effect of Allocation Percentages

Panel A. Cash dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	30,058	75,177	150,376	300,772
33	30,064	75,183	150,382	300,779
50	30,068	75,187	150,385	300,782
67	30,071	75,190	150,389	300,786
100	30,077	75,196	150,395	300,792
Costs to the company ($)	**30,079**	**75,199**	**150,397**	**300,795**

Panel B. Stock dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	24,648	61,623	123,176	246,014

(Table 2.2 Panel B continued)

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
33	22,487	56,225	112,417	224,655
50	21,425	53,571	107,126	214,149
67	20,335	50,848	101,699	203,378
100	17,858	44,668	89,399	179,038
Costs to the company ($)	**30,079**	**75,199**	**150,397**	**300,795**

Notes: This table provides the subjective value and the cost of dividend equivalents. Panel A contains results for cash dividend equivalents and Panel B contains results for stock dividend equivalents. Assume the options vest in twelve quarters. The stock price is $30, the exercise price is $30, the risk-free rate is 0.985% per quarter, the time to expiration is one year, the stock volatility is 50%, the dividend per share is $0.5, the stock beta is 1, the market risk premium is 1.5916% per quarter, the representative executive's non-option wealth is $11 million, the number of options awarded is 267,000, with some of them granted with DERs, the executive's relative risk aversion is 3, and other variables are indicated in the table below. The cost of the DEs are shown in the bottom row.

We assume that the executive reinvests cash dividend equivalents in risk-free bonds. The subjective value of the cash dividend equivalents is calculated using the utility-based model and the cost is the present value of the future cash dividend equivalents. The costs of cash dividend equivalents are not affected by the initial asset allocation, but vary with the usage of DERs on options. The dividend equivalent payments during the vesting period thus can be considered as an annuity. The cost of the dividend equivalents to the firm is the present value of all the dividend equivalents that are paid to the executive during the three-year vesting period. The present value of an annuity is determined by the number and size of payments, and the discount rate. In the context of our analysis, the number of payments is determined by the length of the vesting period, which is a constant. The size of payments is determined by the dividend per share, the number of options that are awarded to the executive and the percentage of options that are granted with dividend equivalents. We assume the dividend per share is $0.5 each quarter and 267,000 options are granted to the executive; thus the size of the annuity payments is only affected by the usage of DERs on options. The discount rate is the risk-free rate. Initial asset allocation does not influence

the value of the annuity. Usage of DERs on options influence the present value of the annuity through the size of the annuity payment. As the usage of DERs on options increases, the number of shares underlying the options that are granted with DERs increases, thus the cost of the dividend equivalents to the company increases.

The results show that the value of the cash dividend equivalents increases as the initial asset allocation increases or the usage of DERs on options increases. The value is always lower than the cost. This is because the representative executive is risk-averse. The gap between the value and the cost of the cash dividend equivalents becomes narrower when the percentage of the firm shares in the executive's portfolio is larger. Once cash dividend equivalents are delivered to the executive, they join the executive's cash compensation and are essentially risk-free. Compared to cash dividend equivalents, firm shares are risky. Therefore when the risk-averse executive's portfolio consists of a higher percentage of risky assets, the risk-free assets become more valuable to him. As the usage of DERs on options increases, the amount of the dividend equivalents received by the executive increases, thus the value of the dividend equivalents also increases.

Panel B summarizes the results when the dividend equivalents are paid in the form of firm shares that have equivalent value. When the representative firm pays out common dividends, the executive receives firm shares of which the amount equals the dividends paid on one share of firm stock divided by the stock price at that time. Thus the number of shares from dividend equivalents on each dividend date is a function of the number of options granted with dividend equivalents, the dividends paid on each share of common stock, and the stock price. Given that the number of options granted with dividend equivalents is constant, the executive earns more stock dividend equivalents when the dividend per share is higher, or when the stock price is lower, or both. At the end of the vesting period, the cumulated number of shares earned from dividend equivalents is

a function of the two series – the amounts of dividend per share over the vesting period, and the stock prices on the dates when dividends are paid out. We assume the dividend per share to be a constant number, and thus the cumulated number of shares earned from dividend equivalents is dependent only on the stock prices on the ex-dividend dates – in other words, the path of the stock price.

The simulation results for dividend equivalents are summarized in Panel B of Table 2.2. First, let us note that as the usage of DERs on options increases the value of stock dividend equivalents increases as well. This is due to the fact that the executive can earn more dividend equivalents as more of his options awards are covered by dividend equivalents. Second, as the initial asset allocation percentage increases, the value of the stock dividend equivalents decreases. The value is a function of the joint effect: As the representative executive invests more in firm shares, the shares become more important, and the other compensation instruments become relatively less important. The dividend equivalents thus becomes less valuable. On the other hand, the dividend equivalents are paid out in the form of firm shares, and as the firm shares occupy a larger portion of the executive's portfolio, the value of the newly obtained stock dividend equivalents becomes higher. The results show that the second effect plays a smaller role than the first. Third, the comparison of the value and the cost of the dividend equivalents shows that the value is much lower than the cost in all combinations of initial asset allocations and usage of DERs on options. This difference, again, can be explained by the risk-averse behavior of the representative executive. The costs are the same as if the dividend equivalents are paid out in cash. This is because on the dividend days, the expenses of paying out dividend equivalents in cash and paying out in the form of firm shares are the same. In both cases the expenses are equal to the product of dividends per share and the number of shares underlying the options with which

dividend equivalents are granted. Since we assume that the executive does not rebalance his investment portfolio and the stock dividend equivalents cannot be freely traded before the options vest[41], the stock dividend equivalents are illiquid. The risk-averse executive thus discounts his stock dividend equivalents.

Let us also compare the values of the dividend equivalents when the payment methods are different. For each combination of the initial asset allocation and the usage of DERs on options, the value of the dividend equivalents is always higher when they are paid out in cash. This is due to the large discount that the risk-averse executive put on the illiquid stock dividend equivalents. The difference between the value of the cash dividend equivalents and the value of stock equivalents is greater when the initial asset allocation gets larger. Considering that the value of the cash dividend equivalents does not vary much with the initial asset allocation, the increasing difference is mainly driven by the decline in the value of the stock dividend equivalents as the initial asset allocation increases. The difference in the values of cash dividend equivalents and stock dividend equivalents also increases when the usage of DERs on options gets larger. This is an effect of increasing scale. The increase in the difference between the stock dividend equivalents and cash dividend equivalents increases approximately in proportion with the growth of the usage of DERs on options. For example, as the usage of DERs on options grows by ten times, from two percent to twenty percent, the value difference between increases from $5,410 to $54,758 when the initial asset allocation is zero, from $7,577 to $76,124 when the initial asset allocation is 30 percent, and from $12,219 to $121,754 when the initial asset allocation is 100 percent.

[41]It is common that when a firm pays dividend equivalents in the form of stocks or units it requires that those stocks or units be held in a separate account managed by the firm before the executive's underlying compensation instruments vest. When those stocks or units are kept in the account, the executive cannot trade them. Thus we assume that stock dividend equivalents cannot be freely traded during the vesting period.

2.6.2 The Effect of the Representative Executive's Relative Risk Aversion

In this section we examine the effect of the degree of executive's relative risk aversion on the value and the cost of dividend equivalents. The relative risk aversion takes a value of 2, 3, or 4. The larger the number, the more risk-averse the executive is. The results are summarized in Table 2.3. Panel A of Table 2.3 contains the results when cash dividend equivalents are paid out, and Panel B contains the results when the dividend equivalents are reinvested in firm shares. In each cell, the numbers from the top to the bottom are the values of dividend equivalents for relative risk aversion of 2, 3, and 4, respectively.

Table 2.3. Effect of Risk Aversion

Panel A. Cash dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	30,080	75,199	150,398	300,796
	30,058	75,177	150,376	300,772
	30,052	75,171	150,369	300,765
33	30,080	75,199	150,398	300,796
	30,064	75,183	150,382	300,779
	30,062	75,181	150,382	300,776
50	30,080	75,199	150,398	300,796
	30,068	75,187	150,385	300,782
	30,068	75,187	150,385	300,782
67	30,080	75,199	150,398	300,796
	30,071	75,190	150,389	300,786
	30,072	75,192	150,390	300,787
100	30,080	75,199	150,398	300,796
	30,077	75,196	150,395	300,792
	30,078	75,198	150,396	300,794
Costs to the company ($)	**30,079**	**75,199**	**150,397**	**300,795**

Panel B. Stock dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	25,509	63,756	127,456	254,695
	24,648	61,623	123,176	246,014
	24,090	60,227	120,355	240,240
33	23,723	59,299	118,576	237,067
	22,487	56,225	112,417	224,655
	21,631	54,082	108,107	215,938
50	22,835	57,084	114,163	228,305
	21,425	53,571	107,126	214,149
	20,436	51,093	102,148	204,108
67	21,918	54,798	109,609	219,272
	20,335	50,848	101,699	203,378
	19,221	48,057	96,095	192,096
100	19,823	49,578	99,230	198,752
	17,858	44,668	89,399	179,038
	16,516	41,305	82,655	165,483
Costs to the company ($)	**30,079**	**75,199**	**150,397**	**300,795**

Notes: This table shows the effect of the degree of the representative executive's relative risk aversion on the subjective value and the cost of dividend equivalents. Panel A contains results for cash dividend equivalents and Panel B contains results for stock dividend equivalents. Assume the options vest in twelve quarters. The stock price is $30, the risk-free rate is 0.985% per quarter, the dividend per share is $0.5, the stock beta is 1, the market risk premium is 1.5916% per quarter, the representative executive's non-option wealth is $11 million, the number of options awarded is 267,000, some of which are granted with DERs, the executive's relative risk aversion is 2, 3, or 4, and other variables are indicated in the table below. In each cell the numbers from the top to the bottom are for relative risk aversion of 2, 3, and 4, respectively. The cost of the DEs is shown in the bottom row.

For both of the two payment methods, the value of the dividend equivalents is always higher when the executive is less risk averse – in each cell the numbers from the top to the bottom are always decreasing. The effect is measured by the difference between the number in the top of each cell and the number on the bottom. The patterns of the effect of risk aversion are different for the two payment methods. For cash dividend equivalents, overall the effect of the executive's risk aversion is quite small. The difference between the top number (relative risk aversion of 2)

and the bottom number (relative risk aversion of 4) in each cell is always equal to $30 or less. The effect becomes weaker as the initial asset allocation gets larger. The effect shows a non-monotone pattern when the usage of DERs on options gets larger. When the usage of DERs on options increases from two percent to five percent, the value of cash dividend equivalents does not change or slightly decreases. When the usage of DERs on options increases from five percent to 20 percent, the value of cash dividend equivalents slightly increases.

For stock dividend equivalents, the effect of the degree of the executive's risk-aversion is much stronger than that of cash dividend equivalents. The dollar difference between the subjective values for risk aversion of 2 and for risk aversion of 4 ranges from $1,419 to $33,269. The effect of the executive's risk aversion is stronger when the initial asset allocation is larger, or when the usage of DERs on options is higher. As the executive becomes more sensitive to risk, he would be more reluctant to increase the portion of risky assets in his portfolio and tends to discount the value of stock dividend equivalents more if he already has a large portion of his wealth invested in firm shares. The stronger effect of relative risk aversion associated with higher usage of DERs on options again can be seen as a result of increasing scales.

2.6.3 The Effect of The Executive's Non-Option Wealth

In this section we examine the effect of the level of the representative executive's non-option wealth on the value and the cost of the dividend equivalents. The executive's non-option wealth takes three values: $9 million, $11 million, and $13 million. The results are summarized in Table 2.4.

Table 2.4. Effect of the Representative Executive's Non-Option Wealth

Panel A. Cash dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20

(Table 2.4 Panel A continued)

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
0	30,068	75,187	150,385	300,783
	30,058	75,177	150,376	300,772
	30,044	75,163	150,362	300,758
33	30,071	75,190	150,389	300,786
	30,064	75,183	150,382	300,779
	30,054	75,173	150,371	300,768
50	30,073	75,192	150,391	300,788
	30,068	75,187	150,385	300,782
	30,060	75,179	150,377	300,774
67	30,075	75,194	150,393	300,790
	30,071	75,190	150,389	300,786
	30,065	75,184	150,383	300,780
100	30,078	75,198	150,396	300,794
	30,077	75,196	150,395	300,792
	30,075	75,194	150,393	300,790
Costs to the company ($)	**30,079**	**75,199**	**150,397**	**300,795**

Panel B. Stock dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	24,343	60,844	121,595	242,794
	24,648	61,623	123,176	246,014
	24,902	62,283	124,518	248,747
33	22,340	55,846	111,641	223,060
	22,487	56,225	112,417	224,655
	22,601	56,528	113,040	225,938
50	21,327	53,317	106,604	213,075
	21,425	53,571	107,126	214,149
	21,499	53,770	107,537	214,997
67	20,273	50,686	101,366	202,700
	20,335	50,848	101,699	203,378
	20,381	50,973	101,957	203,907

(Table 2.4 Panel B continued)

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
100	17,939	44,622	89,317	178,916
	17,858	44,668	89,399	179,038
	17,871	44,703	89,463	179,136
Costs to the company ($)	**30,079**	**75,199**	**150,397**	**300,795**

Notes: This table shows the effect of the representative executive's non-option wealth on the subjective value and the cost of dividend equivalents. Panel A contains results for cash dividend equivalents and Panel B contains results for stock dividend equivalents. Assume the options vest in twelve quarters. The stock price is $30, the risk-free rate is 0.985% per quarter, the time to expiration is one year, the stock volatility is 50%, the dividend per share is $0.5, the stock beta is 1, the market risk premium is 1.5916% per quarter, the representative executive's non-option wealth is $9 million, $11 million, or 13 million, the number of options awarded is 267,000, some of which are granted with DERs, the executive's relative risk aversion is 3, and other variables are indicated in the table below. In each cell, the numbers from the top to the bottom are for the executive's non-option wealth of $9 million, $11 million and $13 million, respectively. The cost of the DEs is shown in the bottom row.

Panel A contains the results when the dividend equivalents are paid out in cash. For all combinations of initial asset allocations and usage of DERs on options, the smallest non-option wealth is associated with the highest subjective value of dividend equivalents, and the largest non-option wealth is associated with the lowest subjective value. The effect of the executive's non-option wealth measured by the difference between the subjective value when the executive has $9 million non-option wealth and when he has $13 million non-option wealth is not influenced by the usage of DERs on options. As the usage of DERs on options increases from two percent to 20 percent, the dollar difference changes by at most one dollar, which can be easily explained by computation errors in the simulation process. The effect of the executive's non-option wealth is slightly decreasing as the initial asset allocation increases. Overall, the executive's non-option wealth has little effect on the subjective value of the cash dividend equivalents. For all the cells, the dollar difference between the number on the top and the number on the bottom is no greater than $25.

Panel B summarizes the results when the dividend equivalents are reinvested in firm shares. It is shown that the effect of the non-option wealth on the value of the dividend equivalents is not monotone. When the executive invests zero percent to sixty-seven percent of his non-option wealth in firm shares, the higher the non-option wealth, the greater the subjective value of dividend equivalents. However, when the executive invests all of his non-option wealth in firm shares, the higher the non-option wealth, the lower the subjective value of dividend equivalents. The effect of non-option wealth is two-fold. On the one hand, when the executive's non-option wealth is large, the marginal importance of his option-related wealth is large. Thus an additional amount of income from options is valuable. This is particularly true when the majority or all of his non-option wealth is cash. To diversify his investments, the executive would welcome a small amount of risky assets. Thus we observe that the positive effect of the executive's non-option wealth is the strongest when initial asset allocation is zero. On the other hand, since dividend equivalents are reinvested in firm shares, they become part of the non-option wealth once they are paid out to the executive (his non-option wealth consists of cash and firm stock holdings). The utility of an additional amount of non-option wealth is smaller when the non-option wealth is large than when the non-option wealth is small (the law of diminishing marginal utility). Similarly, when the majority or all of the executive's non-option wealth is already invested in firm shares. An additional amount of firm shares will not be appreciated and thus are assigned a relatively low value. Thus we observe that when the initial asset allocation is 100 percent, the effect of the executive's non-option wealth is negative.

2.6.4 The Effect of Dividend Payout Level

We examine the effect of the firm's dividend payout level on the value and the cost of the dividend equivalents in this section. The dividend payout level is measured by the firm's dividend

per share. We assume that during the vesting period, the dividend per share remains constant. Then we examine how the value of the dividend equivalent changes when the dividend per share takes on different values. The results are summarized in Table 2.5 as below.

Table 2.5. Effect of the Amount of Dividend per Share

Panel A. Cash dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	12,010	30,058	60,137	120,296
	30,058	75,177	150,376	300,772
	60,137	150,376	300,772	601,566
33	12,018	30,066	60,145	120,304
	30,064	75,183	150,382	300,779
	60,140	150,378	300,775	601,569
50	12,022	30,070	60,149	120,308
	30,068	75,187	150,385	300,782
	60,142	150,380	300,777	601,571
67	12,026	30,074	60,153	120,312
	30,071	75,190	150,389	300,786
	60,144	150,383	300,780	601,574
100	12,031	30,079	60,158	120,318
	30,077	75,196	150,395	300,792
	60,150	150,388	300,785	601,579
Costs to the company ($)	**12,032**	**30,080**	**60,159**	**120,318**
	30,079	**75,199**	**150,397**	**300,795**
	60,159	**150,398**	**300,796**	**601,591**

Panel B. Stock dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	9,848	24,648	49,302	98,566
	24,648	61,623	123,176	246,014

(Table 2.5 Panel B continued)

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	49,302	123,176	246,014	490,672
33	8,937	22,361	44,728	89,437
	22,487	56,225	112,417	224,655
	45,371	113,398	226,624	452,532
50	8,463	21,171	42,347	84,687
	21,425	53,571	107,126	214,149
	43,594	108,974	217,842	435,227
67	7,945	19,873	39,751	79,510
	20,335	50,848	101,699	203,378
	41,905	104,768	209,489	418,758
100	6,481	16,211	32,450	70,560
	17,858	44,668	89,399	179,038
	38,700	96,785	193,638	387,520
Costs to the company ($)	**12,032**	**30,080**	**60,159**	**120,318**
	30,079	**75,199**	**150,397**	**300,795**
	60,159	**150,398**	**300,796**	**601,591**

Notes: This table shows the effect of the dividend payout level on the value and cost of dividend equivalents. Panel A contains results for cash dividend equivalents and Panel B contains results for stock dividend equivalents. Assume the options vest in twelve quarters. The stock price is $30, the risk-free rate is 0.985% per quarter, the time to expiration is one year, the stock volatility is 50%, the dividend per share is $0.2, $0.5 and $1, the stock beta is 1, the market risk premium is 1.5916% per quarter, the representative executive's non-option wealth is $11 million, the number of options awarded is 267,000, some of which are granted with DERs, the executive's relative risk aversion is 3, and other variables are indicated in the table below. In each cell, the numbers from the top to the bottom are for the dividend per share of $0.2, $0.5 and $1, respectively. The cost of the DEs is shown in the bottom row.

Panel A summarizes the results when the dividend equivalents are paid out in cash. The results are not surprising: for all combinations of initial asset allocation and usage of DERs on options, a higher dividend payout level is associated with higher value of the dividend equivalents. Similar to the previous sections, we use the difference between the number in the top of each cell (dividend per share of $0.2) and the number in the bottom of each cell (dividend per share of $1)

to measure the effect of the dividend per share. The effect is not influenced by the initial asset allocation, but it is becoming proportionally stronger with the usage of DERs on options.

Panel B contains the results when the dividend equivalents are reinvested in firm shares. Again the higher dividend payout level leads to a higher value of the dividend equivalents. As the initial asset allocation percentage becomes larger, the effect of the dividend per share becomes weaker. This is due to the decreasing marginal benefit that stock dividend equivalents bring as the firm stock accounts for an increasing portion of the executive's non-option wealth. The results show that the spread between the subjective value when dividend per share is \$0.2 and the subjective value when dividend per share is \$1 becomes wider when the usage of DERs on options increases, and again the increase in the spread is approximately proportional to the increase of the usage of DERs on options.[42]

2.6.5 The Effect of Vesting Period

We examine the effect of the vesting period on the value and the cost of dividend equivalents on options in this section. The vesting periods that we examine are one, two, three, and four years. The corresponding compounding periods are thus four, eight, twelve and sixteen quarters. The results are summarized in Table 2.6.

Table 2.6. Effect of Vesting Period

Panel A. Cash dividend equivalents

Initial asset allocation (%)	Value to the executives (\$)			
	DER usage (%)			
	2	5	10	20
0	10,404	26,037	52,093	104,203
	20,424	51,088	102,197	204,414
	30,058	75,177	150,376	300,772

[42]One should not conclude that the effect itself becomes stronger as the usage of DERs on options gets larger. The wider spread between the top number and the bottom number in each cell is due to the fact that more options are granted with dividend equivalents. The effect on the "per option" basis does not change much.

(Table 2.6 Panel A continued)

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	39,322	98,339	196,702	393,426
33	10,408	26,040	52,096	104,206
	20,428	51,093	102,202	204,419
	30,064	75,183	150,382	300,779
	39,329	98,346	196,708	393,433
50	10,410	26,042	52,098	104,209
	20,432	51,096	102,205	204,422
	30,068	75,186	150,385	300,782
	39,332	98,349	196,712	393,437
67	10,413	26,045	52,101	104,211
	20,435	51,100	102,209	204,426
	30,071	75,190	150,389	300,786
	39,336	98,353	196,716	393,441
100	10,417	26,049	52,106	104,216
	20,441	51,105	102,214	204,431
	30,077	75,196	150,395	300,792
	39,342	98,959	196,722	393,447
Costs to the company ($)	**10,422**	**26,055**	**52,110**	**104,221**
	20,443	**51,109**	**102,217**	**204,435**
	30,080	**75,199**	**150,398**	**300,796**
	39,345	**98,363**	**196,726**	**393,451**

Panel B. Stock dividend equivalents

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	2	5	10	20
0	9,690	24,250	48,514	97,034
	17,709	44,293	88,579	177,071
	24,648	61,623	123,176	246,014
	30,803	76,976	153,762	356,722
33	9,285	23,235	46,484	92,983
	16,454	41,154	82,312	164,596

(Table 2.6 Panel B continued)

Initial asset allocation (%)	Value to the executives ($)			
	DER usage (%)			
	22,487	56,225	112,417	224,655
	27,786	69,452	138,791	277,096
50	9,073	22,703	45,420	90,859
	15,815	39,555	79,121	158,247
	21,425	53,571	107,126	214,149
	26,346	65,855	131,630	262,912
67	8,849	22,139	44,292	88,612
	15,141	37,870	75,758	151,562
	20,335	50,848	101,699	203,378
	24,907	62,263	124,478	248,743
100	8,339	20,860	41,737	83,525
	13,528	33,839	67,731	135,659
	17,858	44,668	89,399	179,038
	21,838	54,608	109,248	218,612
Costs to the company ($)	**10,422**	**26,055**	**52,110**	**104,221**
	20,443	**51,109**	**102,217**	**204,435**
	30,080	**75,199**	**150,398**	**300,796**
	39,345	**98,363**	**196,726**	**393,451**

Notes: This table shows the effect of vesting period on the subjective value and the cost of dividend equivalents. Panel A contains results for cash dividend equivalents and Panel B contains results for stock dividend equivalents. Assume the options vest in 4, 8, 12, or 16 quarters. The stock price is $30, the risk-free rate is 0.985% per quarter, the time to expiration is one year, the stock volatility is 50%, the dividend per share is $0.5, the stock beta is 1, the market risk premium is 1.5916% per quarter, the representative executive's non-option wealth is $11 million, the number of options awarded is 267,000, some of which are granted with DERs, the executive's relative risk aversion is 3, and other variables are indicated in the table below. In each cell, the numbers from the top to the bottom are for the vesting period of 4, 8, 12, and 16 quarters, respectively. The cost of the DEs are shown in the bottom row.

For both of the two payment methods, the subjective value of dividend equivalents are larger when the vesting period is longer. This is anticipated because a longer vesting period means that more dividends and dividend equivalents are paid out.

For cash dividend equivalents, the effect of the vesting period is hardly influenced by initial asset allocation or usage of DERs on options. For example, when the usage of DERs on options

is five percent, as the initial asset allocation increases from zero to 100 percent, the difference between the subjective value of dividend equivalents for 16 quarters and 4 quarters increases by $8, from $72,302 to $72,310. At all levels of initial asset allocation, when the usage of DERs on options grows by ten times, the difference between the subjective values increase by around ten times as well.

For stock dividend equivalents, the effect of the vesting period becomes weaker as the initial asset allocation is greater. This pattern, again, can be explained by the decreasing marginal benefit that stock dividend equivalents can bring when the executive invests more of his non-option wealth in firms shares. The effect of the vesting period is larger when the usage of DERs on options gets larger. As the usage of DERs on options grows from two percent to twenty percent, the spread between the top number and the bottom number in each cell increases by more than ten percent. This increase itself is greater when the initial asset allocation is smaller. When the initial asset allocation is zero, the spread increases by 12.3 times, while for the initial asset allocation of one hundred percent, the spread increases by only 10.0 times. This pattern is consistent with the notion that a risk-averse executive prefers to diversify his investments, so he values the stock dividend equivalents more when the majority of his non-option wealth is cash.

2.6.6 A Case Study - Norfolk Southern Corp.'s Dividend Equivalent Grants

In this section we take real examples to illustrate the effects of various factors on the value and the cost of dividend equivalents. We choose an S&P500 firm that has granted the CEO dividend equivalents on his stock option awards. Below is the company profile on its official web site:

> Norfolk Southern Corporation is one of the nation's premier transportation companies. Its Norfolk Southern Railway subsidiary operates approximately 20,000 route miles in 22 states and the District of Columbia, serves every major container port in the eastern United States, and provides efficient connections to other rail carriers. Norfolk Southern operates the most extensive intermodal network in the East and is a major transporter of coal and industrial products. (NorfolkSouthern)

The company has a long history of granting dividend equivalents on its executive's stock option awards. In the early 1990s the company paid dividend equivalents in cash, but in the late 1990s, the company switched from cash dividend equivalents to stock dividend equivalents. We choose two of its option grants to the CEO as examples, one for cash dividend equivalents and the other for stock dividend equivalents.

Cash dividend equivalents

In 1993 the company granted 40,000 shares of options to its CEO, D. R. Goode (NorfolkSouthern 1993). The options would vest in one year and expire in 10 years. The option strike price was $63.25. At that time, the company made quarterly dividends. In the fiscal year 1993, the four quarterly dividend payments were $0.45, $0.45, $0.48, and $0.48. Instant cash dividend equivalent payments were made to the CEO on those options. In addition to the option award, the CEO received a salary of $535,000, a bonus of $376,480, and cash dividend equivalents earned from his other options performance stocks that were granted before 1993. The CEO also had earned performance shares for the performance period ending December 31, 1993, 1992, and 1991, all of which were paid to him in the form of common shares. The CEO had other compensation of $50,480.[43]

Like other U.S. large firms, Norfolk Southern Corporation had complicated compensation packages for its senior executives. We have to carefully tailor the CEO's compensation package

[43]See the company's 1993 proxy statement available at the SEC web site: http://www.sec.gov/Archives/edgar/data/702165/0000950109-94-000621.txt

before applying our model. The two main differences between Mr. Goode's compensation package and the compensation package in our model are: First, Mr. Goode had sizable compensation coming from the company's long term incentive plan: the performance stock awards, etc. Second, he did not receive common share awards. However those differences can be easily adjusted for in this particular example. We know how many performance shares are earned by the CEO in 1993 and the earned performance shares are paid out in the form of common shares. Thus we can treat the earned out-performance stocks as common share awards. Meanwhile we ignore the new performance share awards that were granted in 1993. By doing this, we are able to keep the model simple, but we may underestimate the CEO's stock holding.

First we examined the effect of the executive's relative risk aversion on the value and the cost of cash dividend equivalents. The cost of the cash dividend equivalents, again, equals the present value of the four dividend equivalent payments during the one-year vesting period. The cost is not affected by the CEO's risk aversion and is equal to $192,543. When the relative risk aversion measure takes a value of 3, the subjective value of the dividend equivalents is $192,542. When the relative risk aversion measure equals 2, the subjective value is $192,543, a difference is only $1. We also calculated the subjective value of the dividend equivalents when the CEO's relative risk aversion is 4 and 5. The results show that changing the relative risk aversion makes only one or two dollars difference. Second, we let the CEO change his investment strategy. When the initial asset allocation percentage changes from zero percent to 100 percent, the subjective value of cash dividend equivalents increases only by one dollar. Next, we examined the effect of non-option wealth and the effect of the dividend payout level. The simulation results show that those effects are all extremely small. The subjective value of cash dividend equivalents is always smaller than the cost, but the difference is less than $2.

Stock dividend equivalents

In 1998, the company paid stock dividend equivalents on the CEO's stock options. The company granted 250,000 stock options, all of which earned dividend equivalents. The strike price was $32.1563. The dividend equivalents are reinvested in Deferred Stock Units, which are payable in cash to the executive when either one of three conditions are met: (a) it is the five-year anniversary of the date of option grant; (b) the CEO exercises the option (exercises of less than the full option grant result in a prorated cash payment); and (c) the CEO is dead, disabled, or retired (NorfolkSouthern 1998). We follow the same procedure to summarize the CEO's other compensation: The executive received $3.402 million non-option related compensation, of which $1.615 million were shares and the rest were cash compensation. The company paid $0.2 dividends each quarter. [44]

According to the company's disclosure, the Deferred Stock Units are paid at the aggregate fair market value. In other word, dividend equivalents are cumulated in the form of shares but are paid out in cash of the same value. In our model, the final payment method will not affect our analysis as long as the dividend equivalents are cumulated in the form of shares. The three conditions for the Deferred Stock Units to become payable add to the complexity of the analysis, but only by a limited amount: Condition (c) involves some events with very small probabilities thus should not bother us. Condition (b) seems to be difficult to model. The executive will not exercise the options if the stock price falls below the strike price. The options will be forfeited if not exercised before the expiration date. It is implied that the related dividend equivalents might be forfeited too. However this possibility will not affect our analysis since we are only interested in the dividend equivalents that have been cumulated during the one-year vesting period. Before

[44]Norfolk Southern Corp 1998 proxy statement. http://www.sec.gov/Archives/edgar/data/702165/0000928385-99-001086.txt

the options vest the CEO cannot exercise them thus all the four quarters' dividend equivalents on the options are cumulated. Those dividend equivalents will become payable if any one of the two events occurs – either the CEO exercises the options before the five-year anniversary (of the date of option grant), or the five-year anniversary comes before the CEO exercises the options. If the first event occurs the dividend equivalents will become payable within four years after the options vest. If the second event occurs the dividend equivalents will become payable exactly four years after they vest. Either way the stock dividend equivalents are delivered to the CEO. The stock options expires ten years after granted so they are still exercisable on the five-year anniversary. Thus the possibility that the dividend equivalents cumulated during the vesting period become forfeited due to the stock options being expired is zero. The possibility for the events in Condition (3) to occur before the five-year anniversary is small. Even if such events occur the dividend equivalents cumulated during the vesting period will be paid to the CEO. After considering all the possibilities described above we conclude that the probability for the dividend equivalents cumulated during the vesting period to be forfeited is zero.

The results show that the cost of the dividend equivalents cumulated during the one – year vesting period has a cost of $192,543 to the company. When the executive has relative risk aversion of 2 the value of the dividend equivalents is $168,523. When the executive has relative risk aversion of 3 the value is $164,173, a decrease of three percent. The subjective value of the dividend equivalents is 85% to 88% of their cost to the firm.

In order to maintain the simplicity of the model, we take the earned performance stock as the common stock awards. Now let us loosen this assumption and let the allocation percentage (the percentage of stock in total non-option wealth) vary from zero percent to 100 percent. The length of the vesting period is still one year.

Let us first see the effect of relative risk aversion given different initial asset allocation percentages. The effect is shown in Figure 2.2. It summarizes the results in a straightforward way: The solid line shows the cost of the dividend equivalents and the two bars represent the value of the dividend equivalents. The light downward diagonal filled bars are for the risk aversion of 2 and the solid filled bars are for the risk aversion of 3. As the very risk-averse executive (risk aversion measure = 3) invests more of his non-option wealth in firm shares, the subjective value of the dividend equivalents drops rapidly from $171,775 to $153,339, a decrease of 11 percent. When the executive is less risk averse (pho=2), the drop of the subjective value of the dividend equivalents was smaller: from $174,419 to $160,523, a drop of eight percent.

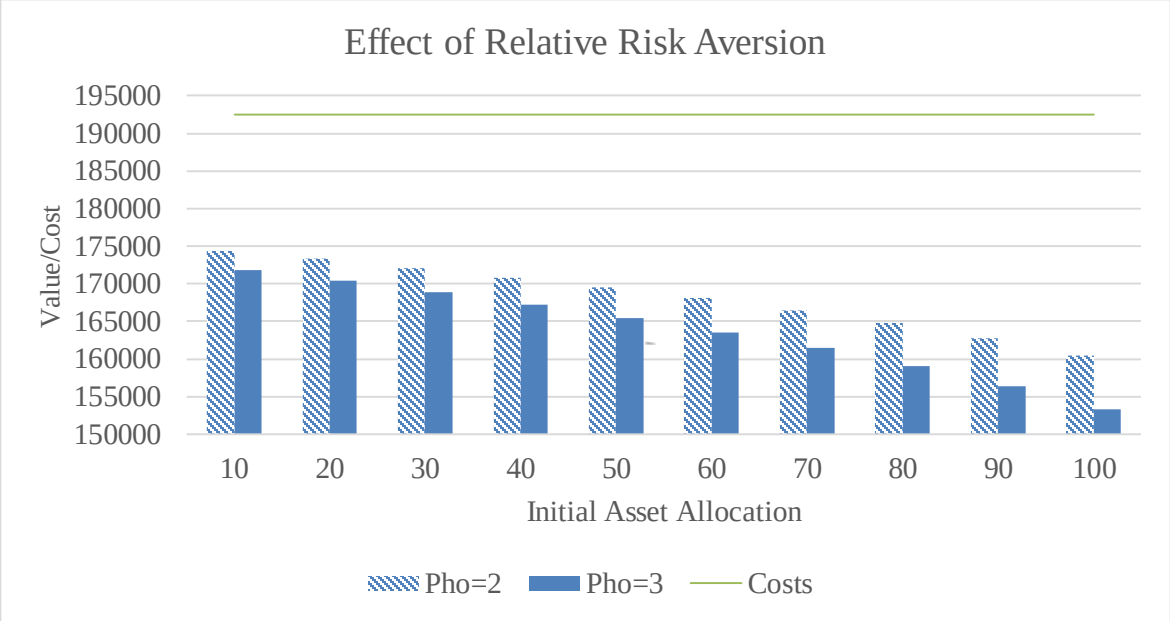


Figure 2.2. Case Study – Effect of Relative Risk Aversion

According to Norfolk Southern Corporation's annual disclosure of executive compensation, its CEO compensation changes greatly each year. For example, the CEO received 4,000 options in 1996, 1,200 options in 1997, and 2,500 options in 1998. In 2002 the options that were granted to the CEO reached to a peak of 6,500. The cash compensation also varies from year to year. In 1995 the total cash compensation paid to the CEO was around $1.5 million. In 1998

the CEO's cash compensation was around $2.5 million. The stock award to the CEO was also quite volatile. In 1994 the CEO received $0.5 million worth of common shares, and in 1997 he received $2.5 million worth of common shares. We want to capture the variation of the CEO's non-option wealth in our analysis. So we let the non-option wealth change from $1 million to $4 million. This range covers the CEO's actual non-option compensation in the 1990s. The results are represented in Figure 2.3 below.

The axis on the left shows the value of the dividend equivalents while the axis on the right shows the cost. The plot shows that there is an interaction effect between the non-option wealth and the initial asset allocation. When the CEO has less than 80% of this non-option wealth invested in firm shares, the higher the non-option wealth the greater the value of the dividend equivalents. When the CEO invests 80% to 90 % of his non-option wealth in firm shares, receiving more or less non-option compensation will not affect his feeling about the dividend equivalents. When he continue to invest more of his non-option wealth in firm shares, the more non-option wealth he has, the smaller value of the dividend equivalents to him.

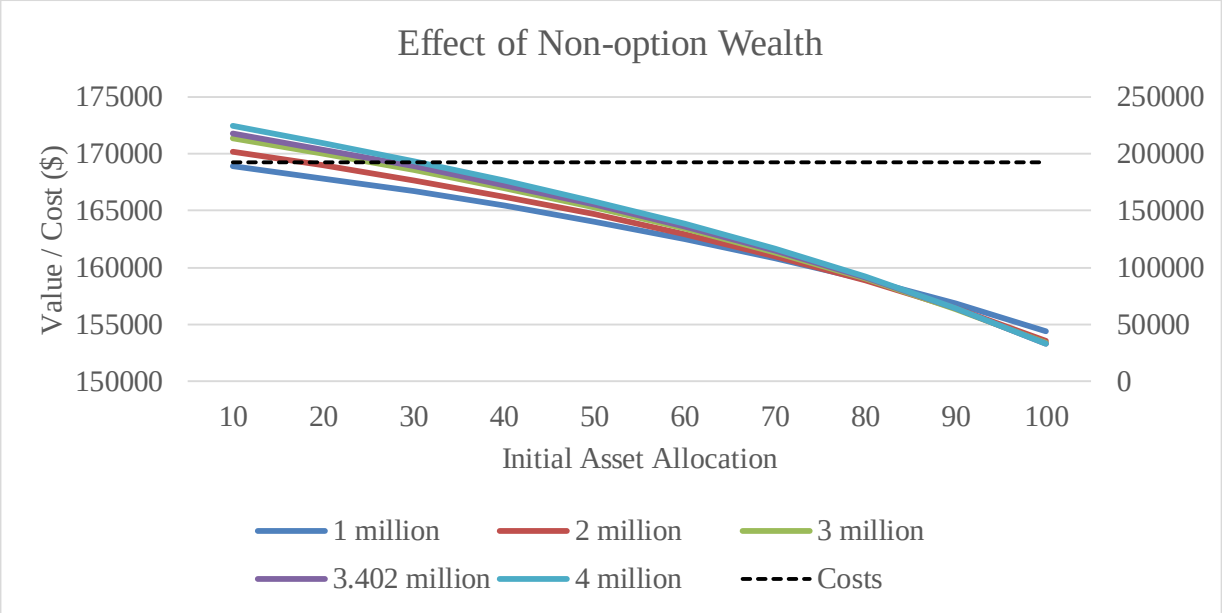


Figure 2.3. Case Study – Effect of Non-option Wealth

The company's dividend payout was volatile. From the 1993 to 2000 the highest annual dividend payout was \$2.24 and the lowest was \$0.80. The average annual dividend payout was \$1.50. We want to show the effect of dividend payout level on the value and the cost of dividend equivalents. We thus allow the quarterly dividend payout to change from \$0.15 to \$0.45, which is a good approximate of the firm's reality. The results are summarized in Table 2.7 and Figure 2.4. The aggregate value of dividend equivalents naturally increases as the dividend per share dividend increases. The subjective value is always lower than the cost of the dividend equivalents. At each level of initial asset allocation, the difference between the value and the cost of dividend equivalents gets larger when the dividend per share gets larger. The value spread between the lowest dividend per share and the highest dividend per share gets narrower as the initial asset allocation gets larger. This pattern can be seen in the plot titled "Effect of Dividend per Share".

Table 2.7. Case Study – Effect of Dividend per Share

Initial asset allocation (%)	Value to the executives (\$)						
	Dividend per Share						
	\$0.15	\$0.20	\$0.25	\$0.30	\$0.35	\$0.40	\$0.45
10	128,877	171,775	214,645	257,489	300,309	343,106	385,881
20	127,817	170,371	212,902	255,411	297,900	340,371	382,823
30	126,682	168,870	211,041	253,195	295,335	337,461	379,575
40	125,458	167,253	209,039	250,815	292,583	334,344	376,098
50	124,127	165,498	206,868	248,238	289,608	330,979	372,351
60	122,668	163,577	204,497	245,427	286,367	327,319	368,281
70	121,054	161,456	201,882	242,333	282,807	323,305	363,824
80	119,248	159,088	198,970	238,894	278,857	318,858	358,897
90	117,202	156,411	195,686	235,023	274,421	313,876	353,387
100	114,874	153,339	191,926	230,605	269,370	308,217	347,143
Cost to the Company (\$)	**144,407**	**192,543**	**240,678**	**288,814**	**336,949**	**385,085**	**433,221**

Notes: This table shows the effect of dividend per share on the subjective value and the cost of dividend equivalents. Assume the options vest in four quarters. The stock price is \$32.1563, the risk-free rate is 0.985% per quarter, the time to expiration is ten years, the stock volatility is 50%, the dividend per share is \$0.15, \$0.20, \$0.25, \$0.30, \$0.35, \$0.40, or \$0.45, the stock beta is 1, the market risk premium is 1.5916%

per quarter, the representative executive's non-option wealth is $3.402 million, the number of options awarded is 250,000, all of which are granted with DERs, the executive's relative risk aversion is 3, and other variables are indicated in the table below. The cost of the DEs is shown in the bottom row.

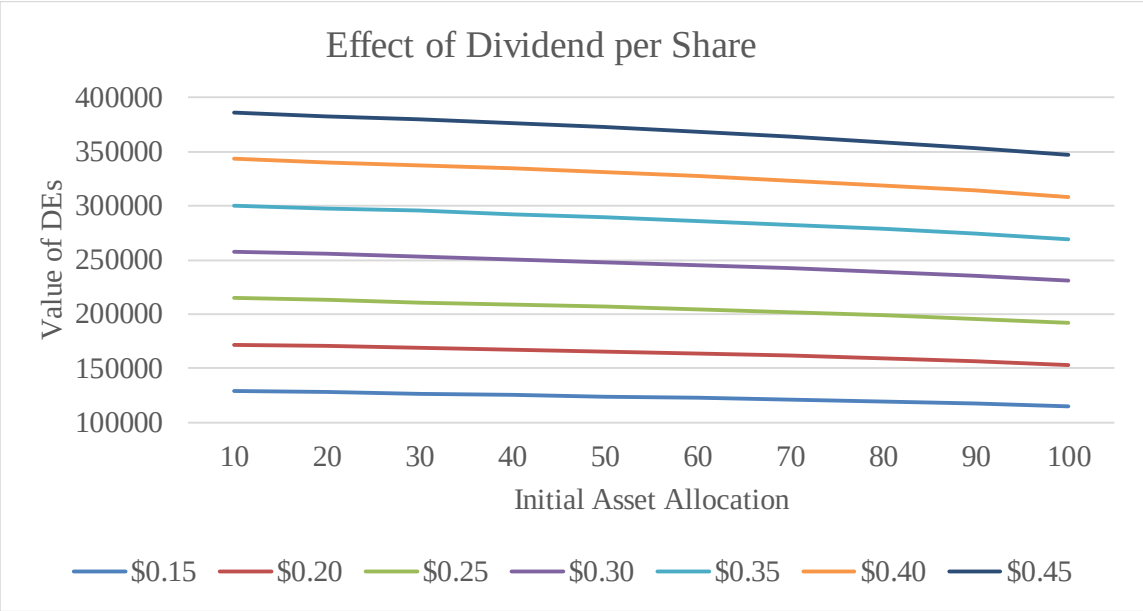


Figure 2.4. Case Study – Effect of Dividend per Share

2.7 Conclusion

In this essay we estimate the subjective value (the value to the executive) and the cost (the cost to the firm) of dividend equivalents paid on an executive's unvested executive stock options. We examine two payment methods of dividend equivalents – cash dividend equivalent payments and firm share dividend equivalent payments. We find that for both of the two payments the subjective value of dividend equivalents is always lower than the cost. The difference between the subjective value and the cost is much larger when dividend equivalents are paid to the executive in the form of firm shares than in the form of cash. The executive's risk aversion has little effect on how he feels about cash dividend equivalents, but will affect how he feels about dividend equivalents. A more risk averse executive tends to value dividend equivalents less. This is more obvious when the executive has a large portion of his non-option wealth invested in firm shares. The executive's non-option wealth also affects his subjective valuation of the dividend equivalents.

Since we assume the size of the executive's option award to be constant, the changes in his non-option wealth will affect the relative size of the executive's option compensation to other types of compensation. When the executive has higher non-option wealth, the option compensation accounts for a smaller portion in his full compensation package. For cash dividend equivalents, smaller non-option wealth is associated with a larger subjective value of dividend equivalents. For stock dividend equivalents, the effect of the executive's non-option wealth is not monotone. When the initial asset allocation percentage is low to medium high, high non-option wealth is associated with a high subjective valuation. When the initial asset allocation percentage is very high, the relation is reversed.

The model in this paper can be modified and applied to the dividend equivalent rights that are granted on performance stocks.[45] DERs granted on performance stocks are becoming more popular among U.S. large firms. A challenge in modifying the model is to account for the achievement of performance goals. The risks assumed in performance stocks as well as in DERs on the performance stocks are strongly affected by the performance goals and how likely those goals can be achieved. The performance goals can consist of a series of accounting objectives and stock return objectives. The variation in the performance goals brings great complexity to the model, and the difficulty to achieve the performance goals is difficult to measure. One way to capture the risks assumed in performance stocks and DERs granted on performance stocks is that we can assume that the performance goals are purely based on stock returns and dividend growth. For example, the performance shares will be earned by the executive if the average annual stock return during the performance period exceeds ten percent, or the cumulated dividend growth rate over the performance period is greater than the industry average. To summarize, the model in this

[45]With proper modification the model can be applied to performance-vested restricted stocks as well, due to the similarity between performance shares and performance-vested restricted stock.

paper can be used to value the dividend equivalents granted on various performance-based compensation instruments albeit with significant modifications.

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APPENDIX A. CLASSIFICATION AND CONCEPTUAL CONTEXT

The most commonly seen underlying shares of DERs are stock units, which are the elements of a grant valued in terms of company stock but in which shares are not issued at the time of the grant. Dividends paid on executives' incentive stock awards are referred to as dividend equivalents, and the right to receive dividend equivalents is referred to as dividend equivalent rights (DERs).

Instruments that can be granted with DERs include executive stock options, restricted stock or units, performance stocks or units, and other equity-based stock awards. Payments can be made in the form of cash, common shares, or incentive shares of equivalent value. The provisions regarding DERs contain details such as the amount of DEs paid, how and when the payments of DEs will be made, and whether the DE payments are subject to certain time-based or performance-based conditions or both.

Our sample of unearned shares includes executives' unvested performance-based restricted stock or units, unearned performance stock or units, shares covered by unexercised executive stock options, and shares covered by stock appreciation rights. Unvested shares include unvested time-based restricted stock or units.

A typical performance stock award has four key elements: the award size, the performance goals, the performance period and the vesting schedule. The award size is the number of shares that can be earned by an executive if certain conditions are met. A small number of firms allow executives to earn more shares than the award size. Performance goals are the criteria to which the performance of an executive is compared. Performance benchmarks typically include stock market measures as well as dividend yield and accounting variables such as total shareholder return, net income, or sales growth. The performance period is the time interval over which an

executive's performance is measured. In most cases, the performance period is three years. During the performance period the underlying shares of the performance stock award are not owned by executives. As such the award is said to be fully risky. At the end of the performance period, the number of shares earned by the executive is determined, issued, and credited to the executive as a shareholder. A vesting period is not a necessity. Some stock awards have one while others do not. Most firms require that stock awards earned by executives vest over a certain period of time. Earned performance shares are similar to restricted stocks. Some firms do not require the share awards to have a vesting period. Once the shares are earned, the holder enjoys full rights as a stockholder. Figure A.1 gives a graphical representation of the performance period and vesting period of performance stock awards. Dividend equivalent payments on performance shares during the performance period are of interest in this study. Dividend equivalents on unearned performance shares can be paid in cash or in additional shares.

Executive stock options are contracts that give the executives the right but not the obligation to buy shares at an agreed-upon price. When the stock options are exercised, the executive receives the shares and all rights as shareholders from then on. Executive stock options sometimes have vesting periods during which certain restrictions may apply. Stock options expire if the executives fail to exercise the options, which will occur if the stock price fails to achieve the exercise price. The shares covered by executive stock options are not owned by the executives before being exercised. Stock options as a means of compensating executives are less common today than ten years ago. Many online resources still define DERs as the dividend rights on the shares covered by executive stock options, showing that the combination of DERs and executive stock options was once common. Restricted stock units and performance stock have greatly reduced the use of stock options. Our sample collected from S&P500 firms shows that around two

percent of firms disclose that they have paid dividends on shares covered by executive stock options. Figure A.2 gives a graphical presentation of dividend equivalent payments made on shares covered by unexercised stock options. Dividend equivalents on options can be paid in cash, shares, or additional stock options.

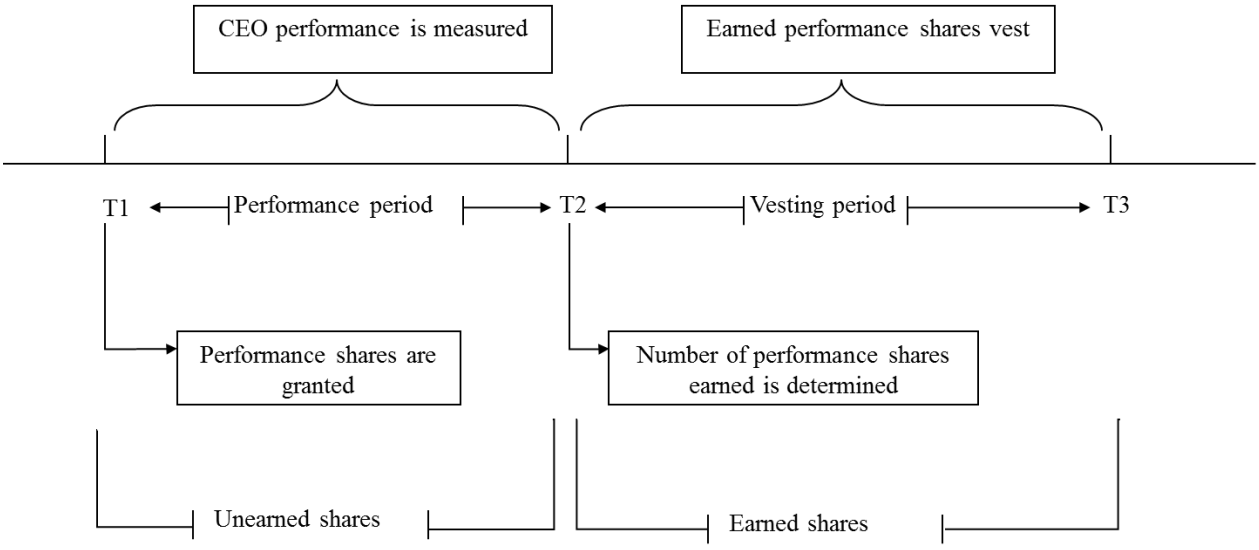

Figure A.1. Example of DERs on Performance Stocks
Notes: DEs paid on the shares during the performance period are classified as "DEs on unearned shares.

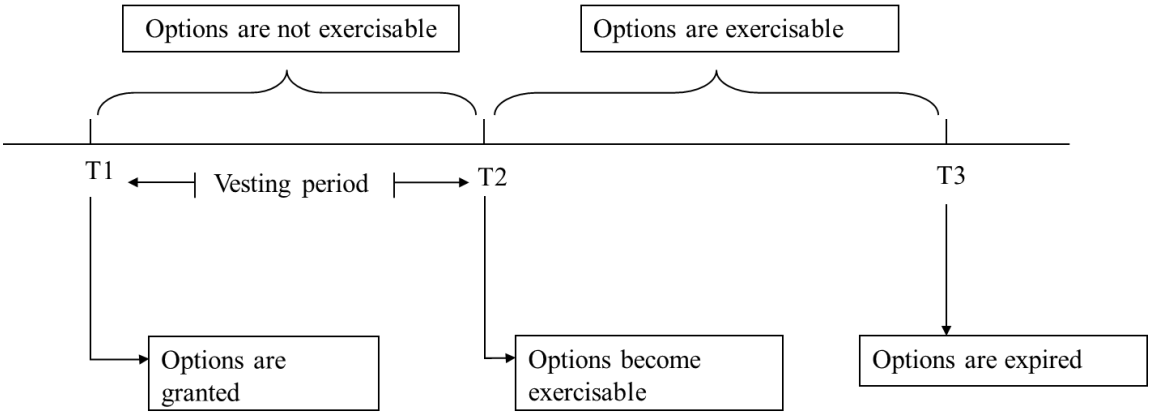

Figure A.2. Example of DERs on Options
Notes: DERs on stock options. DEs paid on the shares covered by stock options prior to the exercise of stock options are classified as "DEs on unearned shares.

Restricted stock is an important alternative to stock options. The most common type of restricted stock is time-vested restricted stock. The vesting condition of restricted stock is that the recipient stays employed by the firm for specified period of time. Restricted stock is not transferable prior to being vested. Time-vested restricted stock is owned by the recipients. A less commonly-seen type is performance-vested restricted stock. It is similar to unearned performance stock in that the vesting conditions include performance goals. For instance, Xcel Energy Inc. requires that the restricted stock units granted after 2004 vest upon satisfaction of criteria including achievement of total shareholder return of 27 percent (XcelEnergy). Shares are subject to forfeiture if the pre-set performance goals are not met. Therefore we consider unvested performance-vested restricted stock as unearned stock. If a firm pays dividends on CEO's unvested performance-vested restricted stocks, we count it is a DER firm and include the observation in the DER sample.

Restricted stock units are frequently referred to as "a sibling of restricted stock". They share some similarities in vesting conditions and vesting periods. There are, however, some differences between restricted stock and restricted stock units. The process of granting, vesting, and delivering of restricted stock units may not actually involve real shares and may be settled in cash. The actual shares vested and delivered to the recipients may depend on how the performance goals are reached. Restricted stock units have become popular in the last 10 years. Restricted stock units can be time-vested or performance-vested. If a firm pays dividends on a CEO's unvested performance-vested restricted stock units, we count it is a DER firm and include it in the DER sample.

APPENDIX B. DESCRIPTIONS OF VARIBLES

Variable	Definition
DER_POLICY	Categorical variable. =1 if the firm allows DE payments on CEOs' unearned shares in year t; =0 otherwise
DER_PAYMENT	Categorical variable. =1 if the firm makes DE payments on CEOs' unearned shares in year t; =0 otherwise
Payout measures:	
DIV/ASSETS	Total annual common dividends over total book value of assets
DIV/OPERATING INCOME	DIV/OIBDP where OIBDP is operating income before depreciation
DIV/EBIT	DIV/EBIT where EBIT is earnings before interests and taxes
DIV/NI	DIV/NI where NI is net income
Dividend yield	DIV/stock price at fiscal year end
Repurchase payout ratio	Annual expenditure on the purchase of common and preferred stocks / Total Assets
DIVDUM	Categorical variable = 1 if annual common dividend > 0; = 0 otherwise
Accounting variables:	
A	Total book value of assets in year t
MEDecile	NYSE decile of market value of equity, which equals stock price times common shares outstanding
V/A	Market value of the firm / Total Assets Market value of the firm = Total Assets – Book Equity + Market Equity; Book Equity = Stockholder's Equity – Preferred Stock + Balance Sheet Deferred Taxes and Investment Tax Credit – Post Retirement Assets
dA/A	Growth rate of firm assets in year t. dA in year t = Total assets in year t – Total Asset in year t-1; dA/A=(Total assets in year t – Total Asset in year t-1)/Total assets in year t
E/A	Earnings Before Interest/Total Asset. Earnings Before Interest = Earnings Before Extraordinary Items + Interest Expense + Deferred Income Taxes (income)
FCF/A	Free Cash Flow/Total Asset Free Cash Flow = Operating Income Before Depreciation – Capital Expenditures
ROA	Return on Assets. =Net income / Total Asset
LEV	Leverage. = (Long Term Debt – Cash Holding)/Total Asset
Market-to-book Ratio	=ME/BE. BE is Book Equity, as defined by Professor Kenneth French: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/variable_definitions.html
Corporate governance measures:	
E-index	Bebchuk Entrenchment Index
Interlock	= 1 if CEO is also on the compensation committee; = 0 otherwise

Dualrole	= 1 if CEO is also the board chair; = 0 otherwise
Board size	Number of directors on board
CEO characteristics and compensation:	
CEO age	Age of the CEO
Tenure	Number of years the person serves as CEO
New CEO	= 1 if it is within the person's first 18 months of being CEO; = 0 otherwise
Totcomp	Total compensation. = salary + bonus + restricted stock awards
Cashcomp	Cash compensation. = salary + bonus
Risk factors:	
MKT	Market excess return. Market portfolio return – risk free rate
HML	High-minus-low. From Fama&French three-factor model
SMB	Small-minus-big. From Fama&French three-factor model
Others:	
SP500_93	Dummy variable. =1 if the firm is a SP500 firm in 1993; =0 otherwise

VITA

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