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ANTICIPATED INCENTIVES IN CEO COMPENSATION CONTRACTS: ESTIMATION AND APPLICATION

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ABSTRACT

Extant empirical research has largely overlooked the incentives that arise when CEOs can reasonably anticipate future awards and liquidations of equity-based compensation. In this study, I use past patterns of stock and option awards, exercises, and sales to estimate future awards, exercises, and sales, which I argue are anticipated by the CEO and act as an important incentive. The anticipated incentives I estimate are large in magnitude and provide information that is incremental to the CEO's existing portfolio of equity incentives disclosed in the annual proxy statement. In empirical analyses, I find that anticipated incentives are negatively (positively) associated with proxies for real (accruals-based) earnings management even in the presence of existing measures of CEO incentives. My findings suggest that the *ex ante* measure of anticipated incentives introduced in this study captures a new source of information that is decision-relevant for CEOs but currently omitted from existing empirical proxies.

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SECTION 1:
INTRODUCTION

> *… [an agent's] reward structure observed at any point in time may be affected substantially by incentive concerns from earlier (or later) time periods. Therefore, the possibility of overlapping incentive problems merits careful consideration when designing and interpreting empirical investigations of agency relationships.*
>
> Demski and Sappington (1999, p. 33)

A significant and fundamental concern—expressed by theorists and empiricists alike—is that the equity incentives driving CEOs' choices have heretofore been mismeasured in archival research. Essentially, existing measures omit changes to a CEO's portfolio of stock and option holdings that a CEO would reasonably anticipate, such an award of new options or a stock sale likely to occur several months in the future. Such changes in holdings imply changes in the CEO's compensation delta (i.e., the sensitivity of personal wealth to a change in the firm's stock price). Core, Guay, and Verrecchia (2003, p. 962), for example, acknowledge that "[o]ur incentive measure is incomplete in that it does not include changes in the present value of the CEO's future pay." If future compensation awards and liquidations are anticipated in the current period and influence behavior, researchers who omit these considerations may fail to find a meaningful relationship between incentives and CEO actions. Therefore, it is important for empirical researchers to understand how anticipated incentives affect CEO decision-making.

In this study, I extrapolate from past patterns of stock and option awards, exercises, and sales to estimate anticipated awards, exercises, and sales. My extrapolation method, which is based on past transactions initiated by corporations and CEOs, yields a measure of anticipated incentives (estimated *ex ante*) that (i) varies across CEOs, (ii) is economically large, and (iii) is sometimes positive and sometimes negative. Additionally, I provide evidence that anticipated incentives are

significantly associated with certain CEO decisions in the presence of existing, widely-used proxies for delta. These findings suggests that anticipated incentives matter to CEOs' decision-making and can be quantified.

My approach to estimating incentives is motivated by literature that calls upon empirical researchers to consider the incentive effects of multi-period compensation contracts (e.g., Demski and Sappington 1999). To empirically quantify incentives, extant research relies mainly on characteristics of compensation contracts reported in firms' annual proxy statements.[1] However, these data represent only the features of a CEO's compensation contract that are mandated by SEC disclosure policy. Analyses based on disclosed data capture the CEO's *existing* incentives but overlook the *anticipated* incentives that arise due to the dependence between past, current, and future compensation contracts. To capture this dynamic relationship, I estimate how incentives from the CEO's existing equity holdings may change over the upcoming fiscal year.[2] Specifically, I develop a Monte Carlo simulation that (i) estimates future stock prices; (ii) predicts the likelihood, timing, and characteristics of future awards and liquidations; and (iii) adjusts the CEO's existing equity holdings to incorporate the effect of anticipated awards and liquidations.

I apply my measure to examine the relation between CEOs' anticipated incentives and two areas of earnings management: (i) real earnings management and (ii) accruals-based earnings management. There is a robust theoretical literature that examines the relation between

[1] This approach is most often used due to data limitations and collection costs. However, I create a dataset that contains substantially more information about the CEO's portfolio of stock and option holdings than is available in commercial databases or firms' annual proxy statements alone. This new dataset is constructed from quantitative and qualitative disclosures in CEOs' Form 3, 4, and 5 filings obtained from the SEC's EDGAR database. These filings contain transaction-level detail that is not available in firms' annual proxy statements, and I exploit the granularity of this information to construct estimates of anticipated incentives.

[2] I estimate anticipated incentives over a one-year horizon; however, the procedure can be modified to consider a different horizon (e.g., three years).

discretionary investment and accounting decisions—which are often cast as "myopic" or "opportunistic"—and incentive characteristics of CEOs' compensation contracts (Stein 1989; Bizjak et al. 1993). Empirically, researchers have studied these decisions by examining the link between equity incentives and period-to-period changes in R&D expenditures (Dechow and Sloan 1991; Cheng 2004; Edmans et al. 2016) and various accrual-based measures (DeAngelo 1986; Cheng and Warfield 2005; Bergstresser and Philippon 2006; Armstrong et al. 2013). However, results from these analyses are mixed. Each of these studies uses a different measure of incentives to investigate their research questions, and none of the measures capture incentives from both existing and anticipated sources.

I find that anticipated incentives are significantly negatively associated with year-to-year growth in measures of real earnings management. A one standard deviation increase in anticipated incentives is associated with a -0.46% (-1.29%) decline in year-to-year growth in R&D expenditures (aggregate discretionary expenditures). These results suggest that CEOs who anticipate an increase in sensitivity to the firm's stock price over the upcoming fiscal year reduce R&D and other investments, which is consistent with the notion that incentives from equity-based compensation exacerbate the conflicts of interest between shareholders and the CEO. Interestingly, I find that when both existing and anticipated incentives are jointly considered, *only* anticipated incentives are statistically associated with the measures of real earnings management. This result suggests that the incentives which are expected to arise over the same horizon as the action being examined are most important for explaining CEO behavior.

This study's contribution is two-fold. First, by developing a proxy for anticipated incentives, this study makes progress toward measuring CEO incentives in a manner that is more representative of the underlying theoretical construct. It is critically important to understand CEO

incentives because researchers attribute a majority of the actions taken by a firm to its CEO, and the efficient allocation of resources in our economy depends in large part on the choices made by these individuals. Indeed, in 2010, the Federal Reserve and three other agencies jointly issued guidance which argued that "[i]ncentive compensation practices in the financial industry were one of many factors contributing to the financial crisis that began in mid-2007."[3] The Federal Reserve's guidance characterizes incentive compensation as "current *or potential* compensation" (emphasis added), which underscores the importance of considering anticipated incentives. Importantly, this study introduces an innovative measure that can help researchers, regulators, and investors better understand the many sources and consequences of CEO incentives. Second, the measure of anticipated incentives I develop is both economically and statistically significant for explaining CEO behavior in empirical analyses. Moreover, anticipated incentives are associated with certain CEO decisions even in the presence of existing, widely-used proxies for delta. Taken together, my results suggest that the *ex ante* measure of anticipated incentives introduced in this study captures a new source of information that is decision-relevant for CEOs but currently omitted from existing empirical proxies.

The remainder of this study is organized as follows. Section 2 motivates this study and reviews related literature. Section 3 describes the procedure for estimating anticipated incentives examines the estimation results. Section 4 discusses the results from an empirical application of my measure. Finally, Section 5 concludes the study and discusses the future direction of this study.

[3] Board of Governors of the Federal Reserve System, Office of the Comptroller of the Currency, Federal Deposit Insurance Corporation (FDIC), and Office of Thrift Supervision. 2010, June 25. Guidance on Sound Incentive Compensation Policies. *Federal Register* 75 (122): 36,395–36,414.

SECTION 2:
MOTIVATION AND RELATED LITERATURE

There is a vast literature in accounting, finance, and economics that examines how the incentive characteristics of compensation contracts affect managers' behavior. Many studies of managerial compensation in the accounting literature are deeply rooted in economic agency theory, which is premised upon the conflicts of interest between shareholders and managers that arise due to the separation of ownership and control. Berle and Means (1932) argue that shareholders can reduce the agency costs of contracting by linking an executive's personal wealth to firm value, and Jensen and Meckling (1976) show that shareholders can accomplish this task by supplementing traditional cash pay (e.g., salary and annual bonus) with compensation that derives its value from the firm's stock price. In practice, the board of directors negotiates a compensation contract for the executive that motivates him to maximize shareholder value and typically includes an array of financial incentives that extend over multiple periods.

Theoretical literature has analyzed the incentive effects of dynamic compensation contracts for decades. Lazear (1979) demonstrates that employees are concerned about the present value of all future compensation, and he shows that employees make effort decisions by considering how current action will affect future rents. Gibbons and Murphy (1992) show that a manager's optimal level of effort depends on the current incentive contract's performance sensitivity and the performance sensitivity of all future incentive contracts. Şabac (2008) explores multi-period compensation arrangements and the effect of managerial effort that influences outcomes in both current and future periods, and he outlines why incentive measures used in current empirical studies are problematic. Şabac concludes that proxies that incorporate current and future compensation are better estimates of incentives than measures which only incorporate current compensation.

A common thread that ties these studies together is the use of multi-period compensation contracts. Principal-agent models such as these demonstrate that the CEO (i.e., the agent) will make decisions by maximizing the present value of his *expected* compensation (i.e., utility) over the term of the contract. However, despite decades of theoretical literature that has stressed its importance, empirical research has largely overlooked the effect of incentives that arise when managers anticipate future compensation. The goal of this study is to overcome this limitation in prior literature by measuring CEO incentives in a manner that is more representative of the underlying theoretical construct.

SECTION 3:
SIMULATION PROCEDURE

In this Section, I describe the aspects of the procedure used to estimate anticipated incentives.[4] Although I am principally interested in measuring and examining anticipated incentives, theory predicts that incentives from both existing and anticipated sources will inform CEO decision-making. Therefore, I detail the calculation of both incentive measures. I measure incentives as the CEO's delta, which is the sensitivity of personal wealth to a 1% change in the firm's stock price. Consistent with extant literature, I estimate delta at the portfolio level following Black and Scholes (1973) as modified by Merton (1973). For brevity, I refer to existing incentives as $\delta Existing$ and anticipated incentives as $\delta Anticipated$ throughout the remainder of this study.

The simulation in this study is inspired by the methods introduced by Shevlin (1990) and further developed by Graham (1996a, 1996b). These authors use a simulation analysis to estimate firms' marginal tax rates by (i) forecasting a stream of future taxable income, (ii) adding a dollar of additional income and calculating taxes due over that horizon, and (iii) discounting the tax bill to the current period. In this study, I measure anticipated incentives by (i) estimating future stock prices; (ii) predicting the likelihood, timing, and characteristics of future awards and liquidations; and (iii) adjusting the CEO's existing holdings to incorporate the effect of anticipated awards and liquidations.

[4] The simulation is coded and run using Python 2.7 and SAS 9.3 on a Windows 7 Professional operating system.

FIGURE 1:
SUMMARY OF ESTIMATION PROCEDURE

This figure summarizes the procedure I follow to estimate anticipated incentives.

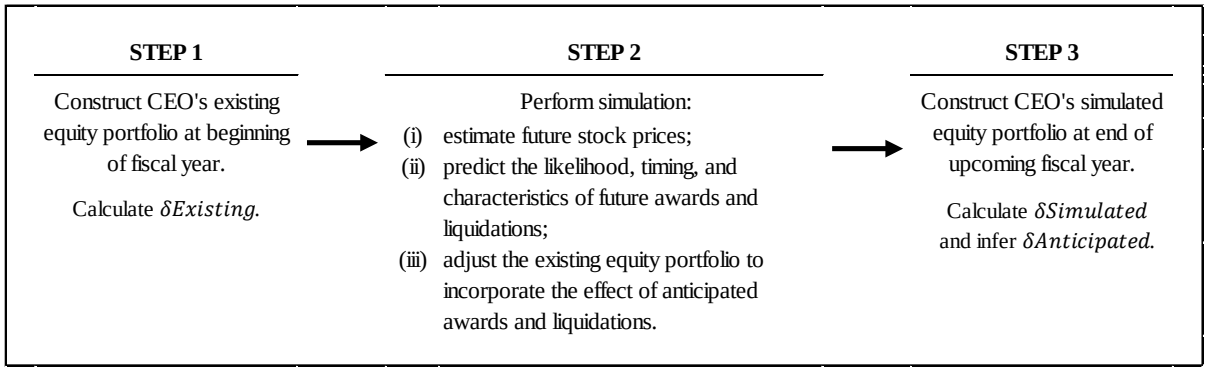


Figure 1 summarizes the estimation procedure. I explicitly calculate $\delta Existing$ in Step 1 using the CEO's existing equity portfolio at the beginning of the fiscal year. The simulation analysis is performed in Step 2. A single iteration of the simulation produces a CEO's equity portfolio adjusted for anticipated awards and liquidations over the upcoming fiscal year. In Step 3, I calculate the delta of the simulated portfolio, which I refer to as $\delta Simulated$, and I infer $\delta Anticipated$ as follows:

$$\delta Anticipated = \delta Simulated - \delta Existing \quad (1)$$

Therefore, $\delta Anticipated$ represents the estimated change in a CEO's existing incentives ($\delta Existing$) due to anticipated awards and liquidations over the upcoming fiscal year. I perform Steps 2 and 3 of the estimation procedure 200 times for each CEO-year. I aggregate the 200 iterations by (i) calculating $\delta Anticipated$ for each iteration; (ii) probability weighting $\delta Anticipated$ and calculating a weighted average; and (iii) discounting weighted average $\delta Anticipated$ to the beginning of the fiscal year so that it is comparable with $\delta Existing$.

The following sub-sections provide more information about how the estimation procedure is operationalized.

3.1: Existing Incentives

The CEO's existing equity portfolio at the beginning of the year can include any combination of the following elements: vested shares of stock, unvested shares of stock, exercisable stock options, and unexercisable stock options. The composition of the CEO's existing portfolio is disclosed in the firm's annual proxy statement, which is typically filed with the SEC 2-3 months following the end of the fiscal year.

3.2: Simulation Analysis

3.2.1: Future Stock Prices

Incentives derived from a CEO's stock and option holdings are a function of the composition of the equity portfolio and characteristics of the firm's stock price. Therefore, estimates of future stock prices are necessary to estimate anticipated awards, exercises, and sales over the upcoming fiscal year, and a probability distribution over the firm's future stock prices is required. Future stock prices paths and their probability weights are computed following the binomial tree method outlined in Cox, Ross, and Rubinstein (1979). Stock price paths are estimated over one-year horizons and divided into twelve steps. Accordingly, each path is a vector of twelve stock prices that can be thought of as month-end stock prices over a one-year horizon. Figure 2 contains a timeline for computing future stock price paths.

FIGURE 2:
TIMELINE FOR ESTIMATING FUTURE STOCK PRICE PATHS

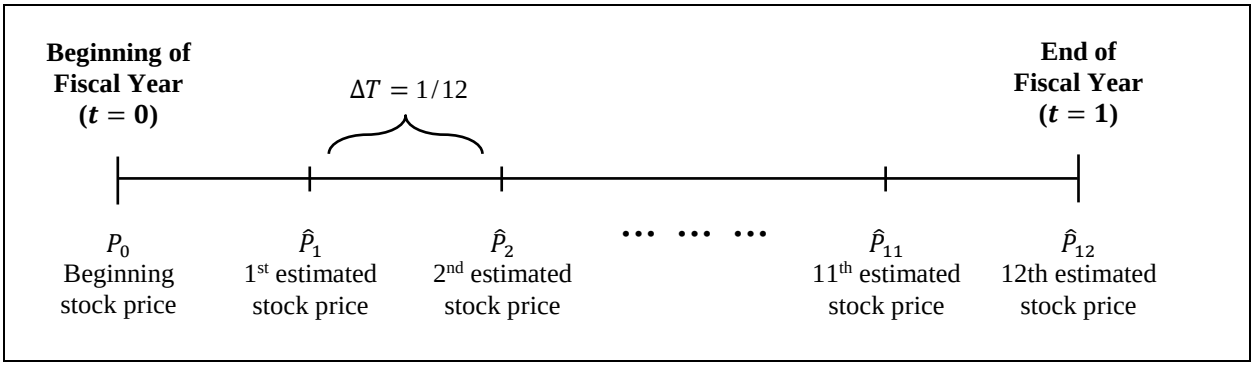
This figure displays the timeline for generating future stock price paths for each iteration of the simulation. Future stock prices paths and their probability weights are computed following the binomial tree method outlined in Cox, Ross, and Rubinstein (1979). Stock price paths are simulated over one-year horizons ($T = 1$) and are divided into twelve steps. Accordingly, each path is a vector of twelve stock prices that can be thought of as month-end stock prices over a one-year horizon. Future stock prices are simulated by estimating the probability that a firm's stock price will increase (p) at each step and the amount that the stock price will move up or down (u or d, respectively).

$$p = \frac{e^{r\Delta T} - d}{u - d}$$

$$u = e^{\sigma\sqrt{\Delta T}}$$

$$d = \frac{1}{u}$$

It is necessary to make assumptions about the risk-free rate (r) and expected stock price volatility (σ) to construct these parameters. I assume that the risk-free rate is equal to a one-year Treasury Constant Maturity Yield, and I estimate expected stock price volatility as the firm's annualized standard deviation of monthly stock returns over the 36 months immediately preceding the beginning of the fiscal year.



A full, 12-step binomial tree includes 2^{12} stock price paths; however, I randomly generate 200 stock price paths from the full tree for each CEO-year and limit my analysis to these paths. After completing the 200 iterations for a CEO-year, I use the probability weights associated with each stock price path to calculate a weighted average measure of anticipated incentives.

3.2.2: Future Awards and Liquidations

I simulate changes to the CEO's existing equity portfolio by using the past pattern of equity compensation awards and liquidations to estimate future awards and liquidations. Specifically, I predict awards of restricted stock and/or options, exercises of options, and open-market sales of stock; I refer to these as *events*. At each step of the stock price path, I construct state-contingent

explanatory variables and estimate the probability that each event will occur using the estimation results from a pooled logistic regression. I estimate logistic regressions for each event independently; however, the regression models contain explanatory variables that capture information about other events (e.g., I predict option awards as a function of how long ago the CEO last exercised a portion of his portfolio).

I estimate the probability that an award will occur using the following logistic model. The unit of analysis for this model is a CEO-month. Therefore, this model estimates the probability of an award during a given month of the fiscal year.

$$\Pr[(award = 1)] = \beta_0 + \beta_1 freq + \beta_2 fmonth + \beta_3 tsa + \beta_4 tse_{award} + \beta_5 age + \beta_6 tenure + \beta_7 retx12 + \varepsilon \quad (2)$$

The dependent variable is 1 if an award is made during the month and 0 otherwise. All explanatory variables are measured at the beginning of the month. $freq$ is a count of the frequency of awards made during the same month over the last three years, and $fmonth$ is the fiscal month. These two variables are meant to capture awards that occur on a fairly routine schedule. tsa is the time (in months) since the last award made to the CEO, and tse_{award} is the time (in months) since the last time the CEO exercised stock options. age and $tenure$ capture the CEO's age and how long they have been employed as CEO, respectively. Finally, $retx12$ is the firm's stock return over the preceding 12-month period. Because I am concerned with the predictive ability of the model rather than the statistical significance of any given explanatory variable, I do not adjust the standard errors for any data clustering.

I estimate the probability that an option exercise will occur using the following model. The unit of analysis for this model is a CEO-month-tranche. Therefore, this model estimates the probability of an option exercise for a particular tranche of stock options at a given time.

$$\Pr[(exercise = 1)] = \beta_0 + \beta_1 itm + \beta_2 prop\_vested + \beta_3 price\_strike + \beta_4 fmonth + \beta_5 ttm + \beta_6 ttv + \beta_7 tse_{exer} + \beta_8 tsx + \beta_9 age + \beta_{10} tenure + \beta_{11} max12 + \beta_{12} retx12 + \beta_{13} prop\_remain + \beta_{14} size + \varepsilon \quad (3)$$

The dependent variable is 1 if an exercise is made during the month and 0 otherwise. All explanatory variables are measured at the beginning of the month. itm is an indicator for whether the stock options are in-the-money, and $prop\_vested$ is the proportion of the remaining options that are vested. These variables capture the options' availability and suitability for exercise. Only vested (i.e., exercisable) stock options are available for exercise, and a rational CEO will only exercise stock options which are in-the-money. $price\_strike$ is a ratio of the firm's stock price divided by the option's exercise price. Bettis et al. (2005) document that employee stock options are often exercised once the options reach a certain level of "moneyness." $fmonth$ is the fiscal month and is included to capture liquidations that occur on a fairly routine schedule. ttm is the options' time till maturity, ttv is the time until the next vesting date, tse_{exer} is the time since the options were exercised, and tsx is the time since the options last vested. The preceding four variables, which are all measured in months, capture the timing of events that previously occurred or are scheduled to occur in the future. Fu and Ligon (2010) find that executives frequently exercise stock options on or very soon following vesting dates. I intend for the explanatory variables to tie the CEO's current decisions to past outcomes (e.g., the time since an exercise was made) and future expectations (e.g., the time until additional options become exercisable). age and $tenure$ capture the CEO's age and how long they have been employed as CEO, respectively. $retx12$ and $max12$ represents the firm's stock return over the preceding 12-month period and whether the current price is at a 12-month high. Heath et al. (1999) find that employees are more likely to exercise stock options when the stock price has reached a 1-year high. $prop\_remain$ represents the

proportion of the original award that still remains, and $size$ represents how large the given tranche of options is relative to the entire portfolio.

3.2.3: Adjusting Existing Portfolios

I incorporate the effect of anticipated awards and liquidations at each step of the stock price path. For event e at step s of the stock price path, the simulation determines the state-contingent probability that event e will occur ($\hat{p}_{es}$) and simultaneously draws a uniformly distributed random number $\tilde{n} \in [0, 1]$. If the realized draw is less than or equal to the calculated probability (i.e., $n \leq \hat{p}_{es}$), I assume that the event will occur. Otherwise, I assume that the event does not occur.

It is crucial that the portfolio is updated for each anticipated event at the predicted time because the value and incentive properties of the CEO's equity portfolio are path dependent (i.e., they depend on the path followed by the stock price and past decisions made). For example, consider a predicted award of stock options. Because stock options are typically granted at-the-money (i.e., with exercise prices equal to the stock price on the grant date), the incentives associated with this group of stock options will be determined by the simulated stock price at the time of the predicted grant. Therefore, this group of new options must be added to the equity portfolio and retain the state-contingent properties that were estimated at the predicted time of the award.

3.2.4: Anticipated Incentives

As outlined in Eq. (1), I infer $\delta Anticipated$ by comparing incentives from the CEO's existing portfolio to incentives from a simulated portfolio that incorporates the effect of anticipated awards and liquidations. Therefore, $\delta Anticipated$—the main variable of interest in this study—represents the estimated change in a CEO's existing incentives ($\delta Existing$) due to anticipated awards and liquidations over the upcoming fiscal year.

3.3: Estimation Results

3.3.1: Data Sources

The data for this study are obtained from commercial databases and supplemented with information obtained from the SEC's Electronic Data Gathering, Analysis, and Retrieval System (EDGAR) database. Financial accounting and firm fundamental data are from Compustat; stock market data are from The Center for Research in Security Prices (CRSP); and compensation data are from Execucomp.

Execucomp contains information collected from the annual proxy statements of S&P 1,500 firms beginning in 1992. These data include detailed information about the number and value of equity securities awarded to the five highest-paid executives during a fiscal period and summary information about the value of shares that vested and stock options that were exercised during the period. Additionally, the data includes the number of equity securities held by these executives at the end of the fiscal period.

The design of the simulation procedure to estimate anticipated incentives requires portfolio-specific information that is far more granular than the data disclosed in the annual proxy statement (and thus contained in Execucomp). For example, data about CEOs' stock option exercises is aggregated in the proxy statement so that only the total number of options exercised and the total dollar value received upon exercise are disclosed each year. However, the predictive model I use to forecast anticipated stock option exercises incorporates time-specific variables such as the number of months that have passed since options in a given tranche were last exercised.

For this reason, I download, filter, and compile data from CEOs' Form 3, 4, and 5 filings obtained from the SEC's EDGAR database. Certain insiders (including CEOs) of firms with equity securities registered under the Securities Exchange Act of 1934 must disclose their equity

holdings—and changes in these holdings—to the SEC.[5] The information disclosed in these filings includes data regarding the timing of equity awards, purchases, sales, and other transactions; the number of securities affected; and other characteristics of the transaction (e.g., the strike price, vesting periods, and expiration date of stock option awards). These filings provide a more comprehensive view of transactions that occur throughout a fiscal period, which is then aggregated and presented in the proxy statement. The Form 3, 4, and 5 filings allows me to incorporate substantial detail about CEOs' portfolios that I would otherwise not be able to consider if relying on commercial databases.[6]

Perhaps the biggest benefit from using data obtained from EDGAR filings in this analysis is the ability to construct CEOs' equity portfolios over a far longer time-series than if I relied only on data disclosed in annual proxy statements. This occurs because information about CEOs' equity portfolios reported in annual proxy statements was aggregated prior to 2006.[7] For fiscal years after 2006, firms are required to disclose the composition of executives' option portfolios at a tranche-level. However, I can construct tranche-level portfolios for executives back as far as 1992, which potentially adds 14 years of data to my analysis.

[5] An executive's initial ownership is disclosed on Form 3, and changes in ownership are reported on Forms 4 and 5. Form 4 must be filed within two business days following a change in ownership unless the transaction is immaterial or exempt in which case it must be reported on Form 5 within 45 days of the firm's fiscal year-end.

[6] As a validation control, I compare properties of the equity portfolios I construct from EDGAR filings to the aggregate data in Execucomp. When differences exist, I research the discrepancies and make adjustments to the raw data as necessary.

[7] In these filings, only the total number of vested/unvested shares and exercisable/unexercisable stock options was disclosed.

FIGURE 3:
DISCLOSED AND CONSTRUCTED PORTFOLIO EXAMPLES

These figures example of the data used in the estimation of anticipated incentives for E. V. Goings, CEO of Tupperware Corporation, in fiscal year 2002. Panel A displays Mr. Goings' existing equity portfolio at December 31, 2002, as disclosed in Tupperware's annual proxy statement. Panel B displays Mr. Goings' existing equity portfolio assembled using data from his Form 3, 4, and 5 filings. Panel C displays Mr. Goings' simulated equity portfolio after incorporating the effect of anticipated awards and liquidations.

Panel A: Disclosed Portfolio at December 31, 2002

Aggregate Option Exercises in Last Fiscal Year and Fiscal Year-End Option Values

Name	Shares Acquired on Exercise (#)[1]	Value Realized ($)[2]	Number of Securities Underlying Unexercised Options at FY-End (#)		Value of Unexercised In-The-Money Options at FY-End ($)(2)	
			Exercisable	Unexercisable	Exercisable	Unexercisable
E. V. Goings	135,207	1,324,447.21	550,377	970,800	0	0
R. Glenn Drake	0	0	29,746	223,300	0	0
Richard W. Heath	10,800	74,304.00	54,000	122,500	94,500	0
Thomas M. Roehlk	5,950	46,552.10	95,474	138,600	0	0
Christian E. Skröder	0	0	235,693	252,500	0	0

(1) Upon the exercise of an option, the optionee must pay the exercise price in cash or stock.

(2) Represents the difference between the fair market value of the common stock underlying the option and the exercise price at exercise, or fiscal year-end, respectively.

Panel B: Constructed Existing Portfolio at January 1, 2003

Constructed (Existing) Portfolio for
GOINGS EVERETT V (CIK# 0001049153)
TUPPERWARE BRANDS CORP
At January 1, 2003

Tranche	Grant Date	Exercise Price	Expiration Date	Number of Securities Underlying Options (#)			Delta ($)
				Exercisable	Unexercisable	Total	δ*Existing*
1	11/02/93	28.57	11/01/03	22,988	0	22,988	58
2	10/31/94	33.02	10/30/04	23,325	0	23,325	189
3	10/30/95	34.28	10/29/05	19,064	0	19,064	320
4	05/19/96	42.25	05/18/06	82,000	0	82,000	949
5	11/11/97	24.25	11/10/07	103,000	0	103,000	6,707
6	11/12/98	19.20	11/11/08	150,000	50,000	200,000	18,344
7	11/11/99	18.75	11/10/09	150,000	0	150,000	14,664
8	10/26/00	15.94	10/25/10	0	382,600	382,600	42,614
9	11/14/00	18.56	11/13/10	0	191,000	191,000	19,483
10	09/25/01	20.65	09/24/11	0	175,100	175,100	17,176
11	11/06/02	16.23	11/05/12	0	172,100	172,100	19,780
				550,377	**970,800**	**1,521,177**	**140,284**

Panel C: Simulated Portfolio at December 31, 2003

Constructed (Simulated) Portfolio for
GOINGS EVERETT V (CIK# 0001049153)
TUPPERWARE BRANDS CORP
At December 31, 2003

Tranche	Grant Date	Exercise Price	Expiration Date	Number of Securities Underlying Options (#)			Delta ($)	
				Exercisable	Unexercisable	Total	$\delta Simulated$	$\delta Anticipated$[a]
1	11/02/93	28.57	11/01/03	0	0	0	0	-58
2	10/31/94	33.02	10/30/04	23,222	0	23,222	210	21
3	10/30/95	34.28	10/29/05	19,064	0	19,064	366	46
4	05/19/96	42.25	05/18/06	82,000	0	82,000	1,086	137
5	11/11/97	24.25	11/10/07	103,000	0	103,000	7,089	382
6	11/12/98	19.20	11/11/08	199,286	0	199,286	18,978	634
7	11/11/99	18.75	11/10/09	148,626	0	148,626	14,884	220
8	10/26/00	15.94	10/25/10	0	382,600	382,600	43,950	1,336
9	11/14/00	18.56	11/13/10	191,000	0	191,000	20,153	670
10	09/25/01	20.65	09/24/11	0	175,100	175,100	17,776	600
11	11/06/02	16.23	11/05/12	57,367	114,733	172,100	20,359	579
12[b]	11/15/03	15.85	11/15/13	0	181,550	181,550	21,967	21,967
				823,565	**853,983**	**1,677,548**	**166,818**	**26,534**

(a) $\delta Anticipated = \delta Simulated - \delta Existing$

(b) Represents a new tranche of options from awards that are anticipated during the upcoming fiscal year.

Figure 3 provides an example of the data used in the estimation of anticipated incentives for E. V. Goings, CEO of Tupperware Corporation, in fiscal year 2002. Panel A displays Mr. Goings' existing equity portfolio at December 31, 2002, as disclosed in Tupperware's annual proxy statement.[8] Prior to December 15, 2006, firms were only required to disclose the aggregate number and value of exercisable and unexercisable stock options for its five highest-paid executives; Mr. Goings' holdings are highlighted in the red box. Panel B displays Mr. Goings' existing equity portfolio assembled using data from his Form 3, 4, and 5 filings. These data allow me to construct a portfolio that contains detailed information about each tranche of stock options (e.g., exercise prices, expiration dates, vesting dates, past exercise activity, etc.) that is not disclosed in the annual proxy statement. Panel C displays Mr. Goings' simulated equity portfolio after incorporating the

[8] Tupperware Corporation. 2003, March 26. *Form DEF 14A*. Retrieved from SEC EDGAR website: https://www.sec.gov/Archives/edgar/data/1008654/000104746903010264/0001047469-03-010264-index.htm.

effect of anticipated awards and liquidations. This portfolio is a weighted average of 200 iterations of the estimation procedure. I use information from Panel B ($\delta Existing$) and Panel C ($\delta Simulated$) to infer Mr. Goings' anticipated incentives ($\delta Anticipated$).

3.3.2: Sample

My initial sample consists of US firms that are simultaneously covered by Compustat, CRSP, and Execucomp from 1992-2015, which are generally S&P 1,500 firms due to Execucomp's coverage criteria. Because I am matching a self-constructed dataset to several commercial databases, I retain only those firms for which I can identify a one-to-one match on firm identifiers (generally Compustat's $gvkey$ and EDGAR's CIK) and CEO identifiers (Compustat's $execid$ and EDGAR's CIK for individuals). I also require that the CEO be employed by the firm for at least one year prior to appearing in the sample so that each CEO has a non-zero equity portfolio at the beginning of the fiscal year. These criteria lead to an initial sample of 12,564 CEO-years and 1,156 unique firms. Given the time-consuming nature of constructing the CEOs' equity portfolios and running the estimation procedure, I randomly select a sample of 231 firms (20%) for my analysis. After removing CEO-years with missing data and additional filtering on the Compustat-EDGAR match, the final sample consists of 1,319 CEO-years and 218 unique firms from 1992-2015. The mean (median) firms appears in the sample for 6.05 (4) years. Each firm appears in the sample for a minimum of two years while five firms appear in the sample for 20 or more years.

TABLE 1:
PROBABILITY OF EQUITY PORTFOLIO-RELATED EVENTS

This table presents the logistic regression estimation results for equity portfolio related events. Panel A contains pooled regression results for the probability of a stock option award (i.e., $\Pr[(award = 1)]$). Panel B contains pooled regression results for the probability of a stock option exercise (i.e., $\Pr[(exercise = 1)]$). Variables are defined in the Appendix. All explanatory variables are measured at the beginning of the month. ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Panel A: Equity awards

Variable	Coefficient Estimate (Standard Error)
$intercept$	-4.5784 *** (0.858)
$freq$	2.0675 *** (0.090)
$fmonth$	-0.0784 *** (0.026)
tsa	0.0012 (0.006)
tse_{award}	-0.0079 (0.006)
age	0.0215 (0.016)
$tenure$	-0.0020 (0.001)
$retx12$	0.2447 (0.201)
Unit of analysis	CEO-month
No. observations	4,063
Pseudo-R^2	0.5426

Panel B: Option exercises

Variable	Coefficient Estimate (Standard Error)
$intercept$	-4.2857 *** (1.117)
itm	4.3460 *** (1.004)
$prop\_vested$	2.1065 *** (0.535)
$price\_strike$	0.2537 *** (0.033)
$fmonth$	0.0281 ** (0.014)
ttm	0.0303 *** (0.003)
ttv	-0.0465 (0.029)
tse_{exer}	-0.0175 ** (0.007)
tsv	0.0060 *** (0.002)
age	-0.0103 (0.008)
$tenure$	-0.0004 (0.001)
$max12$	0.6493 *** (0.105)
$retx12$	-0.0420 (0.142)
$prop\_remain$	-5.2477 *** (0.564)
$size$	0.7061 *** (0.246)
Unit of analysis	CEO-month-tranche
No. observations	24,781
Pseudo-R^2	0.2865

3.3.3: Predictive Models

Table 1 contains results from the logistic regressions that estimate the probability of an event occurring. These events include awards of restricted stock and/or options, exercises of options, and open-market sales of stock. Panel A contains estimation results for the probability of a stock option award (i.e., $\Pr[(award = 1)]$). The unit of analysis for this regression is a CEO-month, and the majority of this model's explanatory power comes from the count variable that captures the frequency of awards made during the same month of the prior three years ($freq$), which is consistent with equity awards being sticky over time. Panel B contains estimation results for the probability of a stock option exercise (i.e., $\Pr[(exercose = 1)]$).[9] The unit of analysis for this regression is a CEO-month-tranche, which means I estimate the probability that a stock option exercise will occur for a particular tranche of the option portfolio. The explanatory power of the model in Panel B (Pseudo-R^2 = 0.2865) is significantly lower than Panel A (Pseudo-R^2 = 0.5426). This demonstrates the difficulty in predicting idiosyncratic CEO behavior (e.g., exercises) compared to firm behavior (e.g., awards).

3.3.4: Descriptive Information

Table 2 presents summary statistics for the variables used in this study. Panel A reports the Pearson correlation coefficients for measures of CEO incentives. Although I do not include $\delta Simulated$ in any empirical tests, I include this variable in the descriptive statistics for reference. The correlation between $\delta Existing$ and $\delta Simulated$ is 0.8597, but the correlations between $\delta Anticipated$ and the two other measures are both negative. This provides some initial evidence that the information contained in $\delta Anticipated$ is different than that of the two other measures.

[9] In addition to estimating the probability that a stock option exercise will occur, I also assume that all in-the-money stock options that expire during a given month will be exercised.

TABLE 2:
SUMMARY STATISTICS

This table presents summary statistics for the variables used in this study. Panel A reports the Pearson correlations between measures of CEO incentives. Panel B reports descriptive statistics for variables that are used to estimate logistic regressions for each anticipated event as part of the simulation procedure. Panel C reports descriptive statistics for the variables that are included in the OLS regression to examine the relation between CEO incentives and measures of real earnings management. Variables are defined in the Appendix.

Panel A: Correlation among Incentive Measures

	$\delta Existing$	$\delta Simulated$	$\delta Anticipated$
$\delta Existing$	1.0000		
$\delta Simulated$	0.8597	1.0000	
$\delta Anticipated$	-0.7904	-0.4305	1.0000

Panel B: Descriptive Statistics – Simulation Estimation

Variable	Mean	Median	Std. Dev.	Min.	Q1	Q3	Max
$award$	0.0636	0.0000	0.2441	0.0000	0.0000	0.0000	1.0000
$freq$	0.2001	0.0000	0.6251	0.0000	0.0000	0.0000	3.0000
$fmonth$	6.5445	7.0000	3.4736	1.0000	4.0000	10.0000	12.0000
tsa	18.6409	9.0000	23.4816	1.0000	5.0000	23.0000	130.0000
tse_{award}	11.1672	5.0000	16.3490	0.0000	0.0000	14.0000	110.0000
age	56.9911	57.0000	6.8996	39.0000	52.0000	62.0000	75.0000
$tenure$	134.4381	117.0000	85.9792	12.0000	76.0000	167.0000	432.0000
$retx12$	0.1665	0.1359	0.4343	-0.9117	-0.0630	0.3325	6.3240
$exercise$	0.0208	0.0000	0.1428	0.0000	0.0000	0.0000	1.0000
itm	0.7739	1.0000	0.4183	0.0000	1.0000	1.0000	1.0000
$prop\_vested$	0.6864	0.9785	0.3786	0.0000	0.3333	1.0000	1.0000
$price\_strike$	1.6008	1.3441	0.9522	0.1081	1.0285	1.8929	16.5080
$fmonth$	6.5269	7.0000	3.4571	1.0000	4.0000	10.0000	12.0000
ttm	-58.6889	-58.0000	31.7445	-119.0000	-83.0000	-33.0000	0.0000
ttv	-2.8507	0.0000	4.5969	-58.0000	-5.0000	0.0000	0.0000
tse_{exer}	1.0355	0.0000	6.0091	0.0000	0.0000	0.0000	98.0000
tsv	18.8691	9.0000	22.2685	0.0000	1.0000	31.0000	114.0000
$max12$	0.3020	0.0000	0.4591	0.0000	0.0000	1.0000	1.0000
$prop\_remain$	0.9722	1.0000	0.1236	0.0120	1.0000	1.0000	1.0000
$size$	0.1640	0.1195	0.1579	0.0022	0.0830	0.1908	1.0000

Panel C: Descriptive Statistics – Empirical Tests

Variable	Mean	Median	Std. Dev.	Min	Q1	Q3	Max
Δrdx	0.0029	0.0000	0.0202	-0.1632	0.0000	0.0017	0.1515
$\Delta discx$	0.0235	0.0141	0.0441	-0.1637	0.0000	0.0422	0.3502
acc_disc	0.0279	0.0205	0.0298	0.0002	0.0092	0.0350	0.2261
acc_qty	0.0242	0.0207	0.0147	0.0048	0.0134	0.0336	0.0744
$\delta Existing$ ($000)	452.3668	249.1673	651.1051	0.0000	92.8698	478.4579	3,810.4187
$\delta Simulated$ ($000)	345.1428	174.5772	470.7113	0.0000	62.8094	408.4598	2,705.5585
$\delta Anticipated$ ($000)	-107.2240	-36.6979	219.5164	-1,559.7345	-116.2032	-4.0482	175.2241
$salary$ ($000)	968.9128	906.4000	534.2918	0.0000	650.0000	1,150.0000	3,300.0000
$bonus$ ($000)	652.7329	0.0000	1,142.4920	0.0000	0.0000	884.2150	5,800.0000
age	56.0663	56.0000	6.8513	38.0000	51.0000	61.0000	74.0000
$tenure$ (months)	130.0346	111.0000	85.4834	12.0000	72.0000	165.0000	420.0000
$tobins\_q$	2.2096	1.8459	1.2585	0.8870	1.4347	2.5235	8.2386
cce	0.1467	0.0760	0.1869	0.0005	0.0318	0.1574	0.9301
mve	8.4001	8.1508	1.4058	5.3424	7.4196	9.3584	12.8646
$retx12$	0.1631	0.1450	0.4113	-0.8607	-0.0710	0.3563	2.6451

Panel B reports descriptive statistics for variables that are used to estimate logistic regressions for each anticipated event as part of the simulation procedure, and Panel C reports descriptive statistics for the variables that are included in the OLS regression to examine the relation between CEO incentives and measures of real earnings management. Panel C shows that $\delta Simulated$ is almost always lower than $\delta Existing$, which indicates that $\delta Anticipated$ is very often negative. This suggests that incorporating anticipated events generally has the effect of lowering the CEO's sensitivity to the firm's stock price.

SECTION 4:
EMPIRICAL APPLICATION

In this section, I empirically examine the association between anticipated CEO incentives and two areas of earnings management: (i) real earnings management and (ii) accruals-based earnings management. Earnings management refers to the ability of managers (e.g., CEOs) to manipulate a firm's reported earnings to achieve a certain goal, such as meeting a pre-determined earnings target or bonus threshold. CEOs have the ability to manage earnings through several channels, including both real and accruals-based activities.[10] In the sections that follow, I motivate the analyses, outline my research designs, and report results.

4.1: Motivation and Literature Review

There is a robust theoretical literature that studies the conflicts of interest between shareholders and managers by examining the relation between discretionary investment and accounting decisions—which are often cast as "myopic" or "opportunistic"—and incentive characteristics of CEOs' compensation contracts. In Stein (1989), capital market pressure induces executive myopia because rational shareholders correctly anticipate and adjust for some level of earnings management, which compels the manager to continue managing earnings because the market expects this behavior in equilibrium. Bizjak et al. (1993) demonstrate that managers' emphasis on current stock price can lead to suboptimal investment (e.g., overinvestment or underinvestment in R&D), and Narayanan (1985) develops a framework where privately informed managers will make short-sighted decisions that destroy value for shareholders.

[10] In untabulated results, I also analyze the *ex post* outcome of earnings management by examining material accounting irregularities (e.g., restatements and Accounting and Auditing Enforcement Releases [AAERs]). However, there were so few restatements (16) and AAERs (3) in my sample that there was not sufficient power to identify a statistically significant relation between CEO incentives and these material accounting irregularities.

In settings such as these, CEOs take actions that are incongruent with shareholders' best interests because incentives derived from equity-based compensation motivate them to focus on short-term performance at the expense of long-term growth. R&D expenditures are generally expensed as incurred under U.S. GAAP, which has the immediate effect of reducing earnings[11]; however, the benefits associated with R&D will likely not be realized for several periods (if at all). Therefore, the timing difference between recognized costs and realized benefits provides an attractive setting to examine the relation between incentives from equity-based compensation and CEOs' discretionary investment choices.

Empirically, researchers have studied this conflict of interest by examining the link between equity incentives and period-to-period changes in R&D expenditures (i.e., real earnings management). Dechow and Sloan (1991) document that CEOs manage R&D expenditures downward as they approach retirement, and the authors find that CEOs' stock and option holdings serve to mitigate this behavior. Cheng (2004) presents evidence that boards of directors adjust annual equity awards to discourage opportunistic reductions in R&D spending. Edmans et al. (2016) find that the incentives associated with newly-vesting equity—prior awards that are scheduled to vest or become exercisable during a period—are negatively related to investment growth rates (e.g., changes in R&D and capital expenditures). However, each of these studies uses a different measure of incentives to investigate their research questions, and none of the measures capture incentives from both existing and anticipated sources.[12]

[11] This argument assumes that reduced earnings will decrease the firm's stock price and thus decrease the value of the CEO's equity-based compensation.

[12] Although Edmans et al. (2016) examine equity that is expected to vest during a period, the authors do not differentiate between newly-vesting equity that a CEO will likely exercise or sell and newly-vesting equity that the CEO will likely hold.

There is also a vast literature that examines the relation between CEO incentives and accruals-based earnings management. A fundamental goal of accrual accounting is the preparation of financial statements for external users that incorporate changes in firm value that occur absent a contemporaneous change in the firm's cash flows. These non-cash changes in firm value are represented by accruals, and the uncertainty and subjectivity inherent in their estimation offer an opportunity for self-interested CEOs to manipulate earnings for personal gain. Holmström (1979) examines such a situation in his seminal study that outlines the conflict of interests that arise when a principal (i.e., shareholders) cannot observe actions taken by managers (e.g., accruals manipulation). Moreover, Crocker and Slemrod (2007) document that contracts that are contingent on reported earnings cannot provide managers with the incentive to maximize profits and report those profits honestly. Dutta and Fan (2014) study a setting where managers can shift earnings across periods through earnings management, and managers can increase compensation by moving earnings to the period with the greatest pay-performance sensitivity.

Empirically, Healy (1985) finds that managers engage in earnings management through accruals to maximize bonus payments. Bergstresser and Philippon (2006) find that firms with "incentivized" CEOs—that is, CEOs whose compensation is more closely tied to the firm's stock price—engage in higher levels of earnings manipulation through discretionary accruals. Cheng and Warfield (2005) find that managers who are compensated with strong equity incentives are more likely to report earnings that meet or beat analysts' forecasts, and the authors conclude that equity compensation creates incentives to manage earnings. Cornett, Marcus, and Tehranian (2008) find that earnings management through discretionary accruals increases significantly and earnings quality decreases as incentives from stock options become stronger.

Finally, it is not obvious whether researchers will find evidence of a relation between CEO incentives and discretionary investment and accounting decisions in archival data. On one hand, theories like those described above depict scenarios where managers take actions that are incongruent with shareholders' best interests, and equity incentives may motivate CEOs to make value-destroying decisions (e.g., reducing investments in R&D). On the other hand, if compensation contracts are designed in a manner that mitigates self-interested behavior, researchers may not find an association between incentives and discretionary investments. This scenario can only be identified if the proxy for incentives used by researchers incorporates the entire incentive structure that CEOs consider when making decisions, which theory predicts will include consideration of past, current, and future incentives.

4.2: Research Design

To test for the relation between anticipated incentives and earnings management, I estimate the following ordinary least squares regression:

$$dep\_var_t = \beta_0 + \boldsymbol{\beta_1 financial\_incentives_{t-1}} + \beta_2 salary_{t-1} + \beta_3 bonus_{t-1} + \beta_4 age_{t-1} + \beta_5 tenure_{t-1} + \beta_6 tobins\_q_{t-1} + \beta_7 cce_{t-1} + \beta_8 mve_{t-1} + \beta_9 retx12_{t-1} + \varepsilon_t \quad (4)$$

For the real earnings management tests, the dependent variable (dep_var_t) is the year-to-year change (scaled by beginning total assets) in one of two measures of real earnings management: R&D expenditures (Δrdx) and aggregate discretionary expenses ($\Delta discx$). Following prior literature (e.g., Roychowdhury 2006), I construct an aggregate measure of discretionary expenses by computing the sum of R&D, advertising, and SG&A expenses. Each element of the discretionary investment measures is (generally) expensed immediately under U.S. GAAP, but the benefits associated with them will likely not be realized for several periods (if at

all). This scenario could give rise to self-interested behavior by managers because of the timing difference between recognized costs and realized benefits. For example, Dechow and Sloan (1991) document that CEOs manage R&D expenditures downward as they approach retirement, ostensibly because the manager can enjoy the benefit of increased income in the current period without being burdened by the cost of lower investment in R&D in the future.

For the accruals-based earnings management tests, the dependent variable (dep_var_t) is one of two common measures of accruals-based earnings management: absolute discretionary accruals (acc_disc) and accruals quality (acc_qty). Higher values for these variables indicate greater levels of discretionary accruals and lower quality accruals, respectively. Following Dechow et al. (1995), I measure discretionary accruals using a modified Jones (1991) method.[13] Discretionary accruals are those that are unexplained by firms' economic circumstances, and they represent a channel through which self-interested managers can manipulate reported earnings. For example, Bergstresser and Philippon (2006) find that firms with CEOs whose compensation is more closely tied to the firm's stock price engage in higher levels of earnings manipulation through discretionary accruals. I measure accruals quality following Dechow and Dichev (2002). Accruals quality captures the variation in total accruals that is not explained by past, current, and future operating cash flows.

The explanatory variable of interest is $financial\_incentives_{t-1}$. I estimate Eq. (4) three times for each dependent variable to examine how CEO incentives relate to changes in measures of earnings management. Model (1) includes $\delta Existing_{t-1}$ as the measure of CEO incentives. $\delta Existing_{t-1}$ represents the incentives that are generated by CEO's existing equity portfolio at the beginning of the fiscal year, but it does not incorporate any expectations about future events.

[13] Industries are determined based on the Fama-French 49 Industry Classification.

This is the proxy of CEO incentives that is often used in extant research. Model (2) includes $\delta Anticipated_{t-1}$ as the measure of CEO incentives. $\delta Anticipated_{t-1}$ represents the estimated change in a CEO's existing incentives due to anticipated awards and liquidations. Finally, both $\delta Existing_{t-1}$ and $\delta Anticipated_{t-1}$ are included in Model (3). Considering both incentive measures allows me to determine whether there is information content in $\delta Anticipated_{t-1}$ that is incremental to $\delta Existing_{t-1}$.

I include CEO-level include control variables, including the CEO's salary and bonus from the prior fiscal year to proxy for the CEO's outside wealth. I include age and tenure because Ali and Zhang (2015) find that CEOs' incentives to manipulate earnings vary with their age and the length of their employment relationship with the firm. Additionally, I include firm-level control variables that prior literature suggests are associated with year-to-year changes in discretionary investments. These control variables, which are all measured at the beginning of the fiscal year, include Tobin's Q to proxy for growth opportunities, the value of cash and cash equivalents to control for the availability of resources, the natural logarithm of the firm's market value of equity, and the firm's stock return measured over the 12-month period immediately preceding the fiscal year.

4.3: Empirical Results

Table 3 presents the OLS regression estimation results for the relation between CEO incentives and year-to-year changes in the two measures of real earnings management examined in this study. Panel A (B) contains pooled regression results with year-to-year changes in R&D (aggregate discretionary investments) as the dependent variable. The results for both variables are similar, so I focus on the results in Panel A. Model (1), which includes $\delta Existing$, documents a significantly positive correlation between CEO incentives and year-to-year changes in R&D (p =

0.006). This result suggests that R&D changes are sensitive to the incentives generated by the CEO's existing equity portfolio at the beginning of the year. The significantly positive coefficient on $\delta Existing$ suggests that higher incentives from CEOs' existing portfolios are associated with positive growth in both measures of real earnings management. This finding can be interpreted as evidence that existing incentives serve to align the interests of managers and shareholders.

TABLE 3:
YEAR-TO-YEAR CHANGES IN REAL INVESTMENTS

This table presents the OLS regression estimation results for the relation between year-to-year changes in measures of real earnings management and CEO incentives. Panel A contains pooled regression results with year-to-year changes in R&D expenditures (Δrdx) as the dependent variable. Panel B contains pooled regression results with year-to-year changes in aggregate discretionary investments ($\Delta discx$) as the dependent variable. Variables are defined in the Appendix. Standard errors are reported in parentheses below coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Panel A: R&D Expenditures (Δrdx)

Variable	Model (1)	Model (2)	Model (3)
intercept	-0.0350 ** (0.0138)	-0.0353 *** (0.0133)	-0.0366 *** (0.0137)
δExisting	**0.0151 *** (0.0055)**		**0.0031 (0.0075)**
δAnticipated		**-0.0408 *** (0.0113)**	**-0.0364 ** (0.0155)**
salary	-0.0001 (0.0032)	-0.0008 (0.0032)	-0.0009 (0.0032)
bonus	-0.0004 (0.0011)	-0.0002 (0.0011)	-0.0002 (0.0011)
age	0.0003 (0.0002)	0.0004 * (0.0002)	0.0004 * (0.0002)
tenure	0.0000 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0002)
tobins_q	0.0029 *** (0.0011)	0.0027 ** (0.0011)	0.0026 ** (0.0011)
cce	0.0132 * (0.0069)	0.0137 ** (0.0068)	0.0133 * (0.0069)
mve	0.0014 (0.0012)	0.0014 (0.0012)	0.0015 (0.0012)
*retx*12	-0.0020 (0.0026)	-0.0025 (0.0026)	-0.0026 (0.0026)
Unit of analysis	CEO-year	CEO-year	CEO-year
R^2	0.1324	0.1460	0.1465

Panel B: Aggregate Discretionary Investments ($\Delta discx$)

Variable	Model (1)	Model (2)	Model (3)
$intercept$	0.0705 *** (0.0262)	0.0727 *** (0.0252)	0.0664 ** (0.0259)
$\delta Existing$	**0.0455 *** (0.0105)**		**0.0151 (0.0142)**
$\delta Anticipated$		**-0.1137 *** (0.0214)**	**-0.0922 *** (0.0294)**
$salary$	0.0069 (0.0060)	0.0053 (0.0060)	0.0049 (0.0060)
$bonus$	-0.0010 (0.0021)	-0.0004 (0.0021)	-0.0006 (0.0021)
age	-0.0012 *** (0.0004)	-0.0011 *** (0.0004)	-0.0010 *** (0.0004)
$tenure$	0.0006 * (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)
$tobins\_q$	0.0122 *** (0.0021)	0.0120 *** (0.0020)	0.0115 *** (0.0021)
cce	-0.0193 (0.0132)	-0.0170 (0.0129)	-0.0193 (0.0130)
mve	-0.0028 (0.0024)	-0.0032 (0.0023)	-0.0027 (0.0023)
$retx12$	0.0120 ** (0.0050)	0.0108 ** (0.0049)	0.0105 ** (0.0049)
Unit of analysis	CEO-year	CEO-year	CEO-year
R^2	0.3405	0.3571	0.3593

However, Models (2) and (3) document a very different result. In Model (2), there is a significantly negative correlation between $\delta Anticipated$ and year-to-year changes in R&D (p = 0.0004). This result suggests that CEOs who anticipate an increase in sensitivity to the firm's stock price over the upcoming fiscal year (i.e., an increase in $\delta Anticipated$) *reduce* R&D and other investments, which is consistent with the notion that incentives from equity-based compensation exacerbate the conflict of interests between shareholders and the CEO. This finding suggests that $\delta Anticipated$ captures a source of information that is distinct from $\delta Existing$.

When both $\delta Existing$ and $\delta Anticipated$ are jointly considered in Model (3), *only* anticipated incentives are statistically associated with the measures of real earnings management. The negative association between anticipated incentives and R&D growth documented in Model (2) holds (p = 0.0193), but $\delta Existing$ is no longer significantly associated with R&D growth. The result in Model (3) is interesting because it implies that $\delta Anticipated$ covaries more with the measures of real earnings management used in this analysis, and it further suggests that $\delta Anticipated$ captures new information that is decision-relevant for CEOs but currently omitted from existing empirical proxies. This result is also congruent with an observation in Şabac (2008), who highlights that incentives can actually move in opposite directions over time, which may give rise to contradictory findings if both are not considered simultaneously.

Table 4 presents the OLS regression estimation results for the relation between absolute discretionary accruals and CEO incentives. Model (1), which includes $\delta Existing$, documents a significantly negative correlation between CEO incentives and absolute discretionary accruals (p = 0.008). This result suggests that absolute discretionary accruals are sensitive to the incentives generated by the CEO's existing equity portfolio at the beginning of the year. The significantly negative coefficient on $\delta Existing$ implies that higher incentives from CEOs' existing portfolios are associated with lower levels of earnings management through discretionary accruals. This finding can be interpreted as evidence that existing incentives serve to align the interests of managers and shareholders, which is incongruent with prior empirical findings in this area (e.g., Bergstresser and Philippon 2006). However, this result is consistent with the results from Model (1) in Table 3 that shows existing incentives seem to curtail opportunistic behavior by managers.

TABLE 4:
DISCRETIONARY ACCRUALS

This table presents the OLS regression estimation results for the relation between absolute discretionary accruals (acc_disc) and CEO incentives. Variables are defined in the Appendix. Standard errors are reported in parentheses below coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Variable	**Model (1)**	**Model (2)**	**Model (3)**
$intercept$	0.0515 *** (0.0198)	0.0391 ** (0.0195)	0.0516 *** (0.0199)
$\boldsymbol{\delta Existing}$	**-0.0287 *** (0.0085)**		**-0.0279 *** (0.0106)**
$\boldsymbol{\delta Anticipated}$		**0.0378 ** (0.0180)**	**0.0030 (0.0222)**
$salary$	-0.0003 (0.0064)	-0.0013 (0.0065)	-0.0002 (0.0065)
$bonus$	-0.0017 (0.0018)	-0.0021 (0.0018)	-0.0017 (0.0018)
age	-0.0026 (0.0292)	0.0061 (0.0299)	-0.0034 (0.0299)
$tenure$	-0.0366 (0.0247)	-0.0375 (0.0259)	-0.0357 (0.0256)
$tobins\_q$	0.0062 *** (0.0016)	0.0054 *** (0.0016)	0.0062 *** (0.0016)
cce	0.0173 * (0.0102)	0.0119 (0.0101)	0.0173 * (0.0102)
mve	-0.0038 ** (0.0018)	-0.0028 (0.0018)	-0.0038 ** (0.0018)
$retx12$	0.0134 *** (0.0038)	0.0133 *** (0.0038)	0.0135 *** (0.0038)
Unit of analysis	CEO-year	CEO-year	CEO-year
R^2	0.1783	0.1609	0.1783

In Model (2), there is a significantly positive coefficient on CEOs' anticipated incentives (p = 0.0361), which suggests that these incentives are distinct from those generated by CEOs' existing incentives and affect CEO behavior in a different manner. This result suggests that CEOs who anticipate an increase in sensitivity to the firm's stock price over the upcoming fiscal year (i.e., an increase in $\delta Anticipated$) *increase* discretionary accruals, which is consistent with the notion that incentives from equity-based compensation exacerbate the conflict of interests between shareholders and the CEO. This finding is further evidence that $\delta Anticipated$ captures a source of information that is distinct from $\delta Existing$. When both $\delta Existing$ and $\delta Anticipated$ are jointly considered in Model (3), only existing incentives are statistically associated with discretionary accruals, which suggests that the effect of existing incentives subsumes that of anticipated incentives.

Table 5 presents the OLS regression estimation results for the relation between accruals quality and CEO incentives. The results of Model (1) are consistent with those from Table 4: the significantly negative correlation suggests that incentives from CEOs' existing equity portfolio are associated with high quality accruals.

TABLE 5:
ACCRUALS QUALITY

This table presents the OLS regression estimation results for the relation between accruals quality (acc_qty) and CEO incentives. Variables are defined in the Appendix. Standard errors are reported in parentheses below coefficient estimates. ***, **, and * denote significance at 1%, 5%, and 10% levels, respectively.

Variable	Model (1)	Model (2)	Model (3)
$intercept$	0.0565 *** (0.0073)	0.0494 *** (0.0072)	0.0555 *** (0.0072)
$\delta Existing$	**-0.0084 *** (0.0031)**		**-0.0141 *** (0.0039)**
$\delta Anticipated$		**0.0020 (0.0066)**	**0.0197 (0.0813)**
$salary$	0.0036 ** (0.0017)	0.0027 (0.0017)	0.0030 * (0.0017)
$bonus$	-0.0004 (0.0006)	-0.0005 (0.0006)	-0.0003 (0.0006)
age	-0.0106 (0.0099)	-0.0020 (0.0101)	-0.0061 (0.0100)
$tenure$	-0.0398 *** (0.0091)	-0.0466 *** (0.0096)	-0.0458 *** (0.0094)
$tobins\_q$	0.0035 *** (0.0006)	0.0029 *** (0.0006)	0.0033 *** (0.0006)
cce	0.0280 *** (0.0037)	0.0254 *** (0.0037)	0.0280 *** (0.0037)
mve	-0.0043 *** (0.0007)	-0.0038 *** (0.0006)	-0.0043 *** (0.0007)
$retx12$	0.0015 (0.0014)	0.0010 (0.0014)	0.0010 (0.0014)
Unit of analysis	CEO-year	CEO-year	CEO-year
R^2	0.5376	0.5280	0.5455

In Model (2), there is not a statistically significant relation between CEOs' anticipated and accruals quality. These findings persist in Model (3) when both $\delta Existing$ and $\delta Anticipated$ are jointly considered. Overall, these results suggest that it is only existing incentives that play a role in CEOs' accruals-based earnings management.

SECTION 5:
CONCLUSION

Despite decades of theoretical literature that has stressed its importance, empirical research has largely overlooked the effect of incentives that arise when managers anticipate future compensation. Extant research relies mainly on characteristics of compensation contracts reported in firms' annual proxy statements to quantify incentives from equity-based compensation. Analyses based on disclosed data capture the CEO's *existing* incentives but overlook the *anticipated* incentives that arise due to the dependence between past, current, and future compensation contracts. If future compensation awards and liquidations are anticipated in the current period and influence behavior, researchers who omit these considerations may fail to find a meaningful relationship between incentives and CEO actions.

In this study, I use the past pattern of CEO equity compensation awards and liquidations to estimate future awards and liquidations, which I argue are anticipated by the CEO and act as an important incentive. Specifically, I develop a Monte Carlo simulation that (i) estimates future stock prices; (ii) predicts the likelihood, timing, and characteristics of future awards and liquidations; and (iii) adjusts the CEO's existing equity holdings to incorporate the effect of anticipated awards and liquidations. The anticipated incentives I estimate are economically significant and capture a source of information that is incremental to the CEO's existing portfolio of equity incentives disclosed in the annual proxy statement.

In empirical tests, I apply my measure to examine the relation between CEOs' anticipated incentives and earnings management. I find that anticipated incentives are significantly negatively associated with year-to-year growth in R&D expenditures and aggregate discretionary expenditures. These results suggest that CEOs who anticipate an increase in sensitivity to the firm's stock price over the upcoming fiscal year reduce R&D and other investments, which is

consistent with the notion that incentives from equity-based compensation exacerbate the conflict of interests between shareholders and the CEO. Interestingly, I find that when both existing and anticipated incentives are jointly considered, *only* anticipated incentives are statistically associated with the measures of real earnings management. However, I find that the effect of anticipated incentives is subsumed by the incentive effect of existing incentives in tests of accruals-based earnings management.

This study makes several contributions to the literature. First, by developing a proxy for anticipated incentives, this study makes progress toward measuring CEO incentives in a manner that is more representative of the underlying theoretical construct. The innovative measure of anticipated incentives introduced in this study answers the call to consider the incentive effects of multi-period compensation contracts in empirical analyses of agency relationships, and it can help researchers, regulators, and investors better understand the many sources and consequences of CEO incentives.

Second, the measure of anticipated incentives I develop is both economically and statistically significant for explaining CEO behavior in empirical analyses of real earnings management. My results related to anticipated incentives are in direct opposition to findings that use existing incentives to explain CEO decisions in this setting, which suggests that anticipated incentives capture a source of information that is distinct from existing incentives. Additionally, my findings suggests that the incentives which are expected to arise over the same horizon as the action being examined are most important for explaining CEO behavior. Taken together, my results suggest that the *ex ante* measure of anticipated incentives introduced in this study captures a new source of information that is decision-relevant for CEOs but currently omitted from existing empirical proxies.

I believe that the procedure developed and measure introduced in this study have several interesting uses and applications. In addition to producing a measure of anticipated incentives, the estimation procedure I develop in this study could be used to identify opportunistic behavior by comparing predictions to actual events that occur during a period. Because the procedure I developed relies entirely on publically available data, deviations from reasonably anticipated events may signal instances where CEOs are relying on private information to make decisions. Additionally, the dataset I constructed from CEOs' Form 3, 4, and 5 filings contains transaction-level detail that is not available in firms' annual proxy statements, and I exploit the granularity of this information to construct estimates of anticipated incentives. However, these data can also be used to explicitly calculate empirical measures that previously could only be estimated, which provides opportunities to answer research questions that could not be addressed using data from existing commercial databases or firms' annual proxy statements alone.

APPENDIX:
VARIABLE DEFINITIONS

Variable	Definition
$\delta Existing$	The sensitivity of the CEO's existing equity portfolio at the beginning of the year to a 1% change in the firm's stock price.
$\delta Simulated$	The sensitivity of the CEO's simulated equity portfolio to a 1% change in the firm's stock price. Discounted back to the beginning of the period for comparability.
$\delta Anticipated$	The difference between $\delta Simulated$ and $\delta Existing$. Represents how the CEO's incentives are expected to change after anticipating future events over the upcoming fiscal year.
$freq$	A count of the frequency of awards made during the same month over the last three years.
$fmonth$	The fiscal month.
tsa	The number of months that have passed since the firm last granted an equity award to the CEO.
itm	Indicator variable set equal to 1 if a tranche of stock options is in-the-money at any point during a fiscal month, and set equal to 0 otherwise.
$prop\_vested$	The proportion of stock options that are exercisable for a given tranche of stock options.
$price\_strike$	The ratio of the firm's stock price to the stock option's exercise price.
ttm	The number of months remaining until the stock options maturity (multiplied by -1).
ttv	The number of months remaining until the next vesting date for a tranche of stock options (multiplied by -1).
tse_{award}	The number of months that have passed since the CEO last exercised stock options from any tranche of stock options.
tse_{exer}	The number of months that have passed since the CEO last exercised stock options from a given tranche of stock options.
tsv	The number of months that have passed since the last time stock options vested for a given tranche of stock options.
$prop\_award$	Represents the proportion of the original award that still remains in the CEO's portfolio.
$size$	Represents how large the given group of options is relative to the entire portfolio.
Δrdx	The year-to-year change in R&D expenditures scaled by beginning total assets.
$\Delta discx$	The year-to-year change in aggregate discretionary expenses (the sum of R&D expenditures, advertising expense, and SG&A) scaled by beginning total assets.
acc_disc	Absolute discretionary accruals measured following the modified Jones (1991) method. Industry-level calculations were made with Fama-French 49 Industry Classifications.

Variable	Definition
acc_qty	Accruals quality measured following Dechow and Dichev (2002).
$salary$	The CEO's cash salary from the most recent fiscal year.
$bonus$	The CEO's cash bonus from the most recent fiscal year.
$tobins\_q$	A measure of the market value of the firm's assets to the book value of its assets measured at the beginning of the period.
cce	The value of the firm's cash and cash equivalents measured at the beginning of the fiscal year.
mve	The natural logarithm of the firm's market value of equity measured at the beginning of the fiscal year.
age	The CEO's age at the beginning of the fiscal year.
$tenure$	How long (in months) the CEO has held the position.
$max12$	An indicator variable set to 1 if the current stock price is at a 12-month high.
$retx12$	The firm's stock return over the preceding 12-month period.

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