Distinguishing accruals-based from real-based earnings management

Joseph J. Gerakos[1], Collin Rabe[2], and Robert J. Resutek[2]

[1]Tuck School of Business at Dartmouth College

[2]J.M. Tull School of Accounting, Terry College of Business at the University of Georgia

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Abstract

We develop a framework to jointly estimate the economic magnitude that accruals-based and real-based earnings management have on current and future reported earnings. Our approach centers on the premise that accruals-based and real-based earnings management reverse into different components of future earnings. We apply our framework to the reported earnings of firms that prior research suspects of engaging in earnings management in annual and quarterly settings. We find evidence consistent with both accruals-based and real-based earnings management for the annual setting and only accruals-based earnings management for the quarterly setting.

JEL classifications: M41

Keywords: Earnings management

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1. Introduction

Corporate executives, the financial media, accounting regulators, and accounting academics agree that firms manage reported earnings in response to capital market incentives. Per survey evidence and academic studies, the consensus view is that firms manage reported earnings toward earnings targets through their discretionary: (i) operating choices (e.g., real earnings management; REM) and (ii) accrual choices (e.g., accruals earnings management; AEM).

There is little consensus, however, on how the empirical earnings management evidence should be interpreted. On one side of the literature, there is a large set of studies showing associations between empirical proxies for REM and AEM, earnings, and a range of agency-based incentives.[1] Although research designs vary across studies, the modal design employs a first stage regressions to split reported earnings into "managed" and "unmanaged" components (Dechow, Sloan, and Sweeney, 1995; Dechow and Dichev, 2002; Roychowdhury, 2006). In the second stage, researchers examine whether there are statistically significant conditional correlations between the "managed" component of earnings and proxies for agency-based incentives. Statistically significant correlations are interpreted as evidence that managers use reporting and operating discretion to manage reported earnings toward targets.

A smaller literature casts doubts on these inferences. Describing these inferences as one of the "most incorrect" in the accounting literature, Ball (2013) strongly condemns the widely held belief of accounting academics that earnings management is "rife." He suggests that academic research has fostered and tolerated a culture that accepts grossly inadequate research designs to support the narrative of earnings management. To support his assessment, he notes that the economic magnitudes related to earnings management are implausible, many of the implied empirical assumptions unreasonable, and that well-informed parties (e.g., auditors) with incentives to detect misrepresentation, apparently, cannot detect these earnings distortions. But, accounting academics can, nonetheless, do so with much less precise information. Lewellen and Resutek (2019) and Rountree, Sivaramakrishnan, and Wang (2024) provide support for Ball's argument by quantifying the

[1] For discussions of this literature, see Dechow, Ge, and Schrand (2010) and DeFond (2010).

implied economic magnitudes of earnings management and highlighting that purposeful earnings distortions cannot plausibly explain the empirical earnings patterns documented in the earnings management literature.

Instead of relying on reduced form regressions to distinguish operating- and reporting discretion from "true" (or "unmanaged") earnings, we develop a two-step framework to identify and quantify the economic magnitude of AEM and REM. Our approach relies on the fundamental property that managed earnings must reverse in the future. For example, financial reporting inherently involves estimating accruals and any errors in these estimates—opportunistic or unintentional—must eventually reverse into future earnings (Dechow and Dichev, 2002; Allen, Larson, and Sloan, 2013).[2] Similarly, the effects of managers' opportunistic operating choices (i.e., REM) must also eventually reverse into future earnings because these operating choices were driven by managerial reporting incentives rather than by changes in the firms' operating fundamentals (Gunny, 2010; Vorst, 2016).

The first step of our framework involves persistence regressions to evaluate whether the net incomes of suspect firms demonstrate greater reversals than control firms and whether such reversals manifest through the accrual or cash components of future net income. Reversals of net income represent a necessary condition for both AEM and REM. We show, however, that AEM requires earnings reversals to manifest through the accrual component of future earnings while REM requires the earnings reversal to stem primarily through the cash component.

For the second step, we develop an analytical specification that relies on the assumption that non-manager stakeholders make forecasts based on imperfect interpretations of how economic shocks affect firms' earnings processes. These imperfect interpretations provide managers with incentives to manage reported earnings in the direction of the non-manager earnings forecasts. The analytical specification is driven by three economic primitives: the percentage of earnings management based on REM versus AEM, the cost of REM in terms of lost future sales, and a measure of how imperfect are non-manager stakeholders' forecasts. We then calibrate these economic primitives to find the magnitudes that best fit the moment conditions from the first step regressions. The

[2]Prior studies suggest that accrual error reversals explain the lower earnings persistence of accruals relative to cash flow (Richardson, Sloan, Soliman, and Tuna, 2005; Lewellen and Resutek, 2019).

magnitudes of the primitives can then be evaluated as whether they plausible evidence of earnings management.

We apply our framework in two empirical settings. First, we examine over annual horizons whether firms recognizing small increases in net income but no sales growth have earnings patterns that can be explained by economically plausible levels of AEM and/or REM activities. We find the lower earnings persistence slopes observed in the sample of "suspect" firms is consistent with these firms managing earnings. Importantly, these patterns cannot be solely explained by AEM or REM. That is, when we calibrate the primitives from the analytical specification to the observed empirical patterns, our results are consistent with firms using a combination of REM and AEM actions: 35% REM and 65% AEM.

Second, we examine in the quarterly setting the earnings patterns of firms that just meet or beat their 4th quarter EPS forecasts ($0.00 or $0.01) relative to firms that just miss (−$0.02 or −$0.01). We evaluate whether the so-called earnings discontinuity Burgstahler and Dichev (1997) can be explained by economically plausible levels of earnings management.[3] We find the lower earnings persistence of firms that just meet-or-beat analyst forecasts is consistent with earnings management. Importantly, and in contrast to our findings in the annual setting, these results are explained by higher future accrual expenses. Our failure to find empirical evidence supporting REM is consistent with the economic plausibility of earnings management choices in short-horizon, quarterly settings. Namely, managers likely have a much more difficult path to change a firm's operations in the last few weeks of a fiscal quarter to meet an earnings target rather than managing their accrual expense estimates.

We contribute to the literature on earnings management by developing a framework to jointly assess the effects and magnitudes of AEM and REM. The extant AEM and REM literatures have largely evolved in parallel, while surveys acknowledge that firms likely engage in both forms of earnings management strategies contemporaneously (Graham, Harvey, and Rajgopal, 2005). Joint estimation of AEM and REM is important when considering the plausibility of previous estimates of

[3]Although the earnings discontinuity has been widely used as prima facie evidence of the existence of earnings management, strong empirical evidence linking the discontinuity to discretionary accruals does not exist (Dechow, Richardson, and Tuna, 2003).

the economic magnitude of earnings management. Prior studies often assess economic plausibility via the cross-sectional volatility of their proxy for the managed portion of reported earnings. Overlooked in these assessments is that if firms jointly engage in REM and AEM and these strategies are positively correlated, the total volatility of earnings attributable to earnings management is a function of the REM strategy, the AEM strategies, and the covariance between these two strategies. Hence, it can be the case that examining either AEM and REM in isolation leads to estimates that underestimate the overall magnitude of earnings management.

2. Quantifying the effects of AEM vs. REM

Absent in the accounting literature is a comprehensive empirical method for identifying and distinguishing the costs of accrual- and real earnings management. Although studies have examined time-series variation in accrual- vs. real earnings management (e.g., Cohen, Dey, and Lys, 2008; Gunny, 2010; Zang, 2012; Pincus, Wu, and Hwang, 2022) and the how accrual- vs. real earnings management varies around significant corporate events (e.g., external financing events Cohen and Zarowin, 2010; Kothari, Mizik, and Roychowdhury, 2016), inferences from these studies lean heavily on the strength of the statistical relations between different empirical constructs of accrual- and real earnings management with future earnings. Accordingly, inferences reached in these studies depend not only on the construct validity of the individual measures, but also the relative construct validity strengths of the measures. That is, in tests of earnings management that jointly examine AEM and REM, statistical relations between the empirical earnings management constructs and future earnings are joint functions of the amount of each type of earnings management and the construct validity of each measure.

In contrast, some studies make explicit assumptions about the earnings process. Typically, the earnings process is assumed to be an autoregressive process (AR1) and the effects of earnings management are modeled with a series of parameters that capture the economic magnitude, reversing qualities, time-horizon, and accrual components. Perhaps the most well-known of these studies is Dechow and Dichev (2002) who model the accrual component of earnings as a linear function of time-series variation in prior-, current-, and next period cash flow from operations and assume accrual errors fully reverse in the next period. Gerakos and Kovrijnykh (2013) and Lewellen and Resutek (2019) each assume "true" earnings follow and AR1 process and that differential predictive power of current accruals over current earnings, for future earnings is due to the reversal of accrual errors. Gerakos and Kovrijnykh assume accrual errors fully reverse in the next fiscal period whereas the reduced form model of Lewellen and Resutek allow accrual errors to reverse over multiple periods. Dechow, Larson, and Resutek (2022) extend the model of Lewellen and Resutek (2019) and other prior accrual studies by allowing the cash- and accrual component of earnings to have differential earnings persistence in the absence of accrual estimation error.

We extend the literature that makes explicit assumptions about the earnings process by developing an analytical specification that allows us to jointly estimate the individual effects that REM and AEM have on current and future reported earnings along with the components of earnings. Thus, our design allows us to jointly test for and quantify the economic magnitudes of the effects of REM and AEM have on future earnings.

2.1. Time-series of "true" variables

We start by presenting an analytical specification that allows us to identify specific patterns in observable accounting measures that should manifest in the presence of earnings management. The specification essentially comprises two components: (i) a set of characteristics that describe the dynamic system of "true" earnings, sales, expenses, cash flows, and accruals; and (ii) a mechanism that defines the signs and magnitudes of the adjustments that manager would make to "true" earnings in order to achieve an earnings target.

For the first component, we assume that each firm is characterized by its levels of "true" net income ($NI^*_{i,t}$), sales revenues ($REV^*_{i,t}$), and cash flows ($CF^*_{i,t}$) over time, where all time-series variables are expressed in units of percentage points relative to assets.[4] In the interest of making our specification as broadly applicable as possible, we avoid assuming that these variables are

[4]For example, $NI_{i,t} = 0.01$ denotes that the firm i's net income amounted to 1% of the values of its total assets at the beginning of period t.

defined by any one specific time-series model, such as an $ARIMA(p,d,q)$, for example. Instead, we assume that the unobserved underlying data generating processes are such that they exhibit the following statistical properties with respect to current "true" net income:[5]

$$StDev[NI^*_{i,t}] \equiv \sigma_{NI} \tag{1a}$$

$$Cov[NI^*_{i,t+1}, NI^*_{i,t}] \equiv \sigma_{F.NI} \tag{1b}$$

$$Cov[REV^*_{i,t}, NI^*_{i,t}] \equiv \sigma_{REV} \tag{1c}$$

$$Cov[REV^*_{i,t+1}, NI^*_{i,t}] \equiv \sigma_{F.REV} \tag{1d}$$

$$Cov[CF^*_{i,t}, NI^*_{i,t}] \equiv \sigma_{CF} \tag{1e}$$

$$Cov[CF^*_{i,t+1}, NI^*_{i,t}] \equiv \sigma_{F.CF} \tag{1f}$$

These properties allow us to calculate in closed form univariate regression coefficients for the relation between future net income and the components of net income with past net income, which we will use in our empirical tests. While working with correlation coefficients between these variables would be appealing due to the ease of interpretation, we instead work with covariances because they do not require that the variances of REV and CF take on specific values.

The absence of t subscripts on all of the σ parameters denotes that they are time-invariant. As such, we are implicitly assuming each time-series process exhibits some degree of stationarity even though we are agnostic about the exact specification of those processes. Conceptually, we assume all series are subject to unobservable stochastic economic shocks, which are jointly drawn from a mean-zero distribution in every period, such that the covariances between series exhibit the specified levels.

By extension, the time-series processes for "true" expenses ($EXP^*_{i,t}$) and "true" accruals

[5]Notationally, the $F.$ subscript is meant to evoke a "forward shift operator" to highlight the intertemporal nature of the relevant covariance relation.

($ACC^*_{i,t}$) are implicitly defined by the following accounting identities:

$$EXP^*_{i,t} \equiv REV^*_{i,t} - NI^*_{i,t} \tag{2a}$$

$$ACC^*_{i,t} \equiv NI^*_{i,t} - CF^*_{i,t}. \tag{2b}$$

Hence, the time series for "true" net income, sales, expenses, cash flows, and accruals operate as an independent system of equations and are unaffected by any other factors in the specification, such as adjustments implemented by managers via AEM and/or REM. In our setting, the "true" descriptor applied to these series implies that they are free of any deliberate manipulations and/or unintentional measurement errors. We also assume that these "true" series define the outcomes that would prevail when managers make optimal decisions for their firms in terms of strategy, financing, operations, and marketing in every period and in response to all exogenous economic shocks. This system thereby establishes a simple "baseline" for the behavior of a firm's fundamental financials relative to which we can then assess the dynamic impacts of earnings management.

2.2. Managers' earnings adjustments

For the second component, which defines managers' adjustments, we assume that all actors external to a firm do not observe the values of the "true" series directly but instead observe the "reported" values of each series, defined as follows:

$$NI_{i,\tau} \equiv NI^*_{i,\tau} + A_{i,\tau} + R_{i,\tau} \tag{3a}$$

$$REV_{i,\tau} \equiv REV^*_{i,\tau} \tag{3b}$$

$$EXP_{i,\tau} \equiv EXP^*_{i,\tau} - A_{i,\tau} - R_{i,\tau} \tag{3c}$$

$$CF_{i,\tau} \equiv CF^*_{i,\tau} + R_{i,\tau} \tag{3d}$$

$$ACC_{i,\tau} \equiv ACC^*_{i,\tau} + A_{i,\tau}, \tag{3e}$$

where $t = \tau$ denotes a period in which the managers of firm i have chosen to adjust their reported income, such that every "reported" value is the sum of the "true" value of that variable and any net managerial adjustments.[6]

Adjustments are implemented via either accrual-based expenses ($A_{i,\tau}$) or changes in cash expenses ($R_{i,\tau}$), which constitute the two options we assume are available to managers attempting to attain specific targets for their reported earnings. We assume that managers implement all adjustments through expenses in the interest of making the specification as tractable and concise as possible.

Following the period of managerial adjustment, the "reported" variables evolve as defined below:

$$NI_{i,\tau+1} \equiv NI^*_{i,\tau+1} - A_{i,\tau} - \kappa_{i,\tau+1} R_{i,\tau} \tag{4a}$$

$$REV_{i,\tau+1} \equiv REV^*_{i,\tau+1} - \kappa_{i,\tau+1} R_{i,t} \tag{4b}$$

$$EXP_{i,\tau+1} \equiv EXP^*_{i,\tau+1} \tag{4c}$$

$$CF_{i,\tau+1} \equiv CF^*_{i,\tau+1} - \kappa_{i,\tau+1} R_{i,\tau} \tag{4d}$$

$$ACC_{i,\tau+1} \equiv ACC^*_{i,\tau+1} - A_{i,\tau}, \tag{4e}$$

based on the following assumptions.

First, we assume that all accrual-based adjustments in period τ must fully reverse in the following period. For example, a firm that deliberately understates bad debt expense by \$10 to increase reported income in the current year must necessarily report income that is diminished by \$10—relative to its "true" value—in the following year once the relevant accounts receivable have proven to be uncollectible.

Second, we assume that any strategic adjustments to real spending in the current period are not offset in the subsequent period, such that real expenses immediately return to their "true" level.

[6] For simplicity, we assume that managers did not also adjust their earnings in $t = \tau - 1$. Using a similar (unreported) approach with a greater focus on the long-term time-series impacts on reported income, we attain similar inferences depending on the parameterization of a hidden Markov switching model dictating the frequency of managers' adjustments.

In this case, the intertemporal sums of "true" and "observed" expenses would "permanently" differ by \$1.

Third, to further capture the essential differences between accrual-based adjustments and real adjustments, we assume that any deviations of real expenses from their true value (i.e., $R_{i,\tau} \neq 0$) will have additional knock-on effects on future cash sales. That is, we explicitly incorporate a causal dynamic relation between current-period expenses and next-period revenues. Intuitively, a \$1 reduction in advertising should engender some degree of lost future sales, due to a reduction in customer attentiveness. Were this not the case, the firm could, at no cost, increase its net income by not spending that additional dollar on a fruitless expense, but this would contradict our assumption that "true" expenses reflect the optimal resource allocations that managers should have made in any period. Therefore, every real adjustment must engender additional "real costs" in the form of lost future revenues.

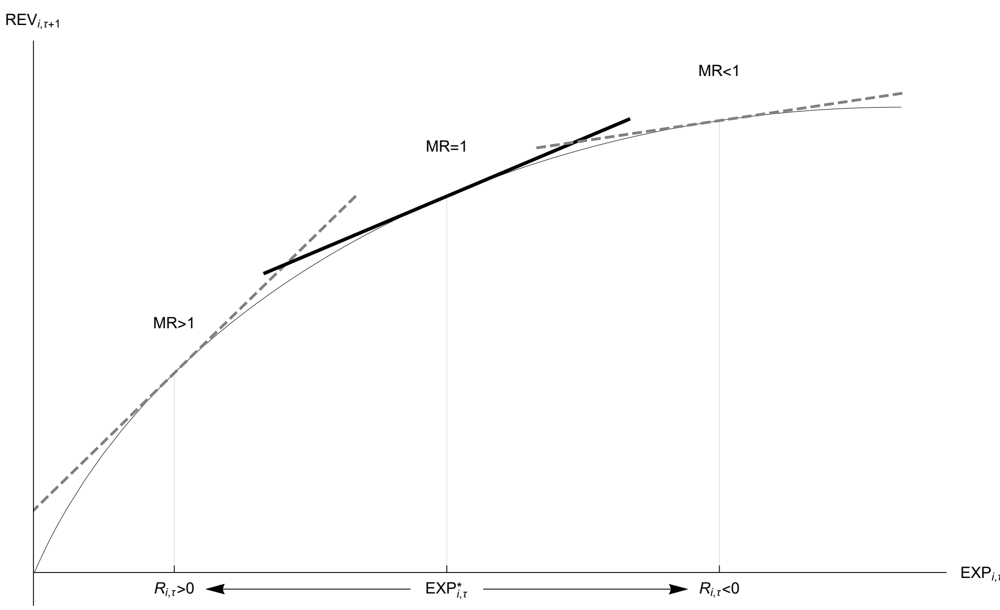


Fig. 1. Link between revenues and expenses.

Consider a function that explicitly links expenses to revenues, as in Figure 1. We assume that expenses exhibit diminishing marginal returns on revenues, such that the function is concave. Our definition of "true" expenses implies that every firm's managers have set their expenses to the exact level at which the marginal costs of additional spending exactly equal the marginal revenues stemming from sales. Therefore, any deviation from this optimal level of spending is characterized by marginal revenues that differ from unity and result in lower net income relative to its true level. In other words, reducing (increasing) expenses causes marginal revenues to rise above (fall below) unity, such that spending more (less) than \$1 yields more (less) than \$1 in future sales. Therefore, any real adjustment implemented by managers results in a sub-optimally lower dynamic outcome in terms of net income, regardless of the sign of the adjustment. Throughout the rest of the paper, we primarily focus on the effects of AEM and REM on the dynamic behavior of earnings, although it should be noted that the aggregate loss to income due to REM may be substantial.

Rather than fully modeling the underlying expense and revenue relation for all firms, we operationalize the real costs of engaging in REM in a reduced-form manner by defining a function, $\kappa_{i,\tau+1}$, that provides a value for the "costs" (in terms of lost cash sales revenues) in period $\tau + 1$ resulting from an adjustment to real expenses in period τ. More specifically, we assume that $\kappa_{i,\tau+1}$ acts as a multiplier that scales up or down the size of the prior-period's net real expense adjustments to define the effect on current sales revenues. For example, if $\kappa_{i,\tau+1} = 1$, then a \$1 decrease in prior-period expenses (relative to their "true" level) would yield a \$1 decrease in current-period sales revenue.

In accordance with the previously outlined intuition that the marginal revenues from expenses should deviate from unity whenever managers implement real adjustments, we further assume that the "real cost" multiplier takes on the following specific functional form:

$$\kappa_{i,\tau+1} \equiv 1 + \gamma R_{i,\tau}. \tag{5}$$

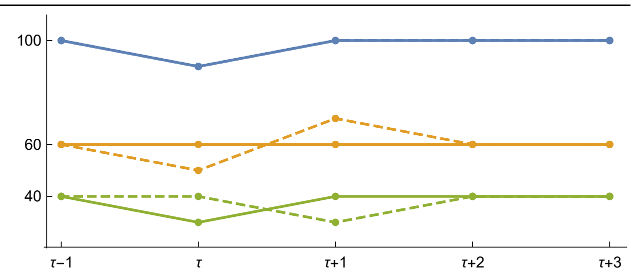
Broadly speaking, γ defines the severity of the "real cost" firms incur as a result of REM activities. More formally, γ represents the pseudo-elasticity of the effect on current-period real sales resulting from a prior-period adjustment to real expenditures.

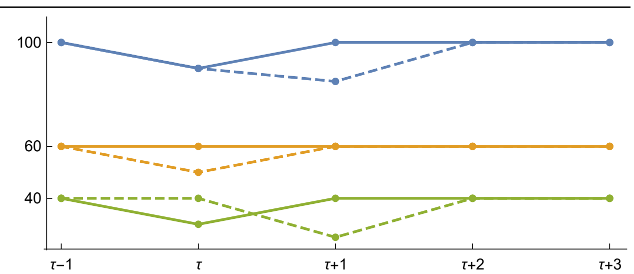
Specifically, the value of γ denotes the percentage by which the adjustment to prior-period real expenditures is inflated/deflated to determine their current-period effect on real sales when the total deviation of prior expenditures from their "true" level. For example, when $\gamma = 10$, a decrease in real expenditures of \$100 below their "true" value yields a multiplier of $\kappa_{i,\tau+1} = 1.1$ thereby implying that real sales will fall below their "true" value by \$110 ($= 1.1 \times \$100$). In practical terms, reducing advertising expenditures by \$100 below their normal level would yield sales revenues that are \$110 below normal in the following period. Our assumed functional form for these real costs incorporates the nonlinearity inherent in diminishing marginal returns, such that doubling the reduction in advertising expenditures results in a more-than-double decline in sales.

Fig. 2. Example Dynamics

In this simplified illustration of the functioning of our mathematical assumptions, we assume that the "true" values of sales revenues, expenses, and net income are constant before and after period $t = \tau$, in which the firm experiences a negative revenue shock. Managers intervene in period τ in order to maintain their income at the pre-shock level. We also assume a value of $\gamma = 0.05$ when calculating the effects of REM.

$t =$	$\tau - 1$	τ	$\tau + 1$	$\tau + 2$	$\tau + 3$	Totals
REV_t^*	100	90	100	100	100	490
EXP_t^*	60	60	60	60	60	300
NI_t^*	40	30	40	40	40	190
Panel A: AEM						
REV_t	100	90	100	100	100	490
EXP_t	60	50	70	60	60	300
NI_t	40	40	30	40	40	190
Panel B: REM						
REV_t	100	90	85	100	100	475
EXP_t	60	50	60	60	60	290
NI_t	40	40	25	40	40	185





Before proceeding, we offer in Figure 2 an illustrative example of how a firm's basic sales revenue, expense, and income accounts would behave dynamically in response to an economic shock and subsequent manipulation by management. First, we assume that sales revenues are generally constant across all time periods at \$100, and likewise expenses reliably amount to \$60, resulting in a persistent level of \$40 in net income leading into period $t = \tau - 1$. In period $t = \tau$, however, the firm experiences an economic shock resulting in a \$10 decline in sales revenue, which drops to \$90, before returning to its normal level of \$100 in period $t = \tau + 1$ and beyond. The firm does not adjust its expenses over this period of time, resulting in a one-period dip in net income from \$40 down to \$30. Next, we assume that the firm's managers are unwilling to report the lower-than-normal level of net income in period τ and choose instead to take steps to positively influence their reported earnings.

First, in Panel A of Figure 2, we show the dynamic outcomes resulting from the managers choosing to make accrual-based adjustments to expenses. For example, suppose managers deliberately underestimate their bad debt expenses in period τ, resulting in a \$10 decrease in reported earnings from \$60 to \$50. Because this decrease in expenses was equal to the decrease in sales revenue, reported net income therefore remains at its standard level of \$40 in period τ. Of course, managers can't simply hide their bad debts forever, so we see the reported level of expenses surges to \$70 in period $\tau + 1$, yielding a lower reported net income of only \$30. In periods $t = \tau + 2$ and beyond, everything returns to its normal level. As a result, the total quantity of earnings over this window of time is equal between the laissez-faire and manager-manipulation scenarios. The only meaningful change was that the hit to income was delayed by one period.

Second, Panel B portrays a similar scenario except that the managers now choose to engage in real earnings management by cutting their discretionary expenses in period τ. As a result of the lower expenditures, the managers are able to continue reporting the same net income of \$40. However, in the following period, we assume that there is knock-on effect on sales resulting from the adjustment to real expenses. For example, managers may have chosen to cancel some of their usual ad buys in period τ, and the absence of marketing results in fewer customers and lower sales in the following period. As a result, sales revenues in period $t = \tau + 1$ fall by \$15 ($= -(1 + 0.05 \times \$10) \times \$10$, based on Equation (5) and assuming $\gamma = 0.05$). Moreover, expenses return to their pre-shock level resulting in a fall in net income to \$25. Again, everything returns to normal in the following periods.

Notably, this course of action again results in net income decreasing exhibiting a delayed reaction to the economic shock, but because the REM adjustment does not completely offset itself like the accrual-based adjustment did, total earnings across all time periods are now lower than they would have been in the absence of any REM.

Now that we have defined how managers' adjustments affect the "observed" values of our fundamental time series, we next formalize why and by how much managers choose to adjust earnings. We assume that managers calculate the size of a "composite adjustment" ($\varepsilon_{i,\tau}$) they would like to implement for the purpose of hitting a specific earnings target ($f_{i,\tau}$), as follows:

$$\varepsilon_{i,\tau} \equiv -(NI^*_{i,\tau} - f_{i,\tau}), \tag{6}$$

where $NI^*_{i,\tau}$ represents the level of income that would be reported in the absence of any additional adjustments.

Unlike external actors, managers are cognizant of what their "true" value of earnings would be in the complete absence of any past or current adjustments, as well as what the impacts are of any unavoidable "reversals" and "real costs" stemming from adjustments made in prior periods. Managers are then free to implement their desired level of composite adjustment through any combination of accrual and real adjustments, such that $A_{i,\tau} + R_{i,\tau} = \varepsilon_{i,\tau}$. Therefore, reported earnings after managers implement their desired adjustments would be $NI_{i,\tau} = NI^*_{i,\tau} + \varepsilon_{i,\tau} = NI^*_{i,\tau} - (NI^*_{i,\tau} - f_{i,\tau}) = f_{i,\tau}$, meaning reported income becomes exactly equal to the managers' target level.

We focus on the attainment of short-term earnings targets constructed by financial analysts. As analysts are external to the firm, they do not know a firm's "true" level of earnings with certainty. However, via technical analysis and managers' guidance provided prior to the earnings announcement, we assume that analysts are able to produce intertemporally unbiased forecasts of true earnings. However, in any given period, the consensus estimates will exhibit some degree of forecast error, denoted by $e_{i,\tau}$.

Formally, we define the managers' income targets as:

$$f_{i,\tau} \equiv NI^*_{i,\tau} + e_{i,\tau}, \tag{7}$$

where $e_{i,\tau}$ is drawn from a random normal distribution with a mean of μ_e and standard deviation of σ_e. Though exogenously determined, σ_e partially captures the nature of the information environment in which the firm is operating, as determined by such factors as the size of the market, the number of analysts, etc. If $\mu_e = 0$, this setup would imply that managers would be adjusting their reported earnings upwards and downwards with equal frequency.

While it may seem counter-intuitive for a manager to deliberately report lower earnings, doing so via accrual adjustments guarantees the manager the opportunity to report higher earnings in the subsequent period (when there is still uncertainty about whether the firm will be able to attain its next-period earnings target) while avoiding any "penalty" imposed by financial markets for missing the current-period earnings target and without any intertemporal loss of income.

With respect to REM, managers are unlikely to real activities to manage earnings downwards, given the intertemporal costs of doing so. For this reason—and in order to best match our assumptions regarding the firms suspected of managing earnings in our quarterly empirical setting discussed in Subsection 4.2—we set $\mu_e > 0$ in order to ensure that the majority of firms are adjusting their reported earnings upwards.

Finally, we also assume that managers choose a constant percentage, denoted by $\lambda \in [0, 1]$, of their desired composite adjustment to be made via expense accruals with the remainder to be made via real cash expenses. Mathematically, we define the accrual and real adjustments as:

$$A_{i,\tau} \equiv \lambda \varepsilon_{i,\tau} \tag{8}$$

$$R_{i,\tau} \equiv (1 - \lambda)\varepsilon_{i,\tau}, \tag{9}$$

such that $A_{i,\tau} + R_{i,\tau} = \varepsilon_{i,\tau}$.

3. Empirical approach

Our empirical identification strategy centers on the idea that although both AEM and REM affect current earnings, the effects of these two types of earnings management reverse into different components of future earnings. These differences provide an important empirical wedge that can distinguish between, and quantify the effects of, AEM and REM on reported earnings.

Specifically, we leverage the closed-form nature of earnings-based accounting identities and the convenient empirical properties of an $AR(1)$ earnings processes and univariate regressions. Because change in earnings (ΔNI) is equal to the difference of change in sales minus change in expenses ($\Delta REV_t - \Delta EXP_t$) and is also equal to the sum of change in cash flows and change in accruals ($\Delta CF_t + \Delta ACC_t$), the sum of the slopes for future earnings components must equal the slope for future earnings.[7] Formally,

$$\Delta NI_{t+1} = \alpha^{NI} + \beta^{NI} NI_t + u^{NI}_{t+1} \tag{10a}$$

$$\Delta REV_{t+1} = \alpha^{REV} + \beta^{REV} NI_t + u^{REV}_{t+1} \tag{10b}$$

$$\Delta EXP_{t+1} = \alpha^{EXP} + \beta^{EXP} NI_t + u^{EXP}_{t+1} \tag{10c}$$

$$\Delta CF_{t+1} = \alpha^{CF} + \beta^{CF} NI_t + u^{CF}_{t+1} \tag{10d}$$

$$\Delta ACC_{t+1} = \alpha^{ACC} + \beta^{ACC} NI_t + u^{ACC}_{t+1} \tag{10e}$$

Accordingly, by definition, $\beta^{NI} = \beta^{REV} - \beta^{EXP} = \beta^{CF} + \beta^{ACC}$.

We start by showing how varying the analytical parameters (γ, λ, and σ_e) affect the slopes on current earnings when we use the dependent variables listed above. Table 1 presents analytically derived predictive slopes for univariate regressions of changes in future earnings (ΔNI) and changes in components of ΔNI (ΔREV, ΔEXP, ΔCF, and ΔACC) on current earnings. These estimates are analytically derived using the slope formulas in the Appendix along with the relevant moments (σ_{NI}, $\sigma_{F.NI}$, σ_{REV}, $\sigma_{F.REV}$, σ_{CF}, and $\sigma_{F.CF}$) from annual Compustat data for 1973 through 2022.

Table 1 presents a lot of results, but the individual results follow intuitive patterns and these

[7] We describe our empirical measures in the Appendix.

patterns follow the economic intuition introduced above. The Table is organized as follows. First, along the vertical axis, we vary the cost of REM, γ, across the values of 0, 10, and 20. Within each value of γ, we vary λ, which captures the extent of AEM versus REM, from "All REM" ($\lambda = 0$) to "All AEM" ($\lambda = 0$).

Next, via the columns, we vary the volatility of the forecast error (σ_e). Given that σ_e captures the range of the adjustments that the manager uses to manage earnings, it provides evidence on the magnitude of the adjustments made to manage earnings. Put differently, σ_e captures the range of adjustments made to achieve a forecast. In the middle set of columns, we set σ_e equal to 0.023, which represents approximately 10% of the variance in accrual expenses. We then adjust this amount down to 0.016 in the first set of columns and up to 0.028 in the third set of columns.

For ease of interpretation, we provide in the text snippets of the Table for ΔNI, ΔREV, and ΔEXP. These snippets are at $\gamma = 20$, but the general results are similar across the other levels of γ. We begin by examining how earnings persistence (ΔNI) varies with the analytical primitives. First, across all levels of the mix between AEM and REM (i.e., λ), earnings persistence decreases monotonically as forecast error volatility increases (σ_e) increases. This result is consistent with the well-known intuition that higher levels of earnings management lead to less persistent earnings. Second, holding forecast volatility constant, persistence increases monotonically as the mix of earnings management shifts toward AEM (i.e., λ increases). This result is consistent with REM having a "real cost." Overall, these two patterns are similar when we vary the levels of γ in the Table.

Coefficients on NI when the dependent variable is ΔNI ($\gamma = 20$)

	Forecast error volatility		
EM Mix	$\sigma_e = 0.016$	$\sigma_e = 0.023$	$\sigma_e = 0.028$
$\lambda = 0$ (All REM)	−0.177	−0.192	−0.213
$\lambda = 1/3$	−0.176	−0.190	−0.208
$\lambda = 2/3$	−0.175	−0.188	−0.205
$\lambda = 1$ (All AEM)	−0.174	−0.187	−0.204

We next examine the coefficients on NI when the dependent variables are the components of

ΔNI (ΔREV, ΔEXP, ΔCF, and ΔACC). We start with ΔREV. As with ΔNI, the coefficients on NI decrease monotonically as forecast error volatility increases. Within each level of forecast volatility, coefficients on NI increase montonically as we move from "All REM" to "All AEM."

Coefficients on NI when the dependent variable is ΔREV ($\gamma = 20$)

	Forecast error volatility		
EM Mix	$\sigma_e = 0.016$	$\sigma_e = 0.023$	$\sigma_e = 0.028$
$\lambda = 0$ (All REM)	0.200	0.189	0.174
$\lambda = 1/3$	0.204	0.196	0.187
$\lambda = 2/3$	0.207	0.203	0.197
$\lambda = 1$ (All AEM)	0.209	0.208	0.204

When we examine the coefficients on NI when the dependent variable is ΔEXP, we find the coefficients on NI increase monotonically as forecast error volatility increases. Within each level of forecast volatility, coefficients on NI increase monotonically as we move from "All REM" to "All AEM."

Coefficients on NI when the dependent variable is ΔEXP ($\gamma = 20$)

	Forecast error volatility		
EM Mix	$\sigma_e = 0.016$	$\sigma_e = 0.023$	$\sigma_e = 0.028$
$\lambda = 0$ (All REM)	0.377	0.381	0.387
$\lambda = 1/3$	0.379	0.386	0.395
$\lambda = 2/3$	0.381	0.390	0.402
$\lambda = 1$ (All AEM)	0.384	0.395	0.410

With respect to ΔCF, the coefficients on NI decrease monotonically as the forecast error volatility increases and they increase monotonically as AEM increases relative to REM. With respect to ΔACC, we find the opposite patterns with respect to forecast error volatility and AEM relative to REM than for ΔCF.

When we compare across the levels of the cost of REM (γ), several patterns emerge. First, at each level of the forecast error volatility, the coefficients on NI for when the dependent variable is either ΔACC and ΔEXP are the same across λs for each level of γ. The pattern with respect to

ΔEXP arises because we assume that when you engage in REM via your expenses, it only affects future revenues. With respect to ΔACC, the coefficients constant across γ because γ does not affect accruals.

Second, the coefficients on NI are the same across all values of γ for the "All AEM" case (λ = 1). This pattern occurs because manipulation only occurs through accruals at this level of γ. Third, when the cost of REM is zero (i.e., $\gamma = 0$), the coefficient on NI when ΔNI is the same across the levels of forecast error volatility. This effect occurs because the manager can adjust earnings to the same level but the cost is zero for both REM and AEM.

4. Empirical tests

In our empirical tests, we compare the persistence in net income for control firms and firms suspected of engaging in earnings management. We then decompose net income into revenues versus expenses and cash flow versus accruals to ascertain the sources of any differences in the persistence of net income between the suspected and control firms.

For the control firms, we then follow the approach used Table 1 in that we estimate the relevant empirical moments (σ_{NI}, $\sigma_{F.NI}$, σ_{REV}, $\sigma_{F.REV}$, σ_{CF}, and $\sigma_{F.CF}$) and then analytically calculate counterfactual slope coefficients for various combinations of parameters from the analytical specification (γ, λ, and σ_e).[8] The goal is to identify combinations of the parameters that would lead to the two groups to have similar (i.e., statistically indistinguishable) slope coefficients.

4.1. Annual suspected vs. control

The bulk of the academic literature examining earnings management centers on annual fiscal settings. Seminal studies examining AEM and REM almost exclusively focus on the interaction between how agency-based incentives and the discretionary accrual and operating choices of man-

[8]By using the empirical moments for the control firms as a baseline, we are not assuming that the control firms do not engage in any earnings management. Instead, we assume that these firms represent a baseline to compare the extent that the suspected firms engage in more earnings management. This issue is common to any empirical test of earnings management.

agers affect annual earnings and cash flow (Dechow et al., 1995; Roychowdhury, 2006; Dechow, Hutton, Kim, and Sloan, 2012).

Table 2 presents summary descriptive statistics of our empirical tests at the annual level. Control firms (Panel A) are drawn from the sample used in Table 1 but include only firms that report in period t: (i) an increase in net income between \$0 and \$25 million, (ii) an increase in net income scaled by assets less than 0.015 and (iii) positive sales growth. Suspected firms (Panel B) are drawn from the same used in Table 1 but includes only firms that report in period t: (i) an increase in net income between \$0 and \$25 million, (ii) an increase in net income scaled by assets less than 0.015 and (iii) non-positive sales growth. The "control" firm sample has 19,597 firm years and the "suspected" sample has 3,268 firm years. All suspected and control firms are publicly traded on major exchanges (CRSP exchange codes 1, 2, 3).

Panel C presents coefficients from regressions of changes in net income and its components on current net income. Specifically, we pool suspected and control firms and then estimate regressions of one-period ahead changes (ΔNI), revenue (ΔREV), expenses (ΔEXP), cash flows (ΔCF), and accruals (ΔACC) on current net income (NI_t) along with an indicator for the suspected firms ($MEET_t$) and interaction of current net income and the indicator variable ($NI_t \times MEET_t$). Regression slopes are estimated from a panel regression and standard errors are double clustered at the firm- and calendar-quarter-year levels.

The coefficients on the interaction represent the differences between the suspected and control firms in the relation between future changes in net income and the components of net income and current net income. Put differently, these regressions provide insight into differences in persistence between the suspected and control firms. To start, for the change in net income, the significantly negative coefficient on the interaction ($\beta = -0.138$ and $se = 0.015$) indicates that net income is less persistent for suspected firms. When we decompose the change in net income into the change in revenue and the change in expenses, the coefficient on the interaction for the change in revenue is not statistically significant while the coefficient on the interaction on the change in expenses is statistically positive ($\beta = 0.067$ and $se = 0.054$).

We next decompose the change in net income into the change in cash flows and the change in accruals. For this decomposition, both the coefficient on the interaction for the change in cash flows is significantly negative ($\beta = -0.079$ and $se = 0.016$) and the coefficient on the interaction for the change in accruals is statistically negative ($\beta = -0.058$ and $se = 0.016$).

Taken together, these result imply that suspected firms have less persistent net income and this lower persistence is driven by higher future cash and accrual expenses. We next examine which combinations of the parameters from the analytical specification would make the slope coefficients for the control firms statistically indistinguishable from the slope coefficients for the suspected firms. Such combinations provide insight into the costs of REM, the extent of AEM versus REM, and the magnitude of adjustments made to manage earnings.

Table 3 presents analytically derived slope coefficients for the control firms. For control firms, we follow the approach used Table 1 in that we estimate the relevant empirical moments for the control firms (σ_{NI}, $\sigma_{F.NI}$, σ_{REV}, $\sigma_{F.REV}$, σ_{CF}, and $\sigma_{F.CF}$) and then analytically calculate the slope coefficients using the equations provided in the Appendix. We then compare the empirically estimated slope coefficients for the suspected firms presented in Panel C of Table 2 ($\beta NI_t + \beta NI_t \times MEET_t$) with the analytically derived slope coefficients for the control firm. We highlight in gray the control slope coefficients that are within two standard errors from the suspected slope coefficients.

To evaluate these results, we focus on combinations of the five slope coefficients for which the empirically estimated "suspected sample" coefficients are close in value to the analytically derived coefficients under differing parameterizations of earnings management activity. In Table 3, we use the following values for σ_e: 0.008, 0.012, and 0.016. The middle value represents approximately 10% of the variance in accrual expenses for the control sample.

In terms of full sets of coefficients for which there are no substantial differences between the analytically implied values and the estimated "suspected" values, none occur at the lowest value of σ_e: 0.008. For the highest value of σ_e, they only occur with relatively low γ values. In all cases, estimated coefficients are only consistent with the expected patterns implied by EM when the earnings adjustments are implemented via 30% AEM and 70% REM. As such, our findings support the notion that firms may implement strategic earnings adjustments via both AEM and REM simultaneously at an annual time horizon.

We additionally attempt to find the set of parameter values that produces the 'best fit' between the empirical estimates and the analytical values. To do so, we search over ranges of different parameter values in order to find the set that minimizes the following "loss" function:

$$\min_{\Theta} \mathscr{L} = \sum_{i} \left(\hat{\beta}^{i} - \beta^{i}_{\Theta}\right)^{2} \tag{11}$$

where Θ represents the space of feasible earnings management parameters defined by combinations of σ_e, λ, and γ, $\hat{\beta}^i$ represents the OLS estimate from the "suspected sample," β^i_{Θ} represents the coefficient value derived from a specific set of parameter values, and $i \in \{NI, REV, EXP, CF, ACC\}$ for each of the five coefficients. In the annual setting, when mean earnings adjustments are $\mu_e = 0.01$, we find that the best fit is characterized by $\sigma_e = 0.0123$, $\lambda = 0.45$, and $\gamma = 20$.

Using these parameter values, we can also gain some further insight into the nature of two types of earnings management by decomposing the variance of the overall composite adjustments, as shown:

$$\begin{aligned} Var[\varepsilon_t] = \sigma_e^2 &= Var[A_t + R_t] \\ &= Var[A_t] + Var[R_t] + 2\ Cov[A_t, R_t] \\ &= Var[\lambda\varepsilon_t] + Var[(1-\lambda)\varepsilon_t] + 2\ Cov[\lambda\varepsilon_t, (1-\lambda)\varepsilon_t] \\ &= \lambda^2\sigma_e^2 + (1-\lambda)^2\sigma_e^2 + 2\lambda(1-\lambda)\sigma_e^2. \end{aligned} \tag{12}$$

Notably, this expression makes it clear that while the variance of the overall adjustment is defined by the sum of variances of the AEM and REM adjustments as well as their covariance. This suggests that when the composite error exhibits a variance that may seem unreasonably large, it may also coincide with variances for AEM and REM that are relatively much lower and still seem quite reasonable when considered individually, because the overall variance is "inflated" in a sense by the covariance term.[9] For example, applying the optimal parameter set described previously to Equation 12 shows that an overall composite adjustment with a standard deviation of 0.0147 corresponds to AEM adjustments with standard deviation of 0.0059 and REM adjustments with a standard deviation of 0.0088 when $\lambda = 0.40$.

4.2. Fourth quarter meet-or-beat

Table 4 presents descriptive statistics for the fourth quarter meet-or-best setting. The control firm sample (Panel A) spans fiscal 4th quarters between 1984:08–2022:12 and comprises firms that just missed their I/B/E/S consensus forecast (−\$0.02 and −\$0.01). The suspected sample (Panel B) the same time horizon as the control sample and comprises firms that met (\$0.00) or just beat (\$0.01) their 4th quarter consensus I/B/E/S EPS forecast. All firms are publicly traded on major exchanges (CRSP exchange codes 1, 2, 3) and have at least two analysts contributing to the forecast.

Panel C presents coefficients from regressions of changes in net income and its components on current net income. We use these regressions to estimate the coefficients for the suspected firms and to generate standard errors to calculate statistical significance for the comparisons presented in Table 5. Specifically, we pool suspected and control firms. We then estimate regressions of one-period ahead changes in net income (ΔNI), revenue (ΔREV), expenses (ΔEXP), cash flows (ΔCF), and accruals (ΔACC) on current net income (NI_t) along with an indicator variable for the suspected firms ($MEET_t$) and interaction of current net income and the indicator variable ($NI_t \times MEET_t$). Regression slopes are estimated from a panel regression and standard errors are double clustered at the firm- and calendar-quarter-year levels.

The coefficients on the interaction represent the differences between the suspected and control firms in the relation between future changes in net income and the components of net income and

[9] Note that our framework leads to the covariance term being non-negative, implying that REM and AEM can only be complements. This covariance is in the cross-section. Hence, for REM and AEM to be substitutes, it would have to the case that firms manage accruals downward to decrease reported earnings while at the same time engaging in real activities that increase reported activities and vice versa. This case does not seem realistic. Our analytical framework does not, however, rule out the possibility that AEM and REM are substitutes over time (e.g., Cohen et al., 2008).

current net income. Put differently, these regressions provide insight into differences in persistence between the suspected and control firms.

To start, for the change in net income, the significantly negative coefficient on the interaction ($\beta = -0.089$ and $se = 0.026$) indicates that net income is less persistent for suspected firms. When we decompose the change in net income into the change in revenue and the change in expenses, the coefficient on the interaction for the change in revenue is not statistically significant while the coefficient on the interaction on the change in expenses is statistically positive ($\beta = 0.066$ and $se = 0.032$).

We next decompose the change in net income into the change in cash flows and the change in accruals. For this decomposition, both the coefficient on the interaction for the change in cash flows is not statistically significant while the coefficient on the interaction for the change in accruals is significantly negative ($\beta = -0.103$ and $se = 0.033$).

Taken together, these result imply that suspected firms have less persistent net income and this lower persistence is driven by higher future accrual expenses. We next examine which combinations of the parameters from the analytical specification would make the slope coefficients for the control firms statistically indistinguishable from the slope coefficients for the suspected firms.

Table 5 presents analytically derived slope coefficients for the control firms. For the control firms, we follow the same approach used Tables 1 and 3. To wit, we estimate the relevant empirical moments for the control firms (σ_{NI}, $\sigma_{F.NI}$, σ_{REV}, $\sigma_{F.REV}$, σ_{CF}, and $\sigma_{F.CF}$) and then analytically calculate the slope coefficients using the equations provided in the Appendix.

We then compare the empirically estimated slope coefficients for the suspected firms presented in Panel C of Table 2. As in Table 3, we highlight in gray the analytically-derived slope coefficients for the control sample that are within two standard errors from the estimated slope coefficients for the suspected firms. To evaluate these results, we again focus on combinations of the five slope coefficients for which the coefficients for the suspected firms are not substantially different from the analytically derived control coefficients. In Table 5, we use the following values for σ_e: 0.007, 0.010, and 0.013. The middle value represents approximately 10% of the variance in accrual expenses for the control sample.

Examining this table, two findings emerge. First, parameter values resulting in all five coefficient values being shaded only occur at the middle level of forecast error volatility. Second, shaded combinations only occur when λ is set to one, which represents all AEM and no REM. The fact that we fail to find empirical evidence supporting REM in this setting dovetails neatly into the economic plausibility of earnings management choices in short-horizon, quarterly settings: managers likely have a much more difficult path to change a firm's operations in the last few weeks of a fiscal quarter to meet an earnings target versus managing their accrual expense estimates.

We again search for the set of parameter values that produces the "best fit" between the empirical estimates and the analytical values, as defined in Equation 11. In the quarterly setting, when mean earnings adjustments are $\mu_e = 0.01$, we find that the best fit is characterized by $\sigma_e = 0.012$, $\lambda = 0.999$, and $\gamma = 12$, similar to what is shown in Table 5.

Using these parameter values, we again consider the variance decomposition expressed in Equation 12. In this setting, when $\lambda = 0.999$, a composite adjustment with a standard deviation of 0.012 must be entirely attributed to AEM adjustments with an equal standard deviation of 0.012.

5. Conclusion

There is perhaps no larger set of studies over the past 35 years in the accounting literature than the set of studies centered on earnings management. Interest is driven by several core features of principal-agent dynamics and how capital market participants evaluate firm performance. Despite the prolonged and continued interest, prior studies offer little evidence on the combined effects of different forms of earnings management on reported earnings

We contribute to the earnings management literature in two ways. First, we propose a novel approach to distill the effects of accrual earnings management (AEM) from the effects of real earnings management (REM) and from the effects of transitory economic shocks. Our analytical specification centers on the premise that the effects of AEM and REM reverse into future earnings, but that these different earnings management actions reverse into different future earnings components. Accrual-based earnings management is primarily explained by the improper delay/acceleration in the recognition of accrual-based expenses. Accordingly, the lower earnings persistence associated with accrual-based earnings management should be primarily explained by higher accrual expenses in future periods.

Real earnings management actions, on the other hand, are primarily explained by current period actions (e.g., reductions in discretionary expenditures, acceleration of sales recognition through sales promotions) that lead to lower future sales. Consquently, lower earnings persistence associated with real earnings management is primarily driven by lower future cash revenues. Our identification strategy to distill AEM from REM using the relation of current earnings with future earnings components offers a richer perspective of how different earnings management strategies affect observed earnings.

Second, we offer formal structure for the "real costs" of real earnings management. The consensus in the academic accounting literature, inclusive of surveys of corporate executives (Graham et al., 2005; Dichev, Graham, Harvey, and Rajgopal, 2013) is that REM actions are more destructive to firm value than accrual-based earnings management. These costs, however, are not formalized in prior studies, preventing relative assessments of the economic significance of REM and AEM actions. Our study formalizes these costs within an empirical design centered on the premise that $1 of REM actions in the current period lead to future sales that negatively offset that REM action by more than $1.

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Appendix

Empirical measures

Our primary measure is Net Income is Compustat item IB for our annual tests and IBQ for our quarterly tests. We take all primitive measures and deflate them average total assets. To derive our cash flow and accrual measures, we start with separating accruals into those associated with revenue and those associated with expenses.

To measure revenue accruals, we use ending accounts receivable (Compustat item AR) under the assumption that most firms collect outstanding accounts within 60 to 90 days. Under this assumption, the ending accounts receivable balance represents accrual revenue over the fiscal period:

$$ACC\_REV_t = AR_t^{Comp}. \tag{13}$$

For the remaining accruals, we use non-working capital accruals that represent reconciling items (i.e., non-transaction accruals).[10] These accruals represent managerial estimates made at the end of the fiscal period relating to changes in the capitalized value of assets and liabilities. Variation in these accruals map "dollar-for-dollar" into earnings.

$$ACC\_EXP_t = XIDOC_t^{Comp} + DPC_t^{Comp} + TXDC_t^{Comp} + ESUBC_t^{Comp} + FOPO_t^{Comp} + SPPIV_t^{Comp}. \tag{14}$$

We then calculate cash-based revenue as the difference between total revenue (Compustat item REV) and accrual-based revenue:

$$CF\_REV_t = REV_t^{Comp} - ACC\_REV_t. \tag{15}$$

To calculate cash expenses, we subtract net income (Compustat item IB) and accruals expenses

[10] We do not use working capital accruals because they do not map "dollar-for-dollar" into earnings and are generally the result of arms-length transactions with independent third-parties. That is, there is very little discretion in how much inventory Walmart accrues as it directly maps from the invoices they receive from their vendors.

from revenue (Compustat item REV):

$$CF\_EXP_t = REV_t^{Comp} - NI_t^{Comp} - ACC\_EXP_t. \tag{16}$$

Given these expressions, we calculate cash-based earnings as

$$CF_t = CF\_REV_t \ - \ CF\_EXP_t \tag{17}$$

and accruals-based earnings as

$$ACC_t = ACC\_REV_t - ACC\_EXP_t. \tag{18}$$

By construction, our cash-based and accruals-based earnings measures sum to the net income reported in Compustat:

$$NI_t^{Comp} = CF_t + ACC_t. \tag{19}$$

Slopes

Our empirical analysis largely relies on the estimated coefficient values resulting from the application of OLS to simple linear regression models of the following general form,

$$y = \alpha + \beta x + e,$$

where β represents our construct of interest. Appealing to standard statistical theory, the asymptotic expected value of β can be expressed as:

$$\beta = \frac{Cov[y, x]}{Var[x]}. \tag{20}$$

From here, we can derive expressions for each of the β coefficients from our regressions of interest in Equations (10a) – (10e).

When we can assume a complete absence of any managerial adjustments, these coefficient expressions are fairly straightforward and can be written purely as functions of the exogenous parameter values listed in Equations (1a) – (1f), as shown:

$$\beta^{NI} = \frac{Cov[\Delta NI^*_{t+1}, NI^*_t]}{Var[NI^*_t]} = \frac{\sigma_{F.NI}}{\sigma^2_{NI}} - 1 \tag{21a}$$

$$\beta^{REV} = \frac{Cov[\Delta REV^*_{t+1}, NI^*_t]}{Var[NI^*_t]} = \frac{\sigma_{F.REV} - \sigma_{REV}}{\sigma^2_{NI}} \tag{21b}$$

$$\beta^{EXP} = \frac{Cov[\Delta EXP^*_{t+1}, NI^*_t]}{Var[NI^*_t]} = \frac{\sigma_{F.REV} - \sigma_{REV} - \sigma_{F.NI} + \sigma^2_{NI}}{\sigma^2_{NI}} \tag{21c}$$

$$\beta^{CF} = \frac{Cov[\Delta CF^*_{t+1}, NI^*_t]}{Var[NI^*_t]} = \frac{\sigma_{F.CF} - \sigma_{CF}}{\sigma^2_{NI}} \tag{21d}$$

$$\beta^{ACC} = \frac{Cov[\Delta ACC^*_{t+1}, NI^*_t]}{Var[NI^*_t]} = \frac{\sigma_{F.NI} - \sigma^2_{NI} - \sigma_{F.CF} + \sigma_{CF}}{\sigma^2_{NI}}. \tag{21e}$$

Instead, when we are interested in knowing the values of these coefficients in the presence of managerial adjustments, we must start with the same basic expression in Equation (20) above, but written using the variables' observed values. Next, we substitute in our theoretical assumptions from Equations (3a) – (3e) and Equations (4a) – (4e) for time periods τ and $\tau + 1$. From there, we apply the rules and properties pertaining to primary statistical moments and work to algebraically reduce the expressions until they can be written solely as functions of the exogenous parameters from Equations (1a) – (1f) as well as the parameters that dictate the degree of earnings management, i.e., γ, λ, and σ_e. Doing so yields the following analytical expressions used to generate the values in Tables 1, 3, and 5:

$$\beta^{NI} = \frac{Cov[\Delta NI_{t+1}, NI_t]}{Var[NI_t]} = \frac{\sigma_{F.NI} - (\lambda + (1-\lambda)(1 + 2\gamma(1-\lambda)\mu_e))\,\sigma_e^2}{\sigma_{NI}^2 + \sigma_e^2} - 1 \tag{22a}$$

$$\beta^{REV} = \frac{Cov[\Delta REV_{t+1}, NI_t]}{Var[NI_t]} = \frac{\sigma_{F.REV} - \sigma_{REV} - (1-\lambda)(1 + 2\gamma(1-\lambda)\mu_e)\sigma_e^2}{\sigma_{NI}^2 + \sigma_e^2} \tag{22b}$$

$$\beta^{EXP} = \frac{Cov[\Delta EXP_{t+1}, NI_t]}{Var[NI_t]} = \frac{\sigma_{F.REV} - \sigma_{REV} - \sigma_{F.NI} + \lambda\sigma_e^2}{\sigma_{NI}^2 + \sigma_e^2} + 1 \tag{22c}$$

$$\beta^{CF} = \frac{Cov[\Delta CF_{t+1}, NI_t]}{Var[NI_t]} = \frac{\sigma_{F.CF} - \sigma_{CF} - (1-\lambda)(1 + (1 + 2\gamma(1-\lambda)\mu_e))\sigma_e^2}{\sigma_{NI}^2 + \sigma_e^2} \tag{22d}$$

$$\beta^{ACC} = \frac{Cov[\Delta ACC_{t+1}, NI_t]}{Var[NI_t]} = \frac{\sigma_{F.NI} - \sigma_{F.CF} + \sigma_{CF} + (1-2\lambda)\sigma_e^2}{\sigma_{NI}^2 + \sigma_e^2}. \tag{22e}$$

Table 1: Analytically-derived predictive slopes on NI across earnings management parameters

This table reports predictive slopes on current net income for regressions in which the dependent variables are changes in one-period ahead: net income (ΔNI), revenue (ΔREV), expenses (ΔEXP), cash flows (ΔCF), and accruals (ΔACC). Slope estimates are analytically derived using slope formulas reported in the Appendix that incorporate empirical moments based on Compustat data for the period starting June 1973 and ending May 2022. Our empirical sample comprises all publicly traded firms on NYSE, AMEX, and NASDAQ with exchange codes 1, 2 & 3, share codes 10–12, non-zero average assets in year t, and necessary Compustat values in years t and $t+1$. We exclude all firms with CRSP SIC codes between 6000–6999, 0, and 9999, resulting in a sample size of 157,289 observations. We adjust the slope estimates over various combinations of the primitive EM parameters from the analytical specification: γ captures the incremental cost of real earnings management over accrual earnings management; λ captures the percentage of accruals-based earnings management; σ_e captures the volatility of the forecast error for the manager's net income targets.

Unadjusted Sample Beta Estimates	ΔNI^*	ΔREV^*	ΔEXP^*	ΔCF^*	ΔACC^*
	−0.162	0.210	0.373	−0.077	−0.085

		Forecast Error Volatility														
		$\sigma_e = 0.016$					$\sigma_e = 0.023$					$\sigma_e = 0.030$				
REM COST	EM MIX	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC
$\gamma = 0$	All REM	−0.174	0.203	0.377	−0.090	−0.085	−0.187	0.194	0.381	−0.103	−0.084	−0.204	0.183	0.387	−0.121	−0.083
	$\lambda = 1/3$	−0.174	0.205	0.379	−0.086	−0.089	−0.187	0.199	0.386	−0.094	−0.093	−0.204	0.191	0.395	−0.106	−0.098
	$\lambda = 2/3$	−0.174	0.207	0.381	−0.081	−0.093	−0.187	0.203	0.390	−0.085	−0.102	−0.204	0.198	0.402	−0.090	−0.113
	All AEM	−0.174	0.209	0.384	−0.077	−0.098	−0.187	0.208	0.395	−0.076	−0.111	−0.204	0.206	0.410	−0.076	−0.128
$\gamma = 10$	All REM	−0.176	0.201	0.377	−0.091	−0.085	−0.190	0.192	0.381	−0.106	−0.084	−0.208	0.179	0.387	−0.125	−0.083
	$\lambda = 1/3$	−0.175	0.204	0.379	−0.086	−0.089	−0.188	0.197	0.386	−0.095	−0.093	−0.206	0.189	0.395	−0.108	−0.098
	$\lambda = 2/3$	−0.175	0.207	0.381	−0.081	−0.093	−0.187	0.203	0.390	−0.085	−0.102	−0.204	0.198	0.402	−0.091	−0.113
	All AEM	−0.174	0.209	0.384	−0.077	−0.098	−0.187	0.208	0.395	−0.076	−0.111	−0.204	0.206	0.410	−0.076	−0.128
$\gamma = 20$	All REM	−0.177	0.200	0.377	−0.093	−0.085	−0.192	0.189	0.381	−0.108	−0.084	−0.213	0.174	0.387	−0.130	−0.083
	$\lambda = 1/3$	−0.176	0.204	0.379	−0.087	−0.089	−0.190	0.196	0.386	−0.097	−0.093	−0.208	0.187	0.395	−0.110	−0.098
	$\lambda = 2/3$	−0.175	0.207	0.381	−0.081	−0.093	−0.188	0.203	0.390	−0.086	−0.102	−0.205	0.197	0.402	−0.091	−0.113
	All AEM	−0.174	0.209	0.384	−0.077	−0.098	−0.187	0.208	0.395	−0.076	−0.111	−0.204	0.206	0.410	−0.076	−0.128

Table 2: Annual meet-or-beat earnings management parameters: 1973:06–2022:05

Panels A and B report the means (Avg.), standard deviations (Std.), 1st and 99th percentiles, and slopes on NI (β) for the Control- and Suspected-firm samples. Control firms are drawn from the sample used in Table 1 but include only firms that report in period t: (i) an increase in net income between \$0 and \$25 million, (ii) an increase in net income scaled by assets less than 0.015 and (iii) positive sales growth. Suspected firms are drawn from the same used in Table 1 but includes only firms that report in period t: (i) an increase in net income between \$0 and \$25 million, (ii) an increase in net income scaled by assets less than 0.015 and (iii) non-positive sales growth. Control firm sample has 19,597 firm years; Suspected sample has 3,268 firm years. Panel C reports slopes and standard errors (double clustered, fyear, gvkey) of future earnings changes on current earnings. Suspected firms ($MEET_t = 1$); Control firms ($MEET_t = 0$).

Panel A: Control Sample

		Summary statistics				
Variable	Description	Avg.	Std.	1st	99th	β
Current period						
NI_t	Net income	0.057	0.056	−0.114	0.182	-
REV_t	Revenue	1.315	0.866	0.152	4.422	3.063
CF_EXP_t	Cash expense	1.203	0.858	0.093	4.318	2.144
ACC_EXP_t	Accrual expense	0.055	0.037	−0.008	0.178	−0.082
CF_t	Cash earnings	−0.065	0.141	−0.503	0.189	0.618
ACC_t	Accrual earnings	0.122	0.138	−0.102	0.548	0.382
Future period						
ΔNI_{t+1}	Change in net income	−0.002	0.043	−0.163	0.109	0.005
ΔREV_{t+1}	Change in revenue	0.139	0.211	−0.382	0.836	0.258
ΔEXP_{t+1}	Change in expenses	0.141	0.201	−0.333	0.820	0.253
ΔCF_{t+1}	Change in cash earnings	−0.010	0.052	−0.183	0.122	−0.056
ΔACC_{t+1}	Change in accrual earnings	0.009	0.053	−0.150	0.175	0.061

Panel B: Suspected Sample

Current period						
NI_t	Net income	0.025	0.091	−0.348	0.181	-
REV_t	Revenue	1.120	0.800	0.000	3.925	2.123
CF_EXP_t	Cash expense	1.044	0.782	0.046	3.846	1.220
ACC_EXP_t	Accrual expense	0.051	0.042	−0.040	0.202	−0.097
CF_t	Cash earnings	−0.078	0.135	−0.522	0.155	0.650
ACC_t	Accrual earnings	0.103	0.125	−0.121	0.479	0.350
Future period						
ΔNI_{t+1}	Change in net income	−0.002	0.054	−0.175	0.161	−0.133
ΔREV_{t+1}	Change in revenue	0.047	0.191	−0.510	0.642	0.187
ΔEXP_{t+1}	Change in expenses	0.049	0.182	−0.502	0.623	0.320
ΔCF_{t+1}	Change in cash earnings	−0.008	0.060	−0.186	0.159	−0.135
ΔACC_{t+1}	Change in accrual earnings	0.006	0.061	−0.171	0.188	0.002

Panel C: Persistence regressions, pooled sample

	ΔNI_{t+1}	ΔREV_{t+1}	ΔEXP_{t+1}	ΔCF_{t+1}	ΔACC_{t+1}
Intercept	−0.002	0.124	0.126	−0.007	0.005
	(0.001)	(0.007)	(0.006)	(0.001)	(0.001)
NI_t	0.005	0.258	0.253	−0.056	0.061
	(0.011)	(0.050)	(0.048)	(0.010)	(0.009)
$MEET_t$	0.004	−0.082	−0.085	0.003	0.001
	(0.001)	(0.006)	(0.006)	(0.001)	(0.002)
$NI_t \times MEET_t$	−0.138	−0.070	0.067	−0.079	−0.058
	(0.015)	(0.054)	(0.054)	(0.016)	(0.016)

Table 3: Annual meet-or-beat parameterization analysis: 1973:06–2022:05

This table reports the predictive slopes on current net income for regressions in which the dependent variables are one-period ahead changes in: net income (ΔNI), revenue (ΔREV), expenses (ΔEXP), cashflow (ΔCF), and accruals (ΔACC). Slope estimates are analytically derived using slope formulas reported in the Appendix and the empirical moments for the Control firms reported in Table 2. We vary the slope estimates for various combinations of the primitive parameters from the analytical specification: γ captures the incremental cost of real earnings management over accrual earnings management; λ captures the percentage of accruals-based earnings management; σ_e captures the volatility of the forecast error for the manager's net income targets. Shaded cells represent analytically derived slopes that are within two standard errors of the corresponding estimated slopes from the Suspected firms reported in Panel C of Table 2.

Control Sample Beta Estimates							ΔNI^*	ΔREV^*	ΔEXP^*	ΔCF^*	ΔACC^*					
							0.005	0.258	0.253	−0.056	0.061					
		Forecast Error Volatility														
REM	EM	$\sigma_e = 0.008$					$\sigma_e = 0.012$					$\sigma_e = 0.016$				
COST	MIX	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC
EM Suspect Sample Beta Estimates																
$\gamma = 0$	All REM	−0.035	0.233	0.268	−0.094	0.059	−0.082	0.203	0.285	−0.140	0.058	−0.145	0.164	0.309	−0.201	0.056
	$\lambda = 1/3$	−0.035	0.239	0.274	−0.081	0.046	−0.082	0.217	0.30	−0.112	0.029	−0.145	0.188	0.333	−0.152	0.007
	$\lambda = 2/3$	−0.035	0.246	0.281	−0.068	0.033	−0.082	0.232	0.314	−0.082	0.000	−0.145	0.214	0.359	−0.101	−0.044
	All AEM	−0.035	0.252	0.287	−0.055	0.020	−0.082	0.246	0.329	−0.053	−0.029	−0.145	0.238	0.383	−0.052	−0.093
$\gamma = 10$	All REM	−0.039	0.229	0.268	−0.098	0.059	−0.091	0.194	0.285	−0.149	0.058	−0.160	0.149	0.309	−0.216	0.056
	$\lambda = 1/3$	−0.037	0.237	0.274	−0.083	0.046	−0.086	0.213	0.30	−0.116	0.029	−0.152	0.181	0.333	−0.159	0.007
	$\lambda = 2/3$	−0.035	0.245	0.281	−0.068	0.033	−0.083	0.231	0.314	−0.083	0.000	−0.147	0.212	0.359	−0.103	−0.044
	All AEM	−0.035	0.252	0.287	−0.055	0.020	−0.082	0.246	0.329	−0.053	−0.029	−0.145	0.238	0.383	−0.052	−0.093
$\gamma = 20$	All REM	−0.043	0.225	0.268	−0.102	0.059	−0.100	0.185	0.285	−0.158	0.058	−0.175	0.134	0.309	−0.231	0.056
	$\lambda = 1/3$	−0.039	0.236	0.274	−0.085	0.046	−0.090	0.209	0.300	−0.120	0.029	−0.159	0.175	0.333	−0.165	0.007
	$\lambda = 2/3$	−0.036	0.245	0.281	−0.069	0.033	−0.084	0.230	0.314	−0.084	0.000	−0.148	0.210	0.359	−0.104	−0.044
	All AEM	−0.035	0.252	0.287	−0.055	0.020	−0.082	0.246	0.329	−0.053	−0.029	−0.145	0.238	0.383	−0.052	−0.093

Table 4: Fourth quarter analyst meet-or-beat earnings management parameters; 1990:06–2021:12

Panels A and B report the means (Avg.), standard deviations (Std.), 1st and 99th percentiles, and slopes on NI (β) for the Control- and Suspected-firm samples. These samples include all firms with fourth quarters ending 1990:06–2021:12, valid CRSP share codes (10–12), CRSP exchange code (1–3). We exclude firms with valid CRSP SIC codes between 6000–6999, 0, 9999 and firms with quarterly EPS realizations (4th quarter) not between −\$0.02 and \$0.01 of the consensus EPS estimate as of the last month of the fiscal quarter. Suspected firms meet or beat EPS estimates (\$0.00 or \$0.01); Control firms miss EPS estimates (−\$0.02 or −\$0.01). Control sample has 5,246 firm-quarters; Suspected sample has 8,902 firm years. Panel C reports slopes and standard errors (double clustered, fyearq, gvkey) of future earnings changes on current earnings. Suspected firms ($MEET_t = 1$); Control firms ($MEET_t = 0$).

Panel A: Control Sample

		Summary statistics				
Variable	Description	Avg.	Std.	1st	99th	β
Current period						
NI_t	Net income	−0.002	0.053	−0.232	0.076	-
REV_t	Revenue	0.265	0.200	0.005	0.937	0.989
CF_EXP_t	Cash expense	0.247	0.192	0.016	0.907	0.332
ACC_EXP_t	Accrual expense	0.021	0.033	−0.046	0.168	−0.343
CF_t	Cash earnings	−0.132	0.122	−0.532	0.045	0.201
ACC_t	Accrual earnings	0.130	0.129	−0.086	0.546	0.799
Future period						
ΔNI_{t+1}	Change in net income	0.001	0.034	−0.088	0.137	−0.376
ΔREV_{t+1}	Change in revenue	−0.012	0.047	−0.173	0.116	−0.121
ΔEXP_{t+1}	Change in expenses	−0.013	0.050	−0.176	0.117	0.255
ΔCF_{t+1}	Change in cash earnings	−0.003	0.034	−0.107	0.104	−0.066
ΔACC_{t+1}	Change in accrual earnings	0.004	0.043	−0.122	0.146	−0.309

Panel B: Suspected Sample

Current period						
NI_t	Net income	0.006	0.047	−0.182	0.086	-
REV_t	Revenue	0.278	0.190	0.012	0.937	1.006
CF_EXP_t	Cash expense	0.253	0.182	0.018	0.904	0.428
ACC_EXP_t	Accrual expense	0.020	0.033	−0.057	0.139	−0.423
CF_t	Cash earnings	−0.134	0.117	−0.521	0.047	0.089
ACC_t	Accrual earnings	0.140	0.125	−0.063	0.536	0.911
Future period						
ΔNI_{t+1}	Change in net income	−0.001	0.034	−0.091	0.125	−0.464
ΔREV_{t+1}	Change in revenue	−0.013	0.045	−0.169	0.116	−0.143
ΔEXP_{t+1}	Change in expenses	−0.012	0.048	−0.177	0.117	0.321
ΔCF_{t+1}	Change in cash earnings	−0.003	0.033	−0.100	0.099	−0.054
ΔACC_{t+1}	Change in accrual earnings	0.002	0.044	−0.122	0.142	−0.410

Panel C: Persistence regressions, pooled sample

	ΔNI_{t+1}	ΔREV_{t+1}	ΔEXP_{t+1}	ΔCF_{t+1}	ΔACC_{t+1}
$Intercept$	−0.000	−0.013	−0.013	−0.003	0.003
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
NI_t	−0.376	−0.121	0.255	−0.066	−0.309
	(0.022)	(0.013)	(0.025)	(0.014)	(0.025)
$MEET_t$	0.002	0.001	−0.002	0.000	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$NI_t \times MEET_t$	−0.089	−0.023	0.066	0.012	−0.100
	(0.026)	(0.016)	(0.032)	(0.018)	(0.032)

Table 5: Fourth quarter analyst meet-or-beat parameterization analysis; 1990:06–2021:12

This table reports the predictive slopes on 4th quarter net income for changes in one-quarter ahead: net income (ΔNI), revenue (ΔREV), expenses (ΔEXP), cashflow (ΔCF), and accruals (ΔACC). Slope estimates are analytically derived using slope formulas reported in the Appendix and the empirical moments for the Control firms reported in Table 4. We vary the slope estimates for various combinations of the parameters from the analytical specification: γ captures the incremental cost of real earnings management over accrual earnings management; λ captures the percentage of accruals-based earnings management; σ_e captures the volatility of the forecast error for the manager's net income targets. Shaded cells represent analytically derived slopes that are within two standard errors of the corresponding estimated slopes from Suspected firms as reported in Panel C of Table 4.

Control Sample Beta Estimates	ΔNI^*	ΔREV^*	ΔEXP^*	ΔCF^*	ΔACC^*
	−0.376	−0.121	0.255	−0.066	−0.309

		Forecast Error Volatility														
		$\sigma_e = 0.007$					$\sigma_e = 0.010$					$\sigma_e = 0.013$				
REM COST	EM MIX	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC	ΔNI	ΔREV	ΔEXP	ΔCF	ΔACC
EM Suspect Sample Beta Estimates																
$\gamma = 0$	All REM	−0.404	−0.136	0.268	−0.100	−0.304	−0.432	−0.151	0.281	−0.133	−0.299	−0.469	−0.171	0.298	−0.177	−0.292
	$\lambda = 1/3$	−0.404	−0.130	0.274	−0.088	−0.316	−0.432	−0.140	0.292	−0.110	−0.322	−0.469	−0.152	0.316	−0.139	−0.330
	$\lambda = 2/3$	−0.404	−0.124	0.279	−0.077	−0.327	−0.432	−0.128	0.304	−0.087	−0.345	−0.469	−0.133	0.336	−0.100	−0.368
	All AEM	−0.404	−0.119	0.285	−0.065	−0.339	−0.432	−0.117	0.315	−0.064	−0.368	−0.469	−0.114	0.355	−0.062	−0.406
$\gamma = 10$	All REM	−0.407	−0.139	0.268	−0.103	−0.304	−0.439	−0.158	0.281	−0.140	−0.299	−0.480	−0.182	0.298	−0.188	−0.292
	$\lambda = 1/3$	−0.405	−0.132	0.274	−0.090	−0.316	−0.435	−0.143	0.292	−0.113	−0.322	−0.474	−0.157	0.316	−0.144	−0.330
	$\lambda = 2/3$	−0.404	−0.125	0.279	−0.077	−0.327	−0.433	−0.129	0.304	−0.088	−0.345	−0.470	−0.134	0.336	−0.101	−0.368
	All AEM	−0.404	−0.119	0.285	−0.065	−0.339	−0.432	−0.117	0.315	−0.064	−0.368	−0.469	−0.114	0.355	−0.062	−0.406
$\gamma = 20$	All REM	−0.411	−0.143	0.268	−0.107	−0.304	−0.446	−0.165	0.281	−0.147	−0.299	−0.491	−0.194	0.298	−0.200	−0.292
	$\lambda = 1/3$	−0.407	−0.133	0.274	−0.091	−0.316	−0.438	−0.146	0.292	−0.117	−0.322	−0.479	−0.162	0.316	−0.149	−0.330
	$\lambda = 2/3$	−0.405	−0.125	0.279	−0.077	−0.327	−0.433	−0.129	0.304	−0.088	−0.345	−0.471	−0.135	0.336	−0.103	−0.368
	All AEM	−0.404	−0.119	0.285	−0.065	−0.339	−0.432	−0.117	0.315	−0.064	−0.368	−0.469	−0.114	0.355	−0.062	−0.406