ASYMMETRY IN OPERATIONAL EFFICIENCY AND MANAGERIAL ABILITY BENCHMARKS

A Dissertation
Submitted to
the Temple University Graduate Board

In Partial Fulfillment
of the Requirements for the Degree
DOCTOR OF PHILOSOPHY

---

by
Muktak Krishnachandra Tripathi
August 2023

Examining Committee Members:

Sudipta Basu, Advisory Chair, Accounting
Dmitri Byzalov, Accounting
Jagan Krishnan, Accounting
Subodha Kumar, External Member, Statistics, Operations, and Data Science

ABSTRACT

Standard empirical models of operating efficiency (OE) and managerial ability (MA) assume a symmetric linear relation of OE and MA with firm performance. However, OE and MA metrics are likely to respond faster to a demand decrease than a demand increase due to cost stickiness and respond faster to negative returns than to positive returns due to accounting conservatism. As predicted, I find large asymmetries in the behavior of OE and MA measures. OE and MA in levels (changes) are 2.4 (1.4) times and 1.5 (1.6) times more sensitive to demand decreases than demand increases. Similarly, OE and MA levels (changes) are 1.7 (1.5) times and 3.6 (2.3) times more sensitive to negative returns than to positive returns. The incremental explanatory power of modeling asymmetry in OE and MA levels (changes) is 20.9% (39.5%) and 263.3% (27.6%), measured as incremental adjusted R^2. Cross-sectionally, asymmetry in OE and MA varies with the determinants of cost stickiness: (1) asset intensity and (2) employee intensity. Moreover, the degree of asymmetry also varies with the determinants of accounting conservatism: (1) book-to-market value of equity, (2) leverage, and (3) market capitalization. In addition, demand decline (i.e., cost stickiness) and bad news (i.e., accounting conservatism) during prior and successive periods have an incremental impact on the asymmetry in OE and MA. The standard models of OE and MA do not control for these correlated-omitted variables or incorporate the cost stickiness and accounting conservatism asymmetries, which yield biased measurements and render incorrect regression estimates and inferences.

DEDICATION

To those touched by the scared, subtle, and powerful method of knowledge transmission – Guru-shishya paramparya, an unbroken lineage of imparted knowledge, an uninterrupted tradition of succession in an undisrupted atmosphere of trust and dedication.

ACKNOWLEDGMENTS

I express my profound gratitude to Professor Rajiv D. Banker for enabling me to achieve significant strides in my research pursuits. Thank you for being a beacon of ingenuity and a source of contemporary intuition. I am truly honored to have spent endless moments of agony and ecstasy under his guidance. His extensive knowledge, experience, and promptness have been critical in shaping my academic journey. In memoriam, this thesis continues his legacy.

I express my most profound appreciation to Professor Sudipta Basu, my committee chairman, for his invaluable guidance and thought-provoking clairvoyance, which have been fundamental in my academic journey. His mentorship has been pivotal in enabling me to achieve my goals, and I cannot thank him enough for providing a conducive research environment, especially during the dissertation phase. His impressive expertise and friendly demeanor have been a tremendous help in composing and strengthening my thesis.

My dissertation is an honorarium to Professors Rajiv D. Banker and Sudipta Basu and a testament to your exceptional leadership, expertise, and mentorship. Their resources and support have enabled me to pursue my academic passions and achieve my goals, and for that, I am truly grateful and forever in debt.

I am immensely grateful to Professor Jagan Krishnan, who granted me the invaluable opportunity to pursue my doctoral studies, which I hold in high esteem. I am thankful for his prudent advice and counsel throughout my doctoral journal. Additionally, I am grateful to Professor Dmitri Byzalov, my committee member, for his insightful conversations and questions that have helped refine my work and research. His input has been truly invaluable in shaping my dissertation.

I also thank Professor Subodha Kumar, an external committee member, who has witnessed the progression of my doctoral studies since the beginning. He keenly lent his passion for interdisciplinary research, which encouraged and motivated me to study further cross-disciplinary research interfaced with accounting. I am grateful to Professors Mark Anderson, Yakov Amihud, Gurdip Bakshi, Indranil Bardhan, and Sunil Wattal for providing me with guidance, critical feedback, constructive comments, and research opportunities.

I want to express my sincerest and most profound appreciation to my beloved parents, who have always been my pillars of strength and stability. Their unwavering love, guidance, and sacrifices have been instrumental in shaping me into the person I am today. And to my devoted wife, whose love and companionship have been my constant source of motivation and inspiration.

I am also indebted to my caring cousins, supportive uncles and aunts, and understanding in-laws, whose unconditional support has been a source of immense comfort and encouragement. Their understanding of my commitments and unavoidable absence during significant life events such as weddings, birth and death ceremonies, rites of passage gatherings, and other pivotal occasions have been truly heartwarming.

Moreover, I am grateful to my extended family and dear friends, whose constant cooperation and accommodation have given me the necessary time and space to focus on my doctoral studies and research activities. Their invaluable contributions to my personal and professional growth cannot be overstated.

Finally, I cannot thank enough the Fox School of Business at Temple University and the Institute of Management Accountants for providing a research platform.

I extend my heartfelt gratitude to all those who have played a significant role in my life. Your love, support, and sacrifices have been immeasurable, and I am forever grateful. The journey would have been difficult without the necessary grace and blessings.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Figure Page

CHAPTER 1

INTRODUCTION

Literature Prologue

Under the umbrella of Upper Echelons theory, Hambrick & Mason (1984) proposed that the cognitive values of individuals with power within an organization affect business outcomes. Therefore, characteristics of key executives such as effort, skill, and capability will likely have an economically meaningful contribution that drives organizational policies and performance (Kaplan, Klebanov, & Sorensen, 2012).

Prior research acknowledges the difficulty in identifying and measuring managerial-specific attributes, whose measures tend to be noisy and are often commingled with organizational features. For example, managers' skill, talent, and ability are proxied by survey ratings, historical industry-adjusted return on assets (ROA) and abnormal market reaction (Hayes & Schaefer, 1999), compensation and employment opportunity (Milbourn, 2003; Tervio, 2008), executive media visibility (Rajgopal, Shevlin, & Zamora, 2006) and social reputation (Francis, Huang, Rajgopal, & Zang, 2008; Falato, Li, & Milbourn, 2015), and managerial style (Bertrand & Schoar, 2003; Ge, Matsumoto, & Zhang 2011).

Using a peer-benchmarking estimate of operating efficiency (OE) and parsing out organizational characteristics, Demerjian, Lev, & McVay (2012) (hereafter, DLM) empirically construct a validated measure of managerial ability (MA).[1] The simplicity and availability of a standardized measure of a manager-specific attribute enabled researchers to model further the

[1] OE is a Data Envelopment Analysis (DEA) parameter that benchmarks a firm's input-output production function against peers. MA is the residual from a Tobit regression of OE on observed firm variables.

role of managerial ability in various accounting, finance, and management topics.[2] As a result, managerial ability is now a well-known and widely accepted proxy to study the managerial impact on earnings and financial reporting quality, capital markets, investing and decision-making, and auditing and corporate governance. I find many published and working empirical papers that adopt and apply the DLM (2012) measures of OE and MA in studying organizational outcomes.[3]

Research Synopsis

Using financial statement data to model the production frontier using Data Envelopment Analysis, Demerjian, Lev, & McVay (2012) derive firm operating efficiency (OE) as the distance from the production frontier. They next quantify managerial ability (MA) as the component of OE that is not explained by firm characteristics. The production function-based OE and MA are typically estimated as a linear or symmetric function of revenues and expenses, likely missing any nonlinear or asymmetric relation between them. To apply these measures in examining their relationship with business outcomes, many studies use OE and MA as a response or explanatory variable and regress them as a linear function of financial data.

The measures are an innovative application of the Data Envelopment Analysis (DEA) model, which is a generally well-understood nonparametric method for peer benchmarking and estimating efficiency given the underlying input-output production model for a set of observations of a decision-making-unit (DMU), a set of DMUs, or a set of both (Charnes,

---

[2] DLM (2012) provides a standard measure of OE, a validated standard measure of MA, and starts a research stream on the empirical assessment, quantification, and application of such standard measures in accounting (cited 1,583 times in 12 years, as of June 2023 in Google Scholar). Demerjian et al. (2013) uses the standard measure of MA to examine its impact on earnings quality, broadly the quality of financial statement reporting (cited 1,163 times in 11 years, as of June 2023 in Google Scholar).

[3] At least 36 studies published in *Contemporary Accounting Research*, *The Accounting Review*, *Management Science*, *Accounting, Organizations, and Society*, *Journal of Accounting and Economics*, and *Journal of Financial Economics* use DLM measures of OE and MA to study their role in organizational outcomes.

Cooper, & Rhodes, 1978, 1981; Banker, 1980; Charnes & Cooper, 1980; Banker, Charnes, & Cooper, 1984; Thore, Kozmetsky, & Phillips, 1994; Murthi, Srinivasan, & Kalyanaram, 1996; Murthi, Choi, & Desai, 1997; Berk & Green, 2004; Berk & Stanton, 2007; Leverty & Grace, 2012; Demerjian, 2017).

OE is measured using DEA to peer-benchmark production models. MA is the estimated residual of a Tobit model regression of OE on firm characteristics (i.e., a two-stage procedure). First, the OE is estimated by benchmarking firms' production function output as revenues given inputs as a linear combination of expensed and allocated resources: costs of goods sold (COGS), operating leases, selling, general and administrative (SG&A), research and development (R&D), plant, property, and equipment (PP&E), intangibles, and goodwill. Second, OE is regressed on identifiable cross-sectional characteristics to control for firm-specific contextual heterogeneity, such as market share, free cash flow, age, size, business segments, and foreign operations. After validations, the residual obtained from the second-stage OE regression is inferred as a measure of MA.

A stream of empirical research investigates the relationship of managerial ability with financial performance, corporate policies and disclosures, and asset valuation (see Demerjian & Lev, 2021), including income smoothing (Baik, Choi & Farber, 2020; Demerjian, Lewis-Western, & McVay, 2020), tax avoidance (Koester, Shevlin, & Wangerin, 2017), executive compensation (Francis, Hasan, & Zhu, 2019; Banker, Darrough, Huang, & Plehn-Dujowich, 2013; Brookman & Thistle, 2013), credit ratings (Bonsall, Holzman, & Miller, 2017; Cornaggia, Krishnan, & Wang, 2017), and audit fees and internal controls (Krishnan & Wang, 2015; Kalelkar & Khan, 2016).

In this dissertation, I focus on further understanding and improving the assumptions in the production model for measuring operating efficiency and managerial ability. I suggest incorporating known functional forms of accounting financial data to comprehensively model firms' production. Typically, prior studies show that the conditional distribution of operating cash flows and operating accruals is asymmetric or a piecewise linear function instead of a symmetric or linear form. Thus, I attempt to uncover the asymmetry in the relation between inputs and outputs to understand production model specification further, examine the appropriateness of the linear functional form and improve measurement precision.

Broadly, my dissertation opens a new and interesting research area focused on an empirical consideration of model specification related to the conceptual production function. Such models estimate efficiency-related parameters by peer or relative benchmarking using DEA or similar nonparametric methods. Using financial datasets, the selected input-output variables are subject to underlying financial and managerial accounting assumptions and mechanisms, which govern the functional form and firm-specific contextual heterogeneity. Specifically, financial accounts and their values vary systematically due to differences in business characteristics such as industry specifics and accounting treatments, production scales (i.e., constant versus variable returns-to-scale), and managerial objectives of profit maximization versus expense minimization. Thus, future research can identify and incorporate business operating and accounting heterogeneity sources to comprehensively model and benchmark, which can further aid in standardizing estimation methods and empirical measurements.

Summary of Discussion

The linear specification of OE and MA is misspecified because of the unmodeled asymmetry of cost stickiness and accounting conservatism (Banker, Basu, Byzalov, & Chen,

2016). Further, the degree of unmodeled asymmetry varies predictably in the cross-section with firm characteristics. As a result, there is a bias on average in the standard measures of OE and MA, which varies systematically with the correlated-omitted firm determinants and the asymmetric effects. Results change for several published papers after modeling OE and MA more comprehensively.

Cost stickiness implies that the rate of decline in OE and MA measures is slower due to a lower rate of change in cost realization (operating expenses) during a revenue decrease than an increase (Anderson, Banker, & Janakiraman, 2003).[4] Contrary to the traditional accounting cost structure theory, costs vary asymmetrically in response to consumer demand, proxied by the change in revenues (Banker & Byzalov, 2014). The rate of change in costs is higher during demand growth than decline, which is a real effect of resource adjustment decisions. Consequently, time-series variation in operating expenses is a piecewise linear function of revenue change. The OE and MA measures incorporate revenues as output and costs as inputs without modeling the asymmetry in cost realization. The omission of asymmetry in the rate of change in costs conditional on the change in revenues leads to the asymmetry in OE and MA measures.

Similarly, variations in OE and MA reflect conditional conservatism that causes earnings (operating accruals) to recognize bad news more quickly than good news (Basu, 1995, 1997).[5] Accounting conservatism or asymmetry in timely loss recognition affects the book value of assets (e.g., plant, property, equipment, intangibles, and goodwill), and the loss flows through the

---

[4] Given the demand decline, the asymmetry in expenses arises from delayed layoffs or plant closures when demand declines are expected to be temporary.

[5] The asymmetry in earnings, given bad news, arises from write-offs and impairments of assets recorded on the balance sheet.

reported values of the related aggregate expenditures. As a result, earnings are a piecewise-linear function of returns, an effect of accounting conservatism. The input values in the denominator of the Demerjian et al. (2012) measure of OE and MA include write-downs and impairments due to asymmetry in timely loss recognition (Byzalov & Basu, 2016). Thus, accounting conservatism systematically affects OE and MA measures that do not control for this asymmetry.

I hypothesize that the omission of correlated variables and nonlinear parameters of cost stickiness and accounting conservatism in modeling OE and MA causes misspecification of the functional form, which induces systematic measurement bias. I define joint asymmetries in revenues-expenses and returns-earnings (REA) as the discrete piecewise linear form of expenses and earnings conditional on revenues (i.e., cost stickiness) and returns (i.e., accounting conservatism). Given the REA, the rate of change in expenses is asymmetrically higher during demand decline than demand growth and bad news than good news periods.

I find results consistent with hypothesized asymmetric effects of cost stickiness and accounting conservatism on OE and MA. Specifically, the piecewise effect of asymmetry due to cost stickiness and accounting conservatism on the level of (change in) OE is 2.4 (1.4) times and 1.7 (1.5) times more than the effect expected under symmetry. Similarly, the effect of asymmetry on the level of (change in) MA, given cost stickiness and accounting conservatism, is 1.5 (1.6) times and 3.6 (2.3) times more than the effect expected under symmetry. Thus, OE and MA are confounded with the asymmetries (REA), and such omissions bias the peer-benchmarking-based measures and their inferences.

I also evaluate the asymmetric contextual effects of firm determinants of cost stickiness and accounting conservatism on the measurement biases in OE and MA. These cross-sectional firm attributes are proxied by asset and employee intensity or resource adjustment costs, the

book-to-market value of equity, leverage, and market capitalization (Khan & Watts, 2009; Anderson et al., 2003). Additionally, I test for the incremental effects of time-series differences due to prior and successive periods of demand decline and bad news on the asymmetry in OE and MA. Both determinants and prior and successive periods of cost stickiness and accounting conservatism significantly affect the degree of asymmetry (i.e., REA) in OE and MA measures. After including REA parameters, controls, and fixed effects, I consistently find that these firm characteristics and time-series variations have an incremental asymmetric (i.e., piecewise-linear) effect on OE and MA measures.

The confounding effects of cost stickiness and accounting conservatism asymmetries in OE and MA should be purged from the measurement. For example, managers' deliberate retention of unused resources to improve future performance (Banker & Chen, 2006) and increased expenses during a decrease in revenues would seem as a genuine decrease in OE and MA. However, such a temporary drop in the output-input ratio during revenue decreases does not constitute a real decrease. Similarly, asymmetry in timely loss recognition due to accounting write-downs would abnormally increase the reported expense during bad news periods, which does not constitute a genuine decrease in OE or MA. The systematic effect of such asymmetries is not integral to OE and MA and, therefore, does not reflect true measurement values.

The REA adjustment controls for the confounding effects of cost stickiness and accounting conservatism, including firm characteristics, that systematically vary with the MA measure and, thus, reduce concerns with the unmodeled heterogeneities. I validate if the REA adjustment in OE and MA meaningfully captures the confounding asymmetries and removes its systematic effects from the measures. After adjusting for REA and its moderating factors, the distributions of OE and MA have similar mean and median, confirming a symmetric distribution,

mitigating homoscedasticity, and controlling autocorrelation and multicollinearity. I show that the distribution of REA-adjusted OE and MA measures controls for the piecewise-linearity due to cost stickiness and accounting conservatism.

Several studies assess the relationship between MA and the asymmetric timeliness of earnings or asymmetrically timely loss recognition, which I use to validate further the importance of addressing REA in OE and MA measures before applying and testing for its effects on firm outcomes.[6] While the mean of unadjusted-MA is higher than the median value of the distribution, the earnings distribution mean is less than its median. Since the distribution of both MA and earnings is non-Normal, I assert that there is an implicit negative correlation and a mechanical relation of MA with the asymmetric timeliness of earnings (Kowalski, 1972). I test the prediction of the negative and zero correlation between the raw unadjusted-MA, and REA adjusted-MA measures with asymmetric timeliness of earnings. While I find a negative relationship between unadjusted-MA and the asymmetric timeliness of earnings, the association of REA adjusted-MA is not different from zero and is statistically insignificant.

Finally, I test the impact of bias in OE and MA due to the omission of asymmetry on the inferences in the published studies. I examine whether the effects of OE and MA on firm outcomes are consistent using piecewise-linearity-controlled estimations. First, I evaluate the association of raw and adjusted MA with income smoothing (Baik et al., 2020; Demerjian et al., 2020). Second, I examine the association of raw and adjusted MA with tax avoidance (Koester et al., 2017). Third, I assess managerial-level inferences using raw and adjusted MA measures for the effects on the chief executive officers' (CEO) total compensation (Francis et al., 2019; Banker et al., 2013; Brookman & Thistle, 2013). The inferences of these studies change

---

[6] For example, Bradley & Sun (2021), Haider, Singh, & Sultana (2021), and Francis, Hasan, Siraj, & Wu (2020).

qualitatively after controlling for correlated-omitted variables and the asymmetric effects of cost stickiness and accounting conservatism.

I contribute to the performance measurement literature by highlighting an unmodeled asymmetric association of OE and MA with firm financials (e.g., Abernethy & Wallis 2019). Most prior studies using these measures ignore any potential time series REA, including firm-specific variation. I propose a solution to reduce nonlinearity bias in the conditional OE and MA distributions. A simple piecewise-linear adjustment to the regression model mitigates inconsistency in coefficient estimation and non-Normality of the OE and MA distributions. First, both measures must account for and isolate the conditional effect of REA, including its contextual factors, in OE and MA. Second, they must control for the nonlinear time series variations and cross-sectional attributes that systematically affect OE and MA measures.

The rest of the dissertation is as follows: Chapter 2 reviews relevant prior research and states the main Hypotheses 1 and 2. Chapter 3 explains the research methodology and key variables. Chapter 4 reports the tests of Hypotheses 1 and 2 and their results. Chapter 5 assesses cross-sectional Hypotheses 3, 4, and 5 on firm characteristics and describes the findings. Chapter 6 presents empirical artifacts of hypotheses testing and validates their consequences on measurement applications. Chapter 7 evaluates implications for interpreting existing relationships and inferring known insights in the literature. Chapter 8 examines the robustness of hypotheses tests and the sensitivity of the related inferences. Chapter 9 concludes.

CHAPTER 2

THEORY

Motivation

Operating Efficiency and Managerial Ability

Operating efficiency (OE) is generally measured as the resource utilization rate to produce goods and services. Simply put, OE is a ratio of costs to sales (i.e., 1 - profit margin ratio of earnings to sales). Most studies use financial data to calculate an absolute or relative ratio of firms' OE and test their relationship with accounting outcomes (e.g., Callen, 1991; Murthi, Choi, & Desai, 1997; Demerjian et al., 2013). By applying Data Envelopment Analysis (DEA), Demerjian et al. (2012) measure firms' yearly peer-benchmarked OE as a linear combination of expenses to revenues.

Researchers seek to understand and evaluate the role of managerial qualities (Hayes & Schaefer, 1999; Tervio, 2008; Kaplan, Klebanov, & Sorensen, 2012). Such studies build on the Upper Echelons theory (Hambrick & Mason, 1984), which postulates that organizational outcomes are related to the perceived and cognitive values of the decision-makers (Bertrand & Schoar, 2003; Holcomb, Holmes, & Connelly, 2009).

The managerial ability (MA) measure is applied to assess firm performance and financial outcomes correlated with the asymmetry in financial data. Demerjian et al. (2012) measured and validated time-varying managerial ability, which spurred the growth in empirical studies across accounting, finance, and management research. MA is a decomposition of organizational OE, which is how much output is generated from given inputs. MA is a residual obtained after controlling for the firm characteristics that affect OE beyond managerial decision-making in the

short term. In other words, MA tries to measure the manager's net contribution to firm OE by removing the effect of other firm contributors.

Cost Stickiness and Accounting Conservatism

Recent cost accounting research examines deliberate resource commitment decisions driven by resource adjustment costs and forward-looking demand expectations (Anderson et al., 2003). Given the demand, the cost stickiness phenomenon underlies cost tradeoffs between resource adjustment and retention. When demand falls, firms decide whether to cut or retain unused resources in anticipation of a demand rebound. Thus, based on a decrease in demand or revenues, firms retain resources instead of cutting back due to high resource adjustment costs or expected future demand growth (Banker & Byzalov, 2014).

Empirical studies show that costs behave asymmetrically given revenues (Banker, Byzalov, Fang, & Liang, 2018). Specifically, costs rise when current demand grows but fall proportionally less when current demand falls. Compared to periods of demand increase, firms cut fewer resources and capacity in periods of demand decrease, and hence, have a proportionally lower cost decrease. Thus, asymmetry in cost stickiness is conditional on revenue decline versus revenue growth, which is associated with the current and future demand variation and resource adjustment cost. As a result, firms keep unused resources, which reflect higher costs relative to revenues during demand contractions.

Furthermore, research provides evidence of asymmetrically timely loss recognition in earnings (Basu, 1995; 1997). As a result of accounting conservatism, firms recognize bad news faster than good news, causing an asymmetric decrease (increase) in earnings (expenses). Costs may increase due to more (less) accruals write-off value (operating accruals balance) in anticipation of demand stagnation, including asymmetrically timely recognition of losses related

to asset impairments, bad debts, and inventory obsolescence (Banker, Basu, & Byzalov, 2017). Thus, the timely losses of disaggregated accruals during bad news periods are recognized as expenses, and accounting conservatism's effect is piecewise linear in multiple performance and growth measures (Byzalov & Basu, 2016).

I predict that the OE and MA measures, on average, are affected by a piecewise linear or asymmetric increase of the input expenses rate given a decrease in operating cash flows (i.e., output revenues) and operating accruals (i.e., input assets) relative to an increase. The mechanism underlying these asymmetric effects related to resource allocation and valuation is conditional on operating cash flows and accruals. During periods of demand decline, there is an asymmetric rate of decrease in operating cash flows due to a proportionally higher resource allocation rate, which increases expenses more than during periods of demand growth. Similarly, the rate of decrease in operating accruals is proportionally more than the rate of resource valuation, which decreases earnings more during periods of bad news than good. As a result, OE and MA measures are confounded with the effects of revenues-expenses and returns-earnings asymmetry (REA) or the effect of cost stickiness and accounting conservatism.

Asymmetry in Operating Efficiency

OE is a peer-benchmarked measure based on a production function that outputs revenue using a linear combination of expense and asset inputs available on the firm's income statement and balance sheet. As a result, several aggregated financial accounts affect the OE measure. Specifically, the income-statement expense accounts include costs of goods sold (COGS), operating leases, selling, general and administrative (SG&A), and research and development. The balance-sheet asset accounts include plant, property, equipment (PP&E), intangibles, and goodwill. Conditional on revenues, or the production output, (Anderson et al., 2003) and returns

(Basu, 1997), the inputs of expenses and asset balances are subject to the effect of cost stickiness and accounting conservatism, which is greater during demand decline and bad news than demand growth or good news periods (Basu & Byzalov, 2016; Banker et al., 2017).

Since revenues are used as an output by construction, the OE measure increases during demand growth. However, the increase (decrease) in input expenses such as COGS and SG&A is proportionally more (less) during demand growth and good news (demand decline and bad news) periods. Furthermore, the beginning of the year asset balances, used as inputs to measure OE, are not affected by cost stickiness due to demand shocks or unexpected declines in demand during the current year. However, the decreases in asset values for PP&E, intangibles, and goodwill used as inputs to OE and MA are captured in the following year if these declines were unexpected at the beginning of the year.[7] In this case, asset balances at the end of the current year do not affect the OE and MA measures conditional on bad news. Thus, firms' retention of unused PP&E balance as an input in the OE measure does not increase in the concurrent year of the unexpected decline in the demand, but it could increase in the following year.

Prior research shows that returns anticipate earnings and so bad news or negative returns in the current year expect a decline in earnings and revenues up to four following years (Beaver, Lambert & Morse, 1980; Collins, Kothari & Rayburn, 1987; Freeman, 1987; Kothari & Sloan, 1991; Collins, Kothari, Shanken & Sloan, 1994). Typically, the balances of input assets decrease in the current year to reflect the effect of accounting conservatism or the timely loss recognition in earnings given bad news in the current year. This decrease in the balances of input assets is recognized in the OE measure for the following year. However, the PP&E balance would decrease in the current year, given an expected decline in demand due to bad news in the prior

---

[7] Demerjian et al. (2012) use the beginning-of-year asset balances (p. 1234) as inputs to OE and MA measures.

year. Similarly, the effect of input assets (intangibles and goodwill) in OE would occur in the current year given an expected demand decline in the current year, anticipated from prior year bad news, and in the following year given an unexpected demand decline and bad news in the current year.

The analysis is more complicated if part or all of the cash flow decline were anticipated in the previous or earlier years. Asymmetrically timely loss recognition in the previous year based on predicted poor cash flows in the current year would affect the prior end-of-year asset balances due to write-offs and impairments. Thus, affect the OE and MA measures in the current year. The anticipated negative cash flows (i.e., bad news) or sales decrease would be reflected in COGS and SG&A expenses in the previous year and affect the current year's starting asset balances and indirectly OE measures in the current year. In addition, bad news return positively correlates with the demand decline (Banker et al., 2016; Makni, Chakroun, & Jarboui, 2020).

Given the effect of accounting conservatism or timely loss recognition, COGS and SG&A increase proportionately more during bad news than good news periods, usually proxied by negative and positive returns.[8] COGS and SG&A expenses for the concurrent year capture the losses due to write-downs, inventory obsolesces, and impairments. Both COGS and SG&A are expense inputs to measure OE and MA. However, both COGS and SG&A expenses are affected in the concurrent year.

---

[8] Basu (1995, 1997) shows that his results hold for several measures of unexpected returns, including raw returns, market-adjusted returns, market-model-adjusted returns, and size-adjusted returns. Basu (1997) and Giner & Rees (2001) use earnings declines as an alternative proxy for bad news. Ball & Shivakumar (2005, 2006) introduce current operating cash flow decreases as a proxy for bad news. Banker, Basu & Byzalov (2017) add sales decline as a proxy for short-term bad news and also document incremental explanatory power for other bad news proxies such as cash sales decrease, negative operating cash flow, cash gross margin decrease, order backlog decrease, as well as negative analyst revisions in their forecasts for future earnings, cash flow, and sales. Banker & Basu (2016) add new indicators, such as employee reductions and past and future cash flow declines.

Cost stickiness is associated with timely loss recognition (Banker et al., 2016), increasing COGS and SG&A more during revenue decline than growth. Given the matching principle, on average, the level of COGS is positively and linearly related to the level of revenues in a fiscal year. However, the rate of decrease in COGS is proportionally less for a given decrease in the rate of revenues than an increase. Under full-absorption costing, fixed or production overhead costs for the fiscal year are allocated and matched with sales of inventory units (i.e., quantities), which increases COGS per unit and the rate of COGS during revenue decline than growth.

Moreover, the increase in COGS is proportionally more conditional on bad cash flow news than good. Given the timely recognition of inventory-related losses, such as obsolescence and related write-offs, COGS would increase in the prior year if the bad cash flow news were anticipated and the current year for the unexpected news. Further, the bad news is confounded demand decline and cost asymmetry. Specifically, expected cash flows would decrease demand or revenues in the current year. Conversely, unanticipated bad news would decrease revenues in the following year. If some or part of all cash flows are anticipated, then COGS would partly increase during prior and current years due to accounting conservatism. While the rate of revenues would decrease during the current and following years, resulting in cost stickiness. Thus, the level of COGS is more during bad news than good news, and the decrease in the rate of COGS is less during the decline in revenues than in growth. Given the accounting conservatism and cost stickiness, such systematic variations in the inputs of OE drive the asymmetry in the measure during demand decline or negative return periods.

Overall, the expense inputs would increase the effect of accounting conservatism and cost stickiness asymmetries in the level and rate of OE in the prior and current year if the negative cash flow news is anticipated. In constraints, the asymmetric effect of accounting conservatism

and cost stickiness in the level and rate of OE would increase in the current and following year, given unexpected negative cash flow news. Furthermore, the impact of asymmetry in the level and rate of OE would spread across prior, current, and following years if only part of negative cash flows were predicted.

Therefore, the realization of expenses is conditional on the rate of revenues (i.e., sticky costs), and cash flow news (i.e., accounting conservatism) is asymmetric, which affects firms' OE measurement. Controlling for the expenses, revenue growth, and positive unexpected stock return increase earnings and OE in the current and following year, respectively. However, the decrease in income and OE is greater proportionally and, thus, piecewise linear conditional on a decline in revenue or price. Analogous to the asymmetry due to cost stickiness and accounting conservatism, by definition, firm OE is asymmetric in demand and news. Under REA, firms' OE exhibits piecewise linear variations, so I test the following hypothesis.

Hypothesis 1:

a) On average, cost stickiness induces an asymmetry in the standard measurement of operating efficiency.
b) On average, accounting conservatism induces an asymmetry in the standard measurement of operating efficiency.

Assuming this hypothesis is correct, studies that measure OE and assess its effects on business outcomes should specify an appropriate piecewise linear model to capture the asymmetric effects of cost stickiness and accounting conservatism.

Asymmetry in Managerial Ability

I investigate how financial asymmetry affects managerial ability (MA) measurement. If the assumed linear function of the OE measure is misspecified, then the residuals obtained from

this linear OE model would also vary systematically with cost stickiness and accounting conservatism, which is revenues-expenses and returns-earnings asymmetry (REA). Thus, OE contains measurement bias. MA is measured as a residual of a Tobit model that linearly models firm OE using firm characteristics. The Tobit model assumes that residuals or MA are Normally distributed about zero. However, like OE, MA needs to be more coherent due to unmodeled cost stickiness and accounting conservatism.

Like the confounding asymmetry in OE, the MA measure is undervalued (overvalued) due to a smaller (greater) decrease (increase) in expenses than the decrease (increase) in revenues and negative (positive) stock returns. Conditional on a demand decrease and bad cash flow news, the variation in MA measure is asymmetric, on average, implying a systematically decreasing piecewise linear function of cost stickiness and accounting conservatism. Further, the balances of asset inputs in the following year may be netted due to the offsetting effects of cost stickiness and accounting conservatism. In addition, the MA measure reflects linearly controlled determinants of OE determinants, controlling for the beginning of the year balance of assets and related ratios.

During demand growth and good cash flow news periods, MA would increase systematically due to revenues increasing and expenses increasing proportionally more than during demand decline and bad cash flow news periods. As a result of demand growth and good news, measured MA is higher in the concurrent year. To compensate for OE, managers are likely to decrease expenses at a different rate than the decrease in short-term revenues. Further, capable managers are less likely to sustain superior peer performance by persistently adjusting costs conditional on short-term REA variations. Thus, MA values are proportionally higher (lower) or overvalued (undervalued) during demand growth and good news (demand decline and bad

news). The Tobit model controls for some firm characteristics as determinants of OE and uses the residual to measure MA. However, the absence of piecewise linear terms results in model misspecification. As a result, on average, an asymmetry arises in the distribution of MA, specifically confounded with the effects of cost stickiness and accounting conservatism.

The linear misspecification of firm OE will bias the measure of MA, given that the linear model needs to sufficiently control for piecewise linearities due to cost stickiness and accounting conservatism. Such linear misspecification will also bias MA, and the measure would vary systematically with the asymmetric effects of omitted-correlated revenues-expenses and returns-earnings (REA) variables. Therefore, I test for the asymmetric effect of cost stickiness and accounting conversation on MA and hypothesize as follows:

Hypothesis 2:

a) On average, cost stickiness induces an asymmetry in the standard measurement of managerial ability.
b) On average, accounting conservatism induces an asymmetry in the standard measurement of managerial ability.

Studies that measure, apply, and assess the MA impact on organizational outcomes would fail to adjust for the revenue-expenses and returns-earnings asymmetry (REA), which would bias the marginal or unconditional estimate using MA to test its relationship with other business outcomes and, thus, could affect the qualitative inferences on the role of managers' abilities.

CHAPTER 3

METHODOLOGY

Research Design

Conceptually, I expand the standard models to measure OE and MA by accommodating and adjusting for the piecewise linearities or asymmetries. Empirically, I test for the existence of piecewise linearity in OE and MA conditional on revenues-expenses and returns-earnings asymmetries (REA). To test the hypothesis on the presence of REA in OE and MA, I use the standard models of cost stickiness and accounting conservatism (Banker, Basu, Byzalov, & Chen, 2016) and standard financial datasets. The model is a simple staggered difference-in-difference specification based on a generalized piecewise functional form.[9] Specifically, I assess the piecewise linear effect in OE and MA conditional on the change in revenues and stock returns as a proxy for demand and news, respectively.

In this context, the treatment variable identifies firm-specific periods of demand decline or bad news relative to a non-treatment variable of demand growth or good news. The binary choice treatment variable captures the average treatment effect, which is the difference in the intercept relative to the non-treated group. The average marginal effect for the treated group is conditional on firms experiencing a demand decline or bad news, which is the difference in the slope relative to the non-treated group or control firms. The estimated slope differences between the coefficients on demand decline and growth or bad news and good would capture the effect of

---

[9] Typically, the standard piecewise linear cost stickiness or accounting conservatism models are not considered a difference-in-difference specification. However, the demand decline and bad news are firm-specific unfavorable shocks and provide signals about future cash flows. Such shocks are firm-specific treatments and provide a setting for a quasi-experiment, which can be estimated using a generalized difference-in-difference (GDD) specification. Compared to a standard difference-in-difference, GDD is a panel data estimator requiring a weaker instrument identification condition, firm-specific treatments are time-varying with a non-zero autocorrelation, and time effects are held constant (i.e., first-differenced). In this context, a piecewise log-log model would correspond to a GDD estimator with staggered interventions (Athey & Imbens, 2006; Wooldridge, 2009; 2022).

REA on OE and MA. Under REA, the effect of cost stickiness and accounting conservatism would decrease OE and MA more during a demand decline (negative return) period than a demand growth (positive return) period. Such asymmetric decreases in OE and MA result from a greater proportion of incurred cost realization (i.e., stickiness) or timelier loss recognition (i.e., conservatism), which would suggest piecewise linearity and the need to expand the model to estimate the effect of asymmetry in financial accounts differentially. In the following subsections, I present model specifications and variable measurement details.

Testing for the Asymmetry in Operational Efficiency and Managerial Ability

I investigate the asymmetry in measures of OE and MA conditional on demand and news. The measures of OE and MA will change faster during revenue decline and negative return periods than during revenue growth and positive return periods. Empirically, prior studies show the asymmetry in costs (earnings) conditional on changes in revenues (change in share prices) (Banker et al., 2017, 2016; Anderson et al., 2003; Basu, 1997). I estimate the OLS models below, Eq. 1, to test Hypotheses 1 and 2, which include cost stickiness and conditional conservatism parameters and their determinants and additional control variables. I first specify Eq. 1 baseline models by excluding any fixed effects and including standard errors clustered by firm.

Then, I estimate robustness models by including multiplicative industry-by-year fixed effects and industry and year two-way clustered standard errors. The multiplicative fixed effects, on average, capture the two-way variations in the industry and year (*Industry*Year* FE). The interactive effects control the intercepts and adjust for the time-series trends by estimating the first-differenced average across industry cross-sections for each year. The two-way double

clustering controls for type I errors in inferring statistical significance by adjusting the standard errors for the heteroskedasticity across industries yearly.[10]

$$(Efficiency_{j,t}, \Delta Efficiency_{j,t}) \mid (Ability_{j,t}, \Delta Ability_{j,t}) =$$

$$\beta_1 * \Delta \ln Rev_{j,t} + \beta_2 * Dec_{j,t} + \beta_3 * \Delta \ln Rev_{j,t} * Dec_{j,t} + \beta_4 * \ln Ret_{j,t} + \beta_5 * Neg_{j,t} + \beta_6 * \ln Ret_{j,t} * Neg_{j,t}$$

$$+ \gamma_{1\ldots k} * Controls^{k}_{j,t} + Industry * Year \text{ FE} + \varepsilon_{j,t} \quad \text{(Eq. 1)}$$

I estimate Eq. 1 to test Hypothesis 1 for the asymmetric effects of the logarithm transformed (i.e., ln(x+1)) change in revenues ($\Delta \ln Rev_{j,t}$) and stock returns ($\ln Ret_{j,t}$) on the level of OE ($Efficiency_{j,t}$) and change in OE ($\Delta Efficiency_{j,t}$). Similarly, I estimate Eq. 1 to assess Hypothesis 2 for asymmetry in the level of MA ($Ability_{j,t}$) and change in MA ($\Delta Ability_{j,t}$) due to cost stickiness and accounting conservatism. The estimated coefficients represent the percentage change in the response variable (i.e., OE and MA) for a 1% change in the explanatory variables. The control variables include cross-sectional determinants of (1) cost stickiness (Anderson et al., 2003) as asset intensity ($AssetInt_{j,t}$) and employee intensity ($EmpInt_{j,t}$), capturing firms' resource adjustment costs, and (2) accounting conservatism (Khan & Watts, 2009) as the book-to-market value of equity ($BtM_{j,t}$), leverage ($Lev_{j,t}$), and market capitalization ($MCap_{j,t}$), which inform about firms' growth expectations, financial policies, and market structures. Additionally, I control for (3) previously identified and observed firm-specific contextual characteristics (DLM, 2012) such as capital expenditures ($Capex_{j,t}$), intangible assets ($Intan_{j,t}$), total liabilities ($Liab_{j,t}$), foreign country operations ($Foreign_{j,t}$), and total assets size ($Size_{j,t}$).

[10] Double clustering maybe too conservative (Abadie, Athey, Imbens, & Wooldridge, 2020) ; however, it captures both longitudinal and cross-sectional heterogeneities within the panel dataset. Untabulated, the inferences on the significance of the coefficients are qualitatively similar separately using either firm or year clusters.

Interpreting the Effect of Cost Stickiness and Accounting Conservatism

I estimate Eq. 1 models separately to test for Hypothesis 1 and 2 on the confounding piecewise linear effects in measures of OE and MA, respectively, conditional on REA. Under Hypothesis 1 and 2, I expect OE and MA to vary asymmetrically more for revenue decline and bad news than revenue growth and good news, respectively. Correspondingly, I hypothesize that the sum of coefficients $\beta_1+\beta_3$ and $\beta_4+\beta_6$ is greater than the estimates of coefficients β_1 (i.e., $\beta_3>0$) and β_4 (i.e., $\beta_6>0$). The coefficients β_2 and β_5 control the average intercept effect of revenue decrease and negative stock return on OE and MA. Under the null hypothesis of symmetry following DLM, the coefficients β_3 or β_6 are not different from zero ($\beta_3=0$, $\beta_6=0$) and are non-incremental to the standalone coefficients ($\beta_1>0$, $\beta_4>0$). In such cases, negative revenues or prices have no differential impact relative to positive variations.

Sample Description

The sample is merged across datasets containing information on firms' financial statements, operating attributes, and measures of OE and MA. Using the WRDS platform, I obtain yearly firm financials and operations data from Compustat North America and CRSP merged files. The dataset is combined with the standard measures of OE and MA, which are empirically constructed, validated, and provided by Demerjian et al. (2012). Finally, I remove observations (*N*) with missing values of firm financial accounts and lag-year (*t*-1), which are required for control and change variables. The final sample comprises 124,889 firm-years (*N*) across 14,695 unique publicly listed firms (*j*) that span 38 years (*t*) from 1981 to 2018. The sampling procedure is outlined in Appendix A. I provide all variable definitions in Appendix B.

In the following subsection, I present details on the dependent, independent, moderating, and control variables. Also, to mitigate the effect of the outliers on hypotheses testing, I

winsorize all continuous composite variables yearly at the 1st and 99th percentiles of the respective distributions. In Panels A and B of Table 1, I present the univariate summary statistics and pairwise correlations among key variables. In Appendix E, I report the firm-level yearly descriptive statistics Panels E.1 and E.2 present yearly summaries for GameStop Corp.

Dependent Variables: Operational Efficiency and Managerial Ability

I assess nonlinearity using the log-log specification, which can be economically interpreted as the partial elasticity between response and explanatory variables. To consistently compare the effect of asymmetry, I use the yearly (t) decile ranked values of OE ($Efficiency_{j,t}$) and MA ($Ability_{j,t}$), which range from zero to one. Then, I calculate the change in OE ($\Delta\ln Efficiency_{j,t}$) and the change in MA ($\Delta Ability_{j,t}$) as the difference in decile ranked values in the current year (t) from the prior year (t-1). The mean OE is 0.30 with a range from zero to one, and the mean MA is about zero because it is a regression residual. The raw OE and MA values have a positive skewness of more than one (>1) and have a positive excess kurtosis (>0), exhibiting heavy tails and dispersion around the mean and deviating away from Normality for which the kurtosis is three (3). Both the decile ranked $Efficiency_{j,t}$ and $Ability_{j,t}$ have a mean (median) of 0.56 (0.60), a standard deviation is ~0.30, skewness close to zero, and a negative excess kurtosis of one, following a platykurtic discrete uniform distribution over zero and one. In comparison, the decile ranked $\Delta Efficiency_{j,t}$ and $\Delta Ability_{j,t}$ are centered around zero (≅0) and median, the standard deviation of ~0.20, skewness close to zero, and positive excess kurtosis of one, which follows a leptokurtic discrete distribution for a Poisson point process at the yearly intervals. Using decile-ranked values of OE and MA and first-differencing firm-specific variations, I ensure homogeneity across measurement scales and further reduce the effects of spurious correlations coinciding with extreme within-firm variations or yearly outliers.

Independent Variables: Cost Stickiness and Accounting Conservatism

I use change in revenues to proxy for firms' demand change ($\Delta \ln Rev_{j,t}$). I calculate the logarithm change in revenues (t) from the prior year (t-1). To examine a piecewise linear functional form, I separately estimate the effect of negative and positive revenue changes. I indicate a binary variable as one (1) if the annual revenues decrease ($Dec_{j,t}$), else the value is zero (0). The $\Delta \ln Rev_{j,t}$ has a mean of 9% (SD=32%), which includes 33% of observations with demand decline or revenue decreases ($Dec_{j,t}$), and the interaction $\Delta \ln Rev_{j,t}$* $Dec_{j,t}$ mean of -6% (SD=16%).

The equity returns ($\ln Ret_{j,t}$) capture value-relevant market variations in publicly available news. As a result, returns reflect current market expectations and proxy for news relative to the historical basis of earnings reports. Return is calculated as the yearly (t) share price difference relative to the prior year (t-1). The mean $\ln Ret_{j,t}$ is -3% (SD=49%), and interaction $\Delta \ln Ret_{j,t}$*$Neg_{j,t}$ is -19% (SD=32%), where the median $\ln Ret_{j,t}$ is 0% and 50% of firm-years have bad news or negative returns ($Neg_{j,t}$).

Table 1: Descriptive Summary

Panel A.
Univariate Statistics

	Statistic: (*N*=124,889)	**Mean**	**Median**	**Standard Deviation**	**Skewness**	**Kurtosis**	Min	Q1 (p25)	Q3 (p75)	Max
	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1)	*Efficiency*-Raw	0.298	0.260	0.154	1.942	8.051	0.030	0.213	0.339	1.000
2)	*Efficiency*	0.566	0.600	0.278	-0.052	1.831	0.100	0.300	0.800	1.000
3)	*ΔEfficiency*	-0.005	0.000	0.178	-0.072	4.789	-0.700	-0.100	0.100	0.600
4)	*Ability*-Raw	0.001	-0.015	0.118	1.716	8.169	-0.302	-0.067	0.041	0.666
5)	*Ability*	0.562	0.600	0.277	-0.042	1.840	0.100	0.300	0.800	1.000
6)	*Δability*	-0.005	0.000	0.218	-0.002	4.227	-0.800	-0.100	0.100	0.800
7)	*ΔlnRev*	0.087	0.070	0.316	0.578	7.573	-1.349	-0.042	0.200	1.873
8)	*Dec*	0.328	0.000	0.469	0.734	1.538	0.000	0.000	1.000	1.000
9)	*ΔlnRev*Dec*	-0.065	0.000	0.159	-3.622	18.256	-1.349	-0.042	0.000	0.000
10)	*lnRet*	-0.030	-0.005	0.487	-0.320	4.970	-2.651	-0.276	0.236	1.925
11)	*Neg*	0.504	1.000	0.500	-0.015	1.000	0.000	0.000	1.000	1.000
12)	*lnRet*Neg*	-0.192	-0.005	0.319	-2.419	10.399	-2.651	-0.276	0.000	0.000
13)	*AssetInt*	1.398	0.962	1.394	3.448	19.189	0.170	0.646	1.565	14.612
14)	*EmpInt*	0.053	0.014	0.110	3.919	20.004	0.000	0.006	0.041	0.866
15)	*BtM*	0.647	0.542	0.880	-0.247	27.714	-10.097	0.284	0.912	9.687
16)	*Lev*	0.692	0.257	1.484	6.607	68.260	0.000	0.067	0.691	23.036
17)	*Mcap*	5.046	4.920	2.398	0.269	2.463	0.268	3.195	6.739	11.858
18)	*Capex*	0.061	0.039	0.070	2.609	11.539	0.000	0.018	0.076	0.550
19)	*Intan*	0.125	0.040	0.175	1.666	5.140	0.000	0.000	0.188	0.817
20)	*Liab*	0.580	0.506	0.555	6.369	61.026	0.047	0.326	0.678	9.049
21)	*Foreign*	0.271	0.000	0.444	1.033	2.067	0.000	0.000	1.000	1.000
22)	*Size*	5.231	5.140	2.345	0.206	2.492	0.222	3.477	6.867	11.696

Note. The table presents summary statistics for operating efficiency, managerial ability, and related financial and control variables for a sample of 124,889 firm-year observations (*N*). Cols 1-2 provide mean and median, and cols 3-5 report on distribution moments such as the standard deviation, skewness, and kurtosis for each variable. Then, cols 6-9, report the minimum, 25th percentile, 75th percentile, and maximum values of distribution for each variable. All variables are defined in Appendix A. All continuous variables are winsorized annually at the 1st and 99th percentile.

Panel B.

Pairwise Correlations

	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
1)	*Efficiency*-Raw		**0.881**	**0.233**	**0.608**	**0.548**	0.168	**0.162**	**-0.184**	**0.213**	0.105	-0.103	0.102	-0.058	**-0.559**	**-0.088**	**-0.178**	**0.583**	0.045	**0.177**	-0.049	**0.183**	**0.561**
2)	*Efficiency*	**0.757**		**0.300**	**0.554**	**0.595**	**0.188**	**0.178**	**-0.195**	**0.223**	0.111	-0.109	0.110	-0.025	**-0.487**	-0.075	**-0.161**	**0.548**	0.099	0.118	-0.061	**0.162**	**0.525**
3)	*ΔEfficiency*	**0.198**	**0.330**		**0.241**	**0.266**	**0.657**	**0.220**	**-0.172**	**0.190**	0.133	-0.105	0.122	-0.033	-0.011	0.037	0.015	-0.015	0.007	-0.019	-0.001	-0.005	0.000
4)	*Ability*-Raw	**0.809**	**0.564**	**0.233**		**0.872**	**0.294**	0.143	-0.119	0.131	0.058	-0.044	0.059	**-0.231**	0.044	-0.111	**-0.206**	-0.034	-0.043	-0.092	**-0.102**	-0.053	-0.123
5)	*Ability*	**0.569**	**0.594**	**0.287**	**0.777**		**0.366**	0.131	-0.112	0.125	0.064	-0.049	0.069	**-0.171**	0.002	-0.098	**-0.162**	0.000	0.010	-0.096	-0.084	-0.044	-0.072
6)	*ΔAbility*	0.175	**0.207**	**0.697**	**0.261**	**0.395**		0.127	-0.101	0.115	0.076	-0.056	0.071	**-0.042**	0.007	0.011	0.013	-0.027	0.010	-0.031	0.017	-0.005	-0.017
7)	*ΔlnRev*	0.128	**0.166**	**0.252**	0.136	0.129	**0.158**		**-0.813**	**0.834**	**0.166**	**-0.144**	0.138	0.008	-0.081	-0.014	-0.089	0.109	0.154	0.079	-0.090	-0.017	0.071
8)	*Dec*	**-0.145**	**-0.197**	**-0.173**	**-0.118**	**-0.112**	**-0.105**	**-0.631**		**-0.974**	**-0.165**	**0.150**	**-0.157**	0.047	0.130	0.014	0.089	-0.157	-0.142	-0.096	0.075	0.001	-0.125
9)	*ΔlnRev*Dec*	**0.180**	**0.236**	**0.203**	0.125	0.134	0.135	**0.700**	**-0.584**		**0.173**	**-0.156**	**0.168**	-0.070	-0.158	-0.002	-0.084	**0.176**	0.152	0.111	-0.076	0.004	0.149
10)	*lnRet*	0.065	0.094	0.138	0.056	0.070	0.082	0.128	**-0.148**	0.131		**-0.866**	**0.937**	-0.020	-0.065	**0.286**	0.067	-0.038	-0.031	0.026	-0.068	0.021	0.061
11)	*Neg*	-0.078	-0.109	-0.102	-0.041	-0.049	-0.054	-0.114	**0.150**	**-0.117**	**-0.725**		**-0.924**	0.016	0.075	**-0.233**	-0.050	0.000	0.017	-0.033	0.058	-0.021	-0.076
12)	*lnRet*Neg*	0.065	0.090	0.117	0.058	0.080	0.075	0.063	-0.124	0.144	**0.855**	**-0.596**		-0.027	-0.064	**0.269**	0.065	-0.026	-0.035	0.030	-0.065	0.020	0.064
13)	*AssetInt*	**-0.064**	**-0.103**	**-0.038**	**-0.155**	**-0.180**	**-0.054**	-0.013	0.060	**-0.173**	-0.027	0.022	-0.055		0.008	-0.008	-0.039	**0.235**	0.003	0.083	-0.168	**0.157**	0.214
14)	*EmpInt*	**-0.319**	**-0.363**	-0.017	-0.025	-0.012	0.006	**-0.141**	**0.151**	**-0.206**	-0.028	0.059	0.002	0.150		0.007	-0.017	**-0.798**	-0.089	**-0.300**	-0.123	**-0.269**	**-0.878**
15)	*BtM*	-0.052	-0.038	0.036	-0.078	-0.058	0.008	0.048	-0.001	0.032	**0.242**	**-0.182**	**0.174**	0.082	-0.086		**0.267**	**-0.242**	-0.019	-0.119	**-0.293**	-0.001	-0.003
16)	*Lev*	**-0.072**	**-0.091**	0.017	**-0.122**	**-0.108**	0.017	-0.032	0.089	-0.050	0.091	-0.042	0.039	0.049	-0.036	-0.005		**-0.263**	0.008	-0.004	**0.677**	-0.069	0.038
17)	*MCap*	**0.575**	**0.553**	-0.013	0.123	0.022	-0.025	0.073	**-0.151**	**0.159**	-0.078	0.000	-0.057	0.135	**-0.467**	-0.150	**-0.211**		0.167	**0.330**	-0.034	**0.300**	**0.913**
18)	*Capex*	-0.022	0.017	0.006	-0.023	0.020	0.015	0.139	-0.106	0.070	-0.045	0.030	-0.057	0.173	0.003	-0.018	-0.021	0.056		-0.235	-0.012	-0.012	0.151
19)	*Intan*	0.092	0.077	-0.014	-0.062	-0.093	-0.027	0.080	-0.077	0.083	0.001	-0.021	0.006	0.055	**-0.120**	-0.076	0.010	**0.258**	**-0.246**		0.084	**0.126**	**0.331**
20)	*Liab*	**-0.086**	**-0.141**	0.002	-0.002	-0.003	0.032	**-0.095**	**0.103**	**-0.115**	-0.058	0.068	-0.035	-0.091	**0.293**	**-0.369**	**0.268**	**-0.146**	-0.027	0.013		-0.018	0.112
21)	*Foreign*	**0.178**	**0.162**	-0.006	0.005	-0.045	-0.006	-0.019	0.001	0.022	0.014	-0.021	0.014	0.076	**-0.168**	0.010	-0.034	**0.303**	-0.052	0.070	-0.049		**0.307**
22)	*Size*	**0.550**	**0.533**	0.003	0.039	-0.050	-0.019	0.063	**-0.121**	0.162	0.031	-0.077	0.033	0.149	**-0.568**	0.014	0.044	**0.915**	0.039	**0.258**	**-0.135**	**0.312**	

Note. The table presents a univariate correlation matrix of operating efficiency, managerial ability, and financial control variables. Lower and upper triangles report the pairwise Pearson and Spearman correlations, respectively. The values in **bold** face are statistically significant at a 10% alpha level.

CHAPTER 4

EMPIRICAL FINDINGS

Hypothesis 1: Asymmetry in Operational Efficiency

Univariate Paired Correlations of Operational Efficiency

In Table 1, Panel B, the Pearson (Spearman) paired correlation for the raw values of OE with the decile ranked values of OE and change in ranked values OE is 76% (88%) and 20% (23%). The Pearson (Spearman) correlation between ranked OE and change in ranked OE is 33% (30%). Consistent with Hypothesis 1, the Pearson (Spearman) paired correlation for raw values of OE, ranked values of OE, and change in ranked OE with the cost stickiness parameter is 18% (21%), 24% (22%) 20% (19%), respectively. The correlations are statistically significant at a minimum of 10% alpha level for a two-tailed test. Alternatively, under the null hypothesis, I do not expect to find a positive and significant correlation between OE and the cost stickiness parameter. While statistically insignificant at a 10% two-tailed alpha, the Pearson (Spearman) positive correlation between three OE variables and the accounting conservatism parameter is meaningful, ranging from 7% to 12% (10% to 12%).

Cost Stickiness and Accounting Conservatism Effects on Operational Efficiency Measure

In Table 2, Panel A, I present the result for the estimation of Eq. 1 on the effect of REA on OE. First, I estimate the baseline symmetric effect of $\Delta \ln Rev_{j,t}$ on the $Efficiency_{j,t}$ (col 1). The coefficient β_1 is 0.12 (t=44.45). Then, I test for the asymmetric effect of cost stickiness given demand decline, $\Delta \ln Rev_{j,t} * Dec_{j,t}$ (col 2), and the coefficient β_3 is 0.16 (t=20.73). Second, I test for the symmetric effect of $\ln Ret_{j,t}$ on the $Efficiency_{j,t}$ (col 3), and the coefficient β_4 is 0.03 (t=22.07). By modeling the piecewise linear parameters, I jointly test for the effects of REA on OE (col 4). Similar to cost stickiness, there is an asymmetric effect of accounting conservatism

conditional on bad news, $\ln Ret_{j,t}*Neg_{j,t}$, which is statistically significant, and the coefficient β_6 are 0.02 (t=4.20) relative to β_4 of 0.01 (t=2.61). Consistently, there is a significant asymmetry in OE given cost stickiness, and coefficient β_3 is 0.15 (t=19.79) compared to β_1 of 0.03 (t=7.79). Third, I assess robustness by controlling for the firm financial and operational attributes that also determine REA (col 5). Fourth, I estimate another robustness model by including industry and year multiplicative fixed effects and clustered standard errors (col 6), which further lower firm-specific heterogeneity and time-series autocorrelation.[11] In each case, coefficients β_3 and β_6 are positive and statistically significant at a 5% or 1% level. On average, the decline in the OE measure is 2.4 times more during revenue decline than revenue growth. Similarly, the decrease in OE is 1.7 times more conditional on a negative return than a positive return.[12] Compared to the baseline model (col 1), the within adjusted-R^2 increases by 39.5% after modeling the REA parameters (col 4). Thus, the effect of REA on OE is robust such that efficiency is more sensitive to demand decline and bad news, which is consistent with rejecting the null hypothesis (H1) of symmetry or linear effect.[13]

In Table 2, Panel B, I present the results for estimating the effect of REA on the change in OE. First, I estimate the baseline effects of symmetry (col 1) and asymmetry (col 2) in the revenues-expenses relation on the $\Delta Efficiency_{j,t.}$ The coefficients β_1 and β_3 are 0.15 (t=67.92) and 0.12 (t=41.52). Second, I test for the effects of symmetry (col 3) and asymmetry (col 4) in the relation between returns and earnings on the rate of change in OE. The coefficients β_4 and β_6 are

[11] E.g., the t-statistic for coefficient β_1 declined from 44.45 in col 1 to 12.05 in col 6, and for coefficient β_4 reduced from 22.07 in col 3 to 5.61 in col 6, which controls for the type I error rate.
[12] The magnitude of REA: (1) $((\beta_1+\beta_3)/\beta_1)$ = ((0.06+0.08)/0.06) times; (2) $((\beta_4+\beta_6)/\beta_4)$ = ((0.05+0.03)/0.05) times.
[13] In untabulated estimation, findings are qualitatively consistent after specifying the model with fixed effects of firms and years.

0.12 (t=9.28) and 0.01 (t=3.95). Third, I assess the robustness by controlling for the firm financial and operational attributes that also determine REA (col 5). Fourth, I present findings for the robustness model, including the two-way fixed effects and double-clustered standard errors (col 6).[14] In each case, coefficients β_3 and β_6 are positive and statistically significant at a 5% or 1% level. On average, the reduction in OE measure is 1.4 times more during revenue decline than growth. Similarly, the decrease in OE is 1.5 times more conditional on bad news than good.[15] Compared to the baseline model (col 1), the within adjusted-R^2 increases by 20.9% after modeling the REA parameters (col 4). Overall, the effect of REA on the rate of change in OE is robust and qualitatively consistent with that on the rate of OE. As a result, the variation in efficiency is asymmetric, given a demand decline or bad news, which is consistent with Hypothesis 1.[16]

Hypothesis 2: Asymmetry in Managerial Ability

Univariate Paired Correlations of Managerial Ability

In Table 1, Panel B, the Pearson (Spearman) paired correlation for the raw values of MA with decile ranked values of MA and change in ranked values of MA is 78% (87%) and 26% (29%). Similarly, the Pearson (Spearman) correlation between ranked MA and change in ranked MA is 40% (37%). The correlation between MA values in levels and changes is low. In addition, the Pearson (Spearman) paired correlation between the raw values of OE and MA is 81% (61%), the ranked values of OE and MA is 59% (60%), change in ranked values of OE and MA is 70% (66%). While the correlation between ranked OE and change in ranked MA is 21% (19%), and

---

[14] E.g., the t-statistic for coefficient β_1 declined from 67.92 in col 1 to 28.23 in col 6, and for coefficient β_4 reduced from 31.68 in col 3 to 9.94 in col 6, which controls for the type I error rate.
[15] The magnitude of REA: (1) $((\beta_1+\beta_3)/\beta_1)$ = ((0.13+0.05)/0.13) times; (2) $((\beta_4+\beta_6)/\beta_4)$ = ((0.03+0.02)/0.03) times.
[16] In untabulated estimation, findings are qualitatively consistent after controlling for fixed effects of firms and years.

the change in ranked OE and ranked MA is 29% (27%). Thus, the cross-correlation among ranked values of OE and MA in levels and changes is lower than raw values.

Consistent with Hypothesis 2, the Pearson (Spearman) paired correlation for raw values of MA, decile ranked values of MA, and change in ranked values of MA with the cost stickiness parameter is 13% (13%), 13% (13%), and 14% (12%), respectively. The Pearson (Spearman) correlations are statistically significant (insignificant) at a minimum of 10% alpha level for a two-tailed test. While statistically insignificant at a 10% two-tailed alpha, the Pearson (Spearman) correlation across three MA variables and accounting conservatism parameter range from 6% to 8% (6% to 7%).

Cost Stickiness and Accounting Conservatism Effects on Managerial Ability Measure

In Table 3, Panel A, I present the estimates of Eq. 1. that test for the REA effects on MA. First, I estimate the baseline symmetric effect of $\Delta \ln Rev_{j,t}$ on the $Ability_{j,t}$ (col 1). The coefficient β_1 is 0.13 (t=41.84). Then, I test for the asymmetric effect of cost stickiness given demand decline, $\Delta \ln Rev_{j,t} * Dec_{j,t}$ (col 2), and the coefficient β_3 is 0.16 (t=17.43). Second, I test for the symmetric effect of $\ln Ret_{j,t}$ on the $Ability_{j,t}$ (col 3), and the coefficient β_4 is 0.03 (t=19.21). Further, I test for the asymmetric effect of accounting conservatism conditional on bad news, $\ln Ret_{j,t} * Neg_{j,t}$ (col 4). By modeling for the piecewise linear parameters, I jointly test for the effects of REA on MA. The coefficients β_3 and β_6 are 0.14 (t=15.27) and 0.07 (t=11.67). Third, I assess the robustness by controlling for the firm financial and operational attributes that also determine REA (col 5). Fourth, I estimate a robustness model, including industry and year interactive fixed effects and clustered standard errors (col 6) to reduce firm-specific

heterogeneity and time-series autocorrelation[17] In each case, coefficients β_3 and β_6 are positive and statistically significant at a 5% or 1% level. On average, the reduction in MA during demand decline is 1.5 times more than growth. Further, the decrease in MA is 3.6 times more conditional on bad news than good news.[18] Compared to the baseline model (col 1), the within adjusted-R^2 increases by 263.3% after modeling the REA parameters (col 4). Therefore, the empirical evidence is robust on the effect of REA on MA and consistent with rejecting the null hypothesis (H2) of a symmetric or linear effect.[19]

In Table 2, Panel B, I present the results for estimating REA on the change in MA. First, I estimate the baseline effects of symmetry (col 1) and asymmetry (col 2) in the revenues-expenses relation on the $\Delta Ability_{j,t}$. The coefficients β_1 and β_3 are 0.09 (t=24.80) and 0.08 (t=12.53). Second, I test for the effects of symmetry (col 3) and asymmetry (col 4) in the relation between returns and earnings on the rate of change in MA. The coefficients β_4 and β_6 are 0.02 (t=6.60) and 0.02 (t=5.38). Similarly, the coefficients β_1 and β_3 are 0.09 (t=24.64) and 0.07 (t=10.93). Third, I assess the robustness by controlling for the firm financial and operational attributes that also determine REA (col 5). Fourth, I estimate the model by including the two-way fixed effects and double-clustered standard errors (col 6).[20] In each case, coefficients β_3 and β_6 are positive and statistically significant at a 5% or 1% level. On average, the reduction in MA during demand decline is 1.6 times more than growth. Further, the decrease in MA is 2.3 times more conditional

---

[17] E.g., the t-statistic for coefficient β_1 declined from 41.84 in col 1 to 16.73 in col 6, and for coefficient β_4 reduced from 19.21 in col 3 to 6.37 in col 6, which controls for the type I error rate.

[18] The magnitude of REA: (1) $((\beta_1+\beta_3)/\beta_1)$ = ((0.09+0.05)/0.09) times; (2) $((\beta_4+\beta_6)/\beta_4)$ = ((0.03+0.07)/0.03) times.

[19] In untabulated estimation, findings are qualitatively consistent after including fixed effects of both firms and years.

[20] E.g., the t-statistic for coefficient β_1 declined from 45.18 in col 1 to 17.87 in col 6, and for coefficient β_4 reduced from 19.14 in col 3 to 5.18 in col 6, which controls for the type I error rate.

on bad news than good news.[21] Compared to the baseline model (col 1), the within adjusted-R^2 increases by 27.6% after modeling the REA parameters (col 4). Overall, the effect of REA on the rate of change in MA is robust and qualitatively consistent with that on the rate of MA. As a result, MA varies asymmetrically conditional on a demand decline or bad news period, which is consistent with Hypothesis 2.[22]

Robustness of Asymmetry in Operational Efficiency and Managerial Ability Measures

To assess the robustness, I re-estimated Eq. 1 model after including firm fixed effects and controlling for firm characteristics in both contemporaneous (*t*) and lagged (*t*-1) periods. The estimated models include year and industry fixed effects and contemporaneous period (*t*) controls. Overall, after including firm fixed effects and prior-period (*t*-1) controls, the results are qualitatively similar to those presented in Tables 2 and 3, testing H1 and H2.

In Table 4, Panel A and B, I present estimates using all four dependent variables defined as the ranked decile values of OE (Panel A) and MA (Panel B) measured in levels (cols 1-4) and changes (cols 5-8). In addition to firm fixed effects, the model is specified with fixed effects for the year (cols 1-2, 5-6) and two-way industry*year (cols 3-4, 7-8) with control variables for the current (*t*) year (cols 1, 3, 5, 7) and for the current (*t*) and prior (*t-1*) years (cols 2, 4, 6, 8). The standard errors are robust-clustered by the firms (cols 1-3, 5-7) and firms and years (cols 4, 8).[23]

Similar to the findings in Tables 2 and 3, the effect of revenues-expenses and returns-earnings asymmetry (REA) on OE and MA is significant and robust to the inclusion of firm-level fixed effects and multi-period control variables. Regarding the degree of asymmetry, the

---

[21] The magnitude of REA: (1) $((\beta_1+\beta_3)/\beta_1)$ = ((0.10+0.06)/0.10) times; (2) $((\beta_4+\beta_6)/\beta_4)$ = ((0.02+0.02)/0.02) times.
[22] In untabulated estimation, findings are qualitatively consistent after controlling for the fixed effects of firms and years.
[23] In untabulated adjustment for over-correction of standard errors (Abadie, Athey, Imbens, & Wooldridge, 2020) using separately either firm or year clusters, the statistical significance of the coefficients are qualitatively the same.

standard measures of OE and MA are affected by cost stickiness and accounting conservatism, respectively. Furthermore, the degree of asymmetry in OE is more due to cost stickiness than accounting conservatism and increases at a marginally decreasing rate. Conversely, the asymmetry in MA is more given accounting conservatism than cost stickiness and increases at a marginally increasing rate. The findings are consistent with H1 and H2 after controlling for firm-fixed effects and lag-year (*t*-1) firm characteristics.

Alternative to the rank-based OE and MA measures, I also estimate the REA effects using the raw values of OE and MA. Repeating the above estimations in Table 4, Panels A and B, I test for the asymmetric effects on OE and MA and present findings in Appendix C. The model specification includes firm fixed effects, year and industry fixed effects, and current-year (*t*) and prior-year (*t*-1) control variables. As for the OE and MA ranks, the findings presented in Panel C.1 and C.2 are consistent with H1 and H2 and qualitatively similar to those reported in Tables 2-4. Specifically, cost stickiness and accounting conservatism systematically affect OE and MA measured as the logarithm values in levels and changes. Thus, on average, a significant effect of the asymmetries in the measures of OE and MA.

Table 2: Effect of Cost Stickiness (CS) and Accounting Conservatism (AC) – Operational Efficiency (OE)

Panel A.

Hypothesis 1 – Estimation of Asymmetry Degree in the Operational Efficiency (OE)

Coef. (t-stat.)	Dep. var: $\boldsymbol{Efficiency_{j,t}}$						
	Model =	Cost Stickiness		Acct. Conservatism		Determinants	Robustness
N=124,889	Predict.	(1)	(2)	(3)	(4)	(5)	(6)
$\boldsymbol{\Delta lnRev_{j,t}}$		0.123***	0.033***	0.031***	0.034***	0.069***	0.056***
		(44.449)	(7.428)	(7.040)	(7.793)	(16.624)	(12.045)
$Dec_{j,t}$			-0.036***	-0.033***	-0.033***	-0.009***	-0.007***
			(-16.565)	(-15.312)	(-15.008)	(-4.375)	(-3.201)
$\boldsymbol{\Delta lnRev_{j,t}*Dec_{j,t}}$	+		0.162***	0.159***	0.154***	0.064***	0.078***
			(20.726)	(20.309)	(19.791)	(8.527)	(8.155)
$\boldsymbol{lnRet_{j,t}}$				0.028***	0.009***	0.050***	0.050***
				(22.067)	(2.605)	(14.814)	(11.650)
$Neg_{j,t}$					-0.010***	-0.006***	-0.004*
					(-5.263)	(-3.089)	(-1.775)
$\boldsymbol{lnRet_{j,t}*Neg_{j,t}}$	+				0.021***	0.012**	0.034***
					(4.199)	(2.472)	(5.606)
$lnAssetInt_{j,t}$						-0.071***	-0.072***
						(-29.288)	(-14.214)
$lnEmpInt_{j,t}$						0.006***	-0.013***
						(2.874)	(-4.073)
$BtM_{j,t}$						-0.003**	0.001
						(-2.357)	(0.766)
$Lev_{j,t}$						0.007***	0.008***
						(7.969)	(9.427)
$MCap_{j,t}$						0.062***	0.071***
						(34.168)	(37.906)
Controls		Included					
Fixed Effects		None					*Year*Industry*
Clustered Standard Errors		*Firm*					*Year* and *Industry*
Within Adj. R^2		0.312	0.320	0.322	0.322	0.380	0.435

Note. The table presents estimates of the model specified in Eq. 1. to test for the degree of asymmetric effects due to demand decrease (cols 1-2) and bad news (cols 3-4) on the operational efficiency, including the determinants of the asymmetry (col 5). The estimates are reported with robust-clustered standard errors by firm (cols 1-5). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (col 6). All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate p<0.1 (0.05)[0.01].

Panel B.

Hypothesis 1 – Estimation of Asymmetry Rate in the Change in Operating Efficiency (OE)

Coef. (t-stat.)	Dep. var: $\Delta Efficiency_{j,t}$						
	Model =	Cost Stickiness		Acct. Conservatism		Determinants	Robustness
N=124,889	Predict.	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta lnRev_{j,t}$		0.148***	0.122***	0.120***	0.122***	0.123***	0.125***
		(67.920)	(41.520)	(41.077)	(40.807)	(40.724)	(28.227)
$Dec_{j,t}$			-0.006***	-0.002*	-0.002*	-0.003**	-0.006***
			(-4.533)	(-1.736)	(-1.660)	(-2.160)	(-3.111)
$\Delta lnRev_{j,t}*Dec_{j,t}$	+		0.058***	0.053***	0.050***	0.044***	0.048***
			(10.924)	(10.081)	(9.283)	(7.936)	(6.207)
$lnRet_{j,t}$				0.038***	0.032***	0.030***	0.032***
				(31.675)	(12.911)	(11.956)	(9.936)
$Neg_{j,t}$					0.001	0.001	-0.000
					(0.627)	(0.621)	(-0.223)
$lnRet_{j,t}*Neg_{j,t}$	+				0.012***	0.013***	0.015***
					(3.951)	(4.000)	(3.472)
$lnAssetInt_{j,t}$						-0.005***	-0.010***
						(-8.852)	(-2.922)
$lnEmpInt_{j,t}$						0.002***	0.005**
						(5.235)	(2.326)
$BtM_{j,t}$						0.001	0.000
						(1.373)	(0.168)
$Lev_{j,t}$						0.000	0.000
						(1.050)	(0.403)
$MCap_{j,t}$						-0.002***	-0.004***
						(-3.276)	(-3.090)
Controls		Included					
Fixed Effects		None					*Year*Industry*
Clustered Standard Errors		*Firm*					*Year* and *Industry*
Within Adj. R^2		0.067	0.069	0.079	0.079	0.080	0.081

Note. The table presents estimates of the model specified in Eq. 1. to test for the rate of asymmetric effects due to demand decrease (cols 1-2) and bad news (cols 3-4) on the change in operational efficiency, including the determinants of the asymmetry (col 5). The estimates are reported with robust-clustered standard errors by firm (cols 1-5). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (col 6). All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Table 3: Effect of Cost Stickiness (CS) and Accounting Conservatism (AC) – Managerial Ability (MA)

Panel A.

Hypothesis 2 – Estimation of Asymmetry Degree in the Managerial Ability (MA)

Coef. (t-stat.)	Dep. var: $\boldsymbol{Ability_{j,t}}$						
	Model =	Cost Stickiness		Acct. Conservatism		Determinants	Robustness
N=124,889	Predict.	(1)	(2)	(3)	(4)	(5)	(6)
$\boldsymbol{\Delta lnRev_{j,t}}$		0.125***	0.048***	0.046***	0.056***	0.088***	0.091***
		(41.837)	(9.787)	(9.454)	(11.559)	(19.216)	(16.727)
$Dec_{j,t}$			-0.025***	-0.022***	-0.021***	0.004	-0.001
			(-9.473)	(-8.402)	(-8.111)	(1.523)	(-0.259)
$\boldsymbol{\Delta lnRev_{j,t}*Dec_{j,t}}$	+		0.155***	0.152***	0.135***	0.044***	0.049***
			(17.433)	(17.091)	(15.273)	(5.092)	(4.322)
$\boldsymbol{lnRet_{j,t}}$				0.027***	-0.011***	0.029***	0.027***
				(19.206)	(-2.739)	(7.438)	(6.370)
$Neg_{j,t}$					-0.001	0.004*	0.003
					(-0.264)	(1.761)	(1.094)
$\boldsymbol{lnRet_{j,t}*Neg_{j,t}}$	+				0.067***	0.063***	0.071***
					(11.672)	(11.385)	(11.104)
$lnAssetInt_{j,t}$						-0.066***	-0.086***
						(-19.423)	(-13.735)
$lnEmpInt_{j,t}$						-0.010***	-0.003
						(-2.867)	(-0.660)
$BtM_{j,t}$						0.005***	0.004***
						(3.131)	(3.520)
$Lev_{j,t}$						0.009***	0.009***
						(8.041)	(9.894)
$MCap_{j,t}$						0.071***	0.069***
						(32.207)	(33.563)
Controls		Included					
Fixed Effects		None					*Year*Industry*
Clustered Standard Errors		*Firm*					*Year* and *Industry*
Within Adj. R^2		0.030	0.036	0.038	0.040	0.105	0.109

Note. The table presents estimates of the model specified in Eq. 1. to test for the degree of asymmetric effects due to demand decrease (cols 1-2) and bad news (cols 3-4) on the managerial ability, including the determinants of the asymmetry (col 5). The estimates are reported with robust-clustered standard errors by firm (cols 1-5). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (col 6). All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Panel B.

Hypothesis 2 – Estimation of Asymmetry in the Change in Managerial Ability (MA)

Coef. (t-stat.)	Dep. var: $\Delta Ability_{j,t}$						
	Model =	Cost Stickiness		Acct. Conservatism		Determinants	Robustness
N=124,889	Predict.	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta lnRev_{j,t}$		0.117***	0.088***	0.086***	0.089***	0.093***	0.096***
		(45.182)	(24.802)	(24.310)	(24.640)	(25.495)	(17.873)
$Dec_{j,t}$			-0.002	0.001	0.001	0.002	-0.001
			(-0.903)	(0.778)	(0.787)	(1.106)	(-0.363)
$\Delta lnRev_{j,t}*Dec_{j,t}$	+		0.079***	0.075***	0.070***	0.056***	0.058***
			(12.526)	(11.975)	(10.928)	(8.435)	(5.872)
$lnRet_{j,t}$				0.028***	0.020***	0.020***	0.019***
				(19.144)	(6.595)	(6.407)	(5.177)
$Neg_{j,t}$					0.005***	0.005***	0.004*
					(2.640)	(2.748)	(1.867)
$lnRet_{j,t}*Neg_{j,t}$	+				0.020***	0.021***	0.024***
					(5.376)	(5.482)	(4.410)
$lnAssetInt_{j,t}$						-0.012***	-0.020***
						(-17.034)	(-4.636)
$lnEmpInt_{j,t}$						0.004***	0.008**
						(6.521)	(2.549)
$BtM_{j,t}$						0.002*	0.001
						(1.923)	(0.603)
$Lev_{j,t}$						0.002***	0.002***
						(4.457)	(2.933)
$MCap_{j,t}$						0.002***	-0.000
						(2.928)	(-0.310)
Controls		Included					
Fixed Effects		None					*Year*Industry*
Clustered Standard Errors		*Firm*					*Year* and *Industry*
Within Adj. R^2		0.029	0.031	0.035	0.035	0.036	0.037

Note. The table presents estimates of the model specified in Eq. 1. to test for the rate of asymmetric effects due to demand decrease (cols 1-2) and bad news (cols 3-4) on the change in managerial ability, including the determinants of the asymmetry (col 5). The estimates are reported with robust-clustered standard errors by firm (cols 1-5). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (col 6). All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Table 4: Robustness for Effects of Cost Stickiness (CS) and Accounting Conservatism (AC) – Controlling for Firm Fixed Effects and Characteristics and Standard Errors

Panel A.

Alternative Controls for the Estimation of Asymmetry Degree in the Operating Efficiency (OE)

Coef. Dep. var: (t-stat.)	***Efficiency***$_{j,t}$				***ΔEfficiency***$_{j,t}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔlnRev$_{j,t}$	0.058***	0.087***	0.061***	0.092***	0.131***	0.112***	0.132***	0.115***
	(17.271)	(10.819)	(18.097)	(10.287)	(35.877)	(11.726)	(35.947)	(10.911)
$Dec_{j,t}$	-0.010***	-0.008***	-0.011***	-0.009***	-0.008***	-0.010***	-0.008***	-0.011***
	(-6.544)	(-5.197)	(-6.824)	(-4.158)	(-5.011)	(-6.092)	(-5.209)	(-4.513)
ΔlnRev$_{j,t}$***Dec***$_{j,t}$	0.029***	0.052***	0.031***	0.054***	0.045***	0.042***	0.048***	0.044***
	(4.502)	(7.563)	(4.762)	(6.668)	(6.554)	(5.742)	(6.970)	(5.274)
lnRet$_{j,t}$	0.031***	0.022***	0.032***	0.024***	0.026***	0.027***	0.026***	0.027***
	(11.578)	(8.059)	(12.091)	(6.309)	(9.206)	(8.847)	(9.100)	(6.136)
$Neg_{j,t}$	-0.002	-0.003**	-0.002	-0.003	0.000	0.001	-0.000	0.001
	(-1.619)	(-2.043)	(-1.615)	(-1.558)	(0.146)	(0.442)	(-0.046)	(0.228)
lnRet$_{j,t}$***Neg***$_{j,t}$	0.023***	0.019***	0.023***	0.019***	0.011***	0.008*	0.013***	0.009*
	(6.252)	(5.016)	(6.285)	(3.878)	(2.978)	(1.857)	(3.489)	(1.928)
Included Controls	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1
Fixed Effects	*Firm* and *Year*		*Firm* and *Industry***Year*		*Firm* and *Year*		*Firm* and *Industry***Year*	
Clustered Standard Errors	*Firm*		*Firm*	*Firm* and *Year*	*Firm*		*Firm*	*Firm* and *Year*
N	124,889	110,194	124,889	110,194	124,889	110,194	124,889	110,194
Within Adj. R^2	0.711	0.722	0.714	0.726	0.143	0.140	0.148	0.145

Note. The table presents estimates of the model specified in Eq. 1. to test for the degree of asymmetric effects due to demand decrease and bad news on the operational efficiency, controlling for firm fixed effects, prior-period firm characteristics, and estimates are reported with robust-clustered standard errors by firm and firm and year. All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Panel B.

Alternative Controls for the Estimation of Asymmetry Degree in the Managerial Ability (MA)

Coef. (t-stat.) Dep. var:	***Ability***$_{j,t}$				***ΔAbility***$_{j,t}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔlnRev$_{j,t}$	0.083***	0.097***	0.086***	0.102***	0.104***	0.098***	0.105***	0.102***
	(21.709)	(10.340)	(22.183)	(9.874)	(23.799)	(8.739)	(23.906)	(8.001)
$Dec_{j,t}$	-0.011***	-0.009***	-0.011***	-0.009***	-0.005**	-0.006***	-0.005**	-0.006**
	(-5.962)	(-4.867)	(-6.127)	(-3.853)	(-2.448)	(-2.898)	(-2.529)	(-2.524)
ΔlnRev$_{j,t}$***Dec***$_{j,t}$	0.018**	0.045***	0.021***	0.048***	0.054***	0.038***	0.057***	0.040***
	(2.466)	(5.729)	(2.890)	(5.002)	(6.608)	(4.228)	(6.920)	(3.525)
lnRet$_{j,t}$	0.019***	0.009***	0.019***	0.010**	0.015***	0.020***	0.015***	0.021***
	(5.906)	(2.656)	(6.115)	(2.072)	(4.193)	(5.504)	(4.186)	(4.068)
$Neg_{j,t}$	0.002	0.001	0.002	0.001	0.004**	0.005**	0.004*	0.005*
	(1.345)	(0.523)	(1.392)	(0.425)	(1.972)	(2.268)	(1.954)	(1.932)
lnRet$_{j,t}$***Neg***$_{j,t}$	0.035***	0.032***	0.036***	0.032***	0.021***	0.015***	0.022***	0.016**
	(8.076)	(6.860)	(8.392)	(5.387)	(4.469)	(3.128)	(4.712)	(2.433)
Included Controls	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1
Fixed Effects	*Firm* and *Year*		*Firm* and *Industry*Year*		*Firm* and *Year*		*Firm* and *Industry*Year*	
Clustered Standard Errors	*Firm*		*Firm*	*Firm* and *Year*	*Firm*		*Firm*	*Firm* and *Year*
N	124,889	110,194	124,889	110,194	124,889	110,194	124,889	110,194
Within Adj. R^2	0.560	0.576	0.563	0.579	0.103	0.105	0.106	0.109

Note. The table presents estimates of the model specified in Eq. 1. to test for the degree of asymmetric effects due to demand decrease and bad news on the managerial efficiency, controlling for firm fixed effects, prior-period firm characteristics, and estimates are reported with robust-clustered standard errors by firm and firm and year. All estimated models include firm characteristics as control variables (cols 1-6) and $^{*(**)[***]}$ indicate $p < 0.10(0.05)[0.01]$.

CHAPTER 5

DETERMINANTS OF COST STICKINESS AND ACCOUNTING CONSERVATISM

The Cross-Sectional Effect of Cost Stickiness Determinants

The cost behavior framework argues that adjustment costs and future demand expectations affect contemporaneous resource allocation decisions (Anderson et al., 2003; Banker & Byzalov, 2014). Moreover, firm attributes and economic conditions are key to identifying the source of nonlinear variations in management cost decisions (Ijiri & Simon, 1974). Typically, managers trade off the marginal costs of resource commitment against flexibility (Trigeorgis & Reuer, 2017) and balance the costs of resource retention versus adjustment. The degree of cost stickiness varies with expected costs to adjust versus retain resources, given the managerial expectations of economic conditions and capacity utilization.

Cross-sectionally, the ratio of asset intensity and employee intensity captures the effect of firms' resource retention and adjustment costs (Anderson et al., 2003; Banker et al., 2016), which further informs on demand growth expectation. On average, the firm-level asset and employee intensity would increase the degree of asymmetry given the retention of resources. Given the high resource adjustment costs, firms are more inclined to retain resources than to cut back to support future demand growth. The high resource retention rates increase assets (i.e., accruals) subject to future losses, impairments, and write-offs conditional on bad news.

In making short-term resource retention decisions to shift resource allocations, managers consider expenses associated with the firms' resource adjustments and demand expectations of resource utilization for the contemporaneous and future periods. Thus, cross-sectional differences in firm asset and employee characteristics will affect the degree of asymmetry (REA)

in OE and MA. Accordingly, firms' asset and employee intensities moderate cost stickiness and accounting conservatism in OE and MA measures.

Hypothesis 3:

a) On average, the degree of asymmetry in the standard measure of operating efficiency and managerial ability increases in asset intensity.
b) On average, the degree of asymmetry in the standard measure of operating efficiency and managerial ability increases in employee intensity.

Testing for Effects of Cost Stickiness Determinants in Varying the Asymmetry

I evaluate the incremental effects of the determinants of cost stickiness on OE and MA measures. Specifically, I evaluate the moderating effects of firm characteristics on the degree of revenue-expense and return-earnings asymmetry (REA). To test Hypothesis 3, I estimate Eq. 2 below, which is the full interactive expansion of the baseline model. By excluding fixed effects and including firm clustered standard errors, I first estimate Eq. 2 baseline models. Then, I estimate robustness models by including the interactive industry-year fixed effects and two-way clustered standard errors. I include all control variables, those specified in Eq. 1 model.

$$\begin{aligned} Efficiency_{j,t} \mid Ability_{j,t} = {} & \beta_1 * \Delta \ln Rev_{j,t} + \beta_2 * Dec_{j,t} + \beta_3 * \Delta \ln Rev_{j,t} * Dec_{j,t} \\ & + \lambda_1 * \Delta \ln Rev_{j,t} * \ln AssetInt_{j,t} + \lambda_2 * Dec_{j,t} * \ln AssetInt_{j,t} + \lambda_3 * \Delta \ln Rev_{j,t} * Dec_{j,t} * \ln AssetInt_{j,t} \\ & + \lambda_4 * \Delta \ln Rev_{j,t} * \ln EmpInt_{j,t} + \lambda_5 * Dec_{j,t} * \ln EmpInt_{j,t} + \lambda_6 * \Delta \ln Rev_{j,t} * Dec_{j,t} * \ln EmpInt_{j,t} \\ & + \beta_4 * \ln Ret_{j,t} + \beta_5 * Neg_{j,t} + \beta_6 * \ln Ret_{j,t} * Neg_{j,t} \\ & + \lambda_7 * \ln Ret_{j,t} * \ln AssetInt_{j,t} + \lambda_8 * Neg_{j,t} * \ln AssetInt_{j,t} + \lambda_9 * \ln Ret_{j,t} * Neg_{j,t} * \ln AssetInt_{j,t} \\ & + \lambda_{10} * \ln Ret_{j,t} * \ln EmpInt_{j,t} + \lambda_{11} * Neg_{j,t} * \ln EmpInt_{j,t} + \lambda_{12} * \ln Ret_{j,t} * Neg_{j,t} * \ln EmpInt_{j,t} \\ & + \gamma_{1\ldots k} * Controls^{k}_{j,t} + Industry * Year \text{ FE} + \varepsilon_{j,t} \end{aligned} \quad \text{(Eq. 2)}$$

For Hypothesis 3a and 3b, I test for the interaction of asset intensity ($\ln AssetInt_{j,t}$) and employee intensity ($\ln EmpInt_{j,t}$) with parameters of cost stickiness ($\Delta\ln Rev_{j,t}*Dec_{j,t}$) and accounting conservatism ($\ln Ret_{j,t}*Neg_{j,t}$) on OE ($Efficiency_{j,t}$) and MA ($Ability_{j,t}$). The coefficients λ_3 and λ_9 (λ_6 and λ_{12}) test for the marginal effect of asset intensity (employee intensity) given demand decline and bad news.

Interpreting the Effects of Cost Stickiness Determinants in Varying the Asymmetry

For Hypothesis 3, I estimate Eq. 2 to test for the incremental effects of firm characteristics that determine cost stickiness. Specifically, the effect of asset intensity ($AssetInt_{j,t}$) and employee intensity ($EmpInt_{j,t}$) in moderating the degree of cost stickiness and accounting conservatism on OE and MA . These firm characteristics have a greater effect in response to demand decline than demand growth and bad news than good news. The three-way (two-way) interaction coefficient λ_3 (λ_1) and λ_6 (λ_4) and λ_9 (λ_7) and λ_{12} (λ_{10}) captures the effect of asset intensity and employee intensity during revenue decline (growth) and bad (good) news periods on OE and MA. Under the REA asymmetry (H3), I expect the sum of asset (employee) intensity coefficients $\lambda_1+\lambda_3$ ($\lambda_4+\lambda_6$) and $\lambda_7+\lambda_9$ ($\lambda_{10}+\lambda_{12}$) to be greater than λ_1 (λ_4) and λ_7 (λ_{10}). Thus, the interactive model (Eq. 2) tests for the positive effect of firm attributes with REA on OE and MA.

Asset and Employee Intensity Effects on the Degree of Asymmetry

In Table 1, Panel A, the mean of asset and employee intensity ratios is 138.9% and 5.3%, while the median is 96.2% and 1.4%. Overall, the distribution of asset and employee intensities is right-skewed, having a positive excess kurtosis. In Panel B, the Pearson (Spearman) paired correlation for the ranked OE with asset and employee intensity is -10% (-3%) and -36% (-49%). Correspondingly, the Pearson (Spearman) paired correlation for the ranked MA with asset and employee intensity is -18% (-17%) and -1% (0.2%).

In Table 1, Panel B, the Pearson (Spearman) paired correlation of cost stickiness parameter with asset and employee intensity is -17% (-7%) and -20% (-16%). The Pearson (Spearman) correlations are statistically significant (insignificant) at a minimum of 10% alpha level for a two-tailed test. While statistically insignificant at a 10% two-tailed alpha, the Pearson (Spearman) correlation of the accounting conservatism parameter with asset and employee intensity is -6% (-3%) and 0.2% (-6%).

In Panel A of Table 5, I present results for the moderating effect of asset intensity and employee intensity on the degree of REA (H3) with OE ($Efficiency_{j,t}$) and MA ($Ability_{j,t}$). In cols 1-2, I report findings for the baseline and robustness models for the effects on OE. The coefficients λ_3 and λ_6 are 0.04 (t=4.44) and 0.03 (t=7.01), and similarly, the coefficients λ_9 and λ_{12} are 0.01 (t=1.60) and 0.03 (t=10.04). In cols 3-4, I provide estimates for the baseline and robustness models for the effects on MA. The coefficients λ_3 and λ_6 are 0.05 (t=4.96) and 0.04 (t=6.84), and likewise, the coefficients λ_9 and λ_{12} are -0.01 (t=-0.94) and 0.05 (t=11.01). As a result, firms' asset intensity and employee intensity increase (decrease) the effect of cost stickiness and accounting conservatism on OE and MA. Further, cols 2 and 4 present findings for the robustness models on OE and MA. For OE and MA estimations, the moderating effect of firm characteristics through REA is consistent with Hypothesis 3. Overall, asset and employee intensities further increase the asymmetry in OE and MA.

Alternatively, in Appendix D, Panel D.1, I present findings for the asymmetric effects of cost stickiness determinants on OE and MA measures using asset and employee intensity in the prior year (t-1) instead of the current year (t). Overall, the findings are consistent with H3 and similar to those reported in Table 5, Panel A, highlighting that the degree of asymmetry in OE and MA varies significantly, given the determinants of cost stickiness.

The Cross-Sectional Effect of Accounting Conservatism Determinants

Generally, managers make rational business decisions on resource allocation and capacity retention, given firms' market opportunity costs, including financial borrowing costs through debt and equity (Myers, 1977; Simon, 1979). Such decisions are contextually influenced based on the variation in firm-level characteristics, identified as a market opportunity, financing accessibility, and demand predictability (Simon & Bonini, 1958). While costs of resource allocation increase with positive expectations, the costs also increase due to timely recognition of resource losses given negative expectations. As a result, determinants of negative expectations or accounting conservatism will further vary the degree of asymmetry in OE and MA.

Organizations with a higher proportion of tangibles or fixed assets, such as plant, property, and equipment (PP&E), are more likely to exhibit conditional conservatism (Basu, 2001, 2005; Giner & Rees, 2001; Beaver & Ryan, 2005; Pae, Thornton & Welker, 2005). As a result, accounting conservatism is more for firms with a higher book value of equity or debt financing relative to the market value of equity (Ball & Shivakumar, 2005; Khan & Watts, 2009). Such firms realize a greater reduction in the value of assets, such as accruals and intangibles, due to timely recognition of losses. While the timely losses increase resource expenses, reducing asset balances decreases accrued resource costs. These changes would decrease the degree of asymmetry in OE and MA conditional on the negative realization of revenues or demand decline and negative expectation of cash flows or bad news.

Since heterogeneity in firm characteristics has an asymmetric relation between returns and earnings (i.e., accounting conservatism), such determinants are also confounded with the asymmetry between revenues and costs (i.e., cost stickiness). For example, resources are adjusted less by firms with high growth expectations during short-term demand shocks or bad

news (Banker et al., 2016). A low (high) book-to-market (market-to-book) ratio makes firms more inclined to commit resources to support future demand. Thus, expected growth affects the degree of cost stickiness and, further, the degree of asymmetry in OE and MA.

While firms have incentives to spend and capitalize on growth opportunities, those with greater financial leverage would face financial challenges to further incur more costs, given demand decline or bad news. Funds for spending on firms' resource commitments are typically drawn from internally generated capital (i.e., operating cash flows) or financial borrowings. For firms with high leverage, marginal costs for resource adjustments are lower than costs for retention of unutilized capacity or financial borrowing costs of additional capital. As a result, firms with high (low) debt obligations are likely to decrease (increase) resource-based expenditures conditional on demand decline or bad news. Correspondingly, high firm-level debt obligations would reduce the asymmetry in the measurement of OE and MA.

Market capitalization captures firms’ equity valuation or expected cash flows given potential demand. Firms with greater market equity capitalization can make optimal resource allocation decisions as the high valuation provides means to finance operating resources. Consequently, high valuations drive the within-firm variation in cost stickiness and accounting conservatism, affecting the asymmetry in OE and MA. Therefore, firms' book value of equity and debt relative to the market value of equity and market capitalization moderate the cost stickiness and accounting conservatism on OE and MA.

Hypothesis 4:

a) On average, the degree of asymmetry in the standard measure of operating efficiency and managerial ability decreases in the book value of common equity.

b) On average, the degree of asymmetry in the standard measure of operating efficiency and managerial ability decreases in financial leverage.

c) On average, the degree of asymmetry in the standard measure of operating efficiency and managerial ability varies in market capitalization.

Testing for Effects of Accounting Conservatism Determinants in Varying the Asymmetry

I evaluate the incremental effects of the determinants of accounting conservatism on OE and MA measures. Below, I specify a full interactive expansion of the baseline OLS model to assess firm heterogeneity. I estimate Eq. 3 to test Hypothesis 4 for the moderating effects of book-to-market, leverage, and market capitalization with the degree of REA on OE and MA. First, I specify Eq. 3 baseline models by excluding the fixed effects and including firm clustered standard errors. Second, I estimate robustness models by including the multiplicative industry-year fixed effects and industry and year two-way clustered standard errors. I include all control variables as in Eq. 1 model.

$$
\begin{aligned}
Efficiency_{j,t} \mid Ability_{j,t} = {} & \beta_1 * \Delta \ln Rev_{j,t} + \beta_2 * Dec_{j,t} + \beta_3 * \Delta \ln Rev_{j,t} * Dec_{j,t} \\
& + \lambda_1 * \Delta \ln Rev_{j,t} * BtM_{j,t} + \lambda_2 * Dec_{j,t} * BtM_{j,t} + \lambda_3 * \Delta \ln Rev_{j,t} * Dec_{j,t} * BtM_{j,t} \\
& + \lambda_4 * \Delta \ln Rev_{j,t} * Lev_{j,t} + \lambda_5 * Dec_{j,t} * Lev_{j,t} + \lambda_6 * \Delta \ln Rev_{j,t} * Dec_{j,t} * Lev_{j,t} \\
& + \lambda_7 * \Delta \ln Rev_{j,t} * MCap_{j,t} + \lambda_8 * Dec_{j,t} * MCap_{j,t} + \lambda_9 * \Delta \ln Rev_{j,t} * Dec_{j,t} * MCap_{j,t} \\
& + \beta_4 * \ln Ret_{j,t} + \beta_5 * Neg_{j,t} + \beta_6 * \ln Ret_{j,t} * Neg_{j,t} \\
& + \lambda_{10} * \ln Ret_{j,t} * BtM_{j,t} + \lambda_{11} * Neg_{j,t} * BtM_{j,t} + \lambda_{12} * \ln Ret_{j,t} * Neg_{j,t} * BtM_{j,t} \\
& + \lambda_{13} * \ln Ret_{j,t} * Lev_{j,t} + \lambda_{14} * Neg_{j,t} * Lev_{j,t} + \lambda_{15} * \ln Ret_{j,t} * Neg_{j,t} * Lev_{j,t} \\
& + \lambda_{16} * \ln Ret_{j,t} * MCap_{j,t} + \lambda_{17} * Neg_{j,t} * MCap_{j,t} + \lambda_{18} * \ln Ret_{j,t} * Neg_{j,t} * MCap_{j,t} \\
& + \gamma_{1\ldots k} * Controls^{k}_{j,t} + Industry * Year \text{ FE} + \varepsilon_{j,t} \qquad \text{(Eq. 3)}
\end{aligned}
$$

For Hypothesis 4a, 4b, and 4c, I test for the interactive effects of book-to-market ($BtM_{j,t}$), leverage ($Lev_{j,t}$), and market capitalization ($MCap_{j,t}$) with cost stickiness (*$\Delta \ln Rev_{j,t}$*$Dec_{j,t}$) and accounting conservatism ($\ln Ret_{j,t}$*$Neg_{j,t}$) on OE ($Efficiency_{j,t}$) and MA ($Ability_{j,t}$). The coefficients λ_3 and λ_{12} (λ_6 and λ_{15}) test for the marginal effects of book-to-market (leverage) during demand decline and bad news. Similarly, the coefficients λ_9 and λ_{18} test for the incremental effect of market capitalization (i.e., market equity size) with REA on OE and MA.

Interpreting Effects of Accounting Conservatism Determinants in Varying the Asymmetry

For Hypothesis 4, I estimate Eq. 3 to test for the incremental effects of firms' characteristics that determine accounting conservatism. Specifically, I estimate the effect of the book-to-market value of equity ($BtM_{j,t}$), debt leverage ($Lev_{j,t}$), and market capitalization ($MCap_{j,t}$) in varying the degree of both cost stickiness and accounting conservatism on OE and MA. I expect these firm characteristics to have an asymmetric effect in response to demand decline than growth and bad news than good. The three-way (two-way) interaction coefficients λ_3 (λ_1), λ_6 (λ_4) and λ_9 (λ_7) and λ_{12} (λ_{10}), λ_{15} (λ_{13}), and λ_{18} (λ_{16}) capture the effect of book-to-market, leverage, and size during demand decline (growth) and bad (good) news on OE and MA, respectively. Under asymmetry (H4), I expect the sum of book-to-market (leverage) coefficients $\lambda_1+\lambda_3$ ($\lambda_4+\lambda_6$) and $\lambda_{10}+\lambda_{12}$ ($\lambda_{13}+\lambda_{15}$) to be less than λ_1 (λ_4) and λ_{10} (λ_{13}). Contrarily, I predict a significant positive marginal effect of market capitalization or size with REA on OE and MA.

Book-to-Market, Leverage, and Market Capitalization Effects on the Degree of Asymmetry

In Table 1, Panel A, the mean (median) book-to-market and leverage ratio is 64.7% (54.2%) and 69.2% (25.7%). While book-to-market and leverage ratios are distributed with a positive excess kurtosis, the leverage ratio is also positively skewed. Comparable to firms' book value of total assets (i.e., size), the mean (median) of the logarithm of the market value of equity

(i.e., capitalization) is 5.1 (4.9) and approximately follows a Normal distribution. In Panel B, the Pearson (Spearman) paired correlation for the ranked OE with book-to-market, leverage, and market capitalization is -4% (-8%) and -9% (-16%) 55% (55%). Similarly, the Pearson (Spearman) paired correlation for the ranked MA with book-to-market, leverage, and market capitalization is -6% (-10%), -10% (-16%), and 2% (0.01%).

In Table 1, Panel B, the Pearson (Spearman) paired correlation of cost stickiness parameter with book-to-market, leverage, and market capitalization is 3% (-0.2%), -5% (-8%), and 16% (18%). Both correlations are significant for market capitalization at a minimum of 10% alpha level for a two-tailed test. Similarly, the Pearson (Spearman) paired correlation of accounting conservatism parameter with book-to-market, leverage, and market capitalization is 17% (27%), 4% (7%), and -6% (-3%). The correlations are significant for book-to-market at a minimum of 10% two-tailed alpha level.

In Panel B of Table 5, I present results for the moderating effect of book-to-market, leverage, and market capitalization on the degree of REA (H4) with OE ($Efficiency_{j,t}$) and MA ($Ability_{j,t}$). In cols 1-2, I report findings for the baseline and robustness models for the effects on OE. The coefficient λ_3, λ_6, and λ_9 is -0.03 (t=-5.11), -0.01 (t=-1.56), and 0.01 (t=2.24), and similarly, the coefficient λ_{12}, λ_{15}, and λ_{18} is -0.02 (t=-3.08), -0.01 (t=-2.03), and -0.02 (t=-7.08). In cols 3-4, I provide estimates for the baseline and robustness models for the effects on MA. The coefficient λ_3, λ_6, and λ_9 is -0.05 (t=-6.64), -0.01 (t=-2.28), and 0.02 (t=3.79), and likewise, the coefficient λ_{12}, λ_{15}, and λ_{18} is -0.03 (t=-4.53), -0.01 (t=-2.50), and -0.02 (t=-7.03). In cols 2 and 4, I estimate the robustness models on OE and MA to examine the consistency of the findings. On average, the moderating effects of book-to-market ($BtM_{j,t}$) and leverage ($Lev_{j,t}$) through REA on OE and MA are negative and, thus, decrease the magnitude of REA. On

average, the effect of market capitalization ($MCap_{j,t}$) through cost stickiness is negative (positive) on OE (MA). Conversely, market capitalization through accounting conservatism has a negative effect on the standard OE and MA measures. Consistent with Hypothesis 4, I find significant variation in OE and MA across firm attributes that further affect the degree of REA.

In Appendix D, Panel D.2, I report results for the asymmetric effects of accounting conservatism determinants on OE and MA using prior year (t-1) values of book-to-market, leverage, and market capitalization. The results are consistent with H4 and qualitatively similar to those using the current year (t) presented in Table 5, Panel B. On average, there is a significant effect of determinants of accounting conservatism on the degree of asymmetry in OE and MA.

Table 5: Determinants of Cost Stickiness (CS) and Accounting Conservatism (AC) – Operating Efficiency (OE) and Managerial Ability (MA)

Panel A.

Hypothesis 3 – Asymmetry Effects given Asset & Employee Intensity

Coef. (t-stat.)	Dep. var:	***Efficiency*$_{j,t}$**		***Ability*$_{j,t}$**	
	Model =	Baseline	Robustness	Baseline	Robustness
N=124,889	Predict.	(1)	(2)	(3)	(4)
***ΔlnRev*$_{j,t}$**		-0.083***	-0.058***	-0.049***	-0.043***
		(-6.651)	(-4.724)	(-3.485)	(-2.858)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$**	+	0.175***	0.115***	0.171***	0.136***
		(9.432)	(5.717)	(7.641)	(5.565)
ΔlnRev$_{j,t}$**lnAssetInt*$_{j,t}$		-0.019***	-0.001	-0.022***	-0.017***
		(-3.854)	(-0.228)	(-3.801)	(-3.080)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$*lnAssetInt$_{j,t}$**	+	0.039***	0.003	0.050***	0.049***
		(4.436)	(0.316)	(4.959)	(4.850)
ΔlnRev$_{j,t}$**lnEmpInt*$_{j,t}$		-0.039***	-0.028***	-0.035***	-0.034***
		(-13.346)	(-10.023)	(-10.045)	(-9.214)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$*lnEmpInt$_{j,t}$**	+	0.033***	0.008	0.040***	0.026***
		(7.006)	(1.516)	(6.844)	(4.118)
***lnRet*$_{j,t}$**		0.001	-0.005	-0.021*	-0.011
		(0.101)	(-0.513)	(-1.814)	(-0.874)
***lnRet*$_{j,t}$*Neg$_{j,t}$**	+	0.146***	0.195***	0.253***	0.234***
		(10.220)	(11.367)	(14.646)	(12.180)
lnRet$_{j,t}$**lnAssetInt*$_{j,t}$		-0.003	-0.001	0.005	0.005
		(-0.624)	(-0.145)	(1.038)	(0.962)
***lnRet*$_{j,t}$*Neg$_{j,t}$*lnAssetInt$_{j,t}$**	+	0.010	0.010	-0.007	-0.004
		(1.597)	(1.010)	(-0.938)	(-0.512)
lnRet$_{j,t}$**lnEmpInt*$_{j,t}$		-0.013***	-0.014***	-0.013***	-0.010***
		(-5.459)	(-5.541)	(-4.424)	(-3.049)
***lnRet*$_{j,t}$*Neg$_{j,t}$*lnEmpInt$_{j,t}$**	+	0.033***	0.041***	0.047***	0.041***
		(10.042)	(9.417)	(11.007)	(8.405)
Controls		Included			
Fixed Effects		None	*Year*Industry*	None	*Year*Industry*
Clustered Standard Errors		*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*
Within Adj. R^2		0.384	0.439	0.111	0.115

Note. The table presents estimates of the model specified in Eq. 2. to test for the effects of asset and employee intensity on the degree of asymmetry (cols 1-4) due to demand decrease and bad news on the operating efficiency (cols 1-2) and managerial ability (cols 3-4). The estimates are reported with robust-clustered standard errors by firm (cols 1,3). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Panel B.

Hypothesis 4 – Asymmetry Effects given Book-to-Market, Leverage, and Market Capitalization

Coef. (t-stat.)	Dep. var:	***Efficiency*$_{j,t}$**		***Ability*$_{j,t}$**	
	Model =	Baseline	Robustness	Baseline	Robustness
N=124,889	Predict.	(1)	(2)	(4)	(4)
***ΔlnRev*$_{j,t}$**		0.002	0.020*	0.051***	0.055***
		(0.191)	(1.749)	(4.248)	(4.198)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$**	+	0.070***	0.019	0.027	-0.000
		(4.139)	(0.999)	(1.282)	(-0.006)
ΔlnRev$_{j,t}$**BtMt*$_{j,t}$		0.028***	0.028***	0.023***	0.022***
		(7.962)	(6.671)	(5.606)	(4.579)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$*BtM$_{j,t}$**	–	-0.031***	-0.038***	-0.046***	-0.041***
		(-5.108)	(-6.030)	(-6.643)	(-5.680)
ΔlnRev$_{j,t}$**Lev*$_{j,t}$		0.001	0.000	0.002	0.002
		(0.637)	(0.143)	(0.899)	(0.742)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$*Lev$_{j,t}$**	–	-0.007	-0.000	-0.011**	-0.004
		(-1.558)	(-0.073)	(-2.284)	(-0.853)
ΔlnRev$_{j,t}$**MCap*$_{j,t}$		0.008***	0.002	0.003	0.003
		(4.648)	(0.885)	(1.171)	(1.199)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$*MCap$_{j,t}$**	+/–	0.007**	0.023***	0.016***	0.023***
		(2.235)	(5.872)	(3.787)	(4.605)
***lnRet*$_{j,t}$**		0.029***	0.021**	0.009	0.016
		(3.643)	(2.550)	(0.950)	(1.425)
***lnRet*$_{j,t}$*Neg$_{j,t}$**	+	0.108***	0.156***	0.195***	0.179***
		(8.608)	(9.373)	(12.365)	(10.735)
lnRet$_{j,t}$**BtM*$_{j,t}$		0.009***	0.011***	0.010***	0.008***
		(3.655)	(4.616)	(3.565)	(3.311)
***lnRet*$_{j,t}$*Neg$_{j,t}$*BtM$_{j,t}$**	–	-0.016***	-0.024***	-0.029***	-0.028***
		(-3.076)	(-3.980)	(-4.534)	(-4.533)
lnRet$_{j,t}$**Lev*$_{j,t}$		-0.001	-0.000	0.000	-0.000
		(-0.973)	(-0.304)	(0.057)	(-0.139)
***lnRet*$_{j,t}$*Neg$_{j,t}$*Lev$_{j,t}$**	–	-0.006**	-0.010***	-0.008**	-0.007**
		(-2.031)	(-3.133)	(-2.502)	(-2.066)
lnRet$_{j,t}$**MCap*$_{j,t}$		0.002*	0.004**	0.002	0.000
		(1.682)	(2.086)	(1.000)	(0.140)
***lnRet*$_{j,t}$*Neg$_{j,t}$*MCap$_{j,t}$**	+/–	-0.015***	-0.019***	-0.021***	-0.017***
		(-7.084)	(-5.992)	(-7.028)	(-5.480)
Controls		Included			
Fixed Effects		None	*Year*Industry*	None	*Year*Industry*
Clustered Standard Errors		*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*
Within Adj. R^2		0.383	0.438	0.108	0.112

Note. The table presents estimates of the model specified in Eq. 3. to test for the effects of book-to-market, leverage, and market capitalization on the degree of asymmetry (cols 1-4) due to demand decrease and bad news on the operating efficiency (cols 1-2) and managerial ability (cols 3-4). The estimates are reported with robust-clustered standard errors by firm (cols 1,3). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-6) and $^{*(**)[***]}$ indicate $p < 0.10(0.05)[0.01]$.

The Longitudinal Effect of Cost Stickiness Accounting Conservatism Asymmetries

Managers incorporate information on demand and information variability (upside and downside) in resource allocation decisions (Banker, Byzalov, Ciftci, & Mashruwala, 2014a; Banker et al., 2016). However, on average, firm-specific resource adjustments are weighted towards the downside demand and information variability: demand decline or bad news periods (Banker, Byzalov, & Plehn-Dujowich, 2014b). Both prior and successive period variations in revenues and returns further provide information to make firms' resource allocation decisions. When demand declines or bad news is received during the prior or successive periods, this, on average, increases firm-specific demand unpredictability (Banker et al., 2014b), further decreases expectation of demand growth (i.e., optimism), and as a result, increases managerial pessimism (Banker et al., 2014a). Thus, operational uncertainty is important in forming managerial future demand expectations.

In Knightian terms, uncertainty represents a condition with unknown chances of outcomes and differentiates from a risky event, which denotes a situation with known probabilities with explicit payoffs (Knight, 1921). Conversely, the risk is "uncertainty that matters" (Murray-Webster & Hillson, 2008, p. 4). The one-sided or one-tailed statistical risk is typically considered the downside risk or value-at-risk. Specifically, downside risk captures the negative or left-tailed variations in firms' expected value outcomes under a joint multivariate probability distribution. In the given context, operational uncertainty relates to the downside risk in demand realizations and market news, providing information to form demand expectations.

Prior and successive period demand decline or bad news is a firm-specific variation in revenues and returns, which proxy for the operational uncertainty or the downside variation in operating risk in demand and information. As a result, firms’ operational uncertainty is high

during a period of demand decline or bad news and further increases with prior or successive periods of demand decline or bad news. Typically, the standard interpretation of prior and successive periods of demand decline and bad news is a lower growth prediction, which decreases (increases) managerial expectation of demand and cash flow growth (pessimism) (Banker et al., 2014a). Thus, on average, I expect a decrease in the rate of cost stickiness and accounting conservatism in the current period, given more pessimistic operating cash flows and accruals expectations.

Moreover, the incremental effect of the prior and successive periods of demand decline and bad news on firms' resource allocation and impairment decisions captures operational uncertainty or downside risk for the expectations of demand or cash flow growth (Banker et al., 2017). When there is higher (more) operating uncertainty (left-tail exposure) regarding demand decline or negative cash flow expectation, the response is greater (lower) operating risk and cost rigidity (accruals), which, on average, increases the degree of cost stickiness and accounting conservatism (Banker et al., 2014b). Thus, the decrease in expenses (assets) is lower (higher) from realizations of unexpected (expected and unexpected) demand decline and bad news over the prior or successive periods because of the effect of more rigid cost behavior and timely loss recognition.

On average, the degree (rate) of cost stickiness and accounting conservatism increases (decreases) with operating uncertainty. For example, the incremental effect of demand uncertainty increases cost stickiness, while demand decline during prior and successive periods decreases cost stickiness. The former results in more cost rigidity due to more downside risk, and the latter in a more cost anti-stickiness due to managerial pessimism regarding future growth in demand and operating cash flows. The resource adjustments (write-offs) are inelastic (elastic)

given demand (cash flow) unpredictability or uncertainty, further driving asymmetric behavior in costs (earnings). Under operational uncertainty, firms' expenses are more rigid, where cost reduction (loss recognition) is proportionally less (more) for demand decline (bad news) than growth (good news). Although costs are sticky and losses are timely, the rate of asymmetry in expenses decreases over time, given prior and successive periods of demand decline and bad news. Specifically, the growth in operating costs and assets is lower than in the prior period, reducing the asymmetry rate.

Given the operational uncertainty, I expect the degree (rate) of asymmetry in OE and MA to increase (decrease). Conversely, the asymmetry rate in OE and MA decreases conditionally on prior and successive periods of demand decline or bad news. First, I evaluate the impact uncertainty proxied by demand decline and bad news in the prior and successive periods on the degree of asymmetry in OE and MA. Both measures are systematically biased in the moderating effect of demand variability on the degree of REA. Second, I assess the effect of prior and successive periods of demand decline and bad news on the asymmetry rate in OE and MA.

Hypothesis 5:

a) On average, the degree of asymmetry in the standard-level measures of operating efficiency and managerial ability increase conditional on cost stickiness and accounting conservatism in the prior and successive periods.
b) On average, the degree of asymmetry in the standard-change measures of operating efficiency and managerial ability decrease conditional on cost stickiness and accounting conservatism in the prior and successive periods.

Testing for Effects of Asymmetry during Prior and Successive Periods

I evaluate the marginal effects of cost stickiness and accounting conservatism during prior and successive years on OE and MA measures. I specify a full interactive expansion of the baseline OLS model with parameters for REA in prior and successive years. I estimate Eq. 4 below to test Hypothesis 5 for the effects of prior-year and successive-year asymmetry on OE and MA. First, I estimate Eq. 4 baseline models, excluding fixed effects and firm clustered standard errors. Second, I specify robustness models by including the multiplicative industry-year fixed effects and industry and year two-way clustered standard errors. Like in Eq. 1, I include all control variables.

$$(Efficiency_{j,t}, Ability_{j,t}) \mid (\Delta Efficiency_{j,t}, \Delta Ability_{j,t}) =$$

$$\beta_1*\Delta\ln Rev_{j,t} + \beta_2*Dec_{j,t} + \beta_3*\Delta\ln Rev_{j,t}*Dec_{j,t} + \omega_1*\Delta\ln Rev_{j,t-1} + \omega_2*Dec_{j,t-1}$$

$$+ \omega_3*\Delta\ln Rev_{j,t-1}*Dec_{j,t-1} + \omega_4*\Delta\ln Rev_{j,t}*Dec_{j,t-1} + \omega_5*Dec_{j,t}*Dec_{j,t-1} + \omega_6*\Delta\ln Rev_{j,t}*Dec_{j,t}*Dec_{j,t-1}$$

$$+ \beta_4*\ln Ret_{j,t} + \beta_5*Neg_{j,t} + \beta_6*\ln Ret_{j,t}*Neg_{j,t} + \omega_7*\ln Ret_{j,t-1} + \omega_8*Neg_{j,t-1} + \omega_9*\ln Ret_{j,t-1}*Neg_{j,t-1}$$

$$+ \omega_{10}*\ln Ret_{j,t}*Neg_{j,t-1} + \omega_{11}*Neg_{j,t}*Neg_{j,t-1} + \omega_{12}*\ln Ret_{j,t}*Neg_{j,t}*Neg_{j,t-1}$$

$$+ \gamma_{1\ldots k}*Controls^{k}_{j,t} + Industry*Year \text{ FE} + \varepsilon_{j,t} \quad \text{(Eq. 4)}$$

For Hypothesis 5a and 5b, I test for the marginal effects of the prior year (t-1) and successive year (t and t+1) cost stickiness ($\Delta\ln Rev_{j,t}*Dec_{j,t}$) and accounting conservatism ($\ln Ret_{j,t}*Neg_{j,t}$) on OE and MA. The outcome variable ($Outcome_{j,t}$) is OE and MA in levels ($Efficiency_{j,t}$, $Ability_{j,t}$) and changes ($\Delta Efficiency_{j,t}$, $\Delta Ability_{j,t}$). The coefficients ω_3 and ω_9 (ω_6 and ω_{12}) capture the effect of REA in the prior (successive) period.

Interpreting Effects of Asymmetry during Prior and Successive Periods

For Hypothesis 5, I estimate Eq. 4 to test for the marginal effects of cost stickiness and accounting conservatism during prior and successive periods. I expect these time-series effects

further to vary the degree of REA on OE and MA. The three-way (two-way) interaction coefficients ω_6 (ω_3) and ω_{12} (ω_9) capture the effect of successive-year (prior-year) demand decline and bad news. Under asymmetry (H5), I expect coefficients ω_3, ω_6, ω_9, and ω_{12} to be positive (negative) on the levels (changes) of OE and MA. In sum, the interactive model (Eq. 4) tests the effects of firm time series with REA on OE and MA.

Effects of Cost Stickiness and Accounting Conservatism in Prior and Successive Periods

In Panel A of Table 6, I present results for the effects of the prior and successive year asymmetry (H5) with the rate of OE ($Efficiency_{j,t}$) and MA ($Ability_{j,t}$). In cols 1 and 3, I report findings for the baseline model for the effects on OE and MA. In col 1, the coefficients ω_3 and ω_9 are 0.08 (t=10.83) and -0.01 (t=-1.36), statistically significant and insignificant, respectively. Similarly, the coefficients ω_6 and ω_{12} are -0.10 (t=-0.71) and 0.04 (t=4.15), which are statistically insignificant and significant for the two coefficients, respectively. In col 3, the coefficients ω_3 and ω_9 are 0.06 (t=6.38) and 0.03 (t=5.07), and both coefficients are statistically significant. Similarly, the coefficients ω_6 and ω_{12} are 0.002 (t=0.11) and 0.04 (t=4.08), where the former is statistically insignificant, and the latter is significant. I also estimate the robustness model and present findings in cols 2 and 4. On average, the rate of REA on OE and MA increases as a result of the decline in prior period demand ($\Delta \ln Rev_{j,t-1}*Dec_{j,t-1}$) and successive periods of demand decline ($\Delta \ln Rev_{j,t}*Dec_{j,t}*Dec_{j,t-1}$) and similarly, conditional on the bad news in prior period ($\ln Ret_{j,t-1}*Neg_{j,t-1}$) and successive periods of bad news ($\ln Ret_{j,t}*Neg_{j,t}*Neg_{j,t-1}$). Consistent with Hypothesis 5, I find significant variation in the levels of OE and MA given REA in prior and successive years.

In Panel B of Table 6, I present findings for the estimation of the prior-year and successive-year REA model (H5) with the rate of change in OE ($\Delta Efficiency_{j,t}$) and MA

($\Delta Ability_{j,t}$). In cols 1 and 3, I report results for the baseline model for the effects on the change in OE and MA. In col 1, the coefficients ω_3 and ω_9 are -0.01 (t=-2.17) and -0.01 (t=-3.35) and are statistically significant. Likewise, the coefficients ω_6 and ω_{12} are -0.05 (t=-3.84) and 0.10 (t=1.41), the former coefficient is statistically significant, and the latter is insignificant. In col 3, the coefficients ω_3 and ω_9 are -0.03 (t=-3.48) and -0.02 (t=-4.94), and both coefficients are statistically significant. Similarly, the coefficients ω_6 and ω_{12} are -0.06 (t=-3.72) and -0.01 (t=-1.37), where the former coefficient is statistically significant, and the latter is insignificant. I also estimate the robustness models for the change in OE and MA and present findings in cols 2 and 4. On average, the rate of change in OE and MA decreases due to REA in the prior year ($\Delta \ln Rev_{j,t-1}*Dec_{j,t-1}$, $\ln Ret_{j,t}*Neg_{j,t}*Neg_{j,t-1}$) and in the successive year ($\Delta \ln Rev_{j,t}*Dec_{j,t}*Dec_{j,t-1}$, $\ln Ret_{j,t}*Neg_{j,t}*Neg_{j,t-1}$). I find significant time-series effects of REA in the prior and successive years on OE and MA, which is consistent with Hypothesis 5.

Table 6: Prior-Period Cost Stickiness (CS) and Accounting Conservatism (AC) – Operating Efficiency (OE) and Managerial Ability (MA)

Panel A.

Hypothesis 5 – Asymmetry given Demand Decrease and Bad News in the Prior-Period

Coef. (t-stat.)	Dep. var:	***Efficiency***$_{j,t}$		***Ability***$_{j,t}$	
	Model =	Baseline	Robustness	Baseline	Robustness
N=110,194	Predict.	(1)	(2)	(3)	(4)
ΔlnRev$_{j,t}$		0.085***	0.067***	0.107***	0.109***
		(16.519)	(12.303)	(18.022)	(16.336)
ΔlnRev$_{j,t}$***Dec***$_{j,t}$	+	0.063***	0.074***	0.025**	0.034***
		(6.398)	(6.801)	(2.213)	(2.649)
ΔlnRev$_{j,t-1}$		-0.015***	-0.013***	-0.000	-0.004
		(-5.492)	(-4.351)	(-0.122)	(-0.927)
ΔlnRev$_{j,t-1}$***Dec***$_{j,t-1}$	+	0.080***	0.087***	0.055***	0.064***
		(10.825)	(9.728)	(6.376)	(5.820)
ΔlnRev$_{j,t}$**Dec*$_{j,t-1}$		-0.021**	-0.008	-0.012	-0.014
		(-2.406)	(-0.928)	(-1.230)	(-1.308)
ΔlnRev$_{j,t}$***Dec***$_{j,t}$***Dec***$_{j,t-1}$	+	-0.010	-0.014	0.002	-0.004
		(-0.708)	(-1.049)	(0.109)	(-0.275)
lnRet$_{j,t}$		0.056***	0.056***	0.038***	0.036***
		(11.118)	(9.860)	(6.329)	(6.634)
lnRet$_{j,t}$***Neg***$_{j,t}$	+	-0.008	0.018**	0.037***	0.046***
		(-1.236)	(2.289)	(4.715)	(5.367)
lnRet$_{j,t-1}$		0.006**	0.002	0.010***	0.007*
		(2.050)	(0.727)	(2.730)	(1.713)
lnRet$_{j,t-1}$***Neg***$_{j,t-1}$	+	-0.006	0.010*	0.027***	0.036***
		(-1.363)	(1.938)	(5.066)	(5.973)
lnRet$_{j,t}$**Neg*$_{j,t-1}$		-0.010	-0.009	-0.013*	-0.013*
		(-1.494)	(-1.398)	(-1.724)	(-1.848)
lnRet$_{j,t}$***Neg***$_{j,t}$***Neg***$_{j,t-1}$	+	0.036***	0.024***	0.042***	0.039***
		(4.151)	(2.784)	(4.084)	(3.777)
Controls		Included			
Fixed Effects		None	*Year*Industry*	None	*Year*Industry*
Clustered Standard Errors		*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*
Within Adj. R^2		0.393	0.445	0.108	0.113

Note. The table presents estimates of the model specified in Eq. 4. to test for the prior-period effect of the asymmetry degree (cols 1-4) due to demand decrease and bad news on the operating efficiency (cols 1-2) and managerial ability (cols 3-4). The estimates are reported with robust-clustered standard errors by firm (cols 1,3). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Panel B.

Hypothesis 5 – Asymmetry Rate given Demand Decrease and Bad News in the Prior-Period

Coef. (t-stat.)	Dep. var:	$\Delta Efficiency_{j,t}$		$\Delta Ability_{j,t}$	
	Model =	Baseline	Robustness	Baseline	Robustness
N=110,194	Predict.	(1)	(2)	(3)	(4)
$\Delta lnRev_{j,t}$		0.120***	0.121***	0.090***	0.091***
		(27.304)	(21.200)	(16.513)	(12.657)
$\Delta lnRev_{j,t}*Dec_{j,t}$	+	0.059***	0.064***	0.069***	0.074***
		(6.853)	(6.190)	(6.626)	(5.712)
$\Delta lnRev_{j,t-1}$		-0.004**	-0.003	0.000	0.001
		(-2.082)	(-1.234)	(0.076)	(0.387)
$\Delta lnRev_{j,t-1}*Dec_{j,t-1}$	–	-0.014**	-0.017**	-0.026***	-0.028***
		(-2.168)	(-2.240)	(-3.482)	(-3.149)
$\Delta lnRev_{j,t}*Dec_{j,t-1}$		0.027***	0.025***	0.041***	0.039***
		(3.361)	(2.765)	(4.207)	(3.793)
$\Delta lnRev_{j,t}*Dec_{j,t}*Dec_{j,t-1}$	–	-0.051***	-0.050***	-0.060***	-0.060***
		(-3.837)	(-3.726)	(-3.721)	(-3.824)
$lnRet_{j,t}$		0.031***	0.034***	0.014***	0.015***
		(8.094)	(7.719)	(3.071)	(3.046)
$lnRet_{j,t}*Neg_{j,t}$	+	0.003	0.007	0.021***	0.025***
		(0.674)	(1.095)	(3.453)	(3.245)
$lnRet_{j,t-1}$		0.003	0.002	-0.006**	-0.007**
		(1.229)	(0.984)	(-2.225)	(-2.324)
$lnRet_{j,t-1}*Neg_{j,t-1}$	–	-0.012***	-0.013***	-0.021***	-0.020***
		(-3.351)	(-2.745)	(-4.940)	(-3.847)
$lnRet_{j,t}*Neg_{j,t-1}$		-0.003	-0.003	0.008	0.008
		(-0.659)	(-0.593)	(1.249)	(1.418)
$lnRet_{j,t}*Neg_{j,t}*Neg_{j,t-1}$	–	0.010	0.008	-0.012	-0.013
		(1.406)	(1.064)	(-1.365)	(-1.354)
Controls		Included			
Fixed Effects		None	*Year*Industry*	None	*Year*Industry*
Clustered Standard Errors		*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*
Within Adj. R^2		0.081	0.083	0.046	0.046

Note. The table presents estimates of the model specified in Eq. 4. to test for the prior-period effect of the asymmetry rate (cols 1-4) due to demand decrease and bad news on the change in operating efficiency (cols 1-2) and change in managerial ability (cols 3-4). The estimates are reported with robust-clustered standard errors by firm (cols 1,3). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

CHAPTER 6

ADJUSTMENT AND VALIDATION OF ASYMMETRY IN BENCHMARKS

Adjustment for the Cost Stickiness and Accounting Conservatism Asymmetry

To evaluate business outcomes, I assert that the peer-benchmarked measures of OE and MA must model and incorporate the unmodeled asymmetric effects (Kummell, 1879). In particular, the effect of time-series REA cost stickiness and accounting conservatism and their cross-sectional moderating firm characteristics should be modeled. After such modeling, the distributions of OE and MA are less skewed and closer to symmetry. After adjusting for the asymmetry, the estimates of OE and MA on business outcomes are statistically consistent. Further, the inferences on the marginal and conditional effects of OE and MA are less biased. Thus, the simple Deming (1964) regression procedure adjusts and controls for the asymmetry in the measurement and estimation, which improves the interpretability of OE and MA effects relating to firm and manager-related outcomes.[24]

In general, OE captures temporal variation in firms' outputs to inputs relative to peers. Meanwhile, MA is OE adjusted for the firms' contextual states, which controls for the environmental or cross-sectional heterogeneity in firm characteristics. Statistically, OE and MA also incorporate estimation error, random noise, and potentially confounding variation. Resulting of the omission of correlated variables or model misspecification, such covariation can induce systematic errors in measured variables and, further, drive estimation biases.[25] In sum,

---

[24] The effect of REA induces piecewise discontinuity in production models. A Deming (1964) approach to estimation accounts for omitted REA and its confounding effect, shrinks noise, and spurious correlation.

[25] The Deming (1964) framework adjusts for mean and dispersion within the panel data model (Banker, Chang, & Cooper, 1996) and captures cross-correlated redundancies in a multivariate estimation (Lee & Choi, 2010; Kuo, Li, & Yu, 2013).

unmodeled systematically and asymmetrically correlated factors of OE and MA could qualitatively lead to incorrect inferences.

OE and MA measures systematically vary with the time-series asymmetry within a firm and its cross-sectional variation between firms. Specifically, the raw and ranked OE and MA measures are sensitive to cost stickiness and accounting conservatism (i.e., REA). Given the determinants of REA, firm characteristics further systematically moderate the degree of asymmetry across firms. Empirically, OE and MA are estimates of a linear functional form or a standard symmetrical model. As a result, the standard measures are not adjusted or controlled for the asymmetry and its correlated factors.

The standard measures suffer from misspecification of the linear model because they are unadjusted for the nonlinear or asymmetrical variations in firm financials. By modeling and adjusting for the asymmetry in OE and MA, the measures are derived using an empirical production function, an observed data-generating process, and thus, shift towards the true theoretical distributions (i.e., Normality). Overall, I expect REA-adjusted measures of OE and MA to be less confounded systematically, less noisy and exhibit more estimation consistency compared to the unadjusted measures.

Validation of the Asymmetry Adjustment in the Measurement of Managerial Ability

To validate the importance of modeling the asymmetry in peer-benchmarked measures, I compare estimates and inferences of OE ($Efficiency_{j,t}$) and MA ($Ability_{j,t}$) using (1) raw unadjusted measures (*Baseline*) with REA omission and measures adjusted for (2) cost stickiness and conditional conservatism (*REA*), (4) REA and determinants of cost stickiness (*REA-DetCS*), and (5) *REA* and determinants of accounting conservatism (*REA-DetAC*). Using estimates in Tables 2 and 3, I estimate asymmetry adjustments in $Efficiency_{j,t}$ (Panel A), and $Ability_{j}$ (Panel

A) measures corresponding to *REA* with fixed effects, which is the last column (col 6). The models for *REA-DetCS and REA-DetAC* are presented in Table 5, Panel A and B (cols 2, 4). The measures of OE and MA are adjusted using fitted values of the Eq. 1 regression that capture time-series REA and Eq. 2 and 3, which assess the cross-sectional firm characteristics as the determinants (Det) of cost stickiness (CS) and accounting conservatism (AC).

In Figure 1, I graph the differential slope of the association of unadjusted REA measures of OE and MA measures using raw *baseline* (x-axis) with *REA*-adjusted (y-axis): (1) OE in Panel A and (2) MA in Panel B. Both OE and MA measures are summarized and ranked by industry and year. Similarly, in Figures 2 and 3, I depict the conditional linear (Figure 2) and nonlinear (Figure 3) slope effects of the *Baseline* with *REA*-adjusted measures of OE and MA in Panel A and B, partitioned by demand decrease and bad news (in red) relative to demand growth and good news (in green). The distribution extrema in OE and MA measures shrink after adjusting for the asymmetries (i.e., *REA*).

In Appendix E, I report the firm-level yearly descriptive for the change in revenues and demand decline, stock return and bad news, ranked decile values of OE and MA (i.e., unadjusted), and values adjusted for the degree of asymmetry (i.e., *REA*), including its determinants (i.e., *REA-DetCS*, *REA-DetAC*). Representing an average retailer in the medium market capitalization category, Appendix E, Panel E.1 and E.2 present a yearly summary for GameStop Corp. and Gap Inc. from 2003 to 2018 (16 years).

Performance and earnings-based outcomes are confounded with asymmetry in cost behavior (i.e., resource allocation) and earnings timeliness (i.e., conditional conservatism) conditional on revenue and price decreases (Banker & Chen, 2006; Banker et al., 2016). Specifically, expenses incurred, earnings reported, and other earnings-based performance

outcomes are conditioned with REA, including moderators, and thus, confounded with OE and MA measures. Further, the MA measurement relies on examining the role of firm attribute quality and assessing its impact on financial quality (Demerjian & Lev, 2021). Absent empirical consideration of REA, the linearly modeled measures are biased due to functional form misspecification (Ball, 2013). Consequently, I test for the effect of the unadjusted-raw (*Baseline*) MA and compare it to measures after adjusting for asymmetry on earnings-related outcomes.[26]

I predict that REA-adjusted OE and MA measures are insignificantly related to asymmetric timeliness of earnings (i.e., conditional conservatism). The REA-adjusted measures are less right-skewed and exhibit distribution symmetry and less upward bias (i.e., skewness) compared to unadjusted measures. By isolating REA and its moderators, OE and MA are less noisy and dispersed with thinner tails. Thus, REA-adjusted measures are less skewed and biased and more consistently estimated. Next, I test and show the bias in unmodeled REA measures of MA with performance (e.g., Huang & Sun, 2017, 150 citations as of June 2023).

Appendix F, Panel F.1, presents the pairwise correlations between asymmetry unadjusted and adjusted OE and MA measured in ranked decile values. Furthermore, Panel F.2 reports on the shifts in the OE and MA measures after adjusting for the asymmetries and partitioning unadjusted MA in roughly three equal partitions. The shift or data variation is calculated as a simple count of the firm-year observations for the asymmetry-adjusted OE and MA measures for each of the three subsamples.

---

[26] The scaled earnings distribution is left-skewed (Deakin, 1976; Frecka & Hopwood, 1983; Watson, 1990), arguably because of conditional conservatism (Basu, 1995; Basu & Markov, 2004). The distribution of DEA models is bounded between zero and positive values and right-skewed (Charnes, Cooper, & Ijiri, 1963). Given the non-Normal distributions, there is an implicitly mechanical negative correlation (Kowalski, 1972) between scaled earnings (revenues less expenses) and DEA-based OE and MA measures (ratio of revenues to expenses).

In addition, Panel F.3 describes the counts of firm-year observations for each of the three subsamples of asymmetry unadjusted and adjusted MA values within the partitions of revenue decrease and bad news. Specifically, grouped into four subsamples: (1) demand growth and good news, (2) demand decline and good news, (3) demand growth and bad news, and (4) demand decline and bad news. The univariate analysis shows the shifts in the distribution of MA before and after asymmetry adjustments. Specifically, the shifts attributed to cost stickiness and accounting conservatism during demand decline and bad news across the three subsamples based on MA values (low, medium, high).

Testing for the Asymmetry in Earnings Timeliness

First, I test for the marginal effect of MA with asymmetric timeliness of earnings (Eq. 5a) using the piecewise linear OLS model of conditional conservatism (Basu, 1997). Second, I assess the interaction effects of REA parameters with MA on the earnings (Eq. 5b). I expect the coefficient on MA to exhibit less (more) bias (consistency) after REA adjustments and controls for the confounding interactions. Further, I include all controls, industry*year fixed effects, and year-clustered standard errors.

$$E/P_{j,t} = \eta_1 * AbilityVar_{j,t-1} + AbilityVar_{j,t-1} * (\eta_2 * \ln Ret_{j,t} + \eta_3 * Neg_{j,t} + \eta_4 * \Delta \ln Ret_{j,t} * Neg_{j,t}) + \beta_{1\ldots6} * AsymVars_{j,t} + \gamma_{1\ldots k} * Controls^{k}_{j,t} + Industry*Year \text{ FE} + \varepsilon_{j,t} \quad \text{(Eq. 5a)}$$

$$E/P_{j,t} = \eta_1 * AbilityVar_{j,t-1} + AbilityVar_{j,t-1} * (\eta_2 * \ln Ret_{j,t} + \eta_3 * Neg_{j,t} + \eta_4 * \Delta \ln Ret_{j,t} * Neg_{j,t}) + AbilityVar_{j,t-1} * (\eta_5 * \ln Rev_{j,t} + \eta_6 * Dec_{j,t} + \eta_7 * \Delta \ln Rev_{j,t} * Dec_{j,t}) + \beta_{1\ldots6} * AsymVars_{j,t} + \gamma_{1\ldots k} * Controls^{k}_{j,t} + Industry*Year \text{ FE} + \varepsilon_{j,t} \quad \text{(Eq. 5b)}$$

In Table 7, I estimate Eq. 5a and Eq. 5b to assess the average linear (cols 1, 3, 5, 7) and interactive nonlinear (cols 2, 4, 6, 8) effects of prior year MA ($Ability_{j,t-1}$) on the ratio of earnings to price ($E/P_{j,t}$) and present findings using four measures of MA: (1) unadjusted-raw (*Baseline*)

in cols 1-2, (2) REA-adjusted (*REA*) in cols 3-4, (3) REA-adjusted with cost stickiness determinants (*REA-DetCS*) in cols 5-6, and (4) REA-adjusted with accounting conservatism determinants (*REA-DetAC*) in cols 7-8.

I replicate prior findings (cols 1-2) on the timeliness of earnings conditional on bad news and managerial ability (η_4=-0.16, t=-3.44), which implies lower timeliness given higher MA. The findings are consistent with studies showcasing the negative relationship between MA and earnings timeliness.[27] In addition, the effect of MA conditional on positive returns (i.e., good news) and bad news intercept is positive and statistically significant. However, the average effect of MA on $E/P_{j,t}$ is statistically insignificant (cols 1-2). Further, the magnitude of $Ability_{j,t-1}$ on $E/P_{j,t}$ (col 2) conditional on demand growth and demand decline is insignificant and negative (η_7=-0.30, t=-3.88). The intercept effect of MA given demand decline (col 2) is positive and significant (η_6=0.06, t=-3.37). Given the findings, the effect of MA on earnings varies conditionally with cost stickiness and accounting conservatism.

The REA-adjusted MA measures are unlikely to bias the estimates and inferences on the impact on earnings, including conditional conservatism. The estimated effects on the timeliness of earnings using MA measures adjusted for *REA* (cols 3-4), *REA-DetCS* (cols 5-6), and *REA-DetAC* (cols 7-8) are statistically insignificant. After modeling the asymmetry, estimates for the interaction between $Ability_{j,t-1}$, and accounting conservatism parameter (η_4) decrease in absolute magnitude (cols 4, 6, 8), while the standard errors increase (cols 3, 5, 7) compared to the baseline model (cols 1-2). Conversely, the interaction between adjusted $Ability_{j,t-1}$, and cost stickiness parameter (η_7) increases in absolute magnitude (cols 4, 5, 7) relative to baseline (col 2). Unlike

[27] The finding is consistent with Francis, Hasan, Siraj, & Wu (2020), Bradley & Sun (2021), and Haider, Singh, & Sultana (2021), which are cited 11, 8, and 42 times, respectively (as of June 2023).

the baseline (cols 1-2), the average effect (η_1) for all estimations using the asymmetry-adjusted MA measure is positive and statistically significant (cols 3-8).

The interaction between adjusted MA measures and demand decline (η_5) is negative and significant (cols 4, 6, 8), and the absolute magnitude increases compared to the baseline (col 2). Furthermore, the absolute effect of MA on $E/P_{j,t}$ conditional on positive return (i.e., good news) using asymmetry-adjusted measures decreases and becomes statistically insignificant compared to the baseline (cols 1-2). For the estimations using asymmetry-adjusted MA measures (cols 3-8), the within adjusted-R^2 increases compared to the baseline model (cols 1-2).

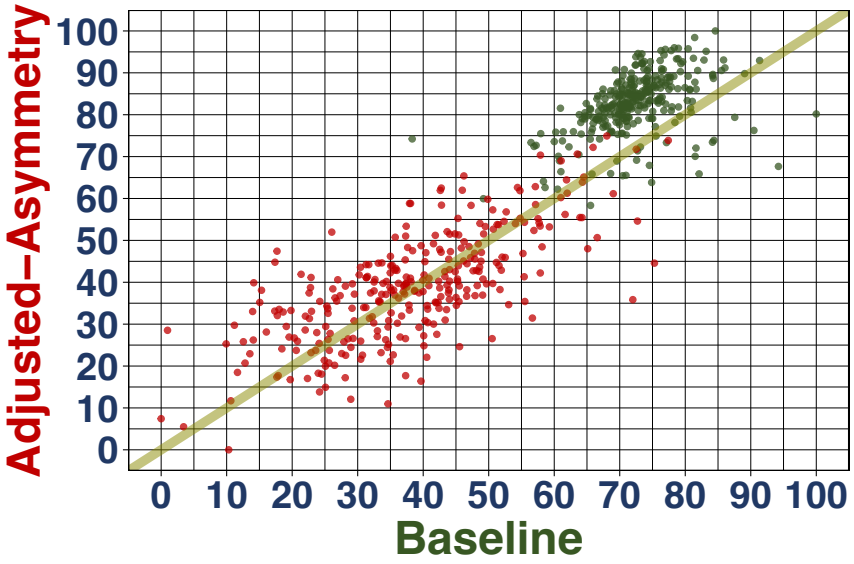
The effect of MA on $E/P_{j,t}$ is consistent across alternative asymmetry-adjusted measures (i.e., *REA*, *REA-CS*, and *REA-AC*). The positive intercept effect of MA conditional on bad news (cols 3-8) and demand decline (cols 4, 6, 8) is more using asymmetry-adjusted measures compared to the baseline (cols 1-2). Overall, unlike the raw *Baseline* MA, the asymmetry-adjusted measures (cols 3-8) are statistically insignificant with timely recognition of losses in earnings. While the marginal effect of such measures on earnings is stronger than the *Baseline*.

Appendix G, Panel G.1 and G.2 showcase the asymmetric timeliness in recognition of losses in earnings conditional on bad news within tercile partitions of MA. The three subsamples are partitioned based on the increasing order of MA values in the prior year (*t*-1), corresponding to those with low, medium, and high values of MA for each year (i.e., Tercile 1-3). For each of the three subsamples, Panel G.1 presents the estimation for the asymmetry in earnings given MA and the confounding effect of accounting conservatism and cost stickiness with the MA measure. Moreover, Panel G.2 shows the impact of the determinants of cost stickiness and accounting conservatism on the degree of asymmetry in earnings within the tercile partitions, which also asymmetrically confounds with MA.

Figure 1: Linear Deviation in Standard Measures and Asymmetry Adjustments

Panel A.

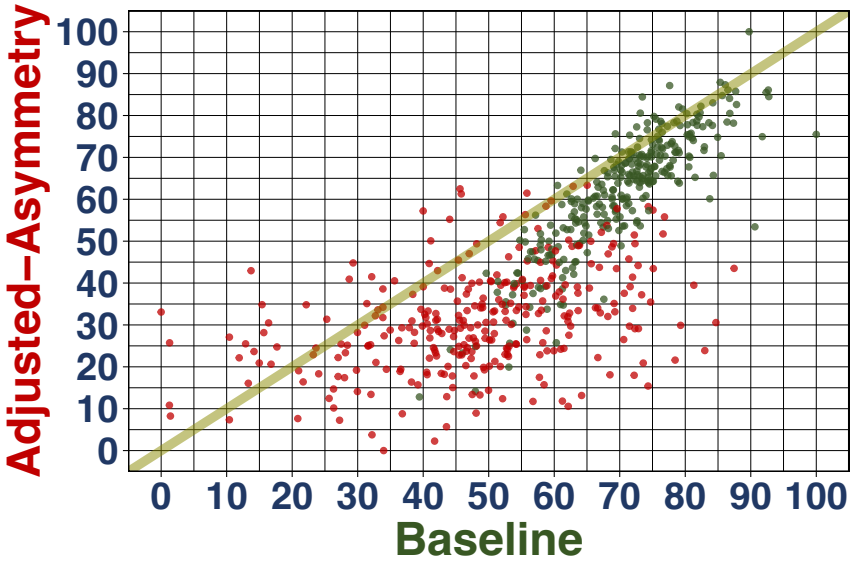
Operational Efficiency Rank in the Baseline vs. Adjusted for Stickiness and Conservatism



Note. Average ranks by industry and year, where red are cases when demand decline or bad news and green when demand increase or good news.

Panel B.

Managerial Ability Rank in the Baseline vs. Adjusted for Stickiness and Conservatism

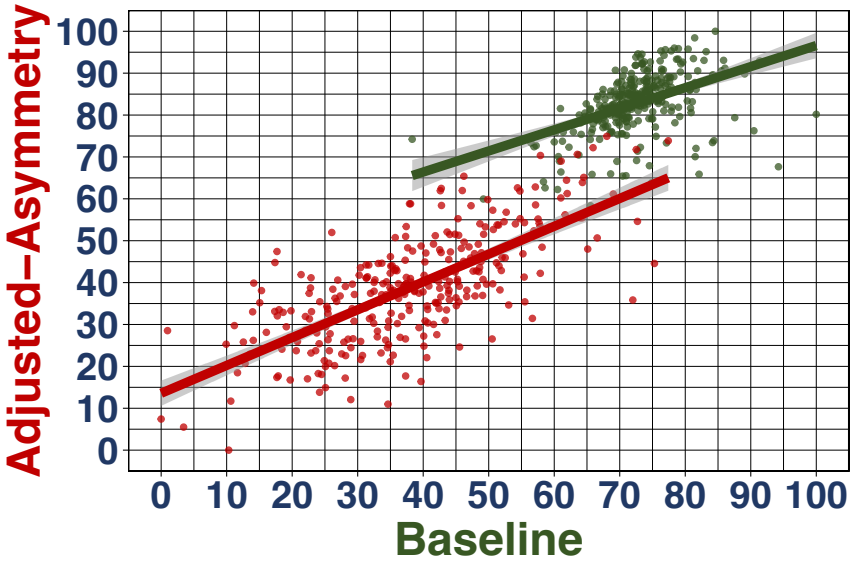


Note. Average ranks by industry and year, where red are cases when demand decline or bad news and green when demand increase or good news.

Figure 2: Piecewise Linearity in Standard Measures and Asymmetry Adjustments

Panel A.

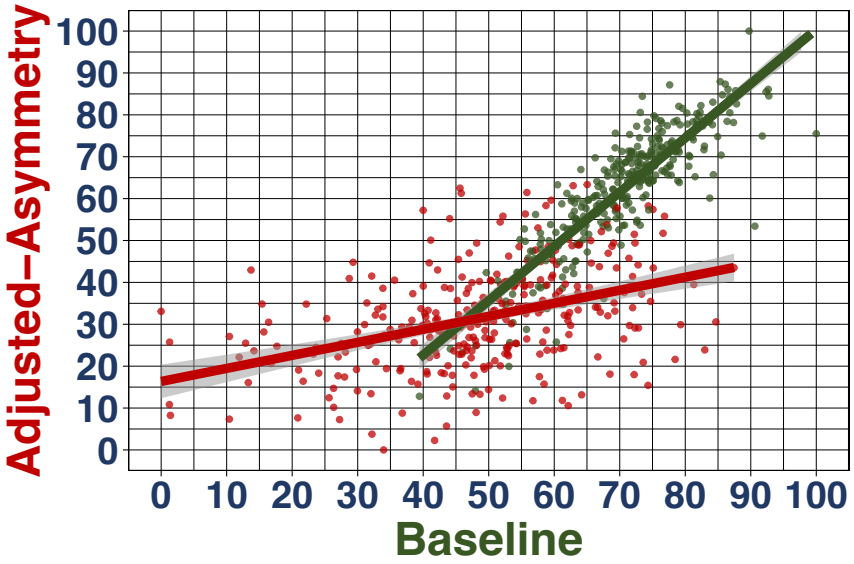
Operational Efficiency Rank in the Baseline vs. Adjusted for Stickiness and Conservatism



Note. Average ranks by industry and year, where red are cases when demand decline or bad news and green when demand increase or good news.

Panel B.

Managerial Ability Rank in the Baseline vs. Adjusted for Stickiness and Conservatism

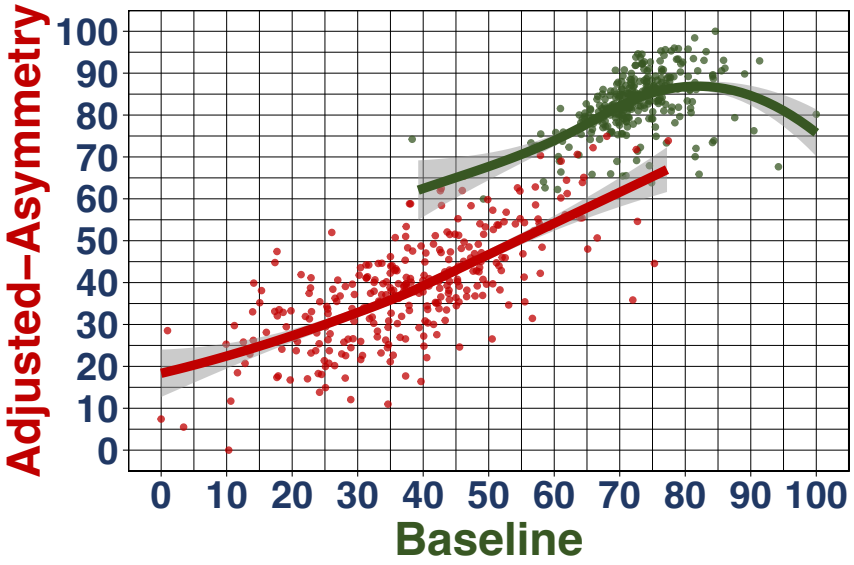


Note. Average ranks by industry and year, where red are cases when demand decline or bad news and green when demand increase or good news.

Figure 3: Non-Linear Concavity in Standard Measures and Asymmetry Adjustments

Panel A.

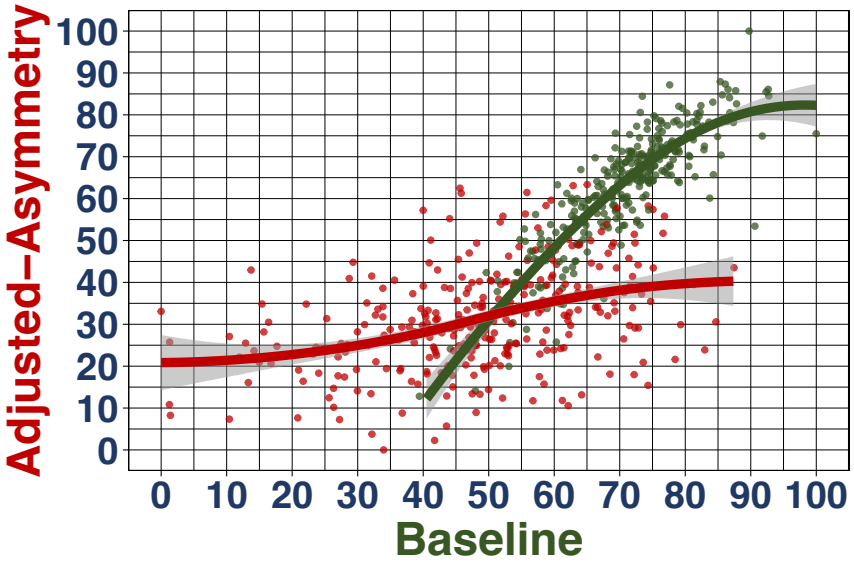
Operational Efficiency Rank in the Baseline vs. Adjusted for Stickiness and Conservatism



Note. Average ranks by industry and year, where red are cases when demand decline or bad news and green when demand increase or good news.

Panel B.

Managerial Ability Rank in the Baseline vs. Adjusted for Stickiness and Conservatism



Note. Average ranks by industry and year, where red are cases when demand decline or bad news and green when demand increase or good news.

Table 7: Validation of Adjusting and Modeling Asymmetry in Managerial Ability (MA) – Earnings Timeliness Conditional on Managerial Ability (MA)

Coef. (t-stat.)	Dep. var: $\boldsymbol{E/P_{j,t}}$							
Measure =	*Baseline*		*REA-Adjusted*		*REA-CS-Adjusted*		*REA-AC-Adjusted*	
N=110,194	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\boldsymbol{Ability_{j,t-1}}$	0.008	-0.022*	0.514***	0.273***	0.461***	0.230***	0.449***	0.205***
	(0.658)	(-1.670)	(6.275)	(3.599)	(5.659)	(3.077)	(5.726)	(2.821)
$lnRet_{j,t}$*$Ability_{j,t-1}$	0.110**	0.110**	0.062	0.097	0.174	0.202	0.101	0.122
	(2.554)	(2.443)	(0.359)	(0.565)	(1.038)	(1.220)	(0.589)	(0.698)
$Neg_{j,t}$*$Ability_{j,t-1}$	0.064***	0.056***	0.295***	0.202***	0.348***	0.260***	0.329***	0.237***
	(4.148)	(3.621)	(4.044)	(2.921)	(4.556)	(3.559)	(4.507)	(3.395)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$	-0.164***	-0.138***	-0.293	-0.238	-0.305	-0.262	-0.291	-0.216
	(-3.443)	(-2.803)	(-1.482)	(-1.206)	(-1.591)	(-1.371)	(-1.478)	(-1.076)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.010		-0.176**		-0.166**		-0.155*
		(0.305)		(-2.114)		(-1.972)		(-1.871)
$Dec_{j,t}$*$Ability_{j,t-1}$		0.058***		0.727***		0.699***		0.714***
		(3.373)		(8.660)		(8.340)		(8.400)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.295***		-0.774***		-0.608**		-0.807***
		(-3.880)		(-2.902)		(-2.466)		(-3.001)
Controls	Included							
Fixed Effects	*Year*Industry*							
Clustered Standard Errors	*Year* and *Industry*							
Within Adj. R^2	0.317	0.318	0.323	0.331	0.324	0.331	0.323	0.331

Note. The table presents estimates of the model specified in Eq. 5. to test for the prior-period average and interactive effects of managerial ability on earnings timeliness (cols 1-6). The models are estimated using four different variables of rank values of managerial ability: *Baseline* (cols 1-2), adjusted for *Revenues-Expenses* and *Returns-Earnings Asymmetry* or *REA* (cols 3-4), and adjusted for *REA* with *Determinants of Cost Stickiness* or *CS* (cols 5-6) and *Accounting Conservatism* or *AC* (cols 7-8). A model with with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-8) and *(**)[***] indicate $p <$ 0.10(0.05)[0.01].

CHAPTER 7

EXAMINATION OF RESEARCH IMPLICATIONS

Implications of Adjusting for the Asymmetry

Given panel data, researchers must accommodate the properties of financial statement time series and cross-sectional firm heterogeneities to measure time-varying OE and MA. Due to Jensen's (1906) inequality, the average marginal effect of OE and MA differs from the marginal effect of the average, generating biased estimates and invalid inferences. Thus, asymmetry-unadjusted raw OE and MA measures encompass confounding relationships and spurious correlations, leading to estimation and inference biases.

I test for the relative importance of asymmetry adjustments to OE and MA measures by examining their implications based on prior findings. First, I assess REA adjustments that directly affect the relationship of OE and MA with earnings-related outcomes. Second, I evaluate contexts where the REA adjustments indirectly affect inferences of the OE and MA associations. In general, earnings incorporate piecewise linearity due to cost stickiness (Anderson et al., 2003) and conditional conservatism (Basu, 1997). The accruals are left-skewed due to accounting conservatism, so the earnings distribution is also left-skewed (Basu, 1995). Therefore, the variations in OE and MA corresponding to the measurement bias are attenuated after adjusting for the REA. Consequently, modeling REA in OE and MA would change assessments and inferences from prior studies.

For each prediction, I consistently estimate the exact two model specifications for the average: (1) marginal effect of MA and (2) interactional effect of MA conditioned by REA and moderating firm characteristics. In the former, I assess outcomes linear in OE and MA (Eq. 6a) and intuitively capture the average unconditional effects. In the latter, the response is an

interactive function of OE and MA with REA parameters (Eq. 6b). The conditional effects capture co-movement in OE and MA with the REA time series, including the cross-sectional heterogeneity in firms' growth prospects, financial constraints, and demand uncertainty. By specifying a fully interactive model, I isolate the average and incremental effects of OE and MA on the dependent variable. To adjust for the average trends, autocorrelations, and type I errors, the following OLS models are specified with all controls, industry-year fixed effects, and yearly robust-cluster standard errors:

$$Outcome_{j,t} = \psi_1 * AbilityVar_{j,t-1} + \beta_{1\ldots6} * AsymVars_{j,t} + \gamma_{1\ldots k} * Controls^{k}_{j,t} + Industry * Year\ \text{FE} + \varepsilon_{j,t} \quad \text{(Eq. 6a)}$$

$$Outcome_{j,t} = \psi_1 * AbilityVar_{j,t-1} + AbilityVar_{j,t-1} * (\psi_2 * \ln Rev_{j,t} + \psi_3 * Dec_{j,t} + \psi_4 * \Delta \ln Rev_{j,t} * Dec_{j,t}) + AbilityVar_{j,t-1} * (\psi_5 * \ln Ret_{j,t} + \psi_6 * Neg_{j,t} + \psi_7 * \Delta \ln Ret_{j,t} * Neg_{j,t}) + \beta_{1\ldots6} * AsymVars_{j,t} + \gamma_{1\ldots k} * Controls^{k}_{j,t} + Industry * Year\ \text{FE} + \varepsilon_{j,t} \quad \text{(Eq. 6b)}$$

Compared to Eq. 5 (i.e., Table 7), I first estimate Eq. 6a for the known baseline effect of REA-unadjusted OE and MA raw measures on the response variable. Second, I evaluate Eq. 6b to examine the confounding impact of REA and its factors with OE and MA on the outcome variable. The former model tests for the linear marginal effects of OE and MA (col 1, 3, 5), and the latter tests the conditional nonlinear impact (col 2, 4, 6). For each dependent variable, I present estimates for the average and interaction effect of OE and MA using three measures: (1) raw-unadjusted in col 1 and 2 (*Baseline*), (2) REA-adjusted in col 3 and 4 (*REA*), and (3) REA-adjusted with moderators in col 5 and 6 (*REAMods*). I follow the same outline for the estimation presented in Tables 8 and 9.

Relating H5, I also construct a measure of MA adjusted for the asymmetries (REA) in the prior period (t-1) and successive periods (t, t-1) to examine its impact on the asymmetric

timeliness of earnings and business outcomes and present findings in Appendix H. After adjusting for the asymmetries during the prior and successive periods, the results are qualitatively similar to those reported in Tables 7 and 8-9.

Direct Implications: Income Smoothing Conditional on Managerial Ability

I estimate Eq. 6 model to test for the (a) average and (b) interaction effects of MA measures with income smoothing (Baik et al., 2020; Demerjian et al., 2020; Doukas & Zhang, 2020, cited 120, 166, and 40 times on Google Scholar as of June 2023), respectively. The income smoothing is calculated as a ratio of variability in cash flow to earnings, which increases with more variation in cash flows than earnings. Compared to the *baseline* (cols 1-2), Table 8, Panel A, presents findings on the direct implication of modeling *REA* (cols 3-4), *REA-DetCS* (cols 5-6), and *REA-DetAC* (cols 7-8) in MA measures.

In Panel A, I replicate the *Baseline* findings of a positive relationship between the prior year MA ($Ability_{j,t-1}$) and income smoothing over a rolling three-year (3yr) period (col 1).[28] In addition, I find that the effect of $Ability_{j,t-1}$ interacted with the bad news indicator is positive and significant on income smoothing (ψ_6=0.21, t=2.47), which is one of the sources of increase in income smoothing given MA (col 2). After modeling for the asymmetry conditional on cost stickiness and accounting conservatism and its determinants, the magnitude for the $Ability_{j,t-1}$ coefficient (ψ_1) decreases (cols 3-4, 7-8), and estimated standard errors increase (cols 3-8). As a result, the effect of MA on income smoothing is not meaningfully different from zero, and

[28] In untabulated estimates, the findings are qualitatively consistent using alternative calculation with fewer sample observations based on a five-year (5yr) rolling period every three years (5yr-by-3yr). The untabulated results are also qualitatively similar in testing the effect of MA on income smoothing if the raw OE is directly adjusted (i.e., in second-stage estimation) for the cost stickiness and accounting conservatism asymmetries in the MA measurement using a yearly Fama-MacBeth procedure.

except for one weakly significant estimate (col 5, $p<0.01$), coefficients are not statistically significant (cols 3-4, 6, 7-8). Conversely, I consistently find a positive and significant interaction between MA and change in revenues (ψ_2) on income smoothing (cols 4, 6, 8). Thus, the income smoothing measure increases due to the covariation between MA and demand. Overall, the prior inferences on the average effect of MA on income smoothing qualitatively differ after modeling for the asymmetry in the measurement.

Indirect Implications: Tax Avoidance Conditional on Managerial Ability

By estimating the Eq. 6 specification, I assess the average (a) and incremental (b) effects of the relationship between MA and tax avoidance (Koester et al., 2017; Francis, Sun, Weng, & Wu, 2022; cited 375 and 21 times on Google Scholar up to June 2023). Corporate tax avoidance is the inverse of the cash effective tax rate, calculated as a ratio of income reported to cash taxes paid and interpreted as more profits for fewer taxes. In Table 8, Panel B, I present the estimates using *Baseline* MA (col 1-2) and measures adjusted for *REA*, *REA-DetCS*, and *REA-DetAC* (cols 3-8).

The unmodeled asymmetry in *Baseline* MA would systematically decrease (increase) the effective cash tax rate for firms facing (expecting) demand decline (cash flow gain). Cost stickiness is a realization effect, which results in a proportionally lower rate of earnings and taxes during periods of demand decline than growth. Conversely, accounting conservatism is an accruals loss recognition effect, which decreases earnings proportionally more given bad news than good. As a ratio of cash taxes paid relative to operating income, the effect of cost stickiness and accounting conservatism appear to affect the rate of tax avoidance positively and negatively, implying a lower and higher effective tax rate for such firms.

A demand decline decreases cash flows, given lower sales with proportionally higher expenses, which also reduces effective tax rates. Generally, long-term assets are expensed faster on a cash basis for taxes than for income purposes. As a result, reductions in accruals or asset balances do not further lower cash paid for taxes paid, given bad news. For tax purposes, firms expecting gains (losses) or good (bad) news will exhibit a lower (higher) tax rate. Further, on average, tax-related accruals (obligations) decrease (increase) the cash paid for taxes.

In Panel B, I replicate the positive relationship between prior-year MA ($Ability_{j,t-1}$) and tax avoidance (col 1). After including the interactions, the average effect of MA (ψ_1) on tax avoidance is not different from zero. The interaction effect (col 2) of $Ability_{j,t-1}$ with revenue growth (positive returns) on tax avoidance is positive (negative) and statistically significant (ψ_2=0.03, t=3.14 and ψ_5=-0.02, t=-1.87). Similarly, the interaction of MA with the cost stickiness (accounting conservatism) parameter is negative (positive) on tax avoidance and statistically significant (ψ_4=-0.17, t=-2.22 and ψ_7=0.07, t=3.86). Thus, the effect of MA on tax avoidance is confounded with cost stickiness and accounting conservatism.

Using MA measures adjusted for *REA*, *REA-DetCS*, and *REA-DetAC* (cols 3-8), the statistical significance of the average effect of $Ability_{j,t-1}$ on tax avoidance rate is either reduced (cols 5, 7) or diminished (cols 3-4, 6, 8). Conversely, the interaction effect of MA with parameters of cost stickiness (ψ_2, ψ_4) and accounting conservatism (ψ_5, ψ_7) on tax avoidance is consistent and statistically significant (cols 4, 6, 8). Further, the intercept effect for *REA-DetCS* and *REA-DetAC* adjusted MA and demand decline indicator on tax avoidance is positive and statistically significant (cols 6, 8). Thus, the estimation of MA on tax avoidance is confounded with cost stickiness and accounting conservatism, including its determinants. When the

asymmetry is unmodeled, the MA estimates are biased, lack consistency, and induce errors-in-variables, and as a result, qualitatively affect inferences on tax avoidance.[29]

Managerial Implications: CEO Compensation Conditional on Managerial Ability

In the third set of analyses, I investigate the pervasiveness of the measurement and inference biases in managerial outcomes given unmodeled asymmetry REA. First, using the *Baseline* measure, I replicate the relationship between MA and chief executive officer (CEO) compensation (Banker et al., 2013; Balsam, Boone, Liu, & Yin, 2016; cited 197 and 112 times on Google Scholar up to June 2023). Second, I test for the interaction of MA with cost stickiness and accounting conservatism on total compensation. Third, I estimate the average and interaction effects using MA measures adjusted for *REA*, *REA-DetCS*, and *REA-DetAC*. To do so, I obtained information on CEO annual compensation from the ExecuComp database using WRDS and merged executive data with Compustat financials to arrive at the firm-year sample. Next, I estimate the Eq. 6 model to assess the (a) average and (b) interaction effect of MA with CEOs' total compensation. In Table 8, Panel C, I present findings for the average (cols 1, 3, 5, 7) and interaction (col 2, 4, 6, 8) effects of *Baseline* MA (cols 1-2) and measures adjusted for *REA*, *REA-DetCS*, and *REA-DetAC* (cols 3-8) on the total compensation.

I replicate the prior findings of a positive relationship between the prior-year MA ($Ability_{j,t-1}$) and the logarithm of CEOs' yearly total compensation (col 1). In addition, I find that total compensation for high MA increases given revenue growth (ψ_2=0.41, t=2.91), while the decreases are proportionally lower during revenue declines (ψ_4=-0.53, t=-2.28). As a result, the

[29] In untabulated estimates, the results are qualitative similarly in testing the effect of MA on tax avoidance if the raw OE in the second stage is directly adjusted for the cost stickiness and accounting conservatism asymmetries in the MA measurement using a yearly Fama-MacBeth procedure.

behavior of CEOs' compensation is sticky, which covaries with MA and demand (col 2). After modeling *REA*, *REA-DetCS*, and *REA-DetAC*, the average effect of MA (ψ_1) on total compensation is insignificant (cols 3-8). The interaction between adjusted MA and revenue growth (ψ_2) and revenue decrease indicator (ψ_3) are positive and marginally insignificant.

Further, the effect of adjusted MA on the total compensation level is statistically insignificant, given positive or negative stock returns. At the same time, the coefficient for the interaction with the bad news indicator (ψ_6) is negative and weakly insignificant (cols 4, 6, 8). Overall, the estimated relationship between MA and CEO compensation covaries with demand, and the average confounds with firm differences when demand declines vs. growth and bad vs. good news. Therefore, I find that empirical inferences on the relationship between MA and compensation qualitatively differ after modeling the asymmetry in the *Baseline* MA measure.[30]

Implications of Modeling the Asymmetry

I examine the sensitivity of the managerial ability measure to the asymmetry adjustments. Following Demerjian et al. (2012), I first re-construct a measure of managerial ability (MA) without adjusting for the revenues-expenses and returns-earnings asymmetry (REA). Specifically, I estimate the second stage Tobit model to obtain residuals identified as MA using operating efficiency (OE) as the dependent variable and controlling for the firm characteristics (Demerjian et al., 2012). The re-constructed MA measure is based on a linear model that does not model for the asymmetries.

---

[30] In untabulated estimates, the findings are qualitatively consistent using the logarithm of salary as an alternative proxy. CEO total compensation (salary) distribution ranges from \$0 to \$655.45 million (\$0 to \$5.50 million) with a mean and median of \$5.07 (\$0.73) and \$3.02 (\$0.67) million for 5,504 individuals for 27 years from 1992 to 2018. The untabulated results are also qualitatively similar if the raw OE in the second stage is directly adjusted for the cost stickiness and accounting conservatism asymmetries in the MA measure using a yearly Fama-MacBeth procedure.

Second, I re-estimate the second-stage Tobit model to obtain residuals (i.e., MA) after modeling the piecewise linearities or asymmetries (i.e., REA) and their determinants. The adjusted MA measure is developed by incorporating asymmetries into the model specified by Demerjian et al. (2012), which uses OE from the first stage to re-estimate the second stage model to obtain residuals or asymmetry-adjusted (REA) measure of MA.

Finally, like Table 8, I replicate prior empirical findings on the relationship between MA and business outcomes using unadjusted raw and REA-adjusted measures. In general, the effect of MA on business outcomes, presented in Table 9, is either decreasing in coefficient estimates or increasing in standard errors after adjusting the measure of MA measure for the asymmetry (i.e., REA) and controlling for its interaction with asymmetry parameters.

Business Outcomes Conditional on Managerial Ability

In Table 9, Panel A, on average, the asymmetry in MA explains the source of more income smoothing given high MA, which is evident from the interaction effects of MA with the asymmetry variables. In this case, MA confounds with the effect of cost stickiness, where income smoothing is a derivative of a lower profit margin during demand decline than growth. On average, resource retention is a less costly alternative than resource adjustment, resulting in sticky cost behavior, and further, the reduction in marginal cost to retain resources increases with management optimism or expectation of growth in demand or cash flows (see Anderson et al. 2003; Banker et al., 2014; 2018).

The asymmetric cost realization or stickiness is a non-reversing permanent effect based on managerial decisions. In contrast, asymmetric timely loss recognition or conservatism is a temporary reversing effect under accounting conventions. On average, the rate of profits decreases more during periods of decrease in revenues compared to the increase in profit rate

during periods of growth in revenues, which improves firms' income smoothing. Thus, in this case, the impact of cost stickiness dominates accounting conservatism and directly confounds with the MA measure, resulting in a perceived positive relationship between MA and income smoothing.

In Table 9, Panel B, the effect of asymmetry in MA positively varies with the rate of tax avoidance. Under accounting conservatism, firms asymmetrically recognize losses (i.e., write-offs and impairments) conditional on bad news regarding future cash flows. Such reduction in operating assets also decreases earnings reported under accruals-based accounting but does not necessarily affect the payment for the taxes accounted under the cash basis. In addition, the effect of cost stickiness decreases (increases) earnings more (less) given demand decline (growth). On average, the decrease in the rate of cash paid for taxes is more during periods of revenue decline than growth. Thus, the rate of cash paid for taxes decreases less (more) during periods of bad news (demand decline) compared to the increase in tax rate during periods of good news (demand growth).

In Table 9, Panel C, the effect of asymmetry confounds with managerial incentives and performance expectations (Banker et al., 2016; 2018). As a result, stickiness or asymmetric cost behavior is systematically related to cash and equity compensation, such as bonuses, grants, stock options, and awards (Aboody, Lev, & Weiss, 2018). Thus, the decrease in executive compensation is lower during demand decline periods than the rate of increase during demand growth periods. Using the estimates of MA after modeling for the asymmetry, the results are consistent with those presented in Table 8, which adjusts for the asymmetry in MA. The findings are qualitatively similar and suggest asymmetry (i.e., REA) as the confounding driver of the spurious relationship between MA and business outcomes.

Table 8: Implication of Adjusting for the Asymmetry on Business Inferences

Panel A.

Income Smoothing Conditional on Managerial Ability (MA)

Coef.	Dep. var: ***Income Smoothing***$_{j,t}$							
(t-stat.) *Measure* =	*Baseline*		*REA-Adjusted*		*REA-CS-Adjusted*		*REA-AC-Adjusted*	
N=98,214	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ability$_{j,t-1}$	0.106***	0.038	0.016	-0.030	0.286**	0.329	-0.027	-0.097
	(3.025)	(0.503)	(0.115)	(-0.114)	(2.109)	(1.240)	(-0.193)	(-0.366)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.032		1.099***		0.762**		1.135***
		(0.254)		(3.201)		(2.373)		(3.055)
$Dec_{j,t}$*$Ability_{j,t-1}$		-0.040		-0.163		-0.127		-0.132
		(-0.434)		(-0.613)		(-0.482)		(-0.519)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.065		-0.587		-0.067		-0.664
		(-0.203)		(-0.972)		(-0.106)		(-1.088)
$lnRet_{j,t}$*$Ability_{j,t-1}$		-0.052		-0.269		-0.359		-0.319
		(-0.473)		(-0.918)		(-1.202)		(-1.103)
$Neg_{j,t}$*$Ability_{j,t-1}$		0.210**		0.078		0.113		0.105
		(2.469)		(0.313)		(0.446)		(0.419)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		0.163		0.676		0.780*		0.681*
		(0.988)		(1.618)		(1.962)		(1.657)
Controls	Included							
Fixed Effects	*Year*Industry*							
Clustered Standard Errors	*Year* and *Industry*							
Within Adj. R^2	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022

Note. The table presents estimates of the model specified in Eq. 6a and 6b. to test for the prior-period average (cols, 2, 4, 6, 8) and interactive (cols, 2, 4, 6, 8) effects of managerial ability on the asymmetric timely recognition of losses in earnings (cols 1-6). The three dependent variables corresponding to unique business outcomes are presented as: (1) income smoothing in Panel A, (2) tax avoidance in Panel B, and (3) chief executive officer (CEO) total compensation in Panel C. The models are estimated using four different variables of rank values of managerial ability: *Baseline* (cols 1-2), adjusted for *Revenues-Expenses* and *Returns-Earnings Asymmetry* or *REA* (cols 3-4), and adjusted for *REA* with *Determinants of Cost Stickiness* or *CS* (cols 5-6) and *Accounting Conservatism* or *AC* (cols 7-8). A model with with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-8) and *(**)[***] indicate $p <$ 0.10(0.05)[0.01].

Panel B.

Tax Avoidance Conditional on Managerial Ability (MA)

Coef.	Dep. var: ***Tax Avoidance***$_{j,t}$							
(t-stat.) *Measure =*	*Baseline*		*REA-Adjusted*		*REA-CS-Adjusted*		*REA-AC-Adjusted*	
N=72,057	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ability$_{j,t-1}$	0.018***	0.007	0.001	-0.060	0.053	-0.016	0.038	-0.023
	(4.667)	(0.984)	(0.035)	(-1.493)	(1.548)	(-0.363)	(1.134)	(-0.567)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.028***		0.101***		0.096***		0.086***
		(3.141)		(3.704)		(3.391)		(3.278)
$Dec_{j,t}$*$Ability_{j,t-1}$		0.022		0.074*		0.111***		0.098***
		(1.528)		(1.845)		(2.951)		(2.619)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.171**		-0.444**		-0.399**		-0.387**
		(-2.215)		(-2.254)		(-2.301)		(-2.233)
$lnRet_{j,t}$*$Ability_{j,t-1}$		-0.024*		-0.019		-0.033		-0.024
		(-1.868)		(-0.437)		(-0.874)		(-0.594)
$Neg_{j,t}$*$Ability_{j,t-1}$		0.013		0.034		0.040		0.036
		(1.048)		(0.839)		(1.022)		(0.941)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		0.071***		0.128*		0.151**		0.139**
		(3.864)		(1.887)		(2.364)		(2.141)
Controls	Included							
Fixed Effects	*Year*Industry*							
Clustered Standard Errors	*Year* and *Industry*							
Within Adj. R^2	0.159	0.160	0.159	0.159	0.159	0.160	0.159	0.159

Panel C.

Chief Executive Officer (CEO) Compensation Conditional on Managerial Ability (MA)

Coef.	Dep. var: ***lnTotal Compensation***$_{j,t}$							
(t-stat.) *Measure =*	*Baseline*		*REA-Adjusted*		*REA-CS-Adjusted*		*REA-AC-Adjusted*	
N=29,240	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ability$_{j,t-1}$	0.102***	0.010	0.023	0.029	-0.073	-0.088	-0.088	-0.083
	(5.255)	(0.283)	(0.149)	(0.135)	(-0.525)	(-0.420)	(-0.664)	(-0.402)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.407***		0.395		0.507		0.452
		(2.912)		(0.824)		(1.042)		(0.983)
$Dec_{j,t}$*$Ability_{j,t-1}$		0.050		0.276		0.280		0.281
		(1.083)		(1.462)		(1.513)		(1.556)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.529**		0.863		0.590		0.485
		(-2.275)		(1.124)		(0.737)		(0.659)
$lnRet_{j,t}$*$Ability_{j,t-1}$		-0.000		-0.298		-0.308		-0.319
		(-0.003)		(-0.826)		(-0.898)		(-0.990)
$Neg_{j,t}$*$Ability_{j,t-1}$		0.027		-0.249		-0.235		-0.274
		(0.528)		(-1.217)		(-1.160)		(-1.419)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		-0.072		-0.132		-0.054		-0.088
		(-0.466)		(-0.250)		(-0.104)		(-0.184)
Controls	Included							
Fixed Effects	*Year*Industry*							
Clustered Standard Errors	*Year* and *Industry*							
Within Adj. R^2	0.393	0.394	0.393	0.393	0.393	0.393	0.393	0.393

Table 9: Implication of Modeling for the Asymmetry on Business Inferences

Panel A.

Income Smoothing Conditional on Managerial Ability (MA)

Coef.	Dep. var: ***Income Smoothing*$_{j,t}$**							
(t-stat.) *Measure* =	*Baseline*		*REA-Adjusted*		*REA-CS-Adjusted*		*REA-AC-Adjusted*	
N=98,214	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
***Ability*$_{j,t-1}$**	0.209**	0.088	0.126	0.133	0.162	0.071	0.172*	0.085
	(2.096)	(0.352)	(1.318)	(0.575)	(1.625)	(0.278)	(1.756)	(0.340)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		-0.081		-0.845***		-0.678**		-0.693**
		(-0.282)		(-3.181)		(-2.529)		(-2.510)
$Dec_{j,t}$*$Ability_{j,t-1}$		-0.102		-0.114		-0.115		-0.095
		(-0.504)		(-0.561)		(-0.540)		(-0.450)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		0.169		1.096*		0.743		0.800
		(0.297)		(1.918)		(1.228)		(1.348)
$lnRet_{j,t}$*$Ability_{j,t-1}$		0.043		0.110		0.197		0.197
		(0.129)		(0.362)		(0.566)		(0.585)
$Neg_{j,t}$*$Ability_{j,t-1}$		0.310		0.275		0.332		0.317
		(1.245)		(1.138)		(1.253)		(1.220)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		-0.113		-0.226		-0.415		-0.428
		(-0.279)		(-0.617)		(-1.028)		(-1.073)
Controls	Included							
Fixed Effects	*Year***Industry*							
Clustered Standard Errors	*Year* and *Industry*							
Within Adj. R^2	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022

Note. The table presents estimates of the model specified in Eq. 6a and 6b. to test for the prior-period average (cols, 2, 4, 6, 8) and interactive (cols, 2, 4, 6, 8) effects of managerial ability on the asymmetric timely recognition of losses in earnings (cols 1-6). The three dependent variables corresponding to unique business outcomes are presented as: (1) income smoothing in Panel A, (2) tax avoidance in Panel B, and (3) chief executive officer (CEO) total compensation in Panel C. The models are estimated using four different variables of rank values of managerial ability: *Baseline* (cols 1-2), adjusted for *Revenues-Expenses* and *Returns-Earnings Asymmetry* or *REA* (cols 3-4), and adjusted for *REA* with *Determinants of Cost Stickiness* or *CS* (cols 5-6) and *Accounting Conservatism* or *AC* (cols 7-8). A model with with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-8) and *(**)[***] indicate $p <$ 0.10(0.05)[0.01].

Panel B.

Tax Avoidance Conditional on Managerial Ability (MA)

Coef.	Dep. var: ***Tax Avoidance*$_{j,t}$**							
(t-stat.) *Measure =*	*Baseline*		*REA-Adjusted*		*REA-CS-Adjusted*		*REA-AC-Adjusted*	
N=72,057	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
***Ability*$_{j,t-1}$**	0.027***	0.018	0.023***	0.014	0.016*	0.014	0.017*	0.016
	(3.046)	(1.203)	(2.704)	(0.989)	(1.877)	(0.927)	(1.935)	(1.074)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.037*		0.008		0.020		0.020
		(1.688)		(0.324)		(0.875)		(0.849)
$Dec_{j,t}$*$Ability_{j,t-1}$		0.035		0.042		0.037		0.038
		(1.333)		(1.518)		(1.277)		(1.323)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.148*		-0.068		0.001		0.006
		(-1.804)		(-0.748)		(0.015)		(0.069)
$lnRet_{j,t}$*$Ability_{j,t-1}$		-0.037		-0.022		-0.028		-0.034
		(-1.197)		(-0.753)		(-0.853)		(-1.023)
$Neg_{j,t}$*$Ability_{j,t-1}$		0.016		0.016		0.009		0.008
		(0.656)		(0.636)		(0.342)		(0.293)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		0.113***		0.081*		0.082*		0.089*
		(2.645)		(1.841)		(1.730)		(1.890)
Controls	Included							
Fixed Effects	*Year***Industry*							
Clustered Standard Errors	*Year* and *Industry*							
Within Adj. R^2	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.159

Panel C.

Chief Executive Officer (CEO) Compensation Conditional on Managerial Ability (MA)

Coef.	Dep. var: ***lnTotal Compensation*$_{j,t}$**							
(t-stat.) *Measure =*	*Baseline*		*REA-Adjusted*		*REA-CS-Adjusted*		*REA-AC-Adjusted*	
N=29,240	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
***Ability*$_{j,t-1}$**	0.230***	0.086	0.245***	0.056	0.253***	0.075	0.258***	0.093
	(4.992)	(1.147)	(5.565)	(0.739)	(5.682)	(0.966)	(5.836)	(1.200)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.799***		0.853***		0.862***		0.857***
		(2.981)		(3.125)		(3.156)		(3.172)
$Dec_{j,t}$*$Ability_{j,t-1}$		0.003		-0.072		-0.069		-0.073
		(0.031)		(-0.659)		(-0.642)		(-0.683)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-1.071**		-1.420***		-1.421***		-1.398***
		(-2.514)		(-3.084)		(-3.094)		(-3.026)
$lnRet_{j,t}$*$Ability_{j,t-1}$		-0.109		0.042		-0.009		-0.041
		(-0.575)		(0.214)		(-0.044)		(-0.212)
$Neg_{j,t}$*$Ability_{j,t-1}$		-0.051		-0.009		-0.017		-0.018
		(-0.519)		(-0.091)		(-0.172)		(-0.187)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		-0.249		-0.409		-0.364		-0.302
		(-0.799)		(-1.286)		(-1.144)		(-0.968)
Controls	Included							
Fixed Effects	*Year***Industry*							
Clustered Standard Errors	*Year* and *Industry*							
Within Adj. R^2	0.393	0.394	0.393	0.394	0.394	0.394	0.394	0.394

CHAPTER 8

SENSITIVITY ANALYSES

Correction of Standard Errors

Correction Methods

I conduct sensitivity analyses to examine the robustness of the statistical significance regarding hypotheses testing and its implications. To control for the rate of type I statistical errors, I first adjust standard errors of the estimates using Newey-West (1987) correction for the panel data autocorrelations, year-by-year serial correlations within firms. Standard errors obtained from Newey-West's (1987) procedure are heteroskedasticity and autocorrelation consistent. Second, I bootstrap standard errors to reduce potential sampling bias and generated regressor bias in statistical inferences, especially for the multi-stage estimates (i.e., two-stage models) and residuals as dependent variables (Chen, Hribar & Melessa, 2018; 2022; 2023). By construction, I obtain the bootstrapped distribution of standard errors from resampling estimations. Such correction procedures for the standard errors are essential to mitigate the effect of statistical bias on the inference (i.e., significance).

To control for panel dataset heterogeneity, I correct standard errors based on Newy-West's (1987) procedures. The standard error correction shows the sensitivity of the coefficient significance estimated using managerial ability (MA) measure due to within-firm heterogeneities, specifically asymmetric adjustments. Generally, corrected standard errors increase with heterogeneity between the panel (firm-year), decreasing the statistical significance of MA estimates.

To control the statistical type I error rate and mitigate potential sampling bias, I bootstrap standard errors by resampling the sample data without making further explicit assumptions about

the population data or its functional form (Efron, 1979). Moreover, bootstrapping standard errors can effectively address the sampling and generated-regressor biases that specify Fama-MacBeth or nonlinear regressions for the second stage model estimation (Chen et al., 2023). The sampling distribution, also known as the bootstrap sample, is derived implicitly from sample data instead of the population. I apply the standard parametric method of bootstrapping by resampling cases, which is less sensitive to model specifications and its functional form.[31]

For each estimation, I empirically construct sampling distribution for the standard errors by resampling it 1000 times and then deriving the statistical inferences (i.e., *t*-statistics) on the significance of the coefficients. Typically, 1000 replications are sufficient for the bootstrapped standard errors to converge to the true estimates of standard errors. Thus, to construct bootstrapped standard errors, I replicate estimation 1000 times by resampling or drawing from the sample distribution (Ashraf & Galor, 2013; Leone, Minutti-Meza, & Wasley, 2019). I follow the same procedure to obtain bootstrapped standard errors for each model specification.

Correction Findings

In Table 10, I present the estimates for the effect of revenues-expenses and returns-earnings asymmetry (REA) on the standard measures of operating efficiency (OE) and managerial ability (MA) after correcting for the standard errors. The values of *t*-statistics reported in parenthesis and brackets are based on standard errors from Newey-West (1987) and bootstrapping procedures, respectively. The values of *t*-statistics are calculated using corrected standard errors, and the coefficients are estimates of the Eq. 1 model, the same presented in cols 5-6, Panel A and B, of Tables 2 and 3. Specifically, the model is estimated using dependent

[31] Chen et al. (2018) outline a residuals bootstrap method for a two-stage estimation, assuming the appropriateness of models, where the second-stage dependent variable is the residual from the first stage.

variables as ranked decile values of OE (cols 1-4) and MA (cols 5-8) in levels (cols 1-2, 5-6) and changes (cols 3-4, 7-8), respectively. On average, the effect of cost stickiness and accounting conservatism (i.e., $b_3>0$, $b_6>0$) is statistically significant for all four dependent variables. As a result, consistent with H1 and H2, there is a statistically significant asymmetry (i.e., REA) in the measures of OE and MA.

In Table 11, Panel A, I report the findings on the relationship between ranked decile values of MA and business outcomes after correcting for the potential bias in standard errors, which affect inferences on statistical significance. Specifically, the average (cols 1, 3, 5) and interaction (cols 2, 4, 6) effects of MA on income smoothing (cols 1-2), tax avoidance (cols 3-4), and chief executive officer (CEO) total compensation (cols 5-6). The coefficient estimates correspond to Eq 6a and 6b models, reported in cols 1-2, Panels A, B, and C of Table 7, respectively. Overall, the average effect of MA on business outcomes is marginally insignificant, except for the statistically significant coefficient on CEO total compensation (col 5). However, the average effect of MA and its interactions with cost stickiness and accounting conservatism variables are insignificant after adjusting standard errors for the heteroscedasticity in the firm cross-section and year time series. The statistical significance of the coefficient on MA in relation with business outcomes using standard errors from Newey-West (1987) and bootstrapping procedures are consistent and qualitatively similar to inferences from Table 7.

Analogous to Panel A, I present the findings in Panel B, Table 11, for effect between estimated raw values of MA and business outcomes. The coefficients are estimates of Eq. 6a and 6b models, reported in cols 1-2, Panels A, B, and C of Table 9, respectively. Comparable with Panel A, the coefficient estimates are statistically insignificant for the average (cols 1, 3, 5) and interaction (cols 2, 4, 6) effects of MA on income smoothing (cols 1-2), tax avoidance (cols 3-4),

and CEO total compensation (cols 5-6). The exception is that the average effect of MA on CEO total compensation (col 5) is marginally significant. In sum, the inferences on the statistical significance of the estimates are consistent with those in Table 9. After correcting for the statistical biases in a multiple-stage estimation, the heteroskedasticity consistent standard errors are larger, adjusted for noise, which decreases (reduces) t-statistics (statistical significance) of the estimated coefficients.

Analysis of Asymmetry Concentration

Partition on Technology and (In)Tangibility

To examine attributes with concentrated effects of the asymmetry in OE and MA, I identify firm factors that are more (less) likely to be affected by cost stickiness and accounting conservatism. I expect low-tangibility firms operating within high-technology to have a higher degree of cost stickiness and accounting conservatism than high-tangibility firms in low-technology industries (e.g., Chandra, 2011; Kwon & Yin, 2015; Montresor & Vezzani, 2015; Jia, Rai, & Xu, 2019). I apply the Jones and Weingram (1996) classification to group firms into the low- and high-technology industries, which use the three-digit SIC codes for the industry categorization.[32] I calculate firm tangibility following the definition of Almeida and Campello (2007), a weighted composite ratio of accounts receivables, inventories, and plant, property, and equipment (PP&E) scaled by total assets. For each year, I group firms with low and high tangibility using values in the first tercile (T1, $p_1<0.33$) and third tercile (T3, $p_3>0.67$) of the

[32] For e.g., Francis, Philbrick, & Schipper (1994), Francis & Schipper (1999), Beasley, Carcello, Hermanson, & Lapides (2000), Johnson, Kasznik, & Nelson (2001), Field, Lowry, & Shu (2005), Kwon, Yin, & Han (2006), Chandra (2011), and Kwon & Jin (2015) also use similar classification of the high and low technology industries.

tangibility distribution, respectively. I partition the sample into two subsamples: (1) high-technology and low-tangibility and (2) low-technology and high-tangibility.

On average, the effects of REA on OE and MA are more (less) likely to be prominent among high (low) technology industry firms with a low (high) tangibility. Compared to low-technology firms, those in high-technology industries typically spend more in developing or acquiring intangibles (i.e., purchase of externally developed software or grant of a patent right for internally produced technologies or researched intellectuals). Such firms with the former (latter) objective report more research and development or R&D expenses (intangible assets) subject to cost stickiness (accounting conservatism). Firms with more R&D intensity (i.e., included in selling, general, and administrative expenditures) have a high resource adjustment cost and a more optimistic management expectation of growth in demand or cash flows resulting in cost stickiness (Banker et al., 2018; 2016). Conversely, firms with more intangible assets have a high capital investment (impairment) rate and a timelier recognition (reduction) of losses (accruals) as expenses (i.e., write-offs) given the bad news of future demand or cash flows, which corresponds to accounting conservatism (Banker et al., 2017; Byzalov & Basu, 2016).

Findings of Subsample Analysis

In Table 12, the empirical findings show that the impact of cost stickiness and accounting conservatism on OE and MA measures, on average, is higher or more intense for firms with low tangibles (i.e., more intangibles) operating in high-technology industries (cols 1, 3, 5, 7) compared to those with high-tangibility (low-intangibility) across low technology industries (cols 2, 4, 6, 8). Consistent with the H1 and H2 findings in Tables 2 and 3, the effect of REA is statistically significant for all four dependent variables as measures of OE (cols 1-4) and MA (cols 5-8) in levels (cols 1-2, 4-6) and changes (cols 3-4, 7-8). For the high-technology and low-

tangibility (treated) firms, the coefficients β_1 and β_3 are greater than zero (>0). Similarly, the coefficients β_3 and β_6 are greater than zero (>0). In contrast, the asymmetric coefficients β_3 and β_6 are not significantly different from zero among low-technology and high-tangibility (control) firms. In comparison, for such (control) firms, the linear or symmetric coefficients β_1 and β_4 are greater than zero (>0) and statistically significant.

Overall, the effect of asymmetry (i.e., REA) in OE and MA measures is more (less) for firms with low (high) tangibility within high (low) technology industries. The REA effect in coefficient magnitude is greater for OE and MA measured in levels (cols 1, 5) than in changes (cols 3, 7). Conversely, the REA effect in model informativeness, or explanatory power, is higher for OE and MA measured in changes (cols 3, 7) than in levels (cols 1, 5). Overall, the effect of asymmetry (i.e., REA) in measures of OE and MA is significantly concentrated among low-tangibility firms within high-technology industries. The results are consistent with H1 and H2, shed insights on firm characteristics prominently affected by REA, and showcase cross-sectional groups with a concentration of REA effects on OE and MA measures.

Alternative Business Outcome and Estimation Method

Implication for Trend-stationary Credit Ratings

In Appendix I, I present an estimation for assessing managerial ability on credit ratings, where higher (lower) credit rating values imply lower (higher) credit risk (Bonsall et al., 2017; Cornaggia et al., 2017). The estimates are robust to using alternative creditworthiness (riskiness) measures for the firms issuing long-term debt, which S&P assesses. The model estimation is performed for the discrete ordered values (i.e., credit ratings) using multinomial logistic specification (cols 1-3) and continuous numeric values (i.e., credit scores) using logarithm OLS specification (cols 4-6), respectively.

All the estimates are using the asymmetry-unadjusted (i.e., baseline) measure of MA in ranked decile values, Panel I.1, and constructed raw values, Panel I.2. Estimates of Eq. 6a and 6b models are presented for the average (cols 1, 4) and interaction (cols 2, 5) effects of MA with asymmetry (i.e., REA) parameters and further, controlling for the heterogeneity and stationarity (i.e., trends) within the credit ratings dataset (cols 3, 6). In Panel 1.3, the estimates reported in Panel 1.1 and 1.2 are corrected for the standard errors, like in Tables 10-11, using the Newey-West (1987) and bootstrapping procedures.

Overall, the results are qualitatively similar to those reported in Tables 8-9, where the effect of MA on credit ratings attenuates after controlling for the asymmetry parameters and non-monotonic trends within the data structure. Given nonlinearity or asymmetry in issuing and updating firms' credit ratings, such long-term datasets are subject to infrequent (low) adjustments to ratings (i.e., data variations) and, specifically, following trend-stationary processes. Thus, the cost stickiness and accounting conservatism parameters (i.e., asymmetry) significantly interact with MA and confound with assessing the relationship between MA and credit risk.

Dynamic Generalized Method of Moments (GMM) Estimation for Panel Data

Appendix J provides a robust generalized method of moments (GMM) estimation as an alternative model specification to examine the robustness of the (1) asymmetry in OE and MA, Panel J.1., and (2) implications of asymmetry in MA on business outcomes of income smoothing, tax avoidance, and executive compensation, Panel J.2, and on external (i.e., third-party) evaluation of credit risk, Panel J.3.

Specifically, I use a dynamic panel model specification with a one-step system GMM estimation or the Arellano-Bond estimator (1991). Moreover, a dynamic system GMM specification adjusts the yearly stochasticity and instruments for incidental trends within firms to

address heterogeneity and reverse causality in the firm-year panel data (Blundell & Bond, 1998; Wooldridge, 2001). Coefficients are dynamically differenced for the variation within panels, including firm and year fixed effects. The estimation uses the dependent variable's lag-2 (t-2) values as an instrument to model for over-identification and control for the autoregressive effects during the prior years (t-1, t-2). Estimates are reported with the Arellano within-group standard errors, robust to heteroskedasticity and serial correlation.

I first estimate Eq. 1 for the asymmetric effect in measure of OE (cols 1-4) and MA (cols 5-8) using ranked decile (cols 1, 3, 5, 7) and raw (cols 2, 4, 6, 8) values. The estimates are presented for OE and MA values measured in levels (cols 1-2, 5-6) and changes (cols 3-4, 7-8). The estimates are reported in Appendix J, Panel J.1. Second, I separately estimate Eq. 6a and 6b for the average (cols 1, 3, 5, 7, 9, 11) and interaction (cols 2, 4, 6, 8, 10, 12) effects of MA on business outcomes: income smoothing (cols 1-4), tax avoidance (cols 5-8), and total compensation (cols 9-12). In Appendix J, Panel J.2, the GMM model is specified using MA measured in the ranked decile values (cols 1-2, 5-6, 9-10) and estimated raw values (cols 3-4, 7-8, 11-12), which are not adjusted for the asymmetries (i.e., REA). Third, in Panel J.3, I present results for the average (cols 1, 4) and the confounding interaction (cols 2-3, 5-6) effects of asymmetry in MA on credit ratings. Overall, the estimates and findings are qualitatively similar to those reported in Tables 2-3, 7-8, and Appendix I.

Table 10: Correcting Standard Errors for the Estimation of Asymmetry Degree

Coef. (t-stat. Newey-West) [t-stat bootstrap] N=124,889	Dep. var:							
	***Efficiency*$_{j,t}$**		***ΔEfficiency*$_{j,t}$**		***Ability*$_{j,t}$**		***ΔAbility*$_{j,t}$**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
***ΔlnRev*$_{j,t}$**	0.069***	0.056***	0.123***	0.125***	0.088***	0.091***	0.093***	0.096***
	(7.981)	(6.483)	(24.394)	(24.650)	(9.239)	(9.629)	(16.293)	(16.706)
	[4.336]	[3.872]	[25.491]	[6.862]	[4.313]	[5.322]	[16.928]	[4.751]
$Dec_{j,t}$	-0.009***	-0.007**	-0.003*	-0.006***	0.004	-0.001	0.002	-0.001
	(-3.015)	(-2.406)	(-1.909)	(-3.434)	(1.024)	(-0.194)	(1.003)	(-0.393)
	[-0.854]	[-1.180]	[-0.301]	[-1.232]	[0.370]	[-0.103]	[0.163]	[-0.153]
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$**	0.064***	0.078***	0.044***	0.048***	0.044**	0.049**	0.056***	0.058***
	(3.644)	(4.421)	(5.470)	(5.987)	(2.226)	(2.451)	(6.351)	(6.621)
	[15.425]	[2.320]	[13.774]	[1.601]	[8.829]	[1.391]	[14.529]	[1.573]
***lnRet*$_{j,t}$**	0.050***	0.050***	0.030***	0.032***	0.029***	0.027***	0.020***	0.019***
	(8.506)	(8.434)	(9.695)	(10.261)	(4.606)	(4.237)	(5.414)	(5.296)
	[2.744]	[4.586]	[1.656]	[3.505]	[1.506]	[2.906]	[0.967]	[2.029]
$Neg_{j,t}$	-0.006***	-0.004**	0.001	-0.000	0.004	0.003	0.005**	0.004*
	(-2.900)	(-2.025)	(0.584)	(-0.236)	(1.534)	(1.148)	(2.567)	(1.901)
	[-0.748]	[-0.714]	[0.150]	[-0.096]	[0.490]	[0.465]	[0.713]	[0.813]
***lnRet*$_{j,t}$*Neg$_{j,t}$**	0.012	0.034***	0.013***	0.015***	0.063***	0.071***	0.021***	0.024***
	(1.568)	(4.619)	(3.590)	(4.255)	(6.224)	(6.955)	(5.160)	(5.912)
	[3.105]	[2.096]	[4.235]	[1.289]	[14.319]	[4.481]	[5.672]	[1.697]
Controls	Included							
Fixed Effects	None	*Year* Industry*	None	*Year* Industry*	None	*Year* Industry*	None	*Year* Industry*
Clustered Standard Errors	*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*
Within Adj. R^2	0.380	0.435	0.080	0.081	0.105	0.109	0.036	0.037

Note. The table presents estimates of the model specified in Eq. 1. to test for the rate of asymmetric effects due to demand decrease and bad news on the level (cols 1-2, 5-6) and change (cols 3-4, 7-8) in operating efficiency (cols 1-4) and managerial ability (cols 5-8). The estimates are reported with robust-clustered standard errors by firm (cols 1, 3, 5, 7). A model with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4, 6, 8). The t-statistics in parenthesis "()" and brackets "[]" corresponds to the corrected standard errors obtained from the Newey-West (1987) and bootstrap procedures. All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Table 11: Implication of Correcting for the Standard Errors on Business Inferences

Panel A.

Estimation Conditional on the Asymmetry in Ranked Decile Values of Managerial Ability (MA)

Coef. (t-stat. Newey-West) [t-stat bootstrap]	Dep. Var:					
	***Income Smoothing*$_{j,t}$**		***Tax Avoidance*$_{j,t}$**		***lnTotal Compensation*$_{j,t}$**	
	(1)	(2)	(3)	(4)	(5)	(6)
***Ability*$_{j,t-1}$**	0.106	0.038	0.018	0.007	0.102**	0.010
	(1.419)	(0.224)	(0.047)	(0.052)	(2.369)	(0.221)
	[0.801]	[0.108]	[0.033]	[0.015]	[2.224]	[0.106]
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.032		0.028		0.407
		(0.167)		(0.032)		(1.378)
		[0.072]		[0.025]		[0.821]
$Dec_{j,t}$*$Ability_{j,t-1}$		-0.040		0.022		0.050
		(-0.194)		(0.149)		(0.902)
		[-0.074]		[0.019]		[0.472]
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.065		-0.171		-0.529
		(-0.069)		(-0.024)		(-1.176)
		[-0.026]		[-0.018]		[-0.733]
$lnRet_{j,t}$*$Ability_{j,t-1}$		-0.052		-0.024		-0.000
		(-0.303)		(-0.033)		(-0.002)
		[-0.117]		[-0.024]		[-0.001]
$Neg_{j,t}$*$Ability_{j,t-1}$		0.210		0.013		0.027
		(1.212)		(0.055)		(0.365)
		[0.482]		[0.012]		[0.191]
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		0.163		0.071		-0.072
		(0.486)		(0.046)		(-0.201)
		[0.185]		[0.032]		[-0.133]
Controls	Included					
Fixed Effects	*Year*Industry*					
Clustered Standard Errors	*Year* and *Industry*					
	98,214		72,057		29,240	
Within Adj. R^2	0.022	0.022	0.159	0.160	0.393	0.394

Note. The table presents estimates of the model specified in Eq. 6a and 6b. to test for the prior-period average (cols, 1, 3, 5) and interactive (cols, 2, 4, 6) effects of managerial ability on the asymmetric timely recognition of losses in earnings (cols 1-6). The three dependent variables corresponding to unique business outcomes are presented as: (1) income smoothing (cols 1-2), (2) tax avoidance (cols 3-4), and (3) chief executive officer (CEO) total compensation (cols 5-6). The models are estimated using the ranked decile values of managerial ability. The estimates are reported with two-way fixed effects and double-clustered standard errors by year and industry. The *t*-statistics in parentheses "()" and brackets "[]" correspond to the corrected standard errors obtained from the Newey-West (1987) and bootstrap procedures. All estimated models include firm characteristics as control variables (cols 1-6) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

Panel B.

Estimation Conditional on the Asymmetry in Estimated Raw Values of Managerial Ability (MA)

Coef. (t-stat. Newey-West) [t-stat bootstrap]	Dep. Var:					
	***Income Smoothing*$_{j,t}$**		***Tax Avoidance*$_{j,t}$**		***lnTotal Compensation*$_{j,t}$**	
	(1)	(2)	(3)	(4)	(5)	(6)
***Ability*$_{j,t-1}$**	0.209	0.088	0.027	0.018	0.230*	0.086
	(0.571)	(0.071)	(0.050)	(0.032)	(1.678)	(0.783)
	[0.365]	[0.034]	[0.031]	[0.014]	[1.830]	[0.423]
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		-0.081		0.037		0.799
		(-0.168)		(0.029)		(1.276)
		[-0.060]		[0.018]		[0.692]
$Dec_{j,t}$*$Ability_{j,t-1}$		-0.102		0.035		0.003
		(-0.223)		(0.043)		(0.019)
		[-0.085]		[0.018]		[0.011]
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		0.169		-0.148		-1.071
		(0.141)		(-0.045)		(-1.378)
		[0.053]		[-0.025]		[-0.700]
$lnRet_{j,t}$*$Ability_{j,t-1}$		0.043		-0.037		-0.109
		(0.030)		(-0.021)		(-0.329)
		[0.013]		[-0.014]		[-0.185]
$Neg_{j,t}$*$Ability_{j,t-1}$		0.310		0.016		-0.051
		(0.324)		(0.073)		(-0.342)
		[0.129]		[0.009]		[-0.188]
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		-0.113		0.113		-0.249
		(-0.073)		(0.041)		(-0.321)
		[-0.031]		[0.030]		[-0.231]
Controls	Included					
Fixed Effects	*Year*Industry*					
Clustered Standard Errors	*Year* and *Industry*					
N	98,214		72,057		29,240	
Within Adj. R^2	0.022	0.022	0.159	0.159	0.393	0.394

Note. The table presents estimates of the model specified in Eq. 6a and 6b. to test for the prior-period average (cols, 1, 3, 5) and interactive (cols, 2, 4, 6) effects of managerial ability on the asymmetric timely recognition of losses in earnings (cols 1-6). The three dependent variables corresponding to unique business outcomes are presented as: (1) income smoothing (cols 1-2), (2) tax avoidance (cols 3-4), and (3) chief executive officer (CEO) total compensation (cols 5-6). The models are estimated using the raw values of managerial ability as constructed residuals from the second stage operating efficiency estimation. The estimates are reported with two-way fixed effects and double-clustered standard errors by year and industry. The *t*-statistics in parentheses "()" and brackets "[]" correspond to the corrected standard errors obtained from the Newey-West (1987) and bootstrap procedures. All estimated models include firm characteristics as control variables (cols 1-6) and $^{*(**)[***]}$ indicate $p < 0.10(0.05)[0.01]$.

Table 12: Examination of the Grouping Effects by Technology and Tangibility – Estimation for the Asymmetry Within Subsample Partitions

Dep. var:	***Efficiency***$_{j,t}$		***ΔEfficiency***$_{j,t}$		***Ability***$_{j,t}$		***ΔAbility***$_{j,t}$	
Partition by:	High-Tech Low-Tang	Low-Tech High-Tang	High-Tech Low-Tang	Low-Tech High-Tang	High-Tech Low-Tang	Low-Tech High-Tang	High-Tech Low-Tang	Low-Tech High-Tang
Coef. (t-stat.)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔlnRev$_{j,t}$	0.037***	0.065***	0.143***	0.113***	0.069***	0.131***	0.124***	0.095***
	(4.358)	(4.883)	(15.634)	(7.381)	(6.857)	(8.891)	(10.392)	(4.918)
$Dec_{j,t}$	-0.022***	-0.006	-0.001	-0.014**	-0.015**	0.005	0.005	0.009
	(-5.055)	(-0.766)	(-0.249)	(-2.305)	(-2.457)	(0.579)	(0.952)	(1.347)
ΔlnRev$_{j,t}$***Dec***$_{j,t}$	0.121***	0.031	0.043***	0.035	0.103***	-0.024	0.064***	0.039
	(6.259)	(1.115)	(2.775)	(1.242)	(5.483)	(-0.811)	(3.303)	(1.143)
lnRet$_{j,t}$	0.025***	0.078***	0.027***	0.051***	0.021**	0.044***	0.009	0.041***
	(3.513)	(6.753)	(4.395)	(4.894)	(2.489)	(3.212)	(1.193)	(3.205)
$Neg_{j,t}$	-0.007	-0.006	0.001	0.001	0.008	0.001	0.005	0.009
	(-1.461)	(-0.929)	(0.386)	(0.176)	(1.491)	(0.096)	(1.384)	(1.465)
lnRet$_{j,t}$***Neg***$_{j,t}$	0.061***	-0.017	0.021***	-0.008	0.087***	0.014	0.038***	0.007
	(7.022)	(-1.119)	(2.785)	(-0.552)	(8.334)	(0.787)	(3.728)	(0.391)
Controls	Included							
Fixed Effects	*Year*Industry*							
Clustered Standard Errors	*Year* and *Industry*							
N	25,077	8,649	25,077	8,649	25,077	8,649	25,077	8,649
Within Adj. R^2	0.448	0.449	0.101	0.044	0.154	0.173	0.052	0.003

Note. The table presents estimates of the model specified in Eq. 1 to test for the subsample effects in the high-technology and low-tangibility partition (cols, 1, 3, 5, 7) and low-technology and high-tangibility partition (cols, 2, 4, 6, 8) for the effect of asymmetry in the decile ranked values of operating efficiency (cols 1-2), change in operating efficiency (cols 3-4), managerial ability (cols 5-6), and change in managerial ability (cols 7-8). A model with Low- and high-technology industries are categorized following Jones & Weingram (1996), based on the three-digit SIC codes. Low and high-tangibility firms are grouped yearly using the first and last terciles of tangibility values, calculated by applying the definition of Almeida & Campello (2007). with two-way fixed effects and double-clustered standard errors by year and industry is also reported (cols 2, 4). All estimated models include firm characteristics as control variables (cols 1-8) and *(**)[***] indicate $p < 0.10(0.05)[0.01]$.

CHAPTER 9

CONCLUSION

Using the peer benchmark of firms' production models and applying data envelopment analysis (DEA), Demerjian, Lev, & McVay (2012, or DLM) provide empirical measures of operating efficiency (OE) and managerial ability (MA). Moreover, DLM (2012) demonstrated that the measure of MA captures information related to firms' managers or CEO, which is less noisy compared to previously known proxies or instruments of managerial-specific components such as capabilities or skills. Many studies adopt and apply OE and MA measures to examine their relationship with business outcomes.

By measuring OE and MA and assessing their relationship with earnings quality, DLM (2012; 2013) contribute to understanding the Upper Echelons theory (Hambrick & Mason, 1984) in the accounting context. By providing such measures, DLM (2012) also contributes to the recent surge of studies that examine relationships of MA in various accounting, finance, and management topics such as earnings quality, income smoothing, management forecasts, tax avoidance, audit fees, innovations, credit ratings (Francis, Hasan, & Zhu, 2019; Bui et al., 2018; Koester et al., 2017; Jiraporn, Leelalai, & Tong, 2016; Krishnan & Wang, 2015; Qiu, Trapkov, & Yakoub, 2014). Thus, the literature in this area grew in the last decade from adopting and standardizing OE and MA measures.

My dissertation focuses on the functional forms of OE and MA measures. Specifically, I explain how the measures of OE and MA can incorporate known functional forms of accounting financial data to model firms' production. Specifically, to comprehensively model firms' production function in an asymmetric or piecewise-linear form instead of measures based on linear assumption. First, accounting financials are, on average, subject to time series variation,

which is asymmetric; thus, a linear or symmetric assumption of input-output function could induce systematic measurement errors. Such errors could bias the OE and MA measures, which are based on a ratio of outputs to a linear set of inputs, and as a result, may not reflect the true identification conditional on firms' financials. Second, the coefficients on MA measured as a second-stage residual of a two-stage method, where the first stage is OE estimation, are typically noisy or less precise, which further induces measurement errors in examining its relationship with other business outcomes. In the case of systematic errors, this effect can further increase based on firms' input-output functional form in the first stage production model and the inclusion of contextual variables in the second stage specification.

I show that the measures of OE and MA exhibit asymmetry for revenue decreases versus increases. Thus, the nonlinearity stems from time-series variation in consumer demand and cross-sectional attributes. Prior research shows that costs and earnings exhibit asymmetry conditional on demand shocks and bad news. I show that the confounding revenues-expenses and returns-earnings asymmetry (REA) due to cost stickiness and conditional conservatism bias the measures of OE and MA. Further, the measurement bias is moderated by firm characteristics: growth prospects, financial constraints, and operational riskiness. I use existing OE and MA measures to reduce the need for further validations, show the relevance of the confounding REA in financials, and evaluate the implications of unmodeled REA on prior findings. After controlling for REA, a simplified approach to examining outcome effects of OE and MA in panel data models is to: (1) adjust, (2) control, and then (3) predict. Furthermore, interaction with confounders of OE and MA also helps reduce measurement bias and improve estimation consistency in testing relationships.

I present simple regression-based adjustments to OE and MA to reduce the upward measurement bias due to confounding asymmetry in financials. Specifically, I use a Deming (1964) regression model for the conditional effects of REA and its moderating factors on OE and MA. As a result, the adjusted measures of OE and MA are closer to the theoretical Normality, exhibiting fewer systematic errors than the unadjusted measures. Furthermore, incorporating REA, regression estimates using adjusted measures of OE and MA are consistent across different sample sizes (subsamples). In conjunction with REA adjustment, the bias in OE and MA measures is reduced by specifying an interaction model. When examining the relationship with organizational and managerial outcomes, the nonlinear model controls for the confounding effects of REA parameters on OE and MA.

REFERENCES

Abadie, A., Athey, S., Imbens, G. W., & Wooldridge, J. M. (2020). Sampling-based versus design-based uncertainty in regression analysis. *Econometrica*, 88(1), 265–296. https://doi.org/10.3982/ECTA12675

Abernethy, M. A., & Wallis, M. S. (2019). Critique on the "manager effects" research and implications for management accounting research. *Journal of Management Accounting Research*, *31*(1), 3–40. https://doi.org/10.2308/jmar-52030

Almeida, H., & Campello, M. (2007). Financial constraints, asset tangibility, and corporate investment. *Review of Financial Studies*, *20*(5), 1429–1460. https://doi.org/10.1093/rfs/hhm019

Anderson, M. C., Banker, R. D., & Janakiraman, S. N. (2003). Are selling, general, and administrative costs "sticky"? *Journal of Accounting Research*, *41*(1), 47–63. https://doi.org/10.1111/1475-679X.00095

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277. https://doi.org/10.2307/2297968

Ashraf, Q., & Galor, O. (2013). The "out of africa" hypothesis, human genetic diversity, and comparative economic development. *American Economic Review*, *103*(1), 1–46. https://doi.org/10.1257/aer.103.1.1

Athey, S., & Imbens, G. W. (2006). Identification and inference in nonlinear difference-in-differences models. *Econometrica*, *74*(2), 431–497. https://doi.org/10.1111/j.1468-0262.2006.00668.x

Baik, B., Choi, S., & Farber, D. B. (2020). Managerial ability and income smoothing. *The Accounting Review*, *95*(4), 1–22. https://doi.org/10.2308/accr-52600

Ball, R. (2013). Accounting informs investors and earnings management is rife: Two questionable beliefs. *Accounting Horizons*, *27*(4), 847–853. https://doi.org/10.2308/acch-10366

Ball, R., & Shivakumar, L. (2005). Earnings quality in UK private firms: Comparative loss recognition timeliness. *Journal of Accounting and Economics*, *39*(1), 83–128. https://doi.org/10.1016/j.jacceco.2004.04.001

Ball, R., & Shivakumar, L. (2006). The Role of Accruals in Asymmetrically Timely Gain and Loss Recognition: loss recognition role of accruals. *Journal of Accounting Research*, *44*(2), 207–242. https://doi.org/10.1111/j.1475-679X.2006.00198.x

Balsam, S., Boone, J., Liu, H., & Yin, J. (2016). The impact of say-on-pay on executive compensation. *Journal of Accounting and Public Policy*, *35*(2), 162–191. https://doi.org/10.1016/j.jaccpubpol.2015.11.004

Banker, R., D. (1980). *Studies in cost allocation and efficiency evaluation*. Harvard University.

Banker, R. D., Basu, S., & Byzalov, D. (2017). Implications of impairment decisions and assets' cash-flow horizons for conservatism research. *The Accounting Review*, *92*(2), 41–67. https://doi.org/10.2308/accr-51524

Banker, R. D., Basu, S., Byzalov, D., & Chen, J. Y. S. (2016). The confounding effect of cost stickiness on conservatism estimates. *Journal of Accounting and Economics*, *61*(1), 203–220. https://doi.org/10.1016/j.jacceco.2015.07.001

Banker, R. D., & Byzalov, D. (2014). Asymmetric cost behavior. *Journal of Management Accounting Research*, *26*(2), 43–79. https://doi.org/10.2308/jmar-50846

Banker, R. D., Byzalov, D., Ciftci, M., & Mashruwala, R. (2014). The moderating effect of prior sales changes on asymmetric cost behavior. *Journal of Management Accounting Research*, *26*(2), 221–242. https://doi.org/10.2308/jmar-50726

Banker, R. D., Byzalov, D., Fang, S., & Liang, Y. (2018). Cost management research. *Journal of Management Accounting Research*, *30*(3), 187–209. https://doi.org/10.2308/jmar-51965

Banker, R. D., Byzalov, D., & Plehn-Dujowich, J. M. (2014). Demand uncertainty and cost behavior. *The Accounting Review*, *89*(3), 839–865. https://doi.org/10.2308/accr-50661

Banker, R. D., Chang, H., & Cooper, W. W. (1996). Chapter 11 Simulation studies of efficiency, returns to scale and misspecification with nonlinear functions in DEA. *Annals of Operations Research*, *66*(4), 231–253. https://doi.org/10.1007/BF02187300

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science*, *30*(9), 1078–1092. https://doi.org/10.1287/mnsc.30.9.1078

Banker, R. D., & Chen, L. (Tony). (2006). Predicting earnings using a model based on cost variability and cost stickiness. *The Accounting Review*, *81*(2), 285–307. https://doi.org/10.2308/accr.2006.81.2.285

Banker, R. D., Darrough, M. N., Huang, R., & Plehn-Dujowich, J. M. (2013). The relation between ceo compensation and past performance. *The Accounting Review*, *88*(1), 1–30. https://doi.org/10.2308/accr-50274

Basu, S. (1995). *Conservatism and the asymmetric timeliness of earnings*. University of Rochester.

Basu, S. (1997). The conservatism principle and the asymmetric timeliness of earnings. *Journal of Accounting and Economics*, *24*(1), 3–37. https://doi.org/10.1016/S0165-4101(97)00014-1

Basu, S. (2001). Discussion of on the asymmetric recognition of good and bad news in France, Germany and the United Kingdom. *Journal of Business Finance & Accounting*, *28*(9 & 10), 1333–1349. https://doi.org/10.1111/1468-5957.00417

Basu, S. (2005). Discussion of "conditional and unconditional conservatism: Concepts and modeling." *Review of Accounting Studies*, *10*(2–3), 311–321. https://doi.org/10.1007/s11142-005-1533-5

Basu, S., & Markov, S. (2004). Loss function assumptions in rational expectations tests on financial analysts' earnings forecasts. *Journal of Accounting and Economics*, *38*, 171–203. https://doi.org/10.1016/j.jacceco.2004.09.001

Beasley, M. S., Carcello, J. V., Hermanson, D. R., & Lapides, P. D. (2000). Fraudulent financial reporting: Consideration of industry traits and corporate governance mechanisms. *Accounting Horizons*, 14(4), 441–454. https://doi.org/10.2308/acch.2000.14.4.441

Beaver, W. H., & Ryan, S. G. (2005). Conditional and unconditional conservatism: concepts and modeling. *Review of Accounting Studies*, *10*(2–3), 269–309. https://doi.org/10.1007/s11142-005-1532-6

Beaver, W., Lambert, R., & Morse, D. (1980). The information content of security prices. *Journal of Accounting and Economics*, *2*(1), 3–28. https://doi.org/10.1016/0165-4101(80)90013-0

Berk, J. B., & Green, R. C. (2004). Mutual fund flows and performance in rational markets. *Journal of Political Economy*, *112*(6), 1269–1295. https://doi.org/10.1086/424739

Berk, J. B., & Stanton, R. (2007). Managerial ability, compensation, and the closed-end fund discount. *The Journal of Finance*, *62*(2), 529–556. https://doi.org/10.1111/j.1540-6261.2007.01216.x

Bertrand, M., & Schoar, A. (2003). Managing with style: The effect of managers on firm policies. *The Quarterly Journal of Economics*, *118*(4), 1169–1208. https://doi.org/10.1162/003355303322552775

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Bonsall, S. B., Holzman, E. R., & Miller, B. P. (2017). Managerial ability and credit risk assessment. *Management Science*, *63*(5), 1425–1449. https://doi.org/10.1287/mnsc.2015.2403

Bradley, W., & Sun, L. (2021). Managerial ability and fair value accounting: Evidence from nonfinancial firms. *Journal of Financial Reporting and Accounting*, *19*(4), 666–685. https://doi.org/10.1108/JFRA-08-2020-0229

Brookman, J. T., & Thistle, P. D. (2013). Managerial compensation: Luck, skill or labor markets? *Journal of Corporate Finance*, *21*, 252–268. https://doi.org/10.1016/j.jcorpfin.2013.03.001

Byzalov, D., & Basu, S. (2016). Conditional conservatism and disaggregated bad news indicators in accrual models. *Review of Accounting Studies*, *21*(3), 859–897. https://doi.org/10.1007/s11142-016-9361-3

Callen, J. L. (1991). Data Envelopment Analysis: Partial Survey and Applications for Management Accounting. *Journal of Management Accounting Research*, *3*, 35–56.

Chandra, U. (2011). Income conservatism in the U.S. Technology sector. *Accounting Horizons*, *25*(2), 285–314. https://doi.org/10.2308/acch-10022

Charnes, A., & Cooper, W. W. (1980). Auditing and accounting for program efficiency and management efficiency in not-for-profit entities. *Accounting, Organizations and Society*, *5*(1), 87–107. https://doi.org/10.1016/0361-3682(80)90025-2

Charnes, A., Cooper, W. W., & Ijiri, Y. (1963). Breakeven budgeting and programming to goals. *Journal of Accounting Research*, *1*(1), 16. https://doi.org/10.2307/2489841

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, *2*(6), 429–444. https://doi.org/10.1016/0377-2217(78)90138-8

Charnes, A., Cooper, W. W., & Rhodes, E. (1981). Evaluating program and managerial efficiency: An application of data envelopment analysis to program follow through. *Management Science*, *27*(6), 668–697. https://doi.org/10.1287/mnsc.27.6.668

Chen, W., Hribar, P., & Melessa, S. (2018). Incorrect inferences when using residuals as dependent variables: Incorrect inferences using residuals as dependent variables. *Journal of Accounting Research*, *56*(3), 751–796. https://doi.org/10.1111/1475-679X.12195

Chen, W., Hribar, P., & Melessa, S. (2023). Standard error biases when using generated regressors in accounting research. *Journal of Accounting Research*, *61*(2), 531–569. https://doi.org/10.1111/1475-679X.12470

Chen, W., Hribar, P., & Melessa, S. J. (2022). On the use of residuals as dependent variables. *Journal of Financial Reporting*, *7*(1), 69–83. https://doi.org/10.2308/JFR-2021-008

Collins, D. W., Kothari, S. P., & Rayburn, J. D. (1987). Firm size and the information content of prices with respect to earnings. *Journal of Accounting and Economics*, *9*(2), 111–138. https://doi.org/10.1016/0165-4101(87)90002-4

Collins, D. W., Kothari, S. P., Shanken, J., & Sloan, R. G. (1994). Lack of timeliness and noise as explanations for the low contemporaneous return-earnings association. *Journal of Accounting and Economics*, *18*(3), 289–324. https://doi.org/10.1016/0165-4101(94)90024-8

Cooper, W. W., Seiford, L. M., Tone, K., & Zhu, J. (2007). Some models and measures for evaluating performances with DEA: Past accomplishments and future prospects. *Journal of Productivity Analysis*, *28*(3), 151–163. https://doi.org/10.1007/s11123-007-0056-4

Cornaggia, K. J., Krishnan, G. V., & Wang, C. (2017). Managerial Ability and Credit Ratings. *Contemporary Accounting Research* 34 (4): 2094–2122. https://doi.org/10.1111/1911-3846.12334.

Deakin, E. B. (1976). Distributions of financial accounting ratios: Some empirical evidence. *The Accounting Review*, *51*(1), 90–96. https://www.jstor.org/stable/245375

Demerjian, P., & Lev, B. (2021). Measuring managerial ability: A retrospective and review of the literature. *Data Envelopment Analysis Journal*, *5*(1), 1–25. https://doi.org/10.1561/103.00000037

Demerjian, P., Lev, B., & McVay, S. (2012). Quantifying managerial ability: A new measure and validity tests. *Management Science*, *58*(7), 1229–1248. https://doi.org/10.1287/mnsc.1110.1487

Demerjian, P., Lewis-Western, M., & McVay, S. (2020). How does intentional earnings smoothing vary with managerial ability? *Journal of Accounting, Auditing & Finance*, *35*(2), 406–437. https://doi.org/10.1177/0148558X17748405

Demerjian, P. R. (2017). Calculating efficiency with financial accounting data: Data envelopment analysis for accounting researchers. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2995038

Demerjian, P. R., Lev, B., Lewis, M. F., & McVay, S. E. (2013). Managerial ability and earnings quality. *The Accounting Review*, *88*(2), 463–498. https://doi.org/10.2308/accr-50318

Deming, W. E. (William E. (1964). *Statistical adjustment of data*. New York, Dover Publications. http://archive.org/details/statisticaladjus00demi

Doukas, J. A., & Zhang, R. (2020). Corporate managerial ability, earnings smoothing, and acquisitions. *Journal of Corporate Finance*, *65*, 101756. https://doi.org/10.1016/j.jcorpfin.2020.101756

Field, L., Lowry, M., & Shu, S. (2005). Does disclosure deter or trigger litigation? *Journal of Accounting and Economics*, 39(3), 487–507. https://doi.org/10.1016/j.jacceco.2005.04.004

Francis, B. B., Sun, X., Weng, C.-H., & Wu, Q. (2022). Managerial ability and tax aggressiveness. *China Accounting and Finance Review*, *24*(1), 53–75. https://doi.org/10.1108/CAFR-02-2022-0002

Francis, B., Hasan, I., Siraj, I., & Wu, Q. (2020). Managerial ability and value relevance of earnings. *China Accounting and Finance Review, Forthcoming*. https://papers.ssrn.com/abstract=3519263

Francis, B., Hasan, I., & Zhu, Y. (2019). Benchmark on themselves: CEO-directors' influence on the CEO compensation. *Managerial Finance*, *45*(7), 810–826. https://doi.org/10.1108/MF-03-2018-0123

Francis, J., Philbrick, D., & Schipper, K. (1994). Shareholder litigation and corporate disclosures. *Journal of Accounting Research*, *32*(2), 137. https://doi.org/10.2307/2491279

Francis, J., & Schipper, K. (1999). Have financial statements lost their relevance? *Journal of Accounting Research*, *37*(2), 319. https://doi.org/10.2307/2491412

Frecka, T. J., & Hopwood, W. S. (1983). The effects of outliers on the cross-sectional distributional properties of financial ratios. *The Accounting Review*, *58*(1), 115–128. https://www.jstor.org/stable/246646

Freeman, R. N. (1987). The association between accounting earnings and security returns for large and small firms. *Journal of Accounting and Economics*, *9*(2), 195–228. https://doi.org/10.1016/0165-4101(87)90005-X

Giner, B., & Rees, W. (2001). On the asymmetric recognition of good and bad news in France, Germany, and the United Kingdom. *Journal of Business Finance & Accounting*, *28*(9 & 10), 1285–1331. https://doi.org/10.1111/1468-5957.00416

Haider, I., Singh, H., & Sultana, N. (2021). Managerial ability and accounting conservatism. *Journal of Contemporary Accounting & Economics*, *17*(1), 100242. https://doi.org/10.1016/j.jcae.2020.100242

Hambrick, D. C., & Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *The Academy of Management Review*, *9*(2), 193. https://doi.org/10.2307/258434

Hayes, R. M., & Schaefer, S. (1999). How much are differences in managerial ability worth? *Journal of Accounting and Economics*, *27*(2), 125–148. https://doi.org/10.1016/S0165-4101(99)00007-5

Holcomb, T. R., Holmes Jr., R. M., & Connelly, B. L. (2009). Making the most of what you have: Managerial ability as a source of resource value creation. *Strategic Management Journal*, *30*(5), 457–485. https://doi.org/10.1002/smj.747

Huang, X. (Sharon), & Sun, L. (2017). Managerial ability and real earnings management. *Advances in Accounting*, *39*, 91–104. https://doi.org/10.1016/j.adiac.2017.08.003

Hwang, I., Jung, T., Lee, W., & Yang, D. G. (2021). Asymmetric inventory management and the direction of sales changes*. *Contemporary Accounting Research*, *38*(1), 676–706. https://doi.org/10.1111/1911-3846.12635

Ijiri, Y., & Simon, H. A. (1974). Interpretations of departures from the pareto curve firm-size distributions. *Journal of Political Economy*, *82*(2, Part 1), 315–331. https://doi.org/10.1086/260194

Jensen, J. L. W. V. (1906). Sur les fonctions convexes et les inégalités entre les valeurs moyennes. *Acta Mathematica*, *30*(0), 175–193. https://doi.org/10.1007/BF02418571

Jia, N., Rai, A., & Xu, S. X. (2020). Reducing capital market anomaly: The role of information technology using an information uncertainty lens. *Management Science*, *66*(2), 979–1001. https://doi.org/10.1287/mnsc.2018.3235

Johnson, M. F., Kasznik, R., & Nelson, K. K. (2001). The impact of securities litigation reform on the disclosure of forward-looking information by high technology firms. *Journal of Accounting Research*, *39*(2), 297–327. https://doi.org/10.1111/1475-679X.00014

Jones, C. L., & Weingram, S. E. (1996). Why 10b-5 litigation risk is higher for technology and financial services firms. *Social Science Research Network*. https://papers.ssrn.com/abstract=2690

Kalelkar, R., & Khan, S. (2016). Ceo financial background and audit pricing. *Accounting Horizons*, *30*(3), 325–339. https://doi.org/10.2308/acch-51442

Kaplan, S. N., Klebanov, M. M., & Sorensen, M. (2012). Which ceo characteristics and abilities matter? *The Journal of Finance*, *67*(3), 973–1007. https://doi.org/10.1111/j.1540-6261.2012.01739.x

Khan, M., & Watts, R. L. (2009). Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics*, *48*(2–3), 132–150. https://doi.org/10.1016/j.jacceco.2009.08.002

Knight, F. H. (1921). *Risk, uncertainty, and profit*. Houghton Mifflin Company. https://oll.libertyfund.org/title/knight-risk-uncertainty-and-profit

Koester, A., Shevlin, T., & Wangerin, D. (2017). The role of managerial ability in corporate tax avoidance. *Management Science*, *63*(10), 3285–3310. https://doi.org/10.1287/mnsc.2016.2510

Kothari, S. P., & Sloan, R. G. (1992). Information in prices about future earnings. *Journal of Accounting and Economics*, *15*(2–3), 143–171. https://doi.org/10.1016/0165-4101(92)90016-U

Kowalski, C. J. (1972). On the effects of non-normality on the distribution of the sample product-moment correlation coefficient. *Applied Statistics*, *21*(1), 1. https://doi.org/10.2307/2346598

Krishnan, G. V., & Wang, C. (2015). The relation between managerial ability and audit fees and going concern opinions. *AUDITING: A Journal of Practice & Theory*, *34*(3), 139–160. https://doi.org/10.2308/ajpt-50985

Kummell, Chas. H. (1879). Reduction of observation equations which contain more than one observed quantity. *The Analyst*, *6*(4), 97. https://doi.org/10.2307/2635646

Kuo, C.-S., Li, M.-Y. L., & Yu, S.-E. (2013). Non-uniform effects of CEO equity-based compensation on firm performance – An application of a panel threshold regression model. *The British Accounting Review*, *45*(3), 203–214. https://doi.org/10.1016/j.bar.2013.06.008

Kwon, S. S., & Yin, J. (2015). A comparison of earnings persistence in high-tech and non-high-tech firms. *Review of Quantitative Finance and Accounting*, *44*(4), 645–668. https://doi.org/10.1007/s11156-013-0421-5

Kwon, S. S., Yin, Q. J., & Han, J. (2006). The effect of differential accounting conservatism on the "over-valuation" of high-tech firms relative to low-tech firms. *Review of Quantitative Finance and Accounting*, *27*(2), 143–173. https://doi.org/10.1007/s11156-006-8794-3

Lee, K., & Choi, K. (2010). Cross redundancy and sensitivity in DEA models. *Journal of Productivity Analysis*, *34*(2), 151–165. https://doi.org/10.1007/s11123-009-0166-2

Leone, A. J., Minutti-Meza, M., & Wasley, C. E. (2019). Influential observations and inference in accounting research. *The Accounting Review*, *94*(6), 337–364. https://doi.org/10.2308/accr-52396

Leverty, J. T., & Grace, M. F. (2012). Dupes or incompetents? An examination of management's impact on firm distress. *Journal of Risk and Insurance*, *79*(3), 751–783. https://doi.org/10.1111/j.1539-6975.2011.01443.x

Makni, Y. F., Chakroun, R. G., & Jarboui, A. (2020). Sticky cost behavior and its implication on accounting conservatism: A cross-country study. *Journal of Financial Reporting and Accounting*, *18*(1), 169–197. https://doi.org/10.1108/JFRA-08-2018-0071

McShane, E. J. (1937). Jensen's inequality. *Bulletin of the American Mathematical Society*, *43*(8), 521–527. https://doi.org/10.1090/S0002-9904-1937-06588-8

Montresor, S., & Vezzani, A. (2015). The production function of top R&D investors: Accounting for size and sector heterogeneity with quantile estimations. *Research Policy*, *44*(2), 381–393. https://doi.org/10.1016/j.respol.2014.08.005

Murray-Webster, R. (2016). *Managing group risk attitude* (1st ed.). Routledge. https://doi.org/10.4324/9781315593579

Murthi, B. P. S., Choi, Y. K., & Desai, P. (1997). Efficiency of mutual funds and portfolio performance measurement: A non-parametric approach. *European Journal of Operational Research*, *98*(2), 408–418. https://doi.org/10.1016/S0377-2217(96)00356-6

Murthi, B. P. S., Srinivasan, K., & Kalyanaram, G. (1996). Controlling for observed and unobserved managerial skills in determining first-mover market share advantages. *Journal of Marketing Research*, *33*(3), 329. https://doi.org/10.2307/3152129

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, *5*(2), 147–175. https://doi.org/10.1016/0304-405X(77)90015-0

Newey, W. K., & West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, *55*(3), 703. https://doi.org/10.2307/1913610

Pae, J., Thornton, D. B., & Welker, M. (2005). The link between earnings conservatism and the price-to-book ratio*. *Contemporary Accounting Research*, *22*(3), 693–717. https://doi.org/10.1506/9FDN-N6ED-LJE9-A1HL

Seiford, L. M., & Thrall, R. M. (1990). Recent developments in DEA. *Journal of Econometrics*, *46*(1–2), 7–38. https://doi.org/10.1016/0304-4076(90)90045-U

Simon, H. A. (1979). Rational decision making in business organizations. *The American Economic Review*, *69*(4), 493–513. https://www.jstor.org/stable/1808698

Simon, H. A., & Bonini, C. P. (1958). The size distribution of business firms. *The American Economic Review*, *48*(4), 607–617. https://www.jstor.org/stable/1808270

Terviö, M. (2008). The difference that ceos make: An assignment model approach. *American Economic Review*, *98*(3), 642–668. https://doi.org/10.1257/aer.98.3.642

Thore, S., Kozmetsky, G., & Phillips, F. (1994). DEA of financial statements data: The U.S. computer industry. *Journal of Productivity Analysis*, *5*(3), 229–248. https://doi.org/10.1007/BF01073909

Trigeorgis, L., & Reuer, J. J. (2017). Real options theory in strategic management: Real options theory in strategic management. *Strategic Management Journal*, *38*(1), 42–63. https://doi.org/10.1002/smj.2593

Watson, C. J. (1990). Multivariate distributional properties, outliers, and transformation of financial ratios. *The Accounting Review*, *65*(3), 682–695. https://www.jstor.org/stable/247957

Wooldridge, J. M. (2001). Applications of generalized method of moments estimation. *Journal of Economic Perspectives*, *15*(4), 87–100. https://doi.org/10.1257/jep.15.4.87

Wooldridge, J. M. (2009). On estimating firm-level production functions using proxy variables to control for unobservables. *Economics Letters*, *104*(3), 112–114. https://doi.org/10.1016/j.econlet.2009.04.026

Wooldridge, J. M. (2022). Simple approaches to nonlinear difference-in-differences with panel data. *SSRN*. https://doi.org/10.2139/ssrn.4183726

APPENDIX A

SAMPLE PROCEDURE

Observations (*N*)	**Description**
200,621 firm-year	Operating efficiency (OE) and managerial ability (MA) measures based on Demerjian et al. (2012) merged with the Compustat North America financials database for 39 years (*t*) from 1980 to 2018, including 20,588 unique firms (*j*).
(14,477)	Remove firm-year (*j,t*) observations with the missing fiscal-end share price (PRCC_F), common shares outstanding (CSHO), total revenue (REVT), earnings before extraordinary items (IB), total employees (EMP), the book value of total assets (AT), current debt (DLC), long-term debt (DLTT), and common equity (CEQ).
(44,444)	Drop firm-year (*j,t*) observations with the missing values of capital expenditures (CAPEX), net plant, property, and equipment (PPENT), intangibles (INTAN), capital expenditures (CAPEX), and total liabilities (LT), including any remaining or non-drop firm (*j*) operating within the financial, real estate, or utilities sector.
(16,811)	Less firm-year (*j,t*) observations with missing values for the prior year (*t*-1) fiscal-end operating efficiency (OE), managerial ability (MA), total revenues (REVT), share price (PRCC_F), and common shares outstanding (CSHO).
124,889	Firm-year (j,t) observations from 1981 to 2018 (38 years) for 14,695 unique firms.
51,927	Firm-year (j,t) observations from 1981 to 1999 (19 years) for 9,149 unique firms.
72,962	Firm-year (j,t) observations from 2000 to 2018 (19 years) for 9,685 unique firms.

APPENDIX B

VARIABLE DEFINITION

Variable	Description
Efficiency$_{j,t}$-Raw	Firm's (j) yearly (t) raw values of peer-benchmark operating efficiency (FirmEfficiency2018), measured and provided by Demerjian et al. (2012).
Efficiency$_{j,t}$	Firm's (j) yearly (t) ranked decile values of operating efficiency (FirmEfficiency2018Rank).
ΔEfficiency$_{j,t}$	Firm's (j) yearly (t) percentage point change in operating efficiency ranks from prior year (t-1).
REA-Adjusted-Efficiency$_{j,t}$	Firm's (j) yearly (t) revenues-expenses and returns-expenses asymmetry (REA) (i.e., cost stickiness and conditional conservatism) adjusted ranked decile values of operating efficiency. The adjustment model is specified in col 6 of Table 2, Panel A.
REA-DetCS-Adjusted-Efficiency$_{j,t}$	Firm's (j) yearly (t) REA and determinants of cost stickiness (CS) (i.e., asset intensity and employee intensity) adjusted ranked decile values of operating efficiency. The adjustment model is specified in col 2 of Table 4, Panel A.
REA-DetAC-Adjusted-Efficiency$_{j,t}$	Firm's (j) yearly (t) REA and determinants of accounting conservatism (AC) (i.e., book-to-market ratio, leverage, and market capitalization) adjusted ranked decile values of operating efficiency. The adjustment model is specified in col 2 of Table 4, Panel B.
Ability$_{j,t}$	Firm's (j) yearly (t) raw estimates of managerial ability (MAScore2018), measured and provided by Demerjian et al. (2012).
Ability$_{j,t}$	Firm's (j) yearly (t) ranked decile values of managerial ability (MAScore2018Rank).
ΔAbility$_{j,t}$	Firm's (j) yearly (t) percentage point change in managerial ability ranks from prior year (t-1).
REA-Adjusted-Ability$_{j,t}$	Firm's (j) yearly (t) revenues-expenses and returns-expenses asymmetry (REA) (i.e., cost stickiness and conditional conservatism) adjusted ranked decile values of managerial ability. The adjustment model is specified in col 6 of Table 3, Panel A.
REA-DetCS-Adjusted- Ability$_{j,t}$	Firm's (j) yearly (t) REA and determinants of cost stickiness (CS) (i.e., asset intensity and employee intensity) adjusted ranked decile values of managerial ability. The adjustment model is specified in col 4 of Table 4, Panel A.
REA-DetAC-Adjusted- Ability$_{j,t}$	Firm's (j) yearly (t) REA and determinants of accounting conservatism (AC) (i.e., book-to-market ratio, leverage, and market capitalization) adjusted ranked decile values of managerial ability. The adjustment model is specified in col 4 of Table 4, Panel B.
ΔlnRev$_{j,t}$	Firm (j) yearly (t) logarithm percent change in total revenues (REVT) from prior year (t-1).
Dec$_{j,t}$	An indicator variable that equals to one (1) if a firm's (j) change in revenues ($\Delta lnRev_{j,t}$) decrease, else the value is zero (0).
lnRet$_{j,t}$	Firm (j) yearly (t) stock return or logarithm percent change in share prices (PRCC_F) from prior year (t-1), adjusted by end-of-year factor for stock splits and dividends.
Neg$_{j,t}$	An indicator variable that equals one (1) if a firm's (j) stock return ($lnRet_{j,t}$) is negative in the year (t), else the value is zero (0).
AssetInt	A ratio of the firm's (j) yearly (t) total assets ($AT_{j,t}$) to total revenues ($REVT_{j,t}$).
EmpInt	A ratio of the firm's (j) yearly (t) employees ($EMP_{j,t}$) to total revenues ($REVT_{j,t}$).

$BtM_{j,t}$	A ratio of firm's (j) yearly (t) common equity ($CEQ_{j,t}$) to market capitalization ($PRCC\_F_{j,t-1}$ *$CSHO_{j,t-1}$) during the beginning of the fiscal-year (t-1).
$Lev_{j,t}$	A ratio of firm's (j) yearly (t) total debt ($DLC_{j,t}$+$DLTT_{j,t}$) to market capitalization ($PRCC\_F_{j,t-1}$ *$CSHO_{j,t-1}$) during the beginning of the fiscal-year (t-1).
MCAP	Firm (j) yearly (t) logarithm of market capitalization ($PRCC\_F_{j,t-1}$*$CSHO_{j,t-1}$) during the beginning of the fiscal-year (t-1).
$E/P_{j,t}$	Firm (j) yearly (t) earnings before extraordinary items ($IB_{j,t}$) scaled by the market capitalization ($PRCC\_F_{j,t-1}$*$CSHO_{j,t-1}$) during the beginning of the fiscal-year (t-1).
$Capex_{j,t}$	A ratio of firm (j) yearly (t) capital expenditures ($CAPX_{j,t}$) to total assets ($AT_{j,t}$).
$Intan_{j,t}$	A ratio of firm (j) yearly (t) intangible assets ($INTAN_{j,t}$) to total assets ($AT_{j,t}$).
$Liab_{j,t}$	A ratio of firm (j) yearly (t) total liabilities ($LT_{j,t}$) to total assets ($AT_{j,t}$).
$Foreign_{j,t}$	An indicator variable that equals one (1) if a firm (j) is multinational (MNC) with non-trivial foreign operations (i.e., non-zero values of $FCA_{j,t}$) in the year (t), else the value is zero (0).
$Size_{j,t}$	Firm (j) yearly (t) logarithm of total assets ($AT_{j,t}$) defined as the size.
Income $Smoothing_{j,t}$	Income smoothing is defined as a ratio of a firm (j) yearly (t) standard deviation of operating income after depreciation ($OIADP_{j,t}$) to the standard deviation of operating cash flows ($OANCF_{j,t}$), scaled by the total assets ($AT_{j,t-1}$) during the beginning of the fiscal-year (t-1). The ratio is inverted to indicate higher (lower) values increasing (decreasing) income smoothing. The yearly (t) standard deviation is calculated for the rolling three (3) year period.
Tax $Avoidance_{j,t}$	Tax avoidance is defined as a ratio of a firm (j) yearly (t) cash-based effective tax rate, inverted to indicate higher (lower) values increasing (decreasing) tax avoidance. The effective tax rate is calculated as a ratio of cash paid for taxes ($TXPD_{j,t}$) scaled by the difference in pre-tax income and special items ($PI_{j,t}$-$SPI_{j,t}$), where the tax rate is bounded between zero (0) and one (1) (i.e., 0% and 100%).
lnTotal Compensation$_{j,t}$	Total compensation is defined as a firm (j) yearly (t) logarithm of total compensation ($TDC1_{j,t}$) for chief executive officer (CEO), including cash and equity, and reported by ExecuComp.

APPENDIX C

ASYMMETRY EFFECTS AFTER CONTROLLING FOR FIRM FIXED EFFECTS AND CHARACTERISTICS AND STANDARD ERRORS IN THE PRIOR-PERIOD

Panel C.1.

Estimation of Asymmetry in Raw Values of Operating Efficiency (OE)

Coef. Dep. var: (t-stat.)	***lnEfficiency***$_{j,t}$				***ΔlnEfficiency***$_{j,t}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔlnRev$_{j,t}$	0.019***	0.027***	0.018***	0.024***	0.049***	0.042***	0.047***	0.038***
	(18.416)	(10.427)	(18.105)	(9.346)	(39.313)	(12.518)	(38.667)	(8.837)
$Dec_{j,t}$	-0.001***	-0.001**	-0.001***	-0.001	-0.000	-0.001	-0.001	-0.001*
	(-2.906)	(-1.983)	(-2.932)	(-1.553)	(-0.293)	(-1.594)	(-1.000)	(-1.824)
ΔlnRev$_{j,t}$****Dec***$_{j,t}$	0.007***	0.011***	0.005***	0.010***	0.020***	0.017***	0.016***	0.013***
	(3.536)	(5.742)	(3.037)	(3.830)	(8.839)	(6.778)	(7.435)	(3.363)
lnRet$_{j,t}$	0.006***	0.003***	0.005***	0.003**	0.007***	0.007***	0.006***	0.006***
	(7.520)	(4.240)	(7.292)	(2.703)	(8.092)	(7.707)	(7.091)	(4.185)
$Neg_{j,t}$	0.001	0.000	0.000	-0.000	0.001**	0.001***	0.001**	0.001*
	(1.532)	(0.981)	(0.290)	(-0.091)	(2.535)	(2.629)	(2.548)	(1.698)
lnRet$_{j,t}$****Neg***$_{j,t}$	0.009***	0.008***	0.008***	0.008***	0.006***	0.005***	0.006***	0.005***
	(8.600)	(7.746)	(8.370)	(5.454)	(5.219)	(4.122)	(5.067)	(2.841)
Included Controls	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1
Fixed Effects	*Firm* and *Year*		*Firm* and *Industry*Year*		*Firm* and *Year*		*Firm* and *Industry*Year*	
Clustered Standard Errors	*Firm*		*Firm*	*Firm* and *Year*	*Firm*		*Firm*	*Firm* and *Year*
N	124,889	110,194	124,889	110,194	124,889	110,194	124,889	110,194
R^2	0.755	0.765	0.768	0.779	0.250	0.251	0.285	0.288

Panel C.2.

Estimation of Asymmetry in Raw Values of Managerial Ability (MA)

Coef. Dep. var: (t-stat.)	***lnAbility*$_{j,t}$**				***ΔlnAbility*$_{j,t}$**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
***ΔlnRev*$_{j,t}$**	0.032***	0.042***	0.031***	0.037***	0.040***	0.044***	0.038***	0.038***
	(21.540)	(10.534)	(21.084)	(9.189)	(25.041)	(10.247)	(24.217)	(7.447)
$Dec_{j,t}$	-0.003***	-0.003***	-0.003***	-0.002***	-0.001	-0.001*	-0.001	-0.002**
	(-4.722)	(-3.699)	(-4.379)	(-3.240)	(-1.075)	(-1.650)	(-1.556)	(-2.134)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$**	0.006**	0.014***	0.005*	0.012***	0.027***	0.020***	0.023***	0.016***
	(2.121)	(4.712)	(1.754)	(2.956)	(9.254)	(6.320)	(7.976)	(3.505)
***lnRet*$_{j,t}$**	0.006***	0.003**	0.006***	0.002	0.006***	0.008***	0.005***	0.007***
	(5.498)	(2.287)	(5.050)	(1.603)	(5.330)	(6.570)	(4.541)	(4.135)
$Neg_{j,t}$	0.002***	0.002***	0.001**	0.001	0.002***	0.003***	0.002***	0.003***
	(3.329)	(2.803)	(2.241)	(1.485)	(3.119)	(3.842)	(3.083)	(3.000)
***lnRet*$_{j,t}$*Neg$_{j,t}$**	0.015***	0.014***	0.014***	0.013***	0.009***	0.008***	0.008***	0.007***
	(9.233)	(8.375)	(9.199)	(6.760)	(5.781)	(4.696)	(5.404)	(3.444)
Included Controls	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1	at *t*	at *t* & *t*-1
Fixed Effects	*Firm* and *Year*		*Firm* and *Industry*Year*		*Firm* and *Year*		*Firm* and *Industry*Year*	
Clustered Standard Errors	*Firm*		*Firm*	*Firm* and *Year*	*Firm*		*Firm*	*Firm* and *Year*
N	124,889	110,194	124,889	110,194	124,889	110,194	124,889	110,194
R^2	0.629	0.641	0.647	0.659	0.122	0.124	0.155	0.159

APPENDIX D

ASYMMETRY EFFECTS OF FIRM DETERMINANTS IN THE PRIOR-PERIOD

Panel D.1.

Cost Stickiness Determinants of Asymmetry in Efficiency and Managerial Ability

Dep. var:	***Efficiency*$_{j,t}$**		***Ability*$_{j,t}$**	
Coef. (t-stat.) Model= *N*=110,194	Baseline	Robustness	Baseline	Robustness
	(1)	(2)	(3)	(4)
***ΔlnRev*$_{j,t}$**	0.014	0.046***	0.073***	0.076***
	(1.170)	(3.765)	(5.475)	(5.467)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$**	0.169***	0.107***	0.161***	0.125***
	(8.106)	(4.543)	(6.397)	(4.339)
ΔlnRev$_{j,t}$**lnAssetInt*$_{j,t-1}$	-0.015***	0.006	-0.016***	-0.010
	(-2.749)	(0.989)	(-2.582)	(-1.431)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$*lnAssetInt$_{j,t-1}$**	0.037***	0.003	0.047***	0.052***
	(3.595)	(0.277)	(3.884)	(3.928)
ΔlnRev$_{j,t}$**lnEmpInt*$_{j,t-1}$	-0.026***	-0.015***	-0.019***	-0.019***
	(-8.866)	(-4.929)	(-5.439)	(-4.923)
***ΔlnRev*$_{j,t}$*Dec$_{j,t}$*lnEmpInt$_{j,t-1}$**	0.029***	0.003	0.032***	0.018**
	(5.505)	(0.460)	(5.013)	(2.442)
***lnRet*$_{j,t}$**	-0.003	-0.011	-0.028**	-0.022*
	(-0.326)	(-1.008)	(-2.364)	(-1.685)
***lnRet*$_{j,t}$*Neg$_{j,t}$**	0.140***	0.192***	0.247***	0.224***
	(8.891)	(10.613)	(13.194)	(11.171)
lnRet$_{j,t}$**lnAssetInt*$_{j,t-1}$	-0.002	0.000	0.002	0.002
	(-0.479)	(0.025)	(0.321)	(0.321)
***lnRet*$_{j,t}$*Neg$_{j,t}$*lnAssetInt$_{j,t-1}$**	0.013**	0.011	0.001	0.004
	(1.964)	(1.231)	(0.168)	(0.441)
lnRet$_{j,t}$**lnEmpInt*$_{j,t-1}$	-0.012***	-0.014***	-0.013***	-0.010***
	(-4.922)	(-5.181)	(-4.242)	(-3.003)
***lnRet*$_{j,t}$*Neg$_{j,t}$*lnEmpInt$_{j,t-1}$**	0.033***	0.041***	0.046***	0.040***
	(9.023)	(9.324)	(9.995)	(7.825)
Controls	Included			
Fixed Effects	None	*Year*Industry*	None	*Year*Industry*
Clustered Standard Errors	*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*
Within Adj. R^2	0.400	0.453	0.119	0.125

Panel D.2.

Accounting Conservatism Determinants of Asymmetry in Efficiency and Managerial Ability

Dep. var:		***Efficiency***$_{j,t}$		***Ability***$_{j,t}$	
Coef.	Model=	Baseline	Robustness	Baseline	Robustness
(t-stat.)	*N*=110,194	(1)	(2)	(3)	(4)
ΔlnRev$_{j,t}$		0.035***	0.046***	0.091***	0.090***
		(2.967)	(4.104)	(6.866)	(6.472)
ΔlnRev$_{j,t}$****Dec***$_{j,t}$		0.043**	-0.005	-0.016	-0.042
		(2.190)	(-0.234)	(-0.663)	(-1.593)
ΔlnRev$_{j,t}$**BtMt*$_{j,t-1}$		0.013***	0.018***	0.009*	0.008
		(2.671)	(4.057)	(1.771)	(1.623)
ΔlnRev$_{j,t}$****Dec***$_{j,t}$****BtM***$_{j,t-1}$		-0.020**	-0.031***	-0.022**	-0.018**
		(-2.537)	(-4.248)	(-2.384)	(-2.136)
ΔlnRev$_{j,t}$**Lev*$_{j,t-1}$		0.002	0.001	-0.000	0.000
		(0.532)	(0.354)	(-0.137)	(0.031)
ΔlnRev$_{j,t}$****Dec***$_{j,t}$****Lev***$_{j,t-1}$		-0.007	0.001	-0.003	-0.001
		(-1.190)	(0.097)	(-0.446)	(-0.114)
ΔlnRev$_{j,t}$**MCap*$_{j,t-1}$		0.010***	0.004**	0.006**	0.006**
		(5.134)	(1.991)	(2.212)	(2.099)
ΔlnRev$_{j,t}$****Dec***$_{j,t}$****MCap***$_{j,t-1}$		0.009**	0.023***	0.016***	0.022***
		(2.464)	(6.056)	(3.354)	(4.025)
lnRet$_{j,t}$		0.034***	0.020**	0.017*	0.019
		(3.981)	(2.092)	(1.676)	(1.620)
lnRet$_{j,t}$****Neg***$_{j,t}$		0.041***	0.096***	0.123***	0.115***
		(3.012)	(5.530)	(7.190)	(6.586)
lnRet$_{j,t}$**BtM*$_{j,t-1}$		0.008***	0.010***	0.007**	0.007**
		(3.201)	(4.145)	(2.207)	(2.313)
lnRet$_{j,t}$****Neg***$_{j,t}$****BtM***$_{j,t-1}$		-0.018***	-0.024***	-0.027***	-0.026***
		(-3.676)	(-5.024)	(-5.057)	(-4.220)
lnRet$_{j,t}$**Lev*$_{j,t-1}$		-0.001	0.001	0.001	0.001
		(-0.940)	(0.576)	(0.655)	(0.407)
lnRet$_{j,t}$****Neg***$_{j,t}$****Lev***$_{j,t-1}$		0.002	-0.001	-0.000	0.000
		(0.763)	(-0.307)	(-0.002)	(0.062)
lnRet$_{j,t}$**MCap*$_{j,t-1}$		-0.003**	-0.001	-0.004**	-0.005**
		(-2.344)	(-0.697)	(-2.145)	(-2.126)
lnRet$_{j,t}$****Neg***$_{j,t}$****MCap***$_{j,t-1}$		-0.003	-0.009***	-0.007**	-0.005*
		(-1.153)	(-2.885)	(-2.308)	(-1.739)
Controls		Included			
Fixed Effects		None	*Year*Industry*	None	*Year*Industry*
Clustered Standard Errors		*Firm*	*Year* and *Industry*	*Firm*	*Year* and *Industry*
Within Adj. R^2		0.376	0.426	0.091	0.096

APPENDIX E

DESCRIPTIVE SUMMARY OF MIDCAP FIRMS

Panel E.1.

GameStop Corp. (Ticker: GME)

Year	$\Delta lnRev_{j,t}$	$Dec_{j,t}$	$Ret_{j,t}$	$Neg_{j,t}$	$Efficiency_{j,t}$				$Ability_{j,t}$			
					Baseline	*REA -Adj.*	*REA-DetCS -Adj.*	*REA-DetAC -Adj.*	*Baseline*	*REA -Adj.*	*REA-DetCS -Adj.*	*REA-DetAC -Adj.*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
2003	0.15	0.00	0.00	0.00	0.50	0.66	0.66	0.66	0.20	0.56	0.56	0.56
2004	0.15	0.00	0.00	0.00	0.50	0.65	0.66	0.65	0.20	0.58	0.58	0.58
2005	0.52	0.00	0.00	0.00	0.40	0.66	0.67	0.66	0.20	0.49	0.50	0.49
2006	0.54	0.00	0.00	0.00	0.60	0.75	0.76	0.74	0.10	0.56	0.57	0.55
2007	0.29	0.00	1.00	1.00	0.70	0.78	0.78	0.77	0.20	0.58	0.58	0.58
2008	0.22	0.00	1.00	1.00	0.80	0.80	0.81	0.83	0.70	0.58	0.59	0.61
2009	0.03	0.00	1.00	1.00	0.80	0.76	0.76	0.77	0.60	0.54	0.54	0.55
2010	0.04	0.00	0.00	0.00	0.50	0.74	0.73	0.73	0.20	0.52	0.51	0.51
2011	0.01	0.00	0.00	0.00	0.50	0.73	0.72	0.71	0.20	0.52	0.50	0.51
2012	-0.07	1.00	1.00	1.00	0.80	0.69	0.71	0.70	0.80	0.53	0.54	0.51
2013	0.02	0.00	0.00	0.00	0.80	0.72	0.72	0.71	0.70	0.54	0.54	0.54
2014	0.03	0.00	0.00	0.00	0.80	0.71	0.71	0.70	0.70	0.55	0.54	0.55
2015	0.01	0.00	1.00	1.00	0.80	0.69	0.69	0.70	0.80	0.53	0.52	0.54
2016	-0.08	1.00	1.00	1.00	0.80	0.65	0.66	0.65	0.70	0.49	0.50	0.47
2017	0.07	0.00	1.00	1.00	0.80	0.65	0.65	0.66	0.80	0.48	0.49	0.49
2018	-0.11	1.00	1.00	1.00	0.80	0.61	0.62	0.62	0.80	0.49	0.50	0.48

Note. The table presents 15-year values for the cost stickiness (CS) and accounting conservatism (AC) parameters (col 1-4) and OE and MA measured as: unadjusted Baseline ranked values (cols 5, 9), adjusted for REA or revenues-expenses and returns-earnings (cols 6, 10), and REA adjusted with the determinants of CS (cols 7, 11) and AC (cols 8, 12).

Panel E.2.

Gap Inc. (Ticker: GPS)

Year	$\Delta lnRev_{j,t}$	$Dec_{j,t}$	$Ret_{j,t}$	$Neg_{j,t}$	$Efficiency_{j,t}$				$Ability_{j,t}$			
					Baseline	*REA* -Adj.	*REA-DetCS* -Adj.	*REA-DetAC* -Adj.	*Baseline*	*REA* -Adj.	*REA-DetCS* -Adj.	*REA-DetAC* -Adj.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
2003	0.09	0.00	0.23	0.00	1.00	0.89	0.89	0.88	0.90	0.65	0.65	0.64
2004	0.03	0.00	0.16	0.00	1.00	0.87	0.87	0.86	1.00	0.64	0.64	0.64
2005	-0.02	1.00	-0.19	1.00	1.00	0.84	0.86	0.87	1.00	0.65	0.66	0.65
2006	-0.01	1.00	0.06	0.00	1.00	0.85	0.87	0.86	1.00	0.63	0.64	0.62
2007	-0.01	1.00	0.00	1.00	0.90	0.87	0.88	0.88	0.70	0.66	0.67	0.64
2008	-0.08	1.00	-0.49	1.00	1.00	0.84	0.85	0.87	1.00	0.63	0.64	0.63
2009	-0.02	1.00	0.49	0.00	1.00	0.86	0.87	0.87	1.00	0.64	0.65	0.63
2010	0.03	0.00	0.01	0.00	1.00	0.86	0.86	0.84	0.90	0.66	0.65	0.66
2011	-0.01	1.00	-0.01	1.00	1.00	0.81	0.82	0.83	0.90	0.64	0.65	0.63
2012	0.07	0.00	0.52	0.00	1.00	0.83	0.83	0.82	1.00	0.64	0.64	0.63
2013	0.03	0.00	0.15	0.00	1.00	0.82	0.81	0.80	1.00	0.68	0.67	0.68
2014	0.02	0.00	0.08	0.00	0.90	0.83	0.82	0.81	0.90	0.65	0.65	0.65
2015	-0.04	1.00	-0.49	1.00	0.90	0.78	0.80	0.82	0.90	0.62	0.64	0.64
2016	-0.02	1.00	-0.07	1.00	1.00	0.78	0.79	0.79	0.90	0.63	0.64	0.62
2017	0.02	0.00	0.35	0.00	0.90	0.80	0.80	0.79	0.90	0.63	0.63	0.63
2018	0.04	0.00	-0.26	1.00	1.00	0.78	0.78	0.79	0.90	0.62	0.62	0.63

Note. The table presents 15-year values for the cost stickiness (CS) and accounting conservatism (AC) parameters (col 1-4) and OE and MA measured as: unadjusted Baseline ranked values (cols 5, 9), adjusted for REA or revenues-expenses and returns-earnings (cols 6, 10), and REA adjusted with the determinants of CS (cols 7, 11) and AC (cols 8, 12)

APPENDIX F

DESCRIPTIVE STATISTICS FOR THE ASYMMETRY ADJUSTED MEASUREMENTS

Panel F.1.

Pairwise Correlations Between Ranks of the Baseline and Asymmetry Adjusted Measures

Baseline Variable	***Efficiency***		***Ability***	
Correlation *Type*:	*Pearson*	*Spearman*	*Pearson*	*Spearman*
Adjusted Variable	(1)	(2)	(3)	(4)
REA-Adjusted	0.616	0.611	0.323	0.320
REA-DetCS-Adjusted	0.620	0.615	0.333	0.331
REA-DetAC-Adjusted	0.619	0.613	0.329	0.325

Panel F.2.

Univariate Comparison of Asymmetry Adjusted Measures with the Baseline Subsamples

Mean (Std. Dev.)		Overall	***Efficiency***		
			Low	*Medium*	*High*
	N	124,889	46,511	39,721	38,657
		(1)	(2)	(3)	(4)
REA-Adjusted:	*Low*	23,605 (18.9)	17,652 (38.0)	4,477 (11.3)	1,476 (3.8)
	Medium	72,275 (57.9)	27,019 (58.1)	28,131 (70.8)	17,125 (44.3)
	High	29,009 (23.2)	1,840 (4.0)	7,113 (17.9)	20,056 (51.9)
REA- DetCS-Adjusted:	*Low*	23,419 (18.8)	17,616 (37.9)	4,338 (10.9)	1,465 (3.8)
	Medium	72,086 (57.7)	27,018 (58.1)	28,195 (71.0)	16,873 (43.6)
	High	29,384 (23.5)	1,877 (4.0)	7,188 (18.1)	20,319 (52.6)
REA-DetAC-Adjusted:	*Low*	25,160 (20.1)	18,741 (40.3)	4,812 (12.1)	1,607 (4.2)
	Medium	70,637 (56.6)	25,932 (55.8)	27,793 (70.0)	16,912 (43.7)
	High	29,092 (23.3)	1,838 (4.0)	7,116 (17.9)	20,138 (52.1)

Mean (Std. Dev.)		Overall	***Ability***		
			Low	*Medium*	*High*
	N	124,889	47,042	40,128	37,719
		(1)	(2)	(3)	(4)
REA-Adjusted:	*Low*	9,323 (7.5)	6,007 (12.8)	1,920 (4.8)	1,396 (3.7)
	Medium	82,672 (66.2)	33,536 (71.3)	27,085 (67.5)	22,051 (58.5)
	High	32,894 (26.3)	7,499 (15.9)	11,123 (27.7)	14,272 (37.8)
REA-DetCS-Adjusted:	*Low*	7,119 (5.7)	4,704 (10.0)	1,423 (3.5)	992 (2.6)
	Medium	78,485 (62.8)	33,061 (70.3)	25,330 (63.1)	20,094 (53.3)
	High	39,285 (31.5)	9,277 (19.7)	13,375 (33.3)	16,633 (44.1)
REA-DetAC-Adjusted:	*Low*	8,688 (7.0)	5,653 (12.0)	1,770 (4.4)	1,265 (3.4)
	Medium	79,481 (63.6)	32,929 (70.0)	25,874 (64.5)	20,678 (54.8)
	High	36,720 (29.4)	8,460 (18.0)	12,484 (31.1)	15,776 (41.8)

Panel F.3.

Univariate Comparison for the Subsamples of Demand Decline (Growth) and Bad (Good) News

Mean (Std. Dev.)		Overall	**Dec=0 & Neg = 0**	**Dec=1 & Neg = 0**	**Dec=0 & Neg = 1**	**Dec=1 & Neg = 1**
	N	124,889	46,052	15,918	37,900	25,019
		(1)	(2)	(3)	(4)	(5)
***Efficiency*:**	*Low*	46,511 (37.2)	13,004 (28.2)	7,058 (44.3)	13,290 (35.1)	13,159 (52.6)
	Medium	39,721 (31.8)	15,942 (34.6)	4,770 (30.0)	12,188 (32.2)	6,821 (27.3)
	High	38,657 (31.0)	17,106 (37.1)	4,090 (25.7)	12,422 (32.8)	5,039 (20.1)
REA-Adjusted:	*Low*	23,605 (18.9)	4,442 (9.6)	4,310 (27.1)	5,420 (14.3)	9,433 (37.7)
	Medium	72,275 (57.9)	26,877 (58.4)	8,476 (53.2)	23,939 (63.2)	12,983 (51.9)
	High	29,009 (23.2)	14,733 (32.0)	3,132 (19.7)	8,541 (22.5)	2,603 (10.4)
REA-DetCS-Adjusted:	*Low*	23,419 (18.8)	3,987 (8.7)	4,214 (26.5)	5,686 (15.0)	9,532 (38.1)
	Medium	72,086 (57.7)	27,616 (60.0)	8,691 (54.6)	23,106 (61.0)	12,673 (50.7)
	High	29,384 (23.5)	14,449 (31.4)	3,013 (18.9)	9,108 (24.0)	2,814 (11.2)
REA-DetAC-Adjusted:	*Low*	25,160 (20.1)	4,371 (9.5)	4,445 (27.9)	6,148 (16.2)	10,196 (40.8)
	Medium	70,637 (56.6)	27,244 (59.2)	8,518 (53.5)	22,819 (60.2)	12,056 (48.2)
	High	29,092 (23.3)	14,437 (31.3)	2,955 (18.6)	8,933 (23.6)	2,767 (11.1)

Mean (Std. Dev.)		**Overall**	**Dec=0 & Neg = 0**	**Dec=1 & Neg = 0**	**Dec=0 & Neg = 1**	**Dec=1 & Neg = 1**
	N	124,889	46,052	15,918	37,900	25,019
		(1)	(2)	(3)	(4)	(5)
***Ability*:**	*Low*	47,042 (37.7)	15,368 (33.4)	6,796 (42.7)	13,775 (36.3)	11,103 (44.4)
	Medium	40,128 (32.1)	14,891 (32.3)	5,027 (31.6)	12,195 (32.2)	8,015 (32.0)
	High	37,719 (30.2)	15,793 (34.3)	4,095 (25.7)	11,930 (31.5)	5,901 (23.6)
REA-Adjusted:	*Low*	9,323 (7.5)	1,149 (2.5)	1,827 (11.5)	2,121 (5.6)	4,226 (16.9)
	Medium	82,672 (66.2)	27,664 (60.1)	11,781 (74.0)	25,016 (66.0)	18,211 (72.8)
	High	32,894 (26.3)	17,239 (37.4)	2,310 (14.5)	10,763 (28.4)	2,582 (10.3)
REA-DetCS-Adjusted:	*Low*	7,119 (5.7)	662 (1.4)	1,434 (9.0)	1,454 (3.8)	3,569 (14.3)
	Medium	78,485 (62.8)	25,900 (56.2)	11,059 (69.5)	24,087 (63.6)	17,439 (69.7)
	High	39,285 (31.5)	19,490 (42.3)	3,425 (21.5)	12,359 (32.6)	4,011 (16.0)
REA-DetAC-Adjusted:	*Low*	8,688 (7.0)	1,123 (2.4)	1,751 (11.0)	1,849 (4.9)	3,965 (15.8)
	Medium	79,481 (63.6)	26,195 (56.9)	11,304 (71.0)	24,272 (64.0)	17,710 (70.8)
	High	36,720 (29.4)	18,734 (40.7)	2,863 (18.0)	11,779 (31.1)	3,344 (13.4)

APPENDIX G

EFFECTS OF ASYMMETRY IN MANAGERIAL ABILITY AND TIMELY LOSSES

Panel G.1.

Estimation of Asymmetric Earnings Timeliness Conditional on Managerial Ability Tercile Values

		Dep. var: $\boldsymbol{E/P_{j,t}}$					
Coef.	*Partition by*:	*Tercile 1*		*Tercile 2*		*Tercile 3*	
(t-stat.)	*N*=110,194	(1)	(2)	(3)	(4)	(5)	(6)
$\boldsymbol{Ability_{j,t-1}}$		-0.009	0.002	-0.001	0.005	0.007	-0.007
		(-1.317)	(0.322)	(-0.074)	(0.596)	(1.144)	(-1.064)
$lnRet_{j,t}$*$Ability_{j,t-1}$		-0.055***	-0.054***	0.044**	0.042*	0.026	0.027
		(-2.739)	(-2.622)	(1.988)	(1.850)	(1.427)	(1.501)
$Neg_{j,t}$*$Ability_{j,t-1}$		-0.025***	-0.022***	0.003	0.005	0.021**	0.017**
		(-2.990)	(-2.599)	(0.315)	(0.469)	(2.519)	(2.005)
$\boldsymbol{lnRet_{j,t}*Neg_{j,t}*Ability_{j,t-1}}$		0.089***	0.079***	-0.063**	-0.065**	-0.051**	-0.039*
		(3.712)	(3.204)	(-2.453)	(-2.460)	(-2.487)	(-1.914)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$			-0.003		0.004		0.003
			(-0.170)		(0.179)		(0.140)
$Dec_{j,t}$*$Ability_{j,t-1}$			-0.019*		-0.014		0.029***
			(-1.833)		(-1.258)		(3.436)
$\boldsymbol{\Delta lnRev_{j,t}*Dec_{j,t}*Ability_{j,t-1}}$			0.115***		0.026		-0.141***
			(2.749)		(0.651)		(-3.854)
Controls		Included					
Fixed Effects		*Year***Industry*					
Clustered Standard Errors		*Year* and *Industry*					
Within Adj. R^2		0.317	0.318	0.316	0.316	0.316	0.317

Panel G.2.

Estimation of Asymmetric Earnings Timeliness within Managerial Ability Tercile Partitions

	Dep. var: $\boldsymbol{E/P_{j,t}}$					
Coef. *Partition by*:	*Tercile 1*		*Tercile 2*		*Tercile 3*	
(t-stat.)	(1)	(2)	(3)	(4)	(5)	(6)
$\boldsymbol{lnRet_{j,t}}$	-0.091***	-0.112***	-0.115***	0.037	-0.091***	0.025
	(-2.974)	(-3.284)	(-2.746)	(0.767)	(-2.819)	(0.860)
$\boldsymbol{lnRet_{j,t}*Neg_{j,t}}$	-0.086	0.153*	-0.103	0.130	-0.094*	-0.011
	(-1.370)	(1.850)	(-1.448)	(1.372)	(-1.781)	(-0.213)
$lnRet_{j,t}*Neg_{j,t}*lnAssetInt_{j,t}$	0.029		0.038		0.028	
	(1.071)		(0.971)		(1.340)	
$lnRet_{j,t}*Neg_{j,t}*lnEmpInt_{j,t}$	-0.051***		-0.036**		-0.036***	
	(-3.564)		(-2.014)		(-3.020)	
$lnRet_{j,t}*Neg_{j,t}*BtM_{j,t}$		-0.081		-0.092		-0.041
		(-1.240)		(-0.815)		(-0.692)
$lnRet_{j,t}*Neg_{j,t}*Lev_{j,t}$		0.031		-0.025		0.033
		(0.892)		(-0.477)		(1.039)
$lnRet_{j,t}*Neg_{j,t}*MCap_{j,t}$		-0.008		-0.003		0.013*
		(-0.773)		(-0.219)		(1.775)
$\boldsymbol{\Delta lnRev_{j,t}}$	-0.214***	-0.142***	-0.197***	-0.019	-0.271***	-0.128**
	(-5.752)	(-3.408)	(-2.610)	(-0.213)	(-4.916)	(-2.319)
$\boldsymbol{\Delta lnRev_{j,t}*Dec_{j,t}}$	0.383***	0.520***	0.568***	0.423***	0.581***	0.458***
	(4.872)	(5.560)	(6.354)	(3.036)	(7.458)	(6.771)
$\Delta lnRev_{j,t}*Dec_{j,t}*lnAssetInt_{j,t}$	-0.181***		-0.100**		-0.006	
	(-4.678)		(-2.198)		(-0.162)	
$\Delta lnRev_{j,t}*Dec_{j,t}*lnEmpInt_{j,t}$	-0.035*		0.034		0.058***	
	(-1.788)		(1.423)		(3.031)	
$\Delta lnRev_{j,t}*Dec_{j,t}*BtM_{j,t}$		0.041		0.101		-0.005
		(0.731)		(1.286)		(-0.108)
$\Delta lnRev_{j,t}*Dec_{j,t}*Lev_{j,t}$		0.135***		0.201**		0.250***
		(3.602)		(2.342)		(5.951)
$\Delta lnRev_{j,t}*Dec_{j,t}*MCap_{j,t}$		-0.084***		-0.082***		-0.073***
		(-5.615)		(-4.569)		(-7.125)
Controls	Included					
Fixed Effects	*Year*Industry*					
Clustered Standard Errors	*Year* and *Industry*					
N	46,424		26,401		52,064	
Within Adj. R^2	0.348	0.370	0.329	0.367	0.281	0.313

APPENDIX H

ADJUSTMENT EFFECTS FOR THE PRIOR AND SUCCESSIVE PERIODS

ASYMMETRY IN MANAGERIAL ABILITY AND BUSINESS OUTCOMES

Dep. var:	***E/P*$_{j,t}$		***Income Smoothing*$_{j,t}$		***Tax Avoidance*$_{j,t}$		***lnTotal Compensation*$_{j,t}$	
Coef. (t-stat.)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
***Ability*$_{j,t-1}$**	0.633***	0.386***	-0.000	-0.007	-0.003	-0.067	-0.096	-0.117
	(7.395)	(5.024)	(-0.002)	(-0.025)	(-0.094)	(-1.482)	(-0.683)	(-0.559)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		-0.213**		0.862***		0.114***		0.773
		(-2.375)		(2.949)		(3.771)		(1.539)
$Dec_{j,t}$*$Ability_{j,t-1}$		0.723***		-0.137		0.119***		0.328*
		(7.985)		(-0.498)		(2.618)		(1.712)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.778***		-0.464		-0.420*		0.437
		(-2.699)		(-0.818)		(-1.940)		(0.569)
$lnRet_{j,t}$*$Ability_{j,t-1}$	0.132	0.158		-0.240		-0.068*		-0.474
	(0.728)	(0.878)		(-0.812)		(-1.821)		(-1.539)
$Neg_{j,t}$*$Ability_{j,t-1}$	0.298***	0.201***		-0.002		0.039		-0.272
	(4.055)	(2.849)		(-0.007)		(0.814)		(-1.441)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$	-0.418*	-0.345		0.422		0.199***		0.082
	(-1.938)	(-1.613)		(0.994)		(2.602)		(0.194)
Controls	Included							
Fixed Effects	*Year*Industry*							
Clustered Standard Errors	*Year* and *Industry*							
N	97,402		88,785		66,033		28,190	
Within Adj. R^2	0.331	0.340	0.021	0.021	0.156	0.157	0.399	0.399

APPENDIX I

IMPLICATION OF UNMODELED DATASET HETEROGENEITY ON THIRD-PARTY INFERENCES

Panel I.1.

Credit Ratings Conditional on Ranked Decile Values of Managerial Ability (MA)

Coef.		Dep. var: ***Credit Ratings***$_{j,t}$			Dep. var: ***lnCredit Scores***$_{j,t}$		
(t-stat.)	N=71,101	(1)	(2)	(3)	(4)	(5)	(6)
Ability$_{j,t-1}$		0.145***	0.068	-0.124**	0.023***	0.004	-0.024***
		(5.478)	(1.395)	(-2.564)	(5.668)	(0.594)	(-3.280)
Rating-Trends$_{j,t}$				0.017***			0.003***
				(52.900)			(49.191)
ΔlnRev$_{j,t}$**Ability*$_{j,t-1}$			0.160*	0.403***		0.036**	0.072***
			(1.651)	(4.592)		(2.331)	(5.100)
Dec$_{j,t}$**Ability*$_{j,t-1}$			0.011	0.040		0.006	0.010
			(0.195)	(0.817)		(0.688)	(1.322)
ΔlnRev$_{j,t}$**Dec*$_{j,t}$**Ability*$_{j,t-1}$			-0.291	-0.497***		-0.066**	-0.096***
			(-1.609)	(-3.286)		(-2.212)	(-3.799)
lnRet$_{j,t}$**Ability*$_{j,t-1}$			-0.076	0.053		-0.005	0.013
			(-0.797)	(0.624)		(-0.360)	(0.982)
Neg$_{j,t}$**Ability*$_{j,t-1}$			0.145**	0.137***		0.025***	0.024***
			(2.584)	(2.719)		(2.986)	(3.147)
lnRet$_{j,t}$**Neg*$_{j,t}$**Ability*$_{j,t-1}$			0.155	-0.069		0.010	-0.023
			(1.224)	(-0.613)		(0.484)	(-1.244)
Controls		Included					
Fixed Effects		*Year*Industry*					
Clustered Standard Errors		*Year* and *Industry*					
Within Adj. R^2		0.184	0.184	0.387	0.184	0.184	0.372

Panel I.2.

Credit Ratings Conditional on Estimated Raw Values of Managerial Ability (MA)

Coef.		Dep. var: ***Credit Ratings***$_{j,t}$			Dep. var: ***lnCredit Scores***$_{j,t}$		
(t-stat.)	*N*=71,101	(1)	(2)	(3)	(4)	(5)	(6)
Ability$_{j,t-1}$		0.134**	-0.337***	-0.203*	0.026***	-0.061***	-0.041***
		(2.192)	(-2.680)	(-1.937)	(2.705)	(-3.360)	(-2.629)
Rating-Trends$_{j,t}$				0.017***			0.003***
				(53.270)			(49.312)
ΔlnRev$_{j,t}$**Ability*$_{j,t-1}$			0.562**	0.774***		0.105***	0.136***
			(2.388)	(3.663)		(2.894)	(4.134)
Dec$_{j,t}$**Ability*$_{j,t-1}$			0.286**	0.186*		0.053***	0.039**
			(2.139)	(1.660)		(2.703)	(2.303)
ΔlnRev$_{j,t}$**Dec*$_{j,t}$**Ability*$_{j,t-1}$			-0.737*	-0.730**		-0.133**	-0.132**
			(-1.909)	(-2.250)		(-2.131)	(-2.511)
lnRet$_{j,t}$**Ability*$_{j,t-1}$			0.351*	0.467***		0.067**	0.084***
			(1.653)	(2.621)		(1.989)	(2.890)
Neg$_{j,t}$**Ability*$_{j,t-1}$			0.484***	0.406***		0.082***	0.070***
			(3.762)	(3.692)		(4.400)	(4.403)
lnRet$_{j,t}$**Neg*$_{j,t}$**Ability*$_{j,t-1}$			-0.394	-0.643***		-0.088**	-0.124***
			(-1.491)	(-2.702)		(-2.090)	(-3.174)
Controls		Included					
Fixed Effects		*Year*Industry*					
Clustered Standard Errors		*Year* and *Industry*					
Within Adj. R^2		0.183	0.184	0.387	0.184	0.184	0.373

Panel I.3.

Standard Errors Correction in Credit Scores given Ranked and Estimated Values

Coef. (t-stat. Newey-West) [t-stat bootstrap]	*Ability*= *N*=71,101	Dep. var: ***lnCredit Scores*$_{j,t}$**					
		Baseline-Ranked Decile			*Baseline*-Estimated Raw		
		(1)	(2)	(3)	(4)	(5)	(6)
***Ability*$_{j,t-1}$**		0.023	0.004	-0.024	0.026	-0.061	-0.041
		(1.538)	(0.218)	(-1.038)	(0.722)	(-1.066)	(-0.823)
		[1.574]	[0.124]	[-0.736]	[0.616]	[-0.687]	[-0.586]
Rating-Trends$_{j,t}$				0.003***			0.003***
				(6.997)			(7.008)
				[1.498]			[1.497]
ΔlnRev$_{j,t}$**Ability*$_{j,t-1}$			0.036	0.072***		0.105	0.136*
			(1.543)	(3.070)		(1.407)	(1.924)
			[0.553]	[1.208]		[0.589]	[0.854]
Dec$_{j,t}$**Ability*$_{j,t-1}$			0.006	0.010		0.053*	0.039*
			(0.452)	(0.891)		(1.798)	(1.684)
			[0.156]	[0.309]		[0.570]	[0.576]
ΔlnRev$_{j,t}$**Dec*$_{j,t}$**Ability*$_{j,t-1}$			-0.066	-0.096**		-0.133	-0.132
			(-1.278)	(-1.983)		(-0.956)	(-1.054)
			[-0.600]	[-1.000]		[-0.490]	[-0.580]
lnRet$_{j,t}$**Ability*$_{j,t-1}$			-0.005	0.013		0.067	0.084*
			(-0.209)	(0.657)		(1.099)	(1.875)
			[-0.083]	[0.228]		[0.466]	[0.681]
Neg$_{j,t}$**Ability*$_{j,t-1}$			0.025**	0.024**		0.082***	0.070***
			(2.272)	(2.476)		(3.444)	(3.386)
			[0.678]	[0.792]		[0.836]	[1.019]
lnRet$_{j,t}$**Neg*$_{j,t}$**Ability*$_{j,t-1}$			0.010	-0.023		-0.088	-0.124*
			(0.292)	(-0.805)		(-1.099)	(-1.896)
			[0.120]	[-0.283]		[-0.481]	[-0.729]
Controls		Included					
Fixed Effects		*Year*Industry*					
Clustered Standard Errors		*Year* and *Industry*					
Within Adj. R^2		0.184	0.184	0.372	0.184	0.184	0.373

APPENDIX J

DYNAMIC EFFECTS OF ASYMMETRY AND

INFERENCE ON BUSINESS OUTCOMES

Panel J.1.

Dynamic GMM Estimation for the Asymmetry in Measures of Efficiency and Ability

Dep. var:	$\boldsymbol{Efficiency}_{j,t}$		$\boldsymbol{\Delta Efficiency}_{j,t}$		$\boldsymbol{Ability}_{j,t}$		$\boldsymbol{\Delta Ability}_{j,t}$	
Ability Measure=	*Ranked Decile*	*Estimated Raw*	*Ranked Decile*	*Estimated Raw*	*Ranked Decile*	*Estimated Raw*	*Ranked Decile*	*Estimated Raw*
Coef.								
(t-stat.) *N*=124,889	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\boldsymbol{\Delta lnRev}_{j,t}$	0.098***	0.036***	0.148***	0.054***	0.111***	0.053***	0.118***	0.047***
	(22.099)	(25.458)	(39.129)	(40.548)	(21.756)	(24.787)	(25.488)	(27.003)
$Dec_{j,t}$	-0.001	0.002***	-0.003*	0.001***	0.006***	0.003***	0.004**	0.002***
	(-0.835)	(4.600)	(-1.948)	(2.608)	(2.816)	(4.289)	(2.032)	(2.929)
$\boldsymbol{\Delta lnRev}_{j,t}$*$\boldsymbol{Dec}_{j,t}$	0.075***	0.011***	0.037***	0.017***	0.056***	0.009***	0.054***	0.024***
	(10.738)	(5.530)	(6.021)	(7.992)	(6.736)	(2.703)	(7.392)	(8.992)
$\boldsymbol{lnRet}_{j,t}$	0.045***	0.009***	0.031***	0.008***	0.021***	0.012***	0.019***	0.007***
	(16.062)	(11.366)	(11.914)	(9.246)	(6.220)	(10.023)	(6.132)	(6.453)
$Neg_{j,t}$	-0.002	0.001*	-0.001	0.001*	0.002	0.003***	0.003	0.002***
	(-1.585)	(1.705)	(-0.746)	(1.873)	(1.098)	(4.116)	(1.595)	(3.518)
$\boldsymbol{lnRet}_{j,t}$*$\boldsymbol{Neg}_{j,t}$	0.020***	0.009***	0.010***	0.007***	0.054***	0.015***	0.021***	0.010***
	(5.087)	(8.073)	(3.099)	(6.008)	(10.806)	(8.218)	(5.231)	(6.759)
$DepVar_{j,t-1}$	0.404***	0.436***	-0.229***	-0.206***	0.344***	0.410***	-0.267***	-0.236***
	(59.802)	(43.707)	(-63.375)	(-44.585)	(57.279)	(53.820)	(-76.858)	(-52.871)
Controls	Included							
Dynamic Instrument Variable	Included dependent variable at *t*-2							
Fixed Effects	*Firm* and *Year*							
Robust Standard Errors	Arellano heteroskedasticity-consistent							

Panel J.2.

Dynamic GMM Estimation for the Asymmetry in the Measurement of Ability and Business Outcomes

	Dep. var: ***Income Smoothing***$_{j,t}$				Dep. var: ***Tax Avoidance***$_{j,t}$				Dep. var: ***lnTotal Compensation***$_{j,t}$			
Coef. *Ability Measure* =	*Ranked Decile*		*Estimated Raw*		*Ranked Decile*		*Estimated Raw*		*Ranked Decile*		*Estimated Raw*	
(t-stat.)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ability$_{j,t-1}$	0.088***	-0.030	0.124	-0.145	0.008**	-0.005	0.009	-0.006	0.076***	-0.018	0.190***	0.027
	(2.614)	(-0.410)	(1.456)	(-0.641)	(2.371)	(-0.939)	(1.627)	(-0.690)	(2.842)	(-0.396)	(3.265)	(0.274)
$\Delta lnRev_{j,t}$*$Ability_{j,t-1}$		0.006		0.015		0.026*		0.062*		0.486***		1.177***
		(0.047)		(0.054)		(1.692)		(1.916)		(2.708)		(3.668)
$Dec_{j,t}$*$Ability_{j,t-1}$		-0.005		0.044		0.006		0.026		0.046		0.003
		(-0.057)		(0.234)		(0.437)		(1.149)		(0.927)		(0.026)
$\Delta lnRev_{j,t}$*$Dec_{j,t}$*$Ability_{j,t-1}$		-0.066		-0.068		-0.175*		-0.185***		-0.576**		-1.568***
		(-0.174)		(-0.112)		(-1.903)		(-3.203)		(-2.106)		(-3.019)
$lnRet_{j,t}$*$Ability_{j,t-1}$		0.077		0.264		-0.009		-0.012		-0.023		-0.226
		(0.599)		(0.685)		(-1.002)		(-0.548)		(-0.220)		(-1.102)
$Neg_{j,t}$*$Ability_{j,t-1}$		0.289***		0.454**		0.012		-0.001		0.030		-0.053
		(3.400)		(2.015)		(1.201)		(-0.065)		(0.611)		(-0.597)
$lnRet_{j,t}$*$Neg_{j,t}$*$Ability_{j,t-1}$		0.136		-0.223		0.032**		0.033		-0.065		-0.147
		(0.706)		(-0.485)		(2.008)		(1.335)		(-0.459)		(-0.503)
$DepVar_{j,t-1}$	0.295***	0.295***	0.295***	0.295***	0.768***	0.768***	0.769***	0.769***	0.154***	0.156***	0.153***	0.155***
	(8.937)	(8.935)	(8.939)	(8.939)	(7.581)	(7.574)	(7.583)	(7.582)	(4.392)	(4.459)	(4.360)	(4.416)
Controls	Included											
Dynamic Instrument Variable	Included dependent variable at *t*-2											
Fixed Effects	*Firm* and *Year*											
Robust Standard Errors	Arellano heteroskedasticity-consistent											
N	88,785				66,033				28,190			

Panel J.3.

Dynamic GMM Estimation for the Asymmetry in the Measurement of Ability and Credit Ratings

Coef. (t-stat.)	*Ability Measure* = *N*=71,101	Dep. var: ***lnCredit Scores***$_{j,t}$					
		Ranked Decile			*Estimated Raw*		
		(1)	(2)	(3)	(4)	(5)	(6)
Ability$_{j,t-1}$		0.023***	0.004	-0.022*	0.006	-0.087***	-0.048*
		(2.612)	(0.302)	(-1.890)	(0.286)	(-2.781)	(-1.867)
Rating-Trends$_{j,t}$				0.002***			0.002***
				(53.385)			(53.689)
ΔlnRev$_{j,t}$**Ability*$_{j,t-1}$			0.035*	0.071***		0.118***	0.137***
			(1.784)	(4.717)		(2.893)	(4.780)
Dec$_{j,t}$**Ability*$_{j,t-1}$			0.007	0.009		0.053**	0.036*
			(0.658)	(1.035)		(2.258)	(1.856)
ΔlnRev$_{j,t}$**Dec*$_{j,t}$**Ability*$_{j,t-1}$			-0.071*	-0.104***		-0.148*	-0.142***
			(-1.943)	(-6.138)		(-1.910)	(-5.493)
lnRet$_{j,t}$**Ability*$_{j,t-1}$			-0.010	0.010		0.074**	0.086***
			(-0.634)	(0.800)		(2.261)	(7.712)
Neg$_{j,t}$**Ability*$_{j,t-1}$			0.023**	0.021***		0.076***	0.064***
			(2.484)	(2.655)		(4.003)	(4.250)
lnRet$_{j,t}$**Neg*$_{j,t}$**Ability*$_{j,t-1}$			0.008	-0.030*		-0.117**	-0.147***
			(0.364)	(-1.687)		(-2.404)	(-6.378)
Controls		Included					
Dynamic Instrument Variable		Included dependent variable at *t*-2					
Fixed Effects		*Firm* and *Year*					
Robust Standard Errors		Arellano heteroskedasticity-consistent					