

Real and Accrual-based Earnings Management During Covid-19 Pandemic

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ABSTRACT

Prior studies have yielded mixed results regarding the effects of the COVID-19 pandemic on financial reporting quality. They have typically focused on specific types of earnings management. Given the relationships between alternative earnings management tools, this study examines the impact of the COVID-19 pandemic on earnings management behavior by comparing both accrual-based earnings management (AEM) and real earnings management (REM) between the pre-pandemic period (2016-2019) and the pandemic period (2020-2022). Our findings indicate that firms engaged in more income-increasing AEM and revenue-boosting REM during the pandemic period. However, they engaged in less costs-and-expenses-decreasing REM compared to the pre-pandemic period. We further found that the results mainly nest in the negatively affected industries. Our findings have implications for investors, market participants, and regulators interested in financial reporting quality during times of crisis.

Keywords: earnings management; real earnings management; accrual earnings management; COVID-19.

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1. Introduction

The COVID-19 pandemic significantly impacted businesses and financial reporting quality, distinct from those of the financial crisis researchers have studied, owing to their different origins and nature. First, the COVID-19 pandemic is a public health crisis caused by the spread of a novel coronavirus, resulting in widespread lockdowns, travel restrictions, and disruptions in economic activities due to health concerns. In contrast, the 2008 financial crisis led to widespread failures of financial institutions and raised concerns about the accuracy and transparency of financial reporting.

Second, the financial crisis, such as the 2008 financial crisis, and the COVID-19 pandemic impacted different groups of industries. The COVID-19 pandemic had a more targeted impact, with certain industries such as travel, hospitality, retail, and entertainment experiencing severe disruptions due to lockdown measures and reduced consumer spending. Other industries, such as healthcare, technology, and e-commerce, experienced varying impacts, including challenges and opportunities.

Third, the 2008 financial crisis exposed weaknesses in accounting and reporting practices, particularly related to fair value measurements, complex financial instruments, and off-balance sheet entities. However, during the COVID-19 pandemic, the main accounting and reporting challenges revolved around uncertainty in estimating provisions for bad debts, valuing impaired assets, assessing going concern assumptions, and providing adequate disclosures about the impact of the crisis on financial statements.

Fourth, the 2008 financial crisis prompted significant regulatory reforms aimed at strengthening financial reporting and enhancing transparency. These reforms included the Dodd-Frank Act in the United States and the adoption of International Financial Reporting Standards (IFRS) in many jurisdictions. In contrast, the COVID-19 pandemic led to regulatory responses focused more on providing relief measures, such as extended reporting deadlines and relaxation of certain accounting requirements, to help businesses navigate the crisis.

Previous studies on the impact of the COVID-19 pandemic on financial reporting quality have focused on discretionary accruals and found mixed evidence using US samples and international samples. For example, Lassoued and Khanchel (2021) and Khanchel and Lassoued (2022) documented income-increasing earnings management in the European and USA markets. However, Liu and Sun (2022) found income-decreasing earnings management in the USA market. Ali et al. (2022) found lower levels of earnings management in twelve countries.

The earnings management literature indicates that firms may practice accrual-based earnings management (AEM) and real earnings management (REM) as substitutes or complements (e.g., Roychowdhury 2006; Gunny 2010; Zang 2012; Kothari et al. 2016). Therefore, we can't fully understand firms' earning management behavior by looking into only AEM or REM. In this study, we further examine the impact of the COVID-19 pandemic on earnings management practices by comparing the levels of AEM and REM in the pre-pandemic period (2016-2019) and the pandemic period (2020-2022). We examine a more extended pandemic period compared to the previous studies because the federal Public Health Emergency for COVID-19 started on January 31, 2020, and expired on May 11, 2023 in USA. We estimated discretionary accruals as a proxy for AEM, using the cross-sectional modified Jones model, adjusted for prior-year performance (Dechow et al., 1995; Kothari et al., 2005). Following

Roychowdhury (2006), we estimated the abnormal levels of cash flow from operations, production costs, and discretionary expenses as REM proxies.

We found that there are significantly higher positive discretionary accruals during the pandemic period compared to the pre-pandemic period. Furthermore, firms offer more deep discounts and lenient credit during the pandemic. The results suggest that US firms practiced more income-increasing AEM and revenue-boosting REM during the pandemic. However, we also found that firms reported significantly lower abnormal production costs but higher abnormal discretionary expenses. That suggests that US firms engaged in less cost-and-expenses-decreasing REM during the pandemic than in the pre-pandemic period. We further separated the positively and negatively affected industries into two subsamples. We found that the results mainly exist in the negatively affected subsample. It confirmed that firms under financial pressure are more likely to engage in earnings management. Our study contributes to the accounting literature and complements the strand of literature on the discretionary use of alternative earnings management techniques during a crisis.

Section 2 reviews related financial reporting and earning management literature. Section 3 describes our research design. Section 4 presents sample selection, descriptive statistics, empirical results, and robustness tests. Section 5 concludes this study. The Appendix provides a description of key variables.

2. Literature Review and Hypotheses Development

This study is closely related to two strands of accounting literature: research on the effects of the COVID-19 pandemic on financial reporting and research on the relationship between AEM and REM.

Earnings Management and COVID-19

Earnings management involves manipulating a company's financial results to meet or exceed expectations, often to satisfy investors, lenders, or other stakeholders. Firms may manage earnings through either or both AEM and REM. REM involves manipulating real economic activities to influence financial results, such as postponing projects or delaying payments to boost earnings. AEM involves manipulating accrual accounts, like accounts receivable and inventory, to boost or smooth earnings. For example, companies can recognize revenue early or delay expense recognition.

Khanchel and Lassoued (2022) examined AEM using a sample of 536 US firms during the 2017–2021 period. They found an income-increasing practice for both socially responsible firms and control firms during the pandemic period. However, Liu and Sun (2022) reported opposite findings, suggesting a significant decline in discretionary accruals from 2019 to 2020, indicating more income-decreasing earnings management to take a big bath in reporting earnings during the pandemic year. Jordan et al. (2021) found no compelling evidence of overall AEM in 2020.

Studies looking at international markets also found mixed results. For example, Ali et al. (2022) reported that firms tended to engage less in AEM during the pandemic period using a sample of 5,519 firms listed in the Group of Twelve countries during 2015–2020. In contrast, Lassoued and Khanchel (2021), focusing on a sample of 2,031 firms listed in 15 European countries, indicated that the sample firms tended to manage earnings upward to rebuild investor and stakeholder confidence needed to support the economic recovery during the pandemic period compared to the preceding period. Taylor et al. (2023) found that earnings management had significantly increased during the pandemic years using a sample of listed European banks.

Relation of AEM and REM

Managers use both AEM and REM to manage earnings. AEM involves the choice of accounting methods, while REM involves changing the firm's underlying operations to boost current-period earnings. Managers make trade-off decisions between AEM and REM based on the costs and constraints of each strategy, suggesting a substitution relationship between AEM and REM (e.g., Ewert and Wagenhofer 2005; Cohen et al. 2008; Badertscher 2011; Braam et al. 2015). Moreover, there is evidence of a positive relationship between predicted REM and AEM, suggesting managers may jointly use REM and AEM to manage earnings (Zang, 2012).

AEM has costs including the one-to-one reduction of future earnings and the cost of detection. Future earnings are eroded as a result of accelerating net income to the current period. The cost of detection refers to (1) the decline in a firm's stock price that results when the market discovers fraud (Palmrose et al., 2004); and (2) the loss of reputation that often accompanies aggressive earnings management (Desai et al., 2006). Prior studies (Graham et al. 2005; Cohen et al. 2008; Chi et al. 2011) suggested that AEM has a higher detection cost than REM. Moreover, AEM is constrained by high-quality auditors, low accounting system flexibility, the provision of cash flow forecasts, operating in the post-SOX environment, and political connections (e.g., Cohen et al. 2008; Badertscher 2011; Chi et al. 2011; McInnis and Collins 2011; Zang 2012; Abernathy et al. 2014; Braam et al. 2015).

REM occurs when managers deviate from optimal business decisions, potentially negatively affecting long-term operating profitability and thus future firm value (e.g., Gunny 2010; Taylor and Xu 2010; Zang 2012; Filip et al. 2015; Kothari et al. 2016; Vorst 2016). For example, managers improperly cut R&D or advertising expenditures which negatively affect future profitability. The negative impact of REM on future operating performance varies depending on various incentives to engage in REM, as well as other factors that affect its associated costs and benefits (Vorst, 2016). REM is constrained by higher tax rates, poor financial conditions, high levels of institutional ownership, and low industry market share (Roychowdhury 2006; Zang 2012; Abernathy et al. 2014).

In summary, prior studies have focused on AEM and found mixed evidence on the impact of the COVID-19 pandemic on financial reporting quality. This study further investigates the impact of the pandemic on earnings management by examining both AEM and REM in the extended pandemic period of 2020-2022 compared to the pre-pandemic period of 2016-2019.

Hypothesis Development

The motivations for earnings management include: (1) meeting expectations of investors, analysts, or financial stakeholders to maintain or improve the company's stock price, attract investors, and preserve market confidence, (2) achieving specific performance targets tied to executive or employee compensation, (3) avoiding negative consequences, such as loan defaults, credit rating downgrades, or increased borrowing costs, (4) minimizing tax liabilities.

The COVID-19 pandemic had immediate impacts on businesses due to the sudden and unprecedented nature of the crisis, resulting in widespread economic disruptions, including recessions and contractions in many countries. Many businesses experienced a significant decline in revenue due to reduced consumer spending, temporary closures, travel restrictions, and decreased demand for non-essential goods and services. This decline in revenue put a strain on businesses' cash flow and profitability.

With reduced revenue and uncertain market conditions, businesses faced cash flow challenges. They had difficulty in generating sufficient cash inflow to cover operational expenses, such as rent, payroll, utilities, and loan repayments. Cash flow issues could lead to difficulties in meeting financial obligations and day-to-day operational needs.

Businesses incurred additional costs to implement health and safety measures required to protect employees and customers from Covid-19. These measures included purchasing personal protective equipment (PPE), implementing social distancing protocols, enhancing sanitation practices, and modifying workspaces. These increased operating costs strained businesses' budgets.

Disruptions in global supply chains affected businesses' ability to source raw materials, components, and finished goods. This led to delays, shortages, and increased costs. Businesses had to find alternative suppliers or adjust their production processes, potentially impacting profitability and operational efficiency.

The pandemic made it challenging for businesses to access financing options. Lenders became more cautious due to the uncertain economic conditions, resulting in stricter lending requirements. Many small businesses and startups faced difficulties obtaining loans or securing additional capital to support their operations and expansion plans. These financial challenges resulted in business closures, layoffs, cost-cutting measures, and in some cases, bankruptcies. To survive, managers may seek to manage earnings to meet investor expectations or alleviate financial pressures, preserve market confidence, meet compensation goals, and avoid negative consequences.

The availability of government relief programs during the pandemic also could have influenced companies' financial reporting decisions. Some companies may have managed their earnings to meet eligibility criteria for financial assistance or to maximize the benefits received from such programs. But as a condition for accessing these programs, businesses were often required to maintain transparency and accurate financial reporting, limiting the scope for earnings management practices.

Moreover, the pandemic's impact on business operations and market conditions may have necessitated significant accounting adjustments, such as impairments, inventory write-downs, or restructuring charges. These adjustments could have provided opportunities for management discretion and potential manipulation of reported earnings. However, the pandemic drew heightened attention from investors, regulators, and the public on companies' financial performance and reporting. Increased scrutiny and awareness of potential earnings management practices could have acted as a deterrent for some companies.

In the first two quarters of 2020, companies faced unprecedented challenges. Many companies are on the edge of missing earnings projections made before the arrival of and economic devastation caused by the coronavirus pandemic. There may be a temptation to assume that earnings shortfalls attributed to COVID-19 will be less likely to cause stock price disruption than they otherwise might, leading companies to increase accruals and reserves more generously than they might have otherwise thought necessary during more normal times. However, this hindsight bias can make legitimate actions, such as increasing reserves due to a legitimate fear of the pandemic's impact on future results, appear as if creating a cookie jar reserve. Conversely, failure to acknowledge the risks of COVID-19 on one's future business could result in under-reserving, which could be equally suspect.

Therefore, it is unclear to what extent AEM occurred during the pandemic. We posited our first hypotheses as:

H1: Firms engage in more AEM during the COVID-19 pandemic than during the pre-pandemic period.

The pandemic caused widespread disruptions in business operations, including temporary closures, supply chain interruptions, and reduced consumer demand. These disruptions limited companies' ability to engage in REM practices involving manipulating real economic activities, such as production levels, inventory management, and capital expenditure decisions. The pandemic significantly impacted consumer behavior and demand patterns, with some industries experiencing increased demand for essential goods and services while others faced reduced consumer spending. This shift in consumer behavior made it challenging for companies to engage in REM practices to manipulate sales or production levels.

More importantly, during the pandemic, many businesses had to prioritize survival and recovery over short-term earnings management strategies. The focus shifted to adapting to changing market conditions, maintaining liquidity, and ensuring business continuity. Companies had to make strategic decisions based on long-term viability rather than short-term earnings manipulation.

While the pandemic may have limited opportunities for REM in certain areas, it can still occur in specific situations or industries where there is room for manipulation. Therefore, we posited our second hypotheses as:

H2: Firms engage in more REM during the COVID-19 pandemic than during the pre-pandemic period.

3. Research Design

3.1 Variable Definition

Measures of Accrual Earnings Management

Following Dechow et al. (1995) and Kothari et al. (2005), we estimated discretionary accruals as proxy of AEM, using cross-sectional modified Jones model, adjusted for prior year performance. The models are:

$$TA_t = a_1(1/ASSET_{t-1}) + a_2(\Delta SALES_t - \Delta AR_t) + a_3PPE_t + a_4ROA_{t-1} + \varepsilon_t \quad (1)$$

$$DA_t = TA_t - [a_1(1/ASSET_{t-1}) + a_2(\Delta SALES_t - \Delta AR_t) + a_3PPE_t + a_4ROA_{t-1}] \quad (2)$$

where TA_t is total accruals (earnings before extraordinary items minus net cash flow from operations), $\Delta SALES_t$ is change in net sales, ΔAR_t is change in net accounts receivable, PPE_t is net property, plant, and equipment, and ROA_{t-1} is the lagged rate of return on total assets. TA_t , $\Delta SALES_t$, ΔAR_t , and PPE_t are scaled by lagged total assets $ASSET_{t-1}$. Firm subscripts are omitted for simplicity. The a_1 , a_2 , a_3 , and a_4 in model (2) are the coefficient estimates of the model (1) by industry and year. DA_t is the estimated discretionary accruals. We used the absolute value of discretionary accruals ($ABSDA$) as proxy of AEM.

Measurement of Real Earnings Management

Following Roychowdhury (2006), we examined the following manipulation of real activities: the abnormal levels of cash flow from operations (CFO), production costs (Prod) and discretionary expenses (DiscExp) to study the level of real activities manipulations. First, we estimated the normal levels of CFO, discretionary expenses, and production costs using the model developed by Dechow et al. (1998) as

implemented in Roychowdhury (2006). To estimate this model, we ran the following cross-sectional regression for each industry and quarter:

$$\frac{CFO_t}{Assets_{t-1}} = k_{1t} \frac{1}{Assets_{t-1}} + k_2 \frac{Sales_t}{Assets_{t-1}} + k_3 \frac{\Delta Sales_t}{Assets_{t-1}} + \varepsilon_t \quad (3)$$

where CFO_t is cash flow from operations, $Sales_t$ is sales revenues, $\Delta Sales_t$ is change in sales revenues, and $Assets_{t-1}$ is lagged total assets. The abnormal level of CFO, R_CFO , is measured as the standardized residual from Equation (3).

Production costs are defined as the sum of COGS and change in inventory during the quarter. Following Roychowdhury (2006), we estimated the normal level of production costs using the following equation:

$$\frac{Prod_t}{Assets_{t-1}} = k_{1t} \frac{1}{Assets_{t-1}} + k_2 \frac{Sales_t}{Assets_{t-1}} + k_3 \frac{\Delta Sales_t}{Assets_{t-1}} + k_4 \frac{\Delta Sales_{t-1}}{Assets_{t-1}} + \varepsilon_t \quad (4)$$

where $Prod_t$ is production costs, which is the sum of the cost of goods sold in year t and the change in inventory from t-1 to t. The abnormal level of Prod, R_PROD , is measured as the standardized residual from Equation (4).

Also following Roychowdhury (2006), we estimated the normal level of discretionary expenditures using the following equation:

$$\frac{DiscExp_t}{Assets_{t-1}} = k_{1t} \frac{1}{Assets_{t-1}} + k_2 \frac{Sales_{t-1}}{Assets_{t-1}} + \varepsilon_t \quad (5)$$

where is $DiscExp_t$ the discretionary expenditures, which is the sum of R&D, advertising, and SG&A expenditures. The abnormal level of DiscExp, R_DISX , is measured as the standardized residual from Equation (5).

We used these three variables (R_CFO , R_PROD , R_DISX) as proxies for real earnings management and aggregated the three real activities manipulation measures into one proxy, RAM ($-R_CFO + R_PROD - R_DISX$), by taking their sum.

3.2 Regression Model

Covid-19 Pandemic and AEM

We first examined H1 and investigated the effect of the Covid-19 pandemic on discretionary accruals with model (6). If H1 is true, β_1 in model (6) shall be significantly different from zero. We expect β_1 is positive.

$$DA_t = \beta_0 + \beta_1 Covid + \beta_2 REM + \beta_3 LEV + \beta_4 LMVE + \beta_5 MTB + \beta_6 E + \beta_7 ROA + \gamma Industry + \varepsilon \quad (6)$$

where DA is performance-adjusted discretionary accruals (we used its absolute values noted as $ABSDA$, positive values noted as $+DA$, or negative values noted as $-DA$); $Covid$ is 1 if the firm quarter observation is in the pandemic period, and 0 otherwise. Following prior studies (Becker et al., 1998; Johnson et al., 2002; Myers et al., 2003; Menon and Williams, 2004; Chen et al. 2008; Zang, 2012), we control for REM, financial risk, growth, size, and profitability. REM is the sum of the three standardized REM proxies, i.e., R_CFO , R_PROD and R_DISX ; LEV is total liabilities divided by total assets of the prior year; $LMVE$ is the logarithm value of market value of equity of the prior year; MTB is the market to book value of the prior year; E refers to the change in earnings scaled by total assets in the prior year; ROA is the return on asset of the prior year.

Company and time subscripts are suppressed. In the pandemic period, different industries experienced varying impacts. For example, travel, hospitality, and tourism sectors were hit particularly hard due to travel restrictions and reduced consumer spending. On the other hand, e-commerce, online services, and delivery businesses witnessed increased demand. Therefore, we included dummy variables of industries in model (6).

Covid-19 Pandemic and REM

We then tested H2 and examined the effect of the Covid-19 pandemic on REM practices with model (7). If H2 is true, θ_1 in model (7) shall be significantly different from zero. We expect θ_1 is positive.

$$REM_i = \theta_0 + \theta_1 Covid + \theta_2 ABSDA + \theta_3 LEV + \theta_4 LMVE + \theta_5 MTB + \theta_6 E + \theta_7 ROA + \gamma \cdot Industry + \epsilon \quad (7)$$

where *REM* represents the three real earnings management metrics, *R_CFO*, *R_PROD*, and *R_DISX*, and the aggregate matrix *REM*; *Covid* is 1 if the firm quarter observation is in the pandemic period, and 0 otherwise. Following prior studies (Press and Weintrop, 1990; DeFond and Jiambalvo, 1994; Becker et al., 1998; Chung et al., 2002), the control variables include AEM proxy (*ABSDA*) and the company's characteristics that have found associations with real earnings management, including financial risk, growth, size, and profitability. *ABSDA* is absolute performance-adjusted discretionary accruals. It measures the magnitude of AEM regardless of whether it is upward or downward AEM. The other control variables are defined the same as in model (6).

4. Empirical Results

4.1 Sample Selection and Descriptive Statistics

Sample Selection

We began with all the companies in the COMPUSTAT North America Annual database from 2016 to 2022 because the tests require data availability in the previous two years. Financial institutions (SIC codes between 6011 and 6712) were excluded due to their special regulations. We further excluded all firm-year observations without information on total assets. All continuous variables were winsorized at the 1st and 99th percentiles to reduce the effect of outliers. The final sample consists of 35,876 firm-years, as shown in Table 1.

Table 1 Sample Selection

	All firm-year observations during 2016-2022 on COMPUSTAT North America Annual Database	87,838
Less:	Observations of financial institutions (SIC between 6011 and 6712)	14,165
	Observations with missing data for key variables	28,371
	Trim all continuous variables at level 1% and 99%	9,426
	Final Sample	35,876

Descriptive Statistics

Table 2 provides descriptive statistics for the variables used in hypothesis tests and described in the Appendix. Discretionary accruals (DA) have a mean of 0.688 and a median of 0.727. The absolute values of DA have a mean of 0.966 and a median of 0.730. Despite winsorizing at 1% and 99%, standard deviations indicate the presence of outliers. We tested different winsorization measures and found that the results are robust to alternative measures. The aggregate measure of REM has a mean of 1.713 and a median of 1.458, with a moderate standard deviation of 2.094. Abnormal cash flows from operations (R_CFO) have a mean of -0.468 and a median of -0.604. Abnormal production costs (R_PROD) have a mean of 0.306 and a median of -0.010. Abnormal discretionary expenses (R_DISX) have a mean of 1.873 and a median of 2.102. The test variable, Covid, has a mean of 0.419, indicating that 41.9% of firm-year observations are in the pandemic period (2020-2022) and 58.1% are in the pre-pandemic period (2016-2019). Control variables include leverage ratio, market value of stockholders' equity, market-to-book value, earnings changes, and return on assets, with descriptive statistics consistent with prior literature.

Table 2 Descriptive Statistics (N=35,876)

Variable	Mean	S.D.	Q1	Median	Q3
<i>Dependent Variables:</i>					
<i>ABSDA</i>	0.966	14.454	0.674	0.730	0.793
<i>DA</i>	0.688	14.470	0.670	0.727	0.789
<i>REM</i>	1.713	2.094	1.172	1.458	2.012
<i>R_CFO</i>	-0.468	1.500	-0.754	-0.604	-0.400
<i>R_PROD</i>	0.306	1.350	-0.396	-0.010	0.615
<i>R_DISX</i>	1.873	1.306	1.799	2.102	2.220
<i>Test Variable:</i>					
<i>Covid</i>	0.419	0.493	0	0	1
<i>Control Variables:</i>					
<i>LEV</i>	0.775	2.090	0.273	0.504	0.703
<i>LMVE</i>	5.767	2.596	3.835	5.887	7.712
<i>MTB</i>	2.967	8.300	0.853	1.857	3.888
<i>E</i>	0.033	0.859	-0.058	0.001	0.047
<i>ROA</i>	-0.238	0.903	-0.238	-0.009	0.053

Note: Appendix provides variables definitions.

Pearson Correlation

Table 3 displays the correlations of dependent variables, the test variable (Covid), and control variables. The test variable, Covid, shows insignificant correlations with discretionary accruals and the absolute value of discretionary accruals, indicating no abnormal practice of AEM during the pandemic period. However, Covid is significantly and negatively related to proxies of aggregate real earnings management, abnormal production costs, and abnormal discretionary expenses, suggesting firms engage in less REM during the pandemic. Specifically, firms produced less but incurred more discretionary expenditures. On the other hand, Covid is significantly and positively related to abnormal cash flow from operations, suggesting that firms offered more lenient credit and deep discounts to promote sales.

Table 3 Pearson Correlation

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.DA	1.000										
2.ABSDA	-0.985*** <i><.0001</i>	1.000									
3.REM	-0.245*** <i><.0001</i>	0.288*** <i><.0001</i>	1.000								
4.R_CFO	-0.141*** <i><.0001</i>	0.144*** <i><.0001</i>	0.474*** <i><.0001</i>	1.000							
5.R_PROD	-0.251*** <i><.0001</i>	0.249*** <i><.0001</i>	0.650*** <i><.0001</i>	-0.040*** <i><.0001</i>	1.000						
6.R_DISX	0.028*** <i><.0001</i>	0.041*** <i><.0001</i>	0.394*** <i><.0001</i>	-0.369*** <i><.0001</i>	0.055*** <i><.0001</i>	1.000					
7.COVID	0.004 <i>0.5126</i>	-0.003 <i>0.5276</i>	-0.035*** <i><.0001</i>	0.013** <i>0.0106</i>	-0.058*** <i><.0001</i>	-0.011** <i>0.0318</i>	1.000				
8.LEV	-0.006 <i>0.3038</i>	0.049*** <i><.0001</i>	0.128*** <i><.0001</i>	0.058*** <i><.0001</i>	0.077*** <i><.0001</i>	0.059*** <i><.0001</i>	-0.021*** <i><.0001</i>	1.000			
9.LMVE	-0.001 <i>0.8063</i>	-0.025*** <i><.0001</i>	-0.061*** <i><.0001</i>	-0.109*** <i><.0001</i>	-0.026*** <i><.0001</i>	0.054*** <i><.0001</i>	0.070*** <i><.0001</i>	-0.203*** <i><.0001</i>	1.000		
10.MTB	-0.003 <i>0.6227</i>	-0.008 <i>0.1554</i>	-0.076*** <i><.0001</i>	0.008 <i>0.1451</i>	-0.045*** <i><.0001</i>	0.086*** <i><.0001</i>	0.028*** <i><.0001</i>	-0.120*** <i><.0001</i>	0.161*** <i><.0001</i>	1.000	
11.E	0.067*** <i><.0001</i>	-0.034*** <i><.0001</i>	-0.000 <i>0.9781</i>	-0.020*** <i>0.0002</i>	-0.020*** <i>0.0002</i>	0.044*** <i><.0001</i>	-0.011** <i>0.0407</i>	0.160*** <i><.0001</i>	-0.063*** <i><.0001</i>	-0.017*** <i>0.0011</i>	1.000
12.ROA	0.100*** <i><.0001</i>	-0.111*** <i><.0001</i>	-0.100*** <i><.0001</i>	-0.300*** <i><.0001</i>	-0.079*** <i><.0001</i>	0.272*** <i><.0001</i>	0.022*** <i><.0001</i>	-0.532*** <i><.0001</i>	0.318*** <i><.0001</i>	0.084*** <i><.0001</i>	0.074*** <i><.0001</i>

Note: a. Italic numbers represent *p*-values.

b. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively (two-tailed).

c. Appendix defined the variables.

Furthermore, the dependent variables are significantly related to the six control variables, including the AEM/REM proxy, leverage ratio, market value of equity, market-to-book ratio, earnings changes, and return on assets. REM is significantly and negatively related to discretionary accruals and positively related to the absolute value of discretionary accruals, suggesting firms may use upward AEM when reducing REM. Five AEM and REM proxies, except for DA, are significantly related to the leverage ratio and market value of equity. REM and R_PROD are significantly and negatively related to the market-to-book ratio, while R_DISX is significantly and negatively related to the ratio. Additionally, five AEM and REM proxies, except for aggregate REM proxy, are significantly related to the earnings-changes ratio. All six AEM and REM proxies are significantly related to return on assets.

4.2 Empirical Results

The impact of the Covid-19 Pandemic on AEM

Table 4 Accrual Earnings Management in Pre-Pandemic and Pandemic Periods

	ABSDA	DA	DA+	DA-
Intercept	-3.1649** ($<.0001$)	4.8275*** ($<.0001$)	0.7285*** ($<.0001$)	9.0292 (0.2553)
Covid	0.1898 (0.2169)	-0.0877 (0.5724)	0.0563*** ($<.0001$)	1.8375 (0.7634)
<i>Control</i>				
REM	1.9250*** ($<.0001$)	-1.6665*** ($<.0001$)	0.1544*** ($<.0001$)	-8.1087*** ($<.0001$)
LEV	-0.2590*** ($<.0001$)	0.5322*** ($<.0001$)	0.1653*** ($<.0001$)	0.4556 (0.4248)
LMVE	0.0808*** (0.0093)	-0.1932*** ($<.0001$)	-0.0507*** ($<.0001$)	-0.9596 (0.5346)
MTB	0.0274*** (0.0028)	-0.0286*** (0.0021)	-0.0001 (0.8521)	-0.3108 (0.1225)
E	-0.3004*** (0.0009)	0.7038*** ($<.0001$)	0.1930*** ($<.0001$)	1.2335 (0.3953)
ROA	-1.7031*** ($<.0001$)	2.0011*** ($<.0001$)	0.0390*** (0.0010)	0.9268 (0.3925)
N	35876	35876	32721	3155
Adj. R ²	0.0920	0.0753	0.1845	0.3307
F	482.21	387.59	1052.71	51.74

Note:

- Numbers in parentheses represent p -values. Coefficients on industry dummies omitted for simplified exhibition.
- ***, **, * indicate significance at the 1%, 5% and 10% level, respectively (two-tailed); We used the two-way cluster-robust standard errors (cluster by firm and by year) to adjust for both cross-sectional and time-series dependences in our data (Petersen 2009; Gow et al. 2010).
- Appendix defined the variables.

Table 4 presents the OLS regression results of H1 (model 6). When the absolute value of discretionary accruals and discretionary accruals are the dependent variables, the coefficients of Covid are insignificant from zero, consistent with our observations in the correlations. However, when investigating further using subsamples of positive discretionary accruals and negative discretionary accruals, the coefficient of Covid is significant and positive when the

dependent variable is positive discretionary accruals. These results suggest that firms practiced a higher level of income-increasing AEM during the pandemic period.

The impact of the Covid-19 Pandemic on REM

Table 5 Real Earnings Management in Pre-Pandemic and Pandemic Periods

	REM	R_CFO	R_PROD	R_DISX
Intercept	1.7870*** ($<.0001$)	-0.5044*** ($<.0001$)	0.3105*** ($<.0001$)	1.9809*** ($<.0001$)
Covid	-0.1259*** ($<.0001$)	0.0570*** (0.0004)	-0.1567*** ($<.0001$)	-0.0262* (0.0514)
<i>Control</i>				
ABSDA	0.0415*** ($<.0001$)	0.0119*** ($<.0001$)	0.0229*** ($<.0001$)	0.0066*** ($<.0001$)
LEV	0.1071*** ($<.0001$)	-0.1053*** ($<.0001$)	0.0340*** ($<.0001$)	0.1784*** ($<.0001$)
LMVE	-0.0165*** (0.0003)	-0.0139*** ($<.0001$)	0.0061** (0.0383)	-0.0086*** (0.0016)
MTB	-0.0149*** ($<.0001$)	0.0042*** ($<.0001$)	-0.0061*** ($<.0001$)	-0.0130*** ($<.0001$)
E	-0.0265** (0.0472)	0.0625*** ($<.0001$)	-0.0326*** (0.0002)	-0.0563*** ($<.0001$)
ROA	0.0041 (0.7854)	-0.5968*** ($<.0001$)	-0.0293*** (0.0030)	0.6308*** ($<.0001$)
N	35876	35876	35876	35876
Adj. R ²	0.1013	0.1153	0.0712	0.1433
F	536.30	623.11	365.19	799.55

Note:

- Numbers in parentheses represent *p*-values. Coefficients on industry dummies omitted for simplified exhibition.
- ***, **, * indicate significance at the 1%, 5% and 10% level, respectively (two-tailed); We used the two-way cluster-robust standard errors (cluster by firm and by year) to adjust for both cross-sectional and time-series dependences in our data (Petersen 2009; Gow et al. 2010).
- Appendix defined the variables.

Table 5 presents the OLS regression results of H2 (model 7). When the dependent variable is aggregate REM proxy, the coefficient of Covid is significantly negative, suggesting that firms engaged less in REM during the pandemic period. When using the individual REM proxies, the coefficients of Covid are significantly negative only in the regressions of R_PROD and R_DISX at 1% and 10% respectively. The coefficient is significantly positive in the regression of R_CFO. These results suggest that firms extended lenient credit and deep discounts to promote sales but reduced production and incurred more discretionary expenditures during the pandemic period. It is probably driven by the additional expenditures of government-required COVID measures and the high risk of overproduction because of slow markets. Most of the control variables have significant and consistent coefficients in both Table 4 and Table 5.

REM and AEM in Most Affected Industries

The pandemic has affected industries differently. Some industries experienced significant growth in demand and thus were positively affected. For example, with remote work and

increased reliance on digital solutions, technology companies providing communication tools and remote work software experienced a surge in demand. With restrictions on in-person shopping and consumers turning to online shopping for safety reasons, e-commerce platforms and online retailers experienced significant growth in sales. Other positively affected industries include pharmaceuticals and healthcare, streaming services and digital entertainment, remote work, and collaboration tools. At the same time, some industries experienced significant declines in demand and thus were negatively affected. For example, airlines, hotels, cruise lines, and tour operators faced significant declines in revenue due to travel restrictions, lockdowns, and consumer reluctance to travel. Restaurants, bars, cafes, and catering services were negatively impacted by restrictions on indoor dining, reduced capacity, and consumer concerns about dining out. Other negatively affected industries include brick-and-mortar retail, entertainment and events, automotive. We expect firms in those negatively affected industries to be more motivated to manage earnings because of the financial stress and operating challenges.

Table 6 presents the AEM empirical results in positively and negatively affected industries during the pre-pandemic and pandemic periods. The positively affected industries include computer-related business (SIC7371-7379), Business Services (SIC7389), e-commerce platforms and online retailers (SIC5961-5963), pharmaceuticals and healthcare (SIC2833-2836, 8099), streaming services and digital entertainment (SIC4841), remote work, and collaboration tools (SIC4899). The negatively affected industries include airlines (SIC4512-4513, 4522, 4581), hospitality (SIC7011, 7022, 7032, 7033, 7041, 5812, 5813,), water transportation and cruise lines (SIC4412, 4424, 4432, 4449, 4481, 4482, 4489, 4491-4493, 4499), brick-and-mortar retail (SIC5311, 5331, 5399, 5611, 5621, 5632, 5641, 5651, 5661, 5699), entertainment and events (SIC7832, 7929, 7911, 7922, 7933, 7941, 7948, 7991, 7996, 7997, 7999), automotive (SIC5012-5015, 5511, 5521, 5531, 5541, 5551, 5561, 5571, 5599). The coefficient of *Covid* is significantly positive in the subsample of negatively affected industries when absolute discretionary accrual is the dependent variable. The absolute discretionary accruals measure only AEM magnitude while discretionary accruals measure both AEM magnitude and the direction. The results suggest that the negatively affected firms engage in more AEM in both directions.

Table 6 Accrual Earnings Management in Pre-Pandemic and Pandemic Periods

	Positively Affected		Negatively Affected	
	ABSDA	DA	ABSDA	DA
Intercept	-7.3443** ($<.0001$)	9.4825*** ($<.0001$)	0.7176*** ($<.0001$)	0.8691 ($<.0001$)
Covid	0.1641 (0.8138)	-0.1738 (0.8026)	0.0338*** (0.0029)	0.0134 (0.2478)
<i>Control</i>				
REM	3.1599*** ($<.0001$)	-3.1659*** ($<.0001$)	0.0362*** ($<.0001$)	-0.0245*** (0.0003)
LEV	-0.5874*** (0.0015)	0.7210*** ($<.0001$)	-0.0350*** (0.0004)	-0.0044 (0.6563)
LMVE	0.4228*** (0.0109)	-0.5239*** (0.0016)	-0.0053*** (0.0409)	-0.0166 ($<.0001$)
MTB	0.0181 (0.6275)	-0.0188 (0.6138)	-0.0008 (0.2515)	-0.0003 (0.6793)
E	-1.7221*** ($<.0001$)	0.2064*** ($<.0001$)	0.0089*** (0.4287)	0.0439 (0.0001)
ROA	-5.1532*** ($<.0001$)	5.4519*** ($<.0001$)	-0.1536*** ($<.0001$)	0.5904 ($<.0001$)
N	6971	6971	1296	1296
Adj. R ²	0.1543	0.1591	0.0692	0.3333
F	181.48	188.22	13.68	91.99

Note:

- a. Numbers in parentheses represent p -values. Coefficients on industry dummies omitted for simplified exhibition.
- b. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively (two-tailed); We used the two-way cluster-robust standard errors (cluster by firm and by year) to adjust for both cross-sectional and time-series dependences in our data (Petersen 2009; Gow et al. 2010).
- c. Appendix defined the variables.

Table 7 Real Earnings Management in Pre-Pandemic and Pandemic Periods**Panel A Positively Affected Industries.**

	REM	R_CFO	R_PROD	R_DISX
Intercept	1.4103*** (<.0001)	-0.5683*** (<.0001)	0.2801*** (<.0001)	1.6998*** (<.0001)
Covid	-0.1626*** (0.0367)	-0.0296 (0.6563)	-0.1265*** (0.0002)	-0.0078 (0.8127)
<i>Control</i>				
ABSDA	0.0395*** (<.0001)	0.0110*** (<.0001)	0.0228*** (<.0001)	0.0057*** (<.0001)
LEV	0.0645*** (0.0018)	-0.1295*** (<.0001)	0.0999*** (<.0001)	0.0942*** (<.0001)
LMVE	-0.0141 (0.4474)	0.1667*** (0.2930)	-0.0394** (<.0001)	0.0085 (0.2806)
MTB	-0.0102*** (0.0140)	0.0030 (0.4004)	-0.0023 (0.2082)	-0.0110*** (<.0001)
E	0.0087 (0.8380)	0.0778*** (0.0320)	-0.0309*** (0.0926)	-0.0382*** (0.0334)
ROA	0.0162 (0.7362)	-0.8201*** (<.0001)	0.0246 (0.2379)	0.8126*** (<.0001)
N	6971	6997	6971	6997
Adj. R ²	0.1329	0.0848	0.2345	0.2265
F	152.46	92.53	304.65	292.32

Panel B Negatively Affected Industries

	REM	R_CFO	R_PROD	R_DISX
Intercept	1.2418*** (<.0001)	-0.8168*** (<.0001)	-0.0312 (0.8316)	2.0878*** (<.0001)
Covid	-0.3211*** (<.0001)	0.1114*** (<.0001)	-0.4331*** (<.0001)	0.0011 (0.9310)
<i>Control</i>				
ABSDA	0.6164*** (<.0001)	0.2211*** (<.0001)	0.4031*** (0.0046)	-0.0058 (0.8534)
LEV	0.1652*** (<.0001)	-0.0802*** (<.0001)	0.2546*** (<.0001)	-0.0091 (0.4119)
LMVE	0.0390*** (0.0003)	-0.0099*** (0.0010)	0.0420** (0.0017)	0.0070*** (0.0168)
MTB	0.0046*** (0.1288)	-0.0006 (0.4563)	0.0059*** (0.1150)	-0.0007 (0.3896)
E	-0.1989*** (<.0001)	0.0223*** (0.0842)	-0.2467*** (<.0001)	0.0256*** (0.0436)
ROA	-0.9185*** (<.0001)	-0.3653*** (<.0001)	-0.6879*** (<.0001)	0.1353*** (<.0001)
N	1296	1300	1296	1300
Adj. R ²	0.1615	0.2095	0.1174	0.0374
F	35.44	48.92	24.47	7.18

Note:

a. Numbers in parentheses represent *p*-values. Coefficients on industry dummies omitted for simplified exhibition.

b. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively (two-tailed); We used the two-way cluster-robust standard errors (cluster by firm and by year) to adjust for

both cross-sectional and time-series dependences in our data (Petersen 2009; Gow et al. 2010).

c. Appendix defined the variables.

Table 7 presents the REM empirical results in positively and negatively affected industries during the pre-pandemic and pandemic periods. For the subsample of positively affected industries, the coefficients of Covid are significantly negative when REM and R_PROD are the dependent variables. For the subsample of negatively affected industries, the coefficients of Covid are significantly negative when REM and R-PROD are the dependent variables but positive when R_CFO is the dependent variable. It suggests that the positively affected firms didn't engage in REM while the negatively affected firms offered lenient credit or deep discounts to increase revenues and incomes but didn't reduce costs of goods sold and discretionary expenditures.

4.3. Robustness Test

Use Discretionary Accruals as a Control Variable

Table 8 Real Earnings Management in Pre-Pandemic and Pandemic Periods

	REM	R CFO	R PROD	R DISX
Intercept	1.8652*** (<.0001)	-0.4797*** (<.0001)	0.3601*** (<.0001)	1.9848*** (<.0001)
Covid	-0.1238*** (<.0001)	0.0578*** (0.0003)	-0.1551*** (<.0001)	-0.0264** (0.0500)
<i>Control</i>				
DA	-0.0360*** (<.0001)	-0.0116*** (<.0001)	-0.0233*** (<.0001)	-0.0011** (0.0217)
LEV	0.1176*** (<.0001)	-0.1019*** (<.0001)	0.0410*** (<.0001)	0.1784*** (<.0001)
LMVE	-0.0204*** (<.0001)	-0.0152*** (<.0001)	0.0034 (0.2500)	-0.0084*** (0.0020)
MTB	-0.0151*** (<.0001)	0.0041*** (<.0001)	-0.0063*** (<.0001)	-0.0130*** (<.0001)
E	-0.0145 (0.2832)	0.0669*** (<.0001)	-0.0232*** (0.0074)	-0.0580*** (<.0001)
ROA	0.0040 (0.7954)	-0.5943*** (<.0001)	-0.0220** (0.0257)	0.6209*** (<.0001)
N	35876	35876	35876	35876
Adj. R ²	0.0818	0.1145	0.0733	0.1381
F	423.90	618.19	376.62	766.11

Note:

a. Numbers in parentheses represent *p*-values. Coefficients on industry dummies omitted for simplified exhibition.

b. ***, **, * indicate significance at the 1%, 5% and 10% level, respectively (two-tailed); We used the two-way cluster-robust standard errors (cluster by firm and by year) to adjust for both cross-sectional and time-series dependences in our data (Petersen 2009; Gow et al. 2010).

c. Appendix defined the variables.

Discretionary accruals measure both the magnitude and the direction of the accrual earning management while the absolute value of discretionary accruals measure only the magnitude of the accrual earning management. As a robustness test, we replaced the absolute

value of the discretionary accruals (ABSDA) with discretionary accruals (DA) as a control variable to test H2. Table 8 presented the results which are consistent with Table 5.

REM and AEM Relation in Pre-Pandemic vs Pandemic Periods

**Table 9 Accrual Earnings Management and Real Earnings Management:
Pre-Pandemic vs. Pandemic**

	Pre-Pandemic		Pandemic	
	ABSDA	DA	ABSDA	DA
Intercept	-7.4721** ($<.0001$)	9.0092*** ($<.0001$)	0.6077** ($<.0001$)	1.2454*** ($<.0001$)
REM	3.9868*** ($<.0001$)	-3.6672*** ($<.0001$)	0.1240*** ($<.0001$)	0.0806*** ($<.0001$)
<i>Control</i>				
LEV	-0.5782*** ($<.0001$)	0.8148*** ($<.0001$)	0.0582*** ($<.0001$)	0.2632*** ($<.0001$)
LMVE	0.1940*** ($<.0001$)	-0.3019*** ($<.0001$)	-0.0132*** (0.0664)	-0.1015*** ($<.0001$)
MTB	0.0583*** (0.0001)	-0.0539*** (0.0005)	-0.0027 (0.1762)	-0.0051** (0.0111)
E	-0.5813*** ($<.0001$)	0.9265*** ($<.0001$)	0.1725*** ($<.0001$)	0.3494*** ($<.0001$)
ROA	-2.4312*** ($<.0001$)	2.6985*** ($<.0001$)	-0.6333*** ($<.0001$)	0.9468*** ($<.0001$)
N	19387	19387	13944	13944
Adj. R ²	0.1758	0.1535	0.1080	0.1395
F	689.01	585.54	281.18	376.55

Note:

- Numbers in parentheses represent *p*-values. Coefficients on industry dummies omitted for simplified exhibition.
- ***, **, * indicate significance at the 1%, 5% and 10% level, respectively (two-tailed); We used the two-way cluster-robust standard errors (cluster by firm and by year) to adjust for both cross-sectional and time-series dependences in our data (Petersen 2009; Gow et al. 2010).
- Appendix defined the variables.

Given the possible structure breaks in data caused by the pandemic, we conducted two sets of tests: one for the pre-pandemic period and one for the pandemic period, to compare the differences in coefficients. Table 9 presents the results. REM is positively and significantly correlated with absolute discretionary accruals (ABSDA) both before and during the pandemic. However, there is a change in the correlation between REM and discretionary accruals (DA). The two variables were negatively and significantly correlated before the pandemic but positively and significantly correlated during the pandemic. The coefficients of other control variables are consistently related to DA before and during the pandemic. The coefficient of ROA is consistently related to ABSDA before and during the pandemic. However, the coefficients of the other four control variables changed during the pandemic compared to the pre-pandemic period.

To test the results' robustness to the potential structure break, we added interaction terms to our regression models as in models 8 and 9. The regression results are largely consistent with Tables 4 and 5. The results are available upon request.

$$DA_i = \beta_0 + \beta_1 Covid + \beta_2 REM + \beta_3 REM * Covid + \beta_4 LEV + \beta_5 LEV * Covid + \beta_6 LMVE + \beta_7 LMVE * Covid + \beta_8 MTB + \beta_9 MTB * Covid + \beta_{10} E + \beta_{11} E * Covid + \beta_{12} ROA + \beta_{13} ROA * Covid + \gamma \cdot Industry + \epsilon$$

(8)

$$REM_i = \theta_0 + \theta_1 Covid + \theta_2 ABSDA + \theta_3 ABSDA * Covid + \theta_4 LEV + \theta_5 LEV * Covid + \theta_6 LMVE + \theta_7 LMVE * Covid + \theta_8 MTB + \theta_9 MTB * Covid + \theta_{10} E + \theta_{11} E * Covid + \theta_{12} ROA + \theta_{13} ROA * Covid + \gamma \cdot Industry + \epsilon$$

(9)

5. Conclusion

In this study, we further investigate the impact of the COVID-19 pandemic by looking into both accrual earnings management and real earnings management in the pre-pandemic (2016-2019) and pandemic (2020-2022) periods. Our study provides valuable insights into how firms managed their earnings during the pandemic, showing a shift towards income-increasing accrual earnings management and real earnings management focused on sales promotion, while reducing production costs and discretionary expenditures. We further tested the robustness of the results and found consistent results.

Our study is subjected to the limited public availability of some necessary data and the common criticism to the stream of research in earnings management. That is its reliance on the estimation of discretionary accruals as measures of accrual earnings management and the estimation of the measures of real earnings management.

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APPENDIX
Definition of Variables

<i>ABSDA</i>	performance-matched modified-Jones model
<i>DA</i>	abnormal accruals, measured as absolute values; performance-matched modified-Jones model abnormal accruals; DA+ refers to positive DA; DA- refers to negative DA;
<i>REM</i>	the sum of the standardized three real earnings management proxies ($R_DISX*(-1)+ R_CFO*(-1)+$ R_PROD);
<i>R_CFO</i>	estimated abnormal cash flows from operations;
<i>R_PROD</i>	estimated overproduction;
<i>R_DISX</i>	estimated abnormal discretionary expenses;
<i>LEV</i>	the previous year's leverage ratio;
<i>LMVE</i>	Logarithm value of market value of equity of the prior year;
<i>MTB</i>	Market to book value at the end of the previous year;
<i>E</i>	The previous year's change in net income divided by total assets;
<i>ROA</i>	the previous year's return on assets;
