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Earnings management during the COVID-19 pandemic
A study on European companies

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Abstract

In this study, the impact of the COVID-19 pandemic on the usage of earnings management in a sample of public, European firms is examined. We employ models to estimate both accrual-based and real earnings management. The results indicate that firms on average manipulated their earnings downwards using accrual-based methods and did this to a higher degree if their headquarters' country of residence experienced negative GDP growth. We also find abnormally high operating cash flows given sales level in the sample, with significant relationships to GDP growth and fiscal support. Lastly, we found no evidence of increased overproduction during the pandemic year.

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Tutor: Milda Tylaite, Assistant Professor Department of Accounting
Keywords: Earnings management, accrual-based earnings management, real earnings management, COVID-19, Modified Jones model, Kasznik model, Roychowdhury model

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1 Introduction

In this section the thesis is introduced with a brief background, followed by the purpose and contribution to contemporary research of earnings management. Finally, the delimitations are described.

1.1 Background

The COVID-19 pandemic disrupted lives and communities all over the world. Governments across the world adopted fiscal and monetary policies, mitigating negative effects on the economy. Supply shortages have caused disruptions in global energy markets, labour markets, production and more (Jackson, 2021). In contrast to the financial crisis of 2008-2009, European countries did not impose synchronized policy responses. Instead, central banks and national governments imposed individual monetary and fiscal support because of the pandemic's effect on the economy. Certain countries adopted quarantines and lockdowns, causing travel and border restrictions and mandatory business closures, while other countries had more easy-going approaches and instead adopted person-limits and other restrictions to prevent large gatherings. The emergence of new COVID variants and pandemic hotspots challenged national efforts to contain infections and re-establish economic activities. Developed economies, comprising 60% of the global economy, are projected to operate below their potential output level through at least 2024. Thus, the global economy may take several years to fully recover, and even longer for countries where the rates of vaccinations are low (Jackson, 2021).

The potential implication of the above-described situation on external financial reporting should be of interest to standard setters, governments, auditors, and investors alike. One area that could be affected is the usage of techniques meant to manipulate a firm’s earnings to portray the performance in a favourable fashion, often called earnings management. Using accounting accruals, managers can over- or underestimate the reported earnings in order to mislead some stakeholders (Cohen & Zarowin, 2010). Another option is to pursue real activities that deviate from the normal, value-maximizing behaviour, and through this impact the reported earnings (Roychowdhury, 2006). Previous research is yet to establish a cohesive view on what the impact of wider issues such as a financial crisis or a pandemic may have on the usage of earnings

management. One study states that the absolute level of discretionary accruals, which is a proxy for earnings management, decreased during the 2008 financial crisis (Filip & Raffournier, 2014). Another claims that firms managed their earnings downwards (Cimini, 2015). The effect of the pandemic is yet to be broadly examined, though one study states that US firms managed their earnings downwards during 2020. This aligns with the theory of Big Bath accounting, declaring that managers who seem to miss their previously set targets may manage their earnings downwards further (Healy, 1985). The capital market acceptance of poor performance may also be higher when the overall economy is weaker as suggested in Conrad et al. (2002). Given the above, this thesis will study the impact of the COVID-19 pandemic on the usage of earnings management.

1.2 Purpose

The purpose of this thesis is to investigate whether earnings management was used to a greater extent during the COVID-19 pandemic in a sample of public, European firms. Further, we will investigate whether the usage of earnings management was impacted by economic growth and the force of governmental response. In comparison to most studies within earnings management, we will investigate both accrual-based earnings management and real earnings management to gain a thorough understanding of the pandemic's impact. We were inspired by previous studies to investigate earnings management and more specifically, the usage during tough economic times, such as financial crises and recessions. As the COVID-19 pandemic has been a subject of debate from various aspects during recent years, we found it interesting to investigate it from the perspective of earnings management. We found it even more interesting to investigate an area for which limited earlier research exists, as we might be able to contribute with new insights.

1.3 Contribution

Our study contributes to prior research in two ways. Firstly, as the COVID-19 pandemic reached Europe in early 2020 and was ongoing until 2022 when it was declared as a non-danger to the public health. At the time of the publication of this thesis, there is limited research of COVID-19 and earnings management. Thus, our study contributes to the existing literature by increasing the knowledge of how earnings management was affected by the COVID-19 pandemic, which could also be perceived as an indication of how earnings management is affected during macroeconomic downturns. Secondly, there is limited research of real earnings management, not only during financial crises but also in general. Thus, our thesis also contributes to prior research by providing

an indication of the usage of real earnings management in a setting where the global economy is challenged.

1.4 Delimitation

The year 2019 has been excluded from the benchmark period due to the pandemic emerging in China in late 2019 and potential disturbance to the global economy that it may have caused. Even though the spread of the virus began in mid-December and might have had a close to insignificant effect on the usage of EM during 2019, the test is comparing pre-COVID levels and COVID-levels. Thus, we exclude 2019 to ensure no contamination in the benchmark period. Further, the sample only includes companies with fiscal year-end December as those who do not would have a fraction of 2019 or 2021 in their 2020 financial data.

In order to test for real earnings management, we follow the models provided in Roychowdhury (2006). Our study will not include the discretionary expense model given poor data availability. Advertising costs were not available for the chosen sample and R&D costs were only available for one-third of the firms. model. We are using the Global Industry Classification Standard (GICS) and have chosen to exclude financial service companies, such as banks and insurance companies. This follows prior studies (Roychowdhury, 2006; Kothari et al., 2005) and the decision is necessary as their financial reports are different to other types of companies, making it difficult to measure accruals.

2 Theory and previous research

In this section, the theoretical framework is presented. Firstly, the agency theory is described, where the principal-agent problem is identified. Secondly, there is a brief review of earnings management followed by an in-depth explanation of accrual-based earnings management and real earnings management. Thirdly, the incentives behind earnings management are described and finally the link between recessions and earnings management, followed by big bath accounting, is presented. Finally, the hypothesis development, including the three hypotheses of this paper, and the earnings management models are presented.

2.1 Agency theory

Agency theory attempts to explain difficulties in the relationship between principals and agents. The principal delegates responsibilities to an agent who is supposed to fulfil tasks on behalf of the principal (Jensen & Meckling, 1976). A major dilemma is the agent typically being extrinsically motivated and more risk averse than the principal, leading to their interests not being aligned. The conflict of interest leads to agency costs, and this situation is often referred to as the principal-agent problem The agency costs can be prevented to some extent by controlling the agent by establishing incentives for the agent to act in a desirable way, such as a bonus if a certain target is achieved. However, it is difficult for the principal to understand which interests the agent acts upon due to potential information asymmetry and monitoring costs. Because of information asymmetry and the targets of the parties not being aligned, the agency-principal theory leads to a situation in which the agent acts on behalf of the principal without the principal being able to know which interests the agent acts upon which could be e.g., individual interests or shareholder interests (Goolsbee et al., 2020). Positive accounting theory is an extension of agency theory which suggests that managers (agents) might alter financial statements to, for instance, reach targets or goals in order to avoid criticism from shareholders (principals) and/or earn bonuses (Watts & Zimmerman, 1990).

2.2 Earnings management

There is an established need for standard setters to allow for judgement in financial reporting through managerial choices of methods and different estimates (Healy & Wahlen, 1999). A problem then arises because of the possibility to abuse these regulations by synthetically over- or underestimate the earnings and therefore risking misallocation of capital. Researchers suggest that struggling companies tend to increase earnings, and thereby lower earnings quality. This implies that firm performance is strongly correlated to engagement in earnings management (Dechow et al., 2010). An often-used definition of earnings management (henceforth "EM") is:

> *"earnings management occurs when managers use judgement in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers"*
>
> (Healy & Wahlen, 1999)

It can also be defined as a “purposeful intervention in the external financial reporting process” (Schipper, 1989). Its main incentive is private gains and thus it covers the external reporting function and not managerial accounting reports or activities. Several accounting methods within different accounting standards can be applied to alter estimates of e.g., depreciable assets to affect earnings (either positively or negatively). By this definition, EM can be made by managers on any level, such as board members or business-unit managers, i.e., anyone with influence over the reported financials.

2.2.1 Accrual-based earnings management

Accrual-based earnings management (hence after AEM) leaves cash flows unchanged and uses accruals to over- or underestimate the reported earnings compared to the actual earnings (Cohen & Zarowin, 2010). The purpose of accruals is to provide a clearer picture of the firm's performance during its fiscal year. Thus, accruals adjust misleading cash flows to correlate more accurately with the firm’s performance (Dechow, 1994).

Accruals are often divided into two main categories, non-discretionary accruals, and discretionary accruals. Discretionary accruals are subject to managerial discretion and non-discretionary accruals are accruals imposed by the accounting regulator, i.e., the expected level of accruals in the firm given that there is no EM. Since discretionary accruals are a result of management judgment, there is no model that can perfectly capture the sum of discretionary accruals. The most widely used models for estimating discretionary accruals all start by identifying total accruals, and then subtracting a non-discretionary accrual component from the total. The most influential models are the Healy model, the DeAngelo model, the Jones model and Modified Jones model, as well as the Industry model (Dechow et al., 1995).

2.2.2 Real earnings management

Real earnings management (hence after REM) is an extension of the definition presented in Schipper (1989) as it is attained through the timing of investments and/or financial decisions to adjust reported earnings. These activities are harder to detect than AEM as it is difficult to distinguish between e.g., investment or production decisions with the goal of maximizing shareholders' value or managing earnings. Thus, there is less scientific research and literature regarding REM compared to AEM.

Real activities are deviations from day-to-day operational practices where the primary target is to mislead stakeholders or shareholders. Managers make decisions to provide a different picture about the firm in which targets are met which would not have been achieved through the normal course of operations (Roychowdhury, 2006). Roychowdhury found evidence consistent with managers manipulating real activities to avoid reporting annual losses. They investigated EM through several real activities such as sales manipulation, overproduction, and R&D. Real activities draw less attention from regulators and auditors than changes in accounting methods and accruals as it is harder to measure and determine abnormal activities where the main intent is to smooth earnings (Roychowdhury, 2006). Thus, REM has a more significant effect on the operational cash flows in comparison to AEM. The real activities model by Roychowdhury captures the aspects of real activities which follows the CFO estimation model from Dechow et al. (2005). The model makes an estimation of real activities that deviate from the usual operations, and thereby providing an indication of whether management make decisions to manipulate the earnings with the intent of misleading e.g., stakeholders and external analysts (Roychowdhury, 2006).

2.3 Incentives for earnings management

There are several incentives for using EM. For instance, firms can adjust earnings in financial statements to be in line with, or even exceed, expectations prior to public securities offerings. There are also incentives to increase earnings to avoid violation of lending contracts or debt covenants. Since earnings are often linked to the success of a firm, one of the most prominent incentives for EM is to increase managers' compensation and job security. EM can also occur to avoid regulatory costs or increase regulatory benefits (Healy & Wahlen, 1999). Earnings are key for investors analyzing companies' financial reports in order to make valuations. There is evidence suggesting that changes in expectations and new information about the firm, such as articles and annual or quarterly reports, can make investors and analysts react in different ways as they are heavily influenced by business cycles and the state of the economy in general (Conrad et al., 2002). In essence, investors react more badly to negative earnings surprises if the overall market is performing strongly. This could imply that 2020 will be a better than normal time to announce poor earnings.

2.4 Recessions and earnings management

An economic recession affects both customers and companies. Negative growth usually results in less earnings for a lot of companies leading to them not being able to fund their operations. With declining revenues comes dropping share prices and lower dividends, leaving shareholders unsatisfied. This could create incentives for companies to increase earnings in the short term by using EM, which may prevent their share price from dropping (Jahmani et al., 2016).

There is evidence indicating that S&P firms in business between 2008 (recession period) and 2013 (recovery period or "post recessionary period") managed their earnings in both periods, but significantly more during the recession period (Jahmani et al., 2016). Both average total accruals and the coefficient of variability of total accruals were significantly higher in 2008 than in 2013, implying that AEM was used to manipulate their earnings. As earnings was managed more during the recession period than in the recovery period, there is a tangible possibility that companies under intense pressure to perform manipulate their financial statements to provide a more positive picture (Jahmani et al., 2016).

2.5 Big Bath Accounting

The term Big Bath Accounting generally refers to accounting choices made by management to reduce (current) reported earnings to increase future earnings. In other words, they might be incentivized to move a fraction of their earnings from the current to the next year as the targets are out of reach. A clear definition of Big Bath Accounting has not yet been agreed upon. Management might have incentives to accelerate write-offs or make other accounting choices to reduce earnings in a fiscal year where targets will not be met (Healy, 1985). Other authors have suggested that it could be considered a big bath in the case of write-offs representing more than 1% of the book value of assets (Elliott & Shaw, 1988). Liu & Sun (2022) found evidence suggesting that companies managed their earnings in 2020 by decreasing their discretionary accruals, leading to decreased earnings. The results from the tests pointed towards big bath theory and more specifically that companies took advantage of the economic crisis to decrease their earnings.

2.6 Hypotheses development

There are several factors regarding accounting information and a study of one aspect will not capture the full effect of how, and why, accounting information may differ periodically. The

COVID 19-pandemic caused economic disruption, with the annual global economic growth rate falling to -3.2%, global trade volume decreasing by 5.3% and wide disturbances in supply chains (Jackson, 2021). The pandemic created a challenging economic landscape for most industries, making annual targets and stakeholder expectations difficult to meet. Thus, we first examine whether companies used EM more during the pandemic year (2020) than the pre-pandemic years (2016-2018). One might believe that a challenging economic landscape would lead to managers engaging in EM to a greater extent (Smith et al., 2001). However, as mentioned previously, there is research suggesting that managers might take advantage of declining profits and a declining economic growth in general by taking a "big bath" and by that deliberately report higher losses in the recession (pandemic) year in order to get a bigger effect of a possible financial recovery in the near future. Thus, our first hypothesis analyses not only whether companies used EM to a greater extent during the pandemic year (2020), but also in which direction, or in other words, whether earnings were increased or decreased.

H1: The usage of accrual-based earnings management increased in 2020 compared to the benchmark period

H2: The usage of real earnings management increased in 2020 compared to the benchmark period

Prior research has indicated that firms are more likely to use EM during recessions, for example due to pressure to perform (Jahmani et al., 2016) but also the possibility to take a big bath (Healy, 1985). As mentioned earlier, EM can be used to avoid regulatory costs or increase regulatory benefits (Healy & Wahlen, 1999). The pandemic had broad effects on the global economy, which could imply difficulty in reaching annual targets and meeting expectations. Prior research has found evidence suggesting that discretionary accruals decreased significantly from 2019 to 2020 and that the absolute value of discretionary accruals significantly increased (Liu & Sun, 2022). These findings indicate that companies took advantage of the somewhat chaotic situation by decreasing their reported earnings during the pandemic year. Previous research regarding the usage of EM during crisis or recession is divided. For example, one study found evidence suggesting that discretionary accruals decreased during the financial crisis of 2008 in 13 out of 15 EU countries (Cimini, 2015). Other prior research suggests that the levels of EM decreased in the crisis period (2008-2009), meaning less income smoothing (Filip & Raffournier, 2014). Evidently, there is mixed evidence regarding the usage of EM during economic crisis periods. Thus, we are interested

in examining whether we can find evidence not only whether the usage of EM increased during the crisis period (2020), but also in which direction meaning whether earnings were adjusted upwards or downwards. Therefore, we will examine whether the severe consequences of the pandemic and the following governmental responses impacted the usage of EM.

H3: The usage of EM in 2020 was impacted by the COVID-19 pandemic through economic growth, and the force of governmental response.

2.7 Models

2.7.1 Modified Jones model

The original Jones model (Jones, 1991) emerged from Healy (1985) and DeAngelo (1986). It measures abnormal accruals and is often perceived as the most established model within EM (Dechow et al 2010). A normal level of accruals is estimated through OLS regression and thus a firm's abnormal accruals are the actual accruals less the suggested normal accruals from the Jones model. Revenues are assumed to be nondiscretionary, causing earnings managed through discretionary revenues to be excluded (Dechow et al., 1995). Thus, the Modified Jones model is said to provide a more accurate estimate in total accruals than the Jones model. The Modified Jones model actively eliminates conjectured tendencies of the Jones model by decreasing the change in revenue by the change in net receivables. Thus, the Modified Jones model assumes that all changes in credit sales during the period are a result of earnings management. The reasoning is that earnings are easier to manage by exercising discretion over recognition of revenue on credit sales than managing earnings by exercising discretion over recognition of revenue on cash sales. This results in a significant difference from the Jones model, as instances where EM has occurred through the management of revenues will no longer be biased toward zero (Dechow et al., 1995).

2.7.2 Kasznik model

The Kasznik model is similar to the Modified Jones model, but the inverse asset variable has been replaced with an operating cash flow variable (Kasznik, 1999). Thus, it detects changes in net cash flow from operating activities which is an indicator of EM as it is negatively correlated with total accruals (Dechow, 1994). Jones' assumptions of revenues being nondiscretionary are relaxed.

2.7.3 Roychowdhury model(s)

The Roychowdhury model has emerged using prior research by Dechow et al. (1998). REM is measured through discretionary expenses, patterns in operating cash flow and production costs for companies close to the zero earnings benchmark. The abnormal level minus the normal level, which is given by the model, is the suggested REM. Several REM activities are estimated, such as sales manipulation, and overproduction, which is captured in the Roychowdhury CFO and Production model respectively (Roychowdhury 2006).

3 Method

In this section, the research methodology is presented. Firstly, a further description of the earnings management models is provided followed by method choices. Secondly, the research design is described, including the regression model and a description of the dependent, independent, and control variables.

3.1 Earnings management models

3.1.1 Modified Jones Model

The Modified Jones Model (henceforth referred to as "MJM") is outlined below in equation 1. The model estimates discretionary accruals, and the components were calculated through items in the income statement and cash flow statement. The estimation will be run through a cross-sectional regression for every industry and year.

$$\frac{TA_{i,t}}{A_{i,t-1}} = \beta_1 \frac{1}{A_{i,t-1}} + \beta_2 \frac{\left(\Delta REV_{i,t} - \Delta REC_{i,t}\right)}{At_{,t-1}} + \beta_3 \frac{\left(PPE_{i,t}\right)}{A_{i,t-1}} + \varepsilon_{i,t} \qquad (1)$$

where

$TA_t = income\ before\ extraordinary\ item\ in\ year\ t - operating\ cash\ flow\ in\ year\ t$

$A_{t-1} = total\ assets\ in\ year\ t-1$

⊿REV = revenues in year t less revenues in year t-1

⊿REC = net receivables in year t less net receivables in year t-1

$PPE_t = gross\ property, plant\ and\ equipment\ in\ year\ t$

3.1.2 Kasznik Model

The Kasznik Model (henceforth referred to as "KAS"), outlined in equation 2, also captures changes in operating cash flow and includes a constant, α. The estimation will be run through a cross-sectional regression for every industry and year.

$$\frac{TA_{i,t}}{A_{i,t-1}} = \alpha + \beta_1 \frac{(\Delta REV_{i,t} - \Delta REC_{i,t})}{A_{i,t-1}} + \beta_2 \frac{(PPE_{i,t})}{A_{i,t-1}} + \beta_3 \frac{\Delta CFO_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (2)$$

$where$

$A_{t-1} = total\ assets\ in\ year\ t-1$

$\Delta REV_t = revenues\ in\ year\ t\ less\ revenues\ in\ year\ t-1$

$\Delta REC_t = net\ receivables\ in\ year\ t\ less\ net\ receivables\ in\ year\ t-1$

$PPE_t = gross\ property, plant\ and\ equipment\ in\ year\ t$

$\Delta CFO = operating\ cash\ flow\ in\ year\ t\ less\ operating\ cash\ flow\ in\ year\ t-1$

3.1.3 Roychowdhury Model(s)

The Roychowdhury models used is 1) an estimation of abnormal cashflows and 2) an estimation of abnormal production. The models will henceforth be referred to as "RCFO" and "RPROD" and are displayed in equation 3 and 4 respectively. In a similar fashion to the accrual-based versions, these models will be run through a cross-sectional regression for every industry and year.

$$\frac{CFO_{i,t}}{A_{i,t-1}} = \alpha_0 + \beta_1 \left(\frac{1}{A_{i,t-1}}\right) + \beta_1 \left(\frac{REV_{i,t}}{A_{i,t-1}}\right) + \beta_2 \left(\frac{\Delta REV_{i,t}}{A_{i,t-1}}\right) + \varepsilon_{i,t} \quad (3)$$

$where$

$CFO_t = operating\ cash\ flow\ in\ year\ t$

$A_{t-1} = total\ assets\ in\ year\ t-1$

$REV_t = revenues\ in\ year\ t$

$\Delta REV_t = revenues\ in\ year\ t\ less\ revenues\ in\ year\ t-1$

$$\frac{PROD_{i,t}}{A_{i,t-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{i,t-1}}\right) + \beta_1\left(\frac{REV_{i,t}}{A_{i,t-1}}\right) + \beta_2\left(\frac{\Delta REV_{i,t}}{A_{i,t-1}}\right) + \beta_3\left(\frac{\Delta REV_{i,t-1}}{A_{i,t-1}}\right) + \varepsilon_{i,t} \quad (4)$$

$where$

$PROD = cost\ of\ goods\ sold\ in\ year\ t + inventory\ in\ year\ t\ less\ invetory\ in\ year\ t-1$

$A_{t-1} = total\ assets\ in\ year\ t-1$

$REV_t = revenues\ in\ year\ t$

$\Delta REV_t = revenues\ in\ year\ t\ less\ revenues\ in\ year\ t-1$

3.2 Method choices

Cross-sectional vs time-series

In order to estimate the coefficients in the EM models, two main methods can be employed, namely a time-series or cross-sectional approach. The original Jones Model implemented the time-series methodology, meaning that the estimation of coefficients and by extension, the total nondiscretionary accruals, are estimated on a firm-specific basis over a longer timespan (Jones, 1991). Several issues can arise when using the time-series approach, such as limiting sample size given the necessity of historic observations and misspecification owing to nonstationary processes (Subramanyam, 1996). The alternative method, i.e., the cross-sectional approach, estimates the coefficients across an entire industry for a given year and is often the preferred method such as in Roychowdhury (2006), Kasznik (1999) and Li (2019). Given that we focus on a specific event, the estimation may be impacted by industry-wide behavior. Essentially, if the general usage of EM hypothetically increased during 2020, the cross-sectional method may fail to identify that increase and only register outliers. While the time-series would be the preferred method from this perspective, it lacks several other aspects, rendering it less useful. The need for full data availability will create a survivorship bias. Also, the hypotheses testing using the time-series turned out to be too volatile as the removal of a single observation could impact the result.

A compromise is to use the average coefficient estimation for the benchmark period 2016-2018 as a proxy for the 2020 coefficients. The purpose is to create base-level coefficients in specific industries to enable detection of broader EM usage. This method ensures a more sufficient sample size and enables us to employ the method preferred by modern research.

Total accruals definition

A central aspect in the estimation of discretionary accruals is the total accruals. In several influential studies such as Jones (1991) and Dechow et al. (1995), different items from the balance sheet as well as depreciation and amortization expense act as the components determining total accruals. This method can potentially contaminate the output, especially in the presence of M&A activity, and falsely estimate EM (Hribar & Collins, 2002). Measuring total accruals using the cash flow statement and earnings provides a better and more reliable tool, and thus, this is what the study will use. The explicit definition is displayed in equation 5.

$$Total\ accruals_t = Income\ before\ extraordinary\ items_t - Operating\ cash\ flow_t \quad (5)$$

Absolute or non-absolute values

A common choice in EM research is whether to use absolute values, such as the absolute value of the estimated discretionary accruals, or to keep them unchanged. Non-absolute numbers can indicate the direction, i.e., if a certain aspect is abnormally high or abnormally low. For example, abnormally high accruals indicate earnings managed upwards. An issue with non-absolute values is their ability to cancel each other out and skew the actual usage of earnings management. Absolute values will more clearly provide a level of the usage of earnings management, though it will not tell you anything about whether it is performed in order to decrease or increase earnings. Given the formulation of the study's hypotheses, we will primarily employ the non-absolute values to test our hypotheses and use the absolute values to further validate the results from the t-tests. The absolute values will mitigate the chance of values cancelling each other out when performing tests using mean values.

Winsorization

In order to avoid skewness caused by extreme values, all data points used in the estimation of EM are winsorized at 1 and 99 percentile levels, similar to previous research in the area (Kothari et al., 2005; Li, 2019).

3.3 Research design

3.3.1 Estimation of earnings management

Using the models defined in 3.1, the coefficients will be estimated using industry-based, cross-sectional OLS regressions. As discussed in 3.2, the coefficients for the 2020 models will be calculated as the average of the coefficients in the 2016-2018 period. The respective coefficients are then applied together with the firm-specific parameters of each model to determine the normal level of output. By deducting this from the actual value, you gain an estimation of the abnormal levels, i.e., the managed part. The actual value is total accruals as defined in equation 5 for MJM and KAS, operating cash flow in RCFO and lastly, production costs for RPROD. For MJM, this would be performed in the following way using the estimated coefficients.

$$EA_t = B_1 \frac{1}{A_{t-1}} + B_2 \frac{(\Delta REV_t - \Delta REC_t)}{A_{t-1}} + B_3 \frac{(PPE_t)}{A_{t-1}} \quad (6)$$

where B_1, B_2 and B_3 are the coefficient estimations of β_1, β_2 and β_3 and EA_t is the estimated normal total accruals.

$$DA_t = TA_t - EA_t$$

where TA_t is defined as in equation 5, and DA_t is the estimated discretionary accruals, i.e. the earnings management proxy for MJM.

3.3.2 Paired t-test

To test H1 and H2, we will use a paired t-test to compare the mean difference between EM estimations for 2020 and the average for the benchmark period 2016-2018. A paired t-test uses pairs of data, which in our case is the EM estimation for 2020 and 2016-2018 respectively, to determine if one group is statistically different from the other. The test will help determine if there is any statistically significant difference between 2020 and the benchmark values as well as showcasing the direction of change, i.e., more or less of each respective EM proxy.

3.3.3 Regression model

To test H3, the following regression will be used:

$$EM_t = \beta_1 * GDP_t + \beta_2 * FIS_t + \beta_3 * GR + \beta_4 * ROADIFF + \beta_5 * CFODIFF + \beta_6 * LEVDIFF \quad (7)$$

The independent variable – EM_t – is defined as the difference between the 2020 measure of earnings management and the average for the benchmark period 2016-2018, i.e., the values used in the paired t-tests. For example, in the case of the Modified Jones model, the variable will be calculated as:

$$DA_{2020} - DA_{Avg} \quad (8)$$

where DA_{Avg} is the average discretionary accruals for the benchmark period 2016-2018.

The regression will be run in four different settings, once for each type of EM measure. Given indications of heteroscedasticity discussed in 6.3, the MJM, KAS and RCFO models will be performed using robust standard errors to mitigate the impact of the variance of the error terms.

The regression incorporates different quantified measures of the severity of the pandemic and the following regulatory responses. We will include *GDP* as a variable and utilize the Oxford COVID Tracker Indices to assign the quantified level to each firm on a country-specific level, specifically in the variables *FIS* and *GR.*

GDP_t is defined as the growth in a country's GDP during 2020. GDP is defined as unadjusted chained linked volumes, expressed in million euros.

FIS_t is defined as announced fiscal stimulus spending divided by a country's average GDP, expressed as chain linked volumes.

GR_t is a variable corresponding to the overall strength of a government's response to the pandemic, including restrictions, lockdown measures and fiscal measures.

The following variables are used as controls and are picked from previous studies in the EM research area.

$ROADIFF_t$, *return-on-assets*, is defined as the difference in the ROA measure for 2020 and the average for the benchmark period 2016-2018 where ROA is defined as net income (net income before extraordinary items) in year t divided by the average of the opening and closing balance of total assets in year t. A higher level of ROA can be correlated to increases in discretionary accruals and is a way to control for firm performance and its impact on accruals (Kothari et al., 2005). It has also been included in influential REM research (Roychowdhury, 2006).

$CFODIFF$, *operating cash flow*, is defined as the difference between the CFO measure for 2020 and the average for the benchmark period 2016-2018 where CFO is defined as operating cash flow in year t divided by the average of the opening and closing balance of total assets in year t. *CFODIFF* is also often referred to as *CFFO* and has been used in several studies analyzing EM and firm performance as a control variable (Dechow et al., 1995).

LEVDIFF is defined as the difference in the LEV measure for 2020 and the average for the benchmark period 2016-2018 where LEV is defined as shareholder's equity divided by the average of the opening and closing balance of total assets in year t. Firms with high leverage may have increased incentives to perform income-increasing actions, such as earnings management, to avoid debt covenant violations (DeAngelo et al., 1994).

4 Empirical data

In this section, an overview of the data collection process, as well as the sample selection process is described. The section is concluded with a presentation of the descriptive statistics for the data sample.

4.1 Data collection

The data used in the estimation of EM is retrieved from S&P's Compustat Global – Fundamentals Annual, accessed via Wharton Research Data Services (WRDS). Compustat Fundamentals is a financial database, covering 80 000 active and inactive public firms across the globe. From the original sample, several adjustments have been made to ensure availability and relevance. Quantification of the severity of the pandemic as well as regulatory and fiscal response used in the

regression is retrieved from the Oxford Government Response Tracker (Hale et al., 2021). The data tracks governmental responses to the COVID-19 pandemic from 1 January 2020 and covers more than 180 countries. GDP data is retrieved from Eurostat.

4.2 Sample selection

Cross-sectional sample

	Adjustments	**Firms**
Original sample		5 205
Fiscal month adjustment	-415	4 790
Industry not available	-76	4 714
Financial industry	-63	4 651
Data for full period	-2 741	1 910
Small industries	-270	1 640
Data trimming	-32	1 608
Final sample		**1 608**

The original sample consists of public firms in the 13 European countries chosen. Several adjustments are made to the sample. First, all firms with a fiscal year end month that is not December are removed. Given the importance of the actual event and its potential impact on the usage of EM, firms experiencing a large part of their fiscal year, and thus the period in which EM could be pursued, outside the event window should be excluded. Firms missing a GIC Industry classification are removed from the sample as it is needed for the cross-sectional method. Further, firms in financial industries, i.e., GIC numbers between 4010 and 4030, are removed as the accrual calculation is not suitable for their reporting type (Roychowdhury, 2006; Kothari et al., 2005). The final coefficient estimation is based on data from 2016-2020, therefore firms lacking data coverage for the entirety of that period are removed. Firms belonging to small industries with fewer than 20 members are removed. This is at or above the minimum threshold in several earlier research papers on the EM topic (Cohen & Zarowin, 2010; Li, 2019; Roychowdhury, 2006). Lastly, outliers are trimmed at 1 and 99 percentile levels, given their ability to skew the hypotheses testing. We also set a limit of minimum 20 observations per country, though this was not triggered as the least number of observations for a country was 44.

4.3 Descriptive statistics

Descriptive statistics are presented in Table 1. for the different components of the regression model. A noticeable feature is that cash flows in relation to assets were higher in 2020 compared to the benchmark period while net income in relation to assets were lower.

Table 1.

Descriptive statistics for 2020 and average variables

Variable	Mean	Std. dev.	Min	Max
CFO2020	0.0531	0.1707	-1.3364	0.7363
CFOAVG	0.0249	0.1792	-1.7365	0.5999
ROA2020	-0.0177	0.1894	-1.6438	2.0241
ROAAVG	-0.0093	0.2563	-3.0007	5.9047
LEV2020	0.4334	0.3527	-5.0613	1.6469
LEVAVG	0.4720	0.3440	-5.9984	1.2133
MJM2020	-0.0665	0.2563	-1.2144	1.9775
MJMAVG	-0.0038	0.2187	-1.3318	2.1299
KAS2020	-0.0221	0.1036	-0.4658	0.5826
KASAVG	-0.0021	0.0718	-0.4690	0.3392
RCFO2020	0.0995	0.5309	-1.5687	2.3227
RCFOAVG	-2.21E-05	0.1424	-0.8410	0.6936
RPROD2020	0.0048	0.2131	-1.0152	1.1581
RPRODAVG	-0.0010	0.2028	-1.0285	0.8560

Note: CFO is defined as operating cash flow. CFOAVG is calculated as the average level of CFO between 2016-2018. ROA is defined as net income before extraordinary items divided by the average balance of total assets over the year. ROAAVG is calculated as the average level of CFO between 2016-2018. LEV is defined as shareholder's equity divided by the average balance of total assets over the year. LEVAVG is calculated as the average level of LEV between 2016-2018. MJM is defined as the estimation of EM according to the Modified Jones model. MJMAVG is calculated the average level of EM between 2016-2018. KAS is defined as the estimation of EM according to the Kasznik model. KASAVG is calculated as the average level of EM according to the Kasznik model between 2016-2018. RCFO is defined as the Roychowdhury model estimation of abnormal cash flows. RCFOAVG is calculated as the average level abnormal cash flows during 2016-2018. RPROD is defined as the Roychowdhury model estimation of abnormal production. RPRODAVG is calculated as the average level of overproduction between 2016-2018.

Over time, it is expected that accrual-based EM will converge to zero, as managers must reverse the previous excessive use of accruals (Jones, 1991). Similarly, one could assume real activities to be biased toward zero over time as abnormal behavior is temporary in definition. Using one-sample t-tests, we tested the hypothesis that the EM measures for the benchmark period were significantly different from zero. The results are presented in Table 2. We find no significant results, meaning that we fail to reject the null hypothesis of the means being zero.

Table 2.

One-sample t-tests of benchmark period

Variable	Mean	Std. err.	Std. dev.	T-stat	P-value
MJMAVG	-0.0038	0.0055	0.2187	-0.6888	0.4910
KASAVG	-0.0021	0.0018	0.0718	-1.1928	0.2331
RCFOAVG	-2.21E-05	0.0036	0.1424	-0.0062	0.9950
RPRODAVG	-0.0010	0.0051	0.2028	-0.1970	0.8438

Note: MJM is defined as the estimation of EM according to the Modified Jones model. MJMAVG is calculated the average level of EM between 2016-2018. KAS is defined as the estimation of EM according to the Kasznik model. KASAVG is calculated as the average level of EM according to the Kasnik model between 2016-2018. RCFO is defined as the Roychowdhury model estimation of abnormal cash flows. RCFOAVG is calculated as the average level abnormal cash flows during 2016-2018. RPROD is defined as the Roychowdhury model estimation of abnormal production. RPRODAVG is calculated as the average level of overproduction between 2016-2018.

In Appendix A We present descriptive statistics for countries. Denmark is the country with the least number of observations at 44. In Appendix B we present descriptive statistics for industries. For the sake of clear reporting, we have consolidated the industries into sectors in accordance with the GIC system. *Utilities* present abnormal differences between MJM and KAS estimations. This is likely to be an effect of the model configurations as MJM incorporates inverse assets and will thus recognize capital intensity better.

5 Results

In this section, the results from the tests of the three hypotheses are presented.

5.1 T-tests

Paired t-tests were run for all EM measures respectively, comparing the mean of the 2020 estimate with the average for the benchmark period 2016-2018 in order to determine if the mean difference is statistically significant. The results are presented in Table 3.

Table 3.

Paired t-tests

Variable	Mean	Std. err.	Std. dev.	P-value	T-stat	Cohen's D
MJM2020	-0.0665	0.0064	0.2563			
MJMAVG	-0.0038	0.0055	0.2187			
DIFF	-0.0628	0.0067	0.2694	0.0000	-9.3394	0.2634
KAS2020	-0.0221	0.0026	0.1036			
KASAVG	-0.0021	0.0018	0.0718			
DIFF	-0.0199	0.0027	0.1069	0.0000	-7.4608	0.2238
RCFO2020	0.0995	0.0132	0.5309			
RCFOAVG	-2.21E-05	0.0036	0.1424			
DIFF	0.0996	0.0141	0.5665	0.0000	7.0471	0.2561
RPROD2020	0.0048	0.0053	0.2131			
RPRODAVG	-0.0010	0.0051	0.2028			
DIFF	0.0058	0.0035	0.1417	0.1001	1.6455	0.0279

Note: MJM is defined as the estimation of EM according to the Modified Jones model. MJMAVG is calculated the average level of EM between 2016-2018. KAS is defined as the estimation of EM according to the Kasznik model. KASAVG is calculated as the average level of EM according to the Kasnik model between 2016-2018. RCFO is defined as the Roychowdhury model estimation of abnormal cash flows. RCFOAVG is calculated as the average level abnormal cash flows during 2016-2018. RPROD is defined as the Roychowdhury model estimation of abnormal production. RPRODAVG is calculated as the average level of overproduction between 2016-2018. DIFF is calculated as the difference between the respective variables.

According to the Modified Jones estimates, the mean discretionary accruals for 2020 were -0.0655, compared to -0.0038 for the benchmark period. The mean difference is statistically significant at a 0.001 level. This result is in line with the estimations of the Kazsnik model, producing a 2020 mean of -0.0221 and a benchmark mean of -0.0021. The mean difference in the Kasznik model is also significant at a 0.001 level. This is expected as both models are intended to estimate discretionary accruals. Overall, these results imply that firms displayed a lower level of discretionary accruals than expected during 2020. In terms of EM, this means that firms managed their earnings downwards.

The Roychowdhury cash flow model provides estimates of abnormal cash flows. The mean difference estimates for 2020 was 0.0995 and the benchmark period mean was close to zero. The difference is statistically significant at a 0.001 level. In practical terms, this means that during 2020, the CFO was on average higher than expected given the revenue compared to the benchmark period. In the Roychowdhury (2006) article, it is expected that sales manipulation, i.e., the real activity performed to impact earnings, will lead to lower abnormal CFO compared to sales levels. In our study though, the CFO is abnormally large given revenue during 2020. With reference to sales manipulation, this would imply stricter credit terms and less price discounts.

The Roychowdhury production model considers the level of COGS and inventory change to estimate real EM through overproduction. The mean difference estimates for 2020 was 0.0048 and the benchmark period mean was -0.0010. The difference is not statistically significant. The higher level for 2020 implies that firms overproduced to a higher degree compared to the benchmark period with the effect of lowering COGS and increasing earnings.

We also performed the same tests using absolute values and thus measuring the implied usage of earnings management, disregarding the direction but gaining a clearer measure of the implementation of EM strategies overall. The results are displayed in Appendix C. From these tests we gained similar results with the MJM, KAS and RCFO models reflecting statistically significant results at a 0.001 significance level of higher usage of EM during 2020 compared to the benchmark period.

The effect size measurement Cohen’s d is reported in Table 3. For the Modified Jones, Kasznik and Roychowdhury CFO models, the effect sizes are 0.2634, 0.2238 and 0.2561 respectively.

These levels are above the lower bound of 0.2 for small effect size (Cohen, 1969). A small effect size implies that the difference between the means is small, though not insignificant. In practical terms, a 0.2 effect size level implies that approximately 15% of the samples do not overlap. The standardized small, medium, and large effect size levels are relative in nature and can differ depending on area of research (Cohen, 1969). The Cohen's d measure for the Roychowdhury PROD model is 0.0279, indicating a very small and trivial effect size. The effect sizes for the absolute value-tests are displayed in Appendix C. The Cohen's d measure is lower for MJM but higher for KAS. The economic significance for RCFO is slightly below the threshold for a large difference implying that cash flows levels were highly abnormal during 2020 compared to the benchmark period.

5.2 Regressions

To test the third hypothesis, a regression was run to measure the impact of different aspects of the COVID-19 pandemic. The regression results are presented in Table 5. GDP growth is the only statistically significant variable in both accrual-based models, with a significance level of 0.1 in MJM and 0.05 in KAS. The coefficient is positive in both models. This could imply that lower or negative GDP growth led to downward adjustment of earnings.

GDP and *FIS* are statistically significant at 0.001 and 0.05 levels respectively in the Roychowdhury CFO model. The coefficient for *GDP* is positive and negative for *FIS.* This seems to imply that higher GDP growth led to positive abnormal cash flows, or analogously, negative growth led to more negative abnormal cash flows. The opposite relationship is reflected in the *FIS* variable as higher fiscal support implies lower abnormal cash flow.

GR, the overall governmental response, is significant at a 0.01 level in the RPROD model. This would imply that a *stronger* governmental response led to higher levels of overproduction. A governmental response can include actions such as investments in vaccine, restrictions, tracing, income support and similar.

The R2 for the MJM, KAS, RCFO models are 0.3387, 0.2682, 0.2712, and 0.0942 respectively. Adjusted R2 is 0.0705 for RPROD and is only available for this model as we used robust standard errors in the remaining models.

The *ROADIFF, CFODIFF* and *LEVDIFF* control variables are all statistically significant in the accrual-based models as seen in Table 5. The direction of the coefficient estimations aligns between the two models as well. For the RCFO model, only the CFODIFF control variable is statistically significant. In the RPROD regression, all control variables are statistically significant at levels below 0.1.

Table 5.

Regression coefficients

	MJMDIFF	KASDIFF	RCFODIFF	RPRODDIFF
GDP	0.3300*	0.1576**	2.2448***	-0.0205
	(0.1814)	(0.0792)	(0.4467)	(0.1057)
FIS	5.86E-10	2.86E-09	-3.42E-08**	-1.85E-10
	(7.59E-09)	(2.87E-09)	(1.65E-08)	(5.27E-09)
GR	-0.0001	0.0001	-3.92E-05	0.0006**
	(0.0005)	(0.0002)	(0.0012)	(0.0003)
ROADIFF	0.2974**	0.2454**	-0.0119	-0.0113
	(0.1450)	(0.1257)	(0.0759)	(0.0151)
CFODIFF	-0.3440***	-0.2068**	0.7718***	-0.1642***
	(0.1093)	(0.0988)	(0.1723)	(0.0233)
LEVDIFF	-0.0135**	-0.0108*	0.0010	0.0033***
	(0.0067)	(0.0057)	(0.0035)	(0.0010)
R2	0.3387	0.2682	0.2712	0.0705

*Note: Significance levels:***=0.01, **=0.05, *=0.1*

GDP is defined as the growth in a country's GDP during 2020. GDP is defined as unadjusted chained linked volumes, expressed in million euros. FIS defined as announced fiscal stimulus spending divided by a country's average GDP, expressed as chain linked volumes. GR is a variable corresponding to the overall strength of a government's response to the pandemic, including restrictions, lockdown measures and fiscal measures. ROADIFF is defined as the difference in the ROA measure for 2020 and the average for the benchmark period 2016-2018. CFODIFF is defined as the difference between the CFO measure for 2020 and the average for the benchmark period 2016-2018. LEVDIFF is defined as the difference between LEV (2020) and LEV (average between 2016-2018). R2 is defined as a statistical measure representing the interrelation and dependency between variables, i.e., it determines the proportion of the variance for a dependent variable explained by independent variable(s).

6 Analysis

In this section, the previously presented results are analyzed. After the analysis of the t-test, regression, and control variables, there is a robustness check followed by a description of the reliability, validity, and comparability of the tests.

6.1 T-test analysis

We conducted paired t-tests to compare the mean difference between EM estimations for 2020 and the average for the benchmark period 2016-2018. To test H1 we used two different models to determine AEM. For both models we find statistically significant differences in the two periods' sample means, with 2020 displaying larger negative discretionary accruals. This implies that firms on average managed their earnings downwards using accruals more during 2020 compared to the benchmark period. The behavior aligns with the ideas underlying big bath accounting and the idea that managers prefer to report bad news during bad times (Conrad et al., 2002). It also follows the findings of similar research on US firms (Liu & Sun, 2022). The results from the paired t-tests imply that we can reject the null hypothesis of no difference between the means. Thus, on average, firms managed their earnings downwards more in 2020 compared to the benchmark period. The tests using absolute values indicate higher usage of EM during 2020 compared to the benchmark period which is in line with the above results.

To test for REM, we use two models to determine different aspects of real activities, namely CFO and production manipulation. Using the RCFO model, we find a statistically significant difference between the means for 2020 and the benchmark period, with 2020 displaying larger abnormal CFO. The model tests the presence of sales manipulation, e.g., management allowing lenient credit terms to increase sales but leaving cash flows unchanged. In our estimation for 2020, the abnormal cash flow is positive, i.e., in relation to sales levels, the operating cash flow is larger than expected. Compared to the Roychowdhury (2006) source article, where the purpose was to determine upward earnings adjustments to break the zero earnings threshold, this study's result indicates downward adjustment. The implied actions taken by managers do not align with the sales manipulation view of EM, though it still presents behavior that deviates from the normal. One possible reason could be that sales manipulation techniques such as price discounts and lenient credit terms were less available for liquidity constrained firms or that supply issues caused product shortages. Another

cause could be decreased discretionary expenditures as for example R&D costs fell in some industries during 2020 (OECD, 2022). This would partly increase CFO compared to expected levels as uncapitalized R&D is accounted for as operating cash flow in accordance with IAS 7 (IFRS, 2022). Generally, real EM is harder to define, and measure compared to accrual-based EM (Roychowdhury, 2006). When measuring real activities, there is a risk of capturing behavior that is not meant to manipulate earnings and mislead stakeholders. To conclude, we find a statistically significant increase in abnormal cash flows for 2020 compared to the benchmark period though one can argue whether the underlying reason is EM.

Using the RPROD model, we do not find a statistically significant difference between the means for 2020 and the benchmark period, with 2020 displaying larger abnormal production costs. We fail to reject the null hypothesis of no increased usage of overproduction as an EM method during 2020. We performed the same test on a sample excluding non-manufacturing firms, which yielded the same result.

Using absolute values, we gained similar indications as the ones above, i.e., that the usage of EM increased during 2020. A difference is that the RCFO model displayed a larger Cohen's d measure, implying that the difference between the usage in 2020 and the benchmark period, disregarding direction, is greater than the non-absolute values indicate. One reason could be that the effect on a firm's cash flow differed highly depending on certain factors such as industry and country.

6.2 Regression

To test H3, i.e., whether different factors of the pandemic impacted the usage of EM, we employed a regression model with country-specific data matched to the geographical location of a firm's headquarters. The independent variables include GDP growth, fiscal support, and overall governmental response.

For the two accrual-based models, MJM and KAS, the *GDP* variables were significant with a positive coefficient, implying that lower or negative GDP growth led to downward adjustment of earnings. The theory of big bath accounting could have some explanatory power in this circumstance. As stated in previous research, managers may be faced with an incentive to manage earnings further downward if it seems like previously stated targets will not be met (Healy, 1985). The COVID-19 pandemic may have provided an opportunity for firms to adjust their earnings

downward. Based on previous research, it could be beneficial for firms to report worse earnings during COVID, as the situation acts as a reference point, increasing the capital market acceptance of poor earnings (Conrad et al., 2002). This idea aligns with similar research based on US firms (Liu & Sun, 2022).

In the case of the RCFO model, we found statistical significance for the GDP and FIS variables. The coefficient of the GDP variable is positive, which would indicate that a higher GDP growth caused the actual CFO to be higher compared to the expected level given reported revenue.

Analogously, negative GDP growth implies abnormally low CFO compared to the expected level, i.e., the indication of sales manipulation described by Roychowdhury (2006). The coefficient of the FIS variable is negative, which implies that higher fiscal support led to abnormally low CFO compared to the expected level given reported revenue.

In the regression for the RPROD model, we find significance for the *GR* variable, indicating the level of governmental response through actions such as investments in vaccine, restrictions, tracing, income support, etc. A positive coefficient would imply that a stronger response led to greater overproduction.

Given the lack of previous research on the effect of the pandemic on real EM combined with the ambiguous interpretation of what could be defined as deliberate manipulation of earnings when external factors can impact the discretionary ability of a manager, we fail to constitute any clear explanations underlying the above results. Thus, we can only conclude the significance and call on further research to delve deeper into the relationships.

For the two accrual-based models, all control variables are significant on at least a 0.1 level. One possible reason for the non-significance of some of the control variables in the REM models is that real activities were affected in ways that traditional control variables failed to capture (Roychowdhury, 2006).

6.3 Robustness

Several assumptions underlie the tests performed with the ability of skewing results if not fulfilled. Below, we will test for heteroscedasticity, multicollinearity, and the assumption of normal distribution.

Heteroscedasticity

Homoscedasticity is an underlying assumption in the performed regressions, i.e., that the variances of the independent variables are equal or at the least similar (Zax, 2011). The opposite is called heteroscedasticity and while it leaves coefficient estimations unchanged, it can lead to inaccurate standard errors. We used a Breusch-Pagan/Cook-Weisberg to test for the presence of heteroscedasticity and found reason to reject the null hypotheses of constant variance (homoscedasticity) for the MJM, KAS and RCFO models. To adjust for this, we use what is called robust standard errors for these regressions.

Multicollinearity

In Appendix D, we display a Pearson correlation table, containing the dependent, independent and control variables in the main regression model. None of the variable combinations display high enough correlation to raise alerts regarding multicollinearity problems. The correlation between the *MJMDIFF* and KASDIFF are the highest at 0.4427 which is somewhat expected given that the models share the same purpose, i.e., estimating discretionary accruals. One may even have suspected a higher correlation between the pair, showing the importance of using several accrual-based models as their output evidently can differ. There is a negative relationship between fiscal support and GDP growth with a correlation of -0.4319. This may imply that countries with higher GDP growth employed less fiscal support, but likely it is also partly due to the definition of fiscal support, as the announced economic spending is divided by GDP to create comparability between countries. We also find a medium correlation of 0.4365 between *RCFODIFF* and *CFODIFF*, which is not surprising given that both variables stem from the operating cash flow. Lastly, a correlation of 0.4353 between *ROADIFF* and *CFODIFF* is quite expected given that high cash flows and high net income likely correlate.

In Appendix E, we display the results of a variance inflation factor (VIF) analysis to further explore the possibility of multicollinearity. The average value, including industry fixed effects, is 2.48 which indicates no clear presence of multicollinearity.

Normal distribution

To conduct the paired t-tests, one underlying assumption is that the sample is approximately normally distributed. As displayed in Appendix F, this aligns with the distribution of the EM measured. Thus, we assume the data to be approximately normally distributed.

6.4 Analysis of the research design

Reliability

Overall, we feel confident in our study's reliability. The source articles and models are for the most part published in quality journals and established in the earnings management research area. The financial data is retrieved from COMPUSTAT which is commonly used and referred to in research generally but also specifically in our source articles such as Roychowdhury (2006). Oxford University's COVID tracker provides an optimal source for the COVID-related variables as it ensures conformity in collection and interpretation.

Validity

One issue is the validity of the models. On one hand the models stem from articles published in respected journals, on the other it is known that earnings management models, especially those tailored for real activities, can capture effects that are not to be considered as abnormal behavior from management. Our results, just as any earnings management research, could wrongly interpret some characteristics as earnings management. We have also strived to test and adjust important aspects and assumptions such as the normality of distributions, heteroscedasticity, and multicollinearity.

Comparability

While earnings management is a well-studied research area in general, the pandemic is a relatively new subarea. Most research focuses on firm-specific effects, rather than industry-wide or global issues. We expect new research regarding earnings management during the pandemic to be published in the future which will improve the comparability of results and methods.

Note on the model

Our proxy for firm-country is the residence of the headquarters, with the purpose of capturing the situation closest to the decision-making authority. It may be that the sample, consisting of active, public companies with 7 years of full data availability, to a degree is made up of firms with an international presence. This would imply that a firm's operative performance and potential inclination to pursue EM are highly based on the situation in several countries, rather than simply the nationality of the headquarters. The model fails to incorporate this fact which could lead to failure in fully explaining the usage of EM.

7 Future research

In our study we focused primarily on overall levels of earnings management or, as in the regression, the impact of country-specific variables. We also discussed how multinational firms could distort the result given that we define a firm as belonging to the same country as the geographical location of their headquarters. An interesting angle would be to research how different industries employed earnings management strategies during COVID. It is possible that patterns can be found for factors such as dependence on supply chains, degree of digitalization, ability to continue operations during a lockdown, and similar.

With better data availability, further research should be conducted using the full Roychowdhury (2006) REM model, i.e., including discretionary expenses. Including this would give a fuller picture of the situation and enable stronger conclusions.

Lastly, further research will be able to include data for the recovery period. This could supply more data for the regression, but also broaden the perspective and observe how the usage of EM differs between the initial phase and later stages of the pandemic.

8 Conclusion

This study attempts to examine the impact of the COVID-19 pandemic on the usage of earnings management in a sample of public, European firms. Using 2020 as the pandemic year and 2016-2018 as benchmark years, several tests were performed to research the difference in earnings management between these periods and how different factors such as macroeconomic conditions and governmental response could impact the usage.

We find statistical significance for an increase in the implementation of accrual-based earnings management during the pandemic year in two separate models. The average direction for firms seems to be downward adjustment of earnings. This aligns with established theories such as Big Bath accounting, stating that managers tend to adjust earnings further downward if previously set earnings target are not forecasted to be met (Healy, 1985). The capital market acceptance of poor earnings results can also increase when the overall economy is weaker (Conrad et al., 2002). This is reflected in our study as we find significant results indicating that weak or negative GDP growth

implies downward adjustment of earnings to a higher degree. These results also align with the findings and conclusions of a study performed in a US setting (Liu & Sun, 2022).

Real activities can be harder to distinguish as earnings management as the discretionary choices made by managers can be impacted by several other factors. We find significant results for higher abnormal cash flows given revenue levels in the pandemic year compared to the benchmark period. This is the opposite of the sales manipulation strategy described in Roychowdhury (2006) and one can thus argue whether this reflects increased usage of earnings management or not. We present several potential causes, such as the unavailability of giving lenient credit terms given liquidity issues and decreased discretionary expenditure, e.g., research and development. We also find significant results indicating that higher GDP growth during the pandemic year led to higher abnormal cash flows while increased fiscal support meant lower abnormal cash flows. Lastly, the study examines the possibility of firms pursuing overproduction in order to impact their earnings. We do not find a significant increase in overproduction during the pandemic year, though we did find significant results showcasing that the strength of the overall governmental response impacted the overproduction in such a way that a stronger response led to more overproduction.

We believe that this study can contribute to the understanding of how a global event such as a pandemic can impact the usage of earnings management and the reliability of financial reporting. Earlier research often examines the impact of firm-specific factors rather than broader issues. Our study can increase the understanding of how macroeconomic conditions and different types of governmental actions can impact the usage of earnings management. A limitation to the study is the fact that the models fail to take globalization and international firms into account.

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Appendix

Appendix A: Descriptive statistics for countries

Country	ISO	Observations	MJMDIFF	KASDIFF	RCFODIFF	RPRODDIFF
Belgium	BEL	48	0.0719	-0.0063	0.0238	-0.0078
Germany	DEU	161	0.0150	-0.0385	0.1807	0.0237
Denmark	DNK	44	0.0724	-0.0309	0.0792	0.0511
Spain	ESP	68	0.0616	-0.0168	0.0377	0.0398
Finland	FIN	60	-0.0936	-0.0276	0.0590	0.0005
France	FRA	159	-0.0847	-0.0268	0.0389	0.0166
Greece	GRC	93	-0.4716	-0.0167	-0.0048	0.0073
Italy	ITA	90	0.0200	-0.0084	-0.0537	0.0284
Netherlands	NLD	55	-0.0820	-0.0397	0.0678	0.0277
Norway	NOR	52	-0.0736	0.0332	0.1379	-0.0102
Poland	POL	265	-0.0970	-0.0456	0.0038	-0.0292
Sweden	SWE	316	-0.0587	0.0156	0.1062	-0.0086
Turkey	TUR	197	-0.2731	0.0046	0.3752	-7.7E-05

Appendix B: Descriptive statistics for sectors

Sector	Name	Observations	MJMDIFF	KASDIFF	RCFODIFF	RPRODDIFF
20	Industrials	423	-0.0417	-0.0287	0.1227	-0.0052
45	Information Technology	258	-0.0372	-0.0225	0.1435	-0.0083
15	Materials	170	-0.0262	-0.0058	0.1147	-0.0097
30	Consumer Staples	123	-0.0095	-0.0101	0.1609	-0.0066
35	Health Care	198	-0.0367	-0.0248	0.0143	0.0213
50	Communication Services	129	-0.0682	0.0651	0.0462	0.0295
25	Consumer Discretionary	232	-0.1412	-0.0247	0.1365	0.0158
10	Energy	34	-0.2437	-0.0236	-0.3953	0.0107
55	Utilities	41	-1.5686	-0.0179	0.1185	-0.0110

Appendix C: Paired t-tests with absolute values

Variable	**Mean**	**Std. err.**	**Std. dev.**	**P-value**	**T-stat**	**Cohen's D**
MJM2020	0.1432	0.0051	0.2027			
MJMAVG	0.0998	0.0044	0.1757			
DIFF	0.0434	0.0046	0.1830	0.0000	9.5013	0.2288
KAS2020	0.0721	0.0019	0.0776			
KASAVG	0.0477	0.0013	0.0537			
DIFF	0.0244	0.0020	0.0804	0.0000	10.9922	0.3657
RCFO2020	0.3188	0.0109	0.4360			
RCFOAVG	0.0898	0.0028	0.1105			
DIFF	0.2289	0.0108	0.4331	0.0000	21.1975	0.7198
RPROD2020	0.1414	0.0038	0.1488			
RPRODAVG	0.1430	0.0037	0.1422			
DIFF	-0.0016	0.0029	0.1138	0.4045	0.8338	0.0107

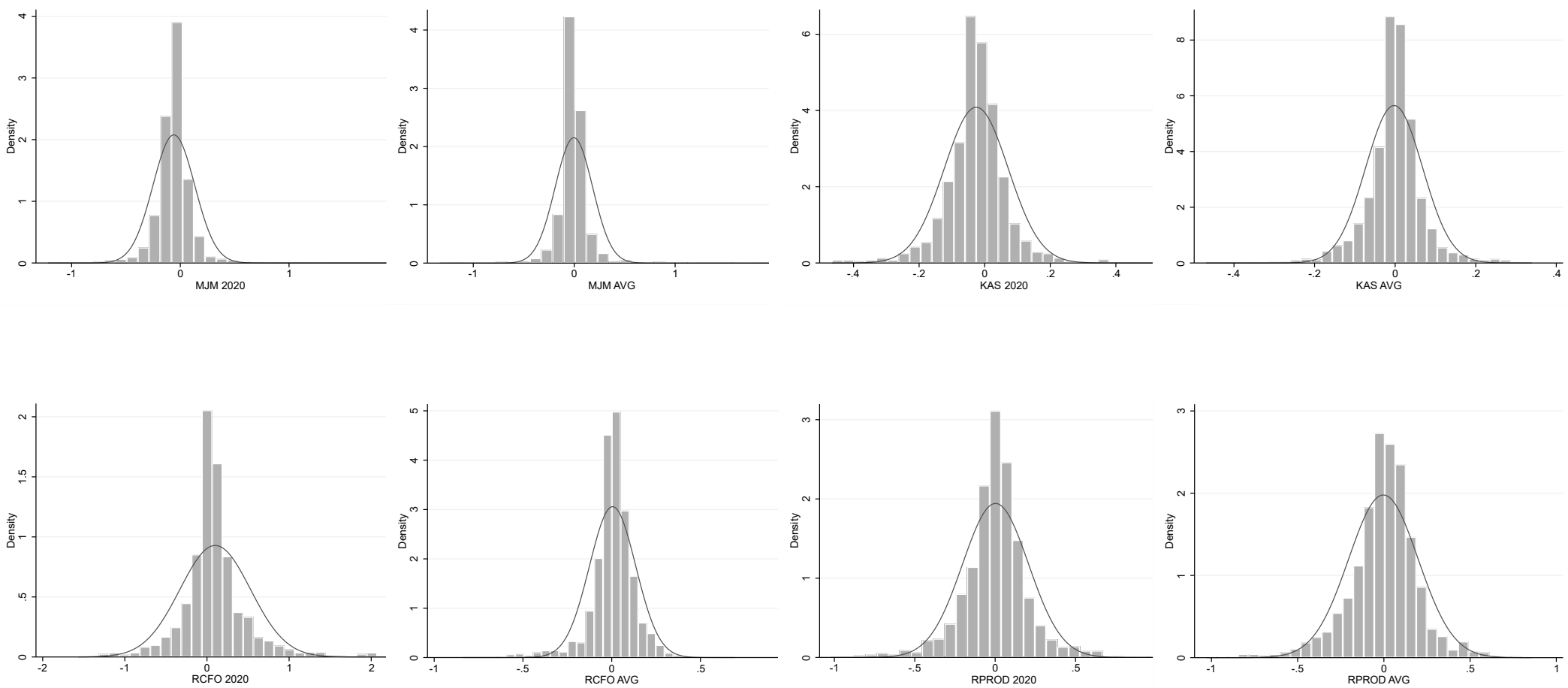
Appendix D: VIF analysis

Variable	VIF	1/VIF
GDP	1.33	0.754
FIS	1.29	0.774
GR	1.06	0.941
ROADIFF	1.33	0.751
CFODIFF	1.35	0.741
LEVDIFF	1.11	0.902
Average	1.25	0.803
Incl. Industry fixed effects	*2.48*	*0.403*

Appendix E: Pearson correlation table (P-values)

	MJMDIFF	DIFFKAS	DIFFRCFO	DIFFRPROD	GDP	FIS	GR	ROADIFF	CFODIFF	LEVDIFF
MJMDIFF	1.000									
KASDIFF	0.443	1.000								
	0.000									
RCFODIFF	-0.166	-0.046	1.000							
	0.000	*0.076*								
RPRODDIFF	-0.014	-0.066	-0.089	1.000						
	0.585	*0.011*	*0.001*							
GDP	0.011	0.036	0.183	-0.039	1.000					
	0.668	*0.161*	*0.000*	*0.132*						
FIS	-0.015	0.004	-0.125	0.040	-0.432	1.000				
	0.567	*0.869*	*0.000*	*0.125*	*0.000*					
GR	0.012	-0.014	-0.004	0.033	-0.020	-0.095	1.000			
	0.639	*0.592*	*0.889*	*0.202*	*0.427*	*0.000*				
ROADIFF	0.119	0.363	0.207	-0.166	0.041	-0.025	0.000	1.000		
	0.000	*0.000*	*0.000*	*0.000*	*0.108*	*0.331*	*0.996*			
CFODIFF	-0.182	-0.184	0.437	-0.237	0.061	-0.071	0.025	0.435	1.000	
	0.000	*0.000*	*0.000*	*0.000*	*0.018*	*0.006*	*0.328*	*0.000*		
LEVDIFF	0.096	0.102	0.064	-0.071	0.053	-0.042	0.012	-0.135	0.142	1.000
	0.000	*0.000*	*0.013*	*0.006*	*0.040*	*0.103*	*0.641*	*0.000*	*0.000*	

Appendix F: Earnings management distribution (2020 and benchmark period)



Distributions of earnings management proxies for 2020 and the benchmark period