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Information quality and Investment efficiency.

Qualidade da informação e eficiência do investimento.

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Abstract

Purpose - The aim of this study is to analyze the impact of the quality of financial information on the investment efficiency of small and medium-sized enterprises (SMEs).

Design/methodology - An unbalanced panel data sample of 608 Portuguese firms in the agri-food sector is analyzed over 2015-2022. Investment inefficiency is measured using the investment model based on growth opportunities. Besides the global inefficiency, the analysis is split into over and underinvestment (two investment inefficiencies). Financial information quality is measured through five proxies, namely earnings smoothing, accruals quality, earnings persistence, earnings predictability, and conservatism. The final model is estimated using Ordinary Least Squares. The impact on the probability of having a higher level of inefficiency is also tested using the Logit model.

Findings - The results show that financial information quality impacts companies' investment efficiency. Companies with more accruals quality (less earnings management practice) increase the likelihood of more efficient investments. Moreover, companies with more conservative practices incur in underinvestment to reduce uncertainties.

Originality - This study contributes to the debate on investment efficiency. It adds knowledge to the existent literature by analyzing unlisted companies, which have singular investment opportunities, and an unexplored sample, the agri-food SMEs. Additionally, the analysis includes several financial information quality proxies, three of which — persistence, predictability and conservatism — have not, as far as we know, been addressed before and are relevant to explaining investment inefficiency. Finally, the conclusions are highly relevant to practice.

Keywords: Information quality; Financial Information Quality; Investment Efficiency; Investment inefficiency; SMEs.

Article classification: research paper

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1. Introduction

Financial information is the basis for financial decision-making. If this information does not accurately reflect the company's true position, stakeholders and managers may allocate resources inefficiently, leading to investment inefficiencies (Assad et al., 2023). Such investments have a negative impact on a company and its growth, which can damage its financial position (Susilawati et al., 2024).

This study aims to understand the impact of financial information quality on investment efficiency. For it, Portuguese small and medium enterprises from the agri-food sector are analysed in the period 2015-2022. Studies focusing on this theme measure financial information quality through accruals, namely discretionary accruals, which is related to earnings management practices (e.g., Chen et al., 2011; Cutillas-Gomariz & Sánchez-Ballesta, 2014; Wang et al., 2015; Ebrahimi Rad et al., 2016; Ren, 2016; Cherkasova & Rasadi, 2017; Houcine, 2017; Carvalho & Kalatzis, 2018; Azani et al., 2019; Shahzad et al., 2019; Harymawan, 2021; Assad et al., 2023; Le et al., 2024; Susilawati et al., 2024). However, financial information quality goes beyond this measure.

The inherent difficulty in measuring the quality of financial information and the attempt to minimize the possible effects of omitted variables have led several authors who analyse this topic to use various proxies (e.g. earnings smoothing, accruals quality, value relevance, earnings persistence, earnings predictability, and conservatism). However, the widespread applicability of these measures is conditioned since some of the proxies are only applicable to listed companies. This explains why most of the existing studies analysing the impact of financial information quality on investment efficiency focus on a limited set of proxies and the analysis of listed companies, such as Cutillas-Gomariz and Sánchez-Ballesta (2014), Wang et al. (2015), Ebrahimi Rad et al. (2016), Ren (2016), Houcine (2017), Azani et al. (2019), Harymawan (2021), Houcine et al. (2022), Assad et al. (2023), Shahzad et al. (2019), Le et al. (2024) and Susilawati et al. (2024).

In this way, this study sees here an opportunity to expand the existing literature. To assess the quality of financial information, five proxies are used: earnings smoothing, accruals quality, earnings persistence, earnings predictability, and conservatism. Only the works of Houcine (2017) and Harymawan (2021) use more than one proxy – accruals quality, earnings smoothing, and value relevance. By considering several proxies that can be applied to unlisted companies, we can draw an overall picture of financial information quality. Additionally, this work analyses non-listed companies, the majority of firms all over the world, instead of listed companies, which are the focus of most of the studies. The agri-food sector was chosen since has not been previously analysed and is one of the most influential sectors in the Portuguese and European economies (FoodDrink Europe, 2021). Analysing a singular sector is relevant since investment opportunities can be singular in each sector.

Investment efficiency is measured using the inefficiency indicator (lack of efficiency) presented by de Biddle et al. (2009), following the majority of the studies in the area (e.g., Chen et al., 2011; Cutillas-Gomariz & Sánchez-Ballesta, 2014; Wang et al., 2015; Ren, 2016; Azani et al., 2019; Shahzad et al., 2019; Houcine et al., 2022; Assad et al., 2023). In addition, we also analyse the two types of inefficiency: over and underinvestment, as Chen et al. (2011), Cutillas-Gomariz and Sánchez-Ballesta (2014), Wang et al. (2015), Ren (2016), Cherkasova and Rasadi (2017), Carvalho and Kalatzis (2018), Houcine et al.

(2022), Assad et al. (2023), and Le et al. (2024). Firms can invest in projects with negative net present value (overinvestment) to satisfy the managers personal interests or avoid investments (underinvestment) to reduce the firm's uncertainties. As these two stances are distinct and can impact results, analysing them separately contributes to a better understanding of firms' behaviours.

The models are regressed using Ordinary Least Squares (OLS), following previous research (e.g., Cutillas-Gomariz & Sanchez-Ballesta, 2014; Shahzad et al., 2019; Duarte et al., 2022; Houcine et al., 2022). In addition, a binary Logit model is also regressed to analyse the impact of financial information quality on the probability of having a higher level of inefficiency (greater deviation from the expected investment level). This new analysis contributes to the ongoing debate of the impact of financial information quality on efficient investments.

This paper is organized into five sections. After this first introductory section, the second section presents a theoretical context and establishes the hypotheses. The third section shows the sample characterization and the description of the methodology and variables to be used in the analysis of default risk. In section four, the results are presented and discussed. Finally, the main conclusions are presented in the last section.

2. Theoretical background

Companies may abandon some projects with a positive net present value or invest in projects with lower performance or quality, resulting in less effective investments (Stiglitz & Weiss, 1981; Lambert et al., 2007; Azani et al., 2019). More specifically, there are two types of inefficiency – underinvestment and overinvestment (Hubbard, 1998; Houcine et al., 2022). Underinvestment occurs when the company does not invest in projects that could create value, leading to negative deviations from the expected level of investment. This situation usually occurs to avoid uncertainty. Conversely, overinvestment arises when companies invest in projects with a negative net present value (NPV), i.e., a positive deviation from the expected level of investment (Biddle et al., 2009; Azani et al., 2019). It is common when managers are less controlled and thus try to make personal investments using the company's wealth.

To eliminate or at least reduce investment inefficiencies, information should be clear and transparent (Shahzad et al., 2019). Complete financial information reduces information asymmetries (Azani et al., 2019) and the so-called agency problems, i.e., conflicts of interest between managers and shareholders (Jensen & Meckling, 1976). Failing to act in the best interests of shareholders, managers, who have access to more information about the company, may invest in projects that maximize their personal benefits to the detriment of maximizing the company's value and sustainability (He & Kyaw, 2018), particularly when the company has more free cash flow (Jensen, 1986). This can result in adverse selection problems, as shareholders with less information may be reluctant to invest, which can have negative consequences (Akerlof, 1970; Arrow et al., 1973; Shahzad et al., 2019). On the other hand, as shareholders cannot control managers' actions, moral hazard may arise and managers may invest in risky projects, thereby damaging shareholders' wealth (Shahzad et al., 2019).

According to the Financial Accounting Standards Board (FASB), financial information must present a set of characteristics to be useful to its users and allow more accurate decision-making. These characteristics are relevance, reliability, understandability, punctuality, comparability, and verifiability (FASB, 2010; IASB, 2010). Financial information is said to be of quality when it clearly and precisely provides reliable information about an entity's performance (Jonas & Blanchet, 2000). Financial information quality can allow for more assertive decisions, contributing to the company's value creation (Ahmed & Duellman, 2007; Cherkasova & Rasadi, 2017).

Literature analysing the impact of financial information quality on investment efficiency (e.g. Biddle et al., 2009; Chen et al., 2011; Cutillas-Gomariz & Sánchez-Ballesta, 2014; Wang et al., 2015; Ebrahimi Rad et al., 2016; Ren, 2016; Houcine, 2017; Azani et al., 2019; Shahzad et al., 2019; Harymawan, 2021; Houcine et al., 2022; Assad et al., 2023; Le et al., 2024; Susilawati et al., 2024) has been conducted in various countries (e.g. the US, France, Spain, China, Indonesia, Tunisia, Pakistan, Vietnam, Shanghai, Malaysia), found that companies with higher quality financial information tend to be more efficient in making investments. This is because information asymmetries are reduced, enabling managers to make more informed decisions with greater confidence.

Based on the above, we intend to analyse whether:

H1: Financial information quality has a negative impact on the investment inefficiency of Portuguese SMEs in the agri-food sector.

Some studies analyse the impact of financial information quality on the two types of investment inefficiency: over and underinvestment.

Chen et al. (2011), Wang et al. (2015), Ebrahimi Rad et al. (2016), Ren (2016), Cherkasova and Rasadi (2017), and Assad et al. (2023) conclude that financial information quality is negatively related to both under and overinvestment. The authors suggest that accurate and relevant financial information allows investors to evaluate the company's ability to generate surplus correctly, to make more informed investment decisions, and to make more accurate projections about future cash flow.

In turn, Cutillas-Gomariz and Sánchez-Ballesta (2014), Harymawan (2021), Houcine et al. (2022), and Le et al. (2024) concluded that financial information quality alleviates existing overinvestment problems, however, it does not affect the increase in efficiency in underinvestment situations. In other words, when companies invest less than expected, the quality of financial information does not help to increase the level of investment.

Based on the above, and the idea that more accurate financial information can lead to better and more efficient decisions, we intend to subdivide the general analysis into the following sub-hypotheses:

H1A: Financial information quality has a negative impact on underinvestment by Portuguese SMEs in the agri-food sector

H1B: Financial information quality has a negative impact on the overinvestment of Portuguese SMEs in the agri-food sector

3. Methodology

This work aims to analyse the impact of financial reporting quality on investment inefficiency. The next figure shows the methodology of this work:

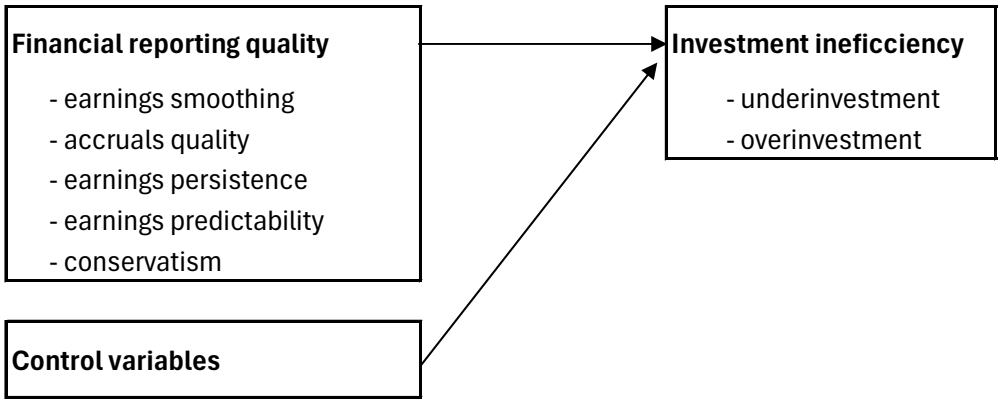

Figure 1- *Methodology*

Source: Own elaboration (2025).

3.1 Model

To test the validity of the study's hypotheses, the following model will be regressed:

$$\text{Investment Inefficiency}_{i,t} = c + \sum_{a=1}^{5} \beta_a \text{FIQ}_{a,i,t} + \sum_{b=1}^{4} \alpha_b \text{Control Variables}_{b,i,t} + \varepsilon_{i,t} \quad (1)$$

With FIQ – financial information quality, a – number of FIQ proxies, b – number of control variables, i - company analysed, t – period analysed, ε – model estimation error.

3.2 Variables

The dependent variable is *investment inefficiency* (II), i.e., the lack of investment efficiency. There are several models that can be used to estimate investment efficiency. Following Chen et al. (2011), Cutillas-Gomariz and Sánchez-Ballesta (2014), Wang et al. (2015), Ren (2016), Azani et al. (2019), Shahzad et al. (2019), Houcine et al. (2022), and Assad et al. (2023), the Biddle et al. (2009) model will be tested.

$$\text{Investment}_{i,t} = c + \alpha_1 \times \text{Sales Growth}_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

With *Investment* the difference of fixed and intangible assets of two consecutive years divided by lagged total assets; sales growth is the annual change in sales divided by lagged total assets.

Investment inefficiency is the component of investment not explained by the company's sales growth and corresponds to the model's residuals. *Investment inefficiency* was divided into overinvestment, when the residual is positive, and underinvestment, when it

is negative. In the case of underinvestment, the value is multiplied by -1 to treat all values as positive and maintain the same interpretation of results (e.g., Cutillas-Gomariz & Sánchez-Ballesta, 2014; Houcine et al., 2022; Assad et al., 2023).

Financial information quality is difficult to measure with a unique proxy (Gaio, 2010). In this study, five proxies are used: earnings smoothing, accruals quality, earnings persistence, earnings predictability, and conservatism. These proxies are the ones that can be applied to small and medium enterprises.

Earnings Smoothing (*Smooth*) is related to earnings variability. This attribute does not have a conclusive impact. For one side, less earnings volatility is desirable for investors as it shows more persistent and predictable earnings (Duarte et al., 2022). In this case it is considered that earnings smoothing provides more information, reducing underinvestment situations (Houcine, 2017). Although, it can result from manipulations as sometimes companies redistribute earnings across economic periods, using accounting policies that favour this situation, to present similar earnings across the years (Cvetanoska & Kerekes, 2015; Houcine, 2017), which compromises investment decisions, and information is less reliable and transparent (Dechow & Skinner, 2000). Based on Houcine (2017) and Harymawan (2021) earnings smoothing is calculated using the following equation:

$$\text{Smooth} = \frac{\sigma\left(\frac{\text{EBIT}}{\text{Assets}}\right)}{\sigma\left(\frac{\text{OCF}}{\text{Assets}}\right)} \quad (3)$$

With EBIT – earnings before interests and taxes, OCF – operational cash flow

The model is applied per firm, using information from the last three consecutive years. The ratio *Smooth* should be less than one. The higher the ratio, the lower earnings smoothing practices and the financial information quality (Houcine, 2017).

Accruals quality (*AQ*) is related to the absence of earnings management practices. Managers can voluntarily change accounting methods, such as changing depreciation methods, inventory valuation, impairment calculation, and recognition of income and expenses to mislead stakeholders about the company's real financial situation (Nagar & Sen, 2018). There are several models for estimating accruals. The present work will use the Kothari et al. (2005) model, following, e.g., Chen et al. (2011), Ebrahimi Rad et al. (2016), Cherkasova and Rasadi (2017), Houcine et al. (2022), Assad et al. (2023).

$$\frac{\text{TA}_{i,t}}{\text{Assets}_{i,t-1}} = \beta_0 + \beta_1 \times \left(\frac{1}{\text{Assets}_{i,t-1}}\right) + \beta_2 \times \left(\frac{\Delta\text{Rev}}{\text{Assets}_{i,t-1}}\right) + \beta_3 \times \left(\frac{\text{PPE}_{i,t}}{\text{Assets}_{i,t-1}}\right) + \beta_{4\times}\left(\text{ROA}_{i,t-1}\right) + \varepsilon_{i,t} \quad (4)$$

With TA - Total accruals ($= \Delta\text{CA} - \Delta\text{CL} - \Delta\text{Cash} + \Delta\text{Debt} + \text{Depreciations}$), ΔCA – annual variation in current assets, ΔCL – annual variation in current liabilities, ΔCash – annual variation in cash and equivalents, ΔDebt – annual variation in short-term debt, ΔRev - annual variation in revenues, PPE - property, plant, and equipment, ROA - return on assets; i – company; t - period.

The model is estimated per firm using time series. This time-series regression method has strong acceptance in the literature and was chosen instead of cross-section regressions (one per year, with all firms) due to the presence of strong heterogeneity within the sample, even though all firms are SMEs and belong to the same industry (Duarte et al.,

2022). Discretionary accruals, which measure earnings management practices, are the residuals of the model. Accruals quality is the multiplication of the absolute value of discretionary accruals by -1 to help the interpretation of results. The higher the *AQ* value (lower the discretionary accruals), the higher the level of financial reporting quality (Cutillas-Gomariz and Sánchez-Ballesta, 2014).

Earnings persistence (*Pers*) is related to its sustainability. Stakeholders prefer persistent earnings since are easier to forecast and can help to support the decision-making (Dechow et al., 2010). As far as we know, this measure has not been used before in studies that relate financial information quality and investment efficiency. Based on the works of Francis et al. (2004) and Gaio and Raposo (2011), we first estimate the following equation per firm:

$$\frac{\text{NIBE}_t}{\text{Assets}_t} = \alpha_0 + \alpha_1 \times \left(\frac{\text{NIBE}_{t-1}}{\text{Assets}_{t-1}}\right) + \varepsilon_{i,t} \quad (5)$$

With NIBE- net income before extraordinary items in year t, as Duarte et al. (2022) for simplification, we use Earnings before interests, taxes, depreciations, and amortization as proxy.

Earnings persistence is captured by the coefficient α_1. Earnings are more persistent when the coefficient is close to one, meaning that financial reporting quality presents more quality (Francis et al., 2004).

Predictability (*Pred*) is defined as the ability of past earnings to predict future ones (Lipe, 1990). As predictability increases, financial information is more accurate to forecast future earnings and increase decision-making (Francis *et al.* 2004). As far as we know, works that analyse financial information quality impact on investment efficiency have not included this proxy. Although, this proxy is related to the previous one and can be estimated using the residuals of the model presented in equation (5) (Watt and Zimmerman, 1986; Lipe, 1990; Francis et al., 2004; Latif et al., 2017).

$$\text{Pred} = \sqrt{\sigma^2(\varepsilon_t)} \quad (6)$$

High values of *Pred* mean that financial reporting quality increases (Duarte *et al*., 2022; Latif et al., 2017; Watt and Zimmerman, 1986).

Conservatism (*Cons*) is related to predicting zero revenues and forecasting all possible losses (Basu, 1997). An increase in accounting conservatism helps to increase financial information comparability, relevance, and reliability, improving financial information quality (Watts, 2003). Earnings conservatism are measured, per firm, by looking at how economic losses and economic gains are incorporated into earnings, following Basu (1997), Pope and Walker (1999) and Gaio and Raposo (2011).

$$\frac{\text{TA}_t}{\text{Assets}_{t-1}} = c + \alpha_1 \times \text{DOCF}_t + \alpha_2 \times \left(\frac{\text{OCF}_t}{\text{Assets}_{t-1}}\right) + \alpha_3 \times \left(\frac{\text{OCF}_t}{\text{Assets}_{t-1}}\right) \times \text{DOCF}_t + \varepsilon_t \quad (7)$$

With DOCF – dummy variable which is 1 if operational cash flow (OCF) is negative and zero otherwise.

$$\text{CONS} = \frac{\alpha_2 + \alpha_3}{\alpha_2} \quad (8)$$

A higher value of *Cons* means that negative news are incorporated earlier than good news, so the accounting conservatism increases as well as financial reporting quality (Ball and Shivakumar, 2005).

We also include control variables, namely company *size*, *age*, *debt*, and *asset structure*, following Chen et al. (2011), Cutillas-Gomariz and Sanchez-Ballesta (2014), Ebrahimi Rad et al. (2016), Houcine (2017), Harymawan (2021), Assad et al. (2023), and Susilawati et al. (2024). *Size* is measured as the natural logarithm of total assets. Usually, large-size companies have more resources, disclose more information, and have more growth opportunities (Kim & Kwon, 2015). According to Chen et al. (2011), larger companies tend to have greater investment efficiency, mainly because they reduce cases of underinvestment. *Age* is the natural logarithm of the company's years of activity. A company's investment behaviour can vary throughout its life cycle. Older companies have more propensity for investment inefficiency, based on Biddle et al. (2009), Cutillas-Gomariz and Sanchez-Ballesta (2014), and Harymawan (2021). *Debt* is the ratio between total liabilities and total assets. Less indebted companies have more capacity to take advantage of investment opportunities and thus present less investment inefficiencies (Ebrahimi Rad et al., 2016). Finally, *asset structure* is the ratio of tangible fixed assets to total assets. Chen et al. (2011) and Cutillas-Gomariz and Sánchez-Ballesta (2014) found a positive association between over and underinvestment and the assets structure, suggesting that companies with higher tangible fixed assets have more investment inefficiencies.

3.3 Sample

This work focuses on Portuguese SMEs in the agri-food sector. This sector has a greater impact not only on the Portuguese economy but also across Europe (FoodDrink Europe, 2021). In Portugal, there are around 11,156 companies and 109,519 workers in the sector, and it contributes to a gross value added (GVA) of 3,412 million euros (2.1% of GVA) and has a turnover of 18,131 million euros (INE, 2021). It is also worth highlighting the various challenges that the agri-food sector has faced over the last few years, namely the impact of the war in Ukraine and the effect of rising prices for food and raw materials, particularly fertilizers (Lopes & Santos, 2023). As far as we know, there is a gap in studies that analyse the relationship between the financial information quality and the investment efficiency of Portuguese companies, more specifically on SMEs belonging to the agri-food industry.

All variables, namely companies' financial information, was obtained from the ORBIS database of Bureau Van Dijk. The period analysed comprises the years between 2015 and 2022. Information from 2014 was also collected to calculate the annual variation of the variables in 2015. For each company was required a minimum of three consecutive years with data to be included in the data set. The final sample is an unbalanced panel of 608 companies with a total of 4,530 observations.

4. Results

Table 1 shows the descriptive statistics, namely mean, median, standard deviation, minimum, and maximum, for the total sample and the two subsamples: over and underinvestment. Since the variables are not normally distributed (conclusion drawn from Kolmogorov-Smirnov test), the Mann–Whitney nonparametric test (MW) is performed to test if the medians for both groups, over and underinvestment cases, are statistically equal.

Table 1 - *Descriptive Statistics*

Variável	Group	Mean	Median	Std. Deviation	Minimum	Maximum	MW test
II		**0.1123**		**0.1659**	**0.0001**	**5.3390**	-
Over		**0.2102**	**0.0969**	**0.3892**	**0.0002**	**5.3390**	-
Under		**0.0961**	**0.0911**	**0.0724**	**0.0001**	**1.0001**	-
Smooth	**Total**	**1.2165**	**1.0924**	**0.9790**	**0.0219**	**25.1500**	-
	Over	1.2057	1.0569	1.0596	0.0219	12.0922	0.0220
	Under	1.2183	1.0969	0.9649	0.0233	25.1500	
AQ	**Total**	**-1.3596**	**-0.8510**	**2.0279**	**-68.4440**	**0.0000**	-
	Over	-1.7965	-1.1425	2.9612	-45.5310	-0.0080	0.0000
	Under	-1.2874	-0.8265	1.8190	-68.4440	0.0000	
Pers	**Total**	**0.0029**	**-0.0010**	**0.0532**	**-0.4185**	**0.6293**	-
	Over	-0.0005	-0.0019	0.0297	-0.4185	0.4133	0.0290
	Under	0.0035	-0.0009	0.0562	-0.4185	0.6293	
Pred	**Total**	**0.0484**	**0.0381**	**0.0556**	**0.0015**	**1.4447**	-
	Over	0.0586	0.0425	0.0618	0.0035	0.6425	0.0000
	Under	0.0466	0.0364	0.0544	0.0015	1.4447	
Cons	**Total**	**1.2681**	**0.0000**	**3.9525**	**0.0000**	**19.3132**	
	Over	1.0517	0.0000	3.4271	0.0000	17.7400	0.3740
	Under	1.3046	0.0000	4.0336	0.0000	19.3132	
Size	**Total**	**15.6178**	**15.6096**	**0.8972**	**10.6033**	**17.7450**	-
	Over	15.4087	15.3889	0.9585	10.6033	17.5393	0.0000
	Under	15.6532	15.6568	0.8817	10.8012	17.7450	
Age	**Total**	**31.1882**	**26.0000**	**26.0539**	**3.0000**	**308.0000**	-
	Over	24.2274	19.0000	22.1917	3.0000	307.0000	0.0000
	Under	32.3381	26.0000	26.4650	3.0000	308.0000	
Debt	**Total**	**0.6453**	**0.5925**	**0.5785**	**0.0000**	**9.0043**	-
	Over	0.7265	0.6412	0.7459	0.0000	8.8359	0.0000
	Under	0.6316	0.5817	0.5440	0.0000	9.0043	
AS	**Total**	**0.3626**	**0.3498**	**0.1991**	**0.0000**	**0.9581**	-

Over	0.4680	0.4694	0.1766	0.0047	0.9316	0.0000
Under	0.3448	0.3257	0.1971	0.0000	0.9581	

With- Age: Company's age; AQ: Accruals quality; AS: Asset Structure; Cons: Conservatism; Debt: debt ratio; II: Investment Inefficiency; Over: Overinvestment; Pred: Earnings Predictability; Pers: Earnings Persistence; Size: Company' size; Smooth: Earnings Smoothing: Under: Underinvestment.

Table 1 shows that Portuguese agri-food SMEs make investments that are inefficient (II), either underinvestment or overinvestment. Similar results were found by Biddle et al. (2009), Chen et al. (2011), Cutillas-Gomariz and Sanchez-Ballesta (2014), Wang et al. (2015), Ebrahimi Rad et al. (2016), Ren (2016), Cherkasova and Rasadi (2017), Carvalho and Kalatzis (2018), Harymawan (2021), Houcine et al. (2022), and Assad et al. (2023). Important to notice that underinvestment is more an exception, overinvestment situations prevail.

In what concerns earnings smoothing (*Smooth*), in median, the companies in the sample do not engage in smoothing practices (the values are near one), but not all follow the same trend, as in Harymawan (2021). Companies that avoid investing (underinvestment situations) are the ones with higher earnings smoothing practices.

Accruals quality (*AQ*) result shows that several companies engage in earnings management practices, which contributes to decrease accruals quality and financial information quality. The results are very volatile, suggesting different situations through the sample. Similar results were found in previous studies, as in Houcine (2017), but the author found less volatile values. Moreover, accruals quality is higher in underinvestment situations.

Analysing persistence (*Pers*) and predictability (*Pred*), results suggest that the company's earnings are not very persistent, neither very predictable. This situation occurs both in under and overinvestments.

Finally, results indicate that the companies analysed have more conservative accounting (*Cons*), but there are exceptions in the sample, as can be seen from the standard deviation obtained. The median value of this variable is similar to situations of under and overinvestments.

Regarding the control variables, size is not too volatile since all companies are small and medium enterprises; the median *age* is around 26 years old; around 59.25% of the company's investment is financed through liabilities (*Debt*); and around 34.98% of the company's assets are fixed assets (*AS*). Overinvestment situations mainly occur is small-size companies, younger, more indebted, and with higher fixed assets over total assets.

When analysing the subsamples under and overinvestments, results suggest that there are significant differences between the subsamples, except for conservatism (*Cons*). Therefore, analysing the two cases of inefficiency separately is relevant.

The correlation matrix is performed, and the collinearity through the determination of the Variance inflation factor (VIF) is analysed. Results show that there is no high correlation or problem of multicollinearity[4].

[4] Results under request.

The models are estimated using the OLS estimator with all variables. The fixed effects model has been excluded since the model includes time invariant variables (Persistence, Predictability, and Conservatism) which makes impossible their inclusion[5]. Similar procedure was used by similar works as Cutillas-Gomariz and Sanchez-Ballesta (2014), Shahzad et al. (2019), Duarte *et al.* (2022), Houcine *et al.* (2022).

The results of the model estimations are presented in Table 2. Column 1 presents the results for the total sample, and the two specific cases of investment inefficient are present in Column 2 (overinvestment) and Column 3 (underinvestment).

Table 2 - *Model Results*

	II (1)	Overinvestment (2)	Underinvestment (3)
C	0.01674 **	0.0899 ***	0.4682 *
Smooth	-0.0007	-0.0010	0.0053
AQ	-0.0098 *	-0.0000	-0.0332 *
Pers	0.0124	0.0071	-0.4263
Pred	0.1897	-0.0060	0.7369
Cons	-0.0010	0.0006 **	0.0017
Size	-0.0078 *	-0.0006	-0.0380 **
Age	-0.0002	-0.0000	-0.0010
LevDebt	-0.0016	-0.0000	-0.0131
AS	0.1270 ***	0.0194 ***	0.5492 ***
Adj. R^2	5.26%	1,44%	15.01%

With- Age: Company age; AQ: Accruals quality; AS: Asset Structure; Cons: Conservatism; Debt: Debt ratio; II: Investment Inefficiency; Pred: Earnings Predictability; Pers: Earnings Persistence; Size: Company' size; Smooth: Earnings Smoothing

*, **, *** represent a level of 10%, 5% and 1%, respectively.

Table 2 shows that the quality of financial information proxies impact investment efficiency, although this impact is more significant in situations of overinvestment.

Regarding earnings smoothing, the results are not statistically significant, suggesting that earnings stability is not the most important factor in explaining investment efficiency.

Accruals quality (*AQ*) contributes to increase investment efficiency, mainly by reducing cases of underinvestment. In this situation, earnings management practices are reduced and information becomes more transparent, thereby reducing information asymmetries. This leads to more accurate decision-making, which increases investments efficiency. Similar results have been found by e.g., Chen et al. (2011), Cutillas-Gomariz and Sanchez-Ballesta (2014), Wang et al. (2015), Ebrahimi Rad *et al.* (2016), Ren (2016),

[5] We have also used the fixed effects method to estimate the models with the other two variables of financial information quality and results were similar to those obtain using OLS.

Cherkasova and Rasadi (2017), Carvalho and Kalatzis (2018), Harymawan (2021), Houcine et al. (2022), and Assad et al. (2023).

Earnings persistence (*Pers*) and predictability (*Pred*) are not relevant to explain investment efficiency, at least at a significant level. The results suggest that persistent earnings and the capacity to predict future earnings are not relevant to explain investment efficiency.

Conservatism (*Cons*) has a positive impact on explaining the underinvestment but not a significant impact on the total sample. As companies recognize bad news more quickly than good news, i.e., they provide higher financial information quality, they tend to invest less than expected (underinvestment) to reduce uncertainty. This conclusion contradicts the expected in hypothesis 1 but can be explained as conservatism practices decrease risk situations, so managers can avoid making new investments, and when investing can have more difficulties in accurately predicting future earnings.

As a synthesis, financial information quality through avoiding earnings management practices contributes to reducing the investment inefficiency of Portuguese SMEs in the agri-food sector. Although, there are exceptions since firms that that recognize losses more quickly avoid making investments, leading to underinvestment situations.

Analysing the impact of the control variables, investment inefficiencies are more pronounced in small companies as large-size companies usually have more growth and investment opportunities. Similar results were found by, e.g., Chen *et al.* (2011), Harymawan (2021), Houcine et al. (2022). Regarding asset structure (*AS*), it is positive and statistically significant in explaining investment inefficiencies, whether total or cases of over or underinvestment. A higher proportion of tangible fixed assets over total assets decreases the investment efficiency, maybe because companies are not being efficient in managing the existing fixed assets. Similar results were found by, e.g., Chen *et al.* (2011), Cutillas-Gomariz and Sánchez-Ballesta (2014), Shahzad et al. (2019). *Age* and *debt* are not statistically significant to explain investment inefficiencies, at least at a significant level.

4.1 Robustness analysis

To analyse the robustness of the results, it was examined whether the quality of financial information affects the probability that the investment level deviates too much from the optimal level (above the median). To this end, a dummy variable was determined that takes the value 1 when the level of inefficiency is greater than or equal to the median and zero otherwise. The binary logit model was used for estimation. The results are shown in Table 3.

Table 3 - *Robustness analysis*

	Prob (II)	Odds Ratio
C	0.6583	1.931
Smooth	-0.0204	0.980
AQ	-0.0024	0.998

Pers	-0.1974	0.821
Pred	-0.2367	0.789
Cons	0.0172**	1.017
Size	-0.079**	0.924
Age	-0.0012	0.999
Debt	0.030	1.031
AS	1.488 ***	4.43
Number of observations	4132	
McFadden R^2	0.0187	
Likelihood Ratio Test $\chi 2(9)$	107.181	
Accuracy (% of correct classifications)	56.1	

With- Age: Company age; AQ: Accruals quality; AS: Asset Structure; Cons: Conservatism; Debt: Debt ratio; II: Investment Inefficiency; Pred: Earnings Predictability; Pers: Earnings Persistence; Size: Company' size; Smooth: Earnings Smoothing

*, **, *** represent a level of 10%, 5% and 1%, respectively.

The results are similar to those obtained in the case of over and underinvestment in separate. When companies recognise bad news faster than good news, i.e., present higher quality financial information, they tend to increase investment inefficiencies, as managers are more risk averse. The model is statistically significant (Likelihood Ratio Test) however the overall explanatory power is low (McFadden $R^2 = 0.0187$). The percentage of correctly predicted cases is 56.1%.

5. Conclusion

Financial information should be accurate and transparent, i.e. present quality, to support decision-making and to promote efficient investments. This work analyses the impact of financial information quality on investment efficiency, studying Portuguese SMEs in the agri-food sector during the years 2015 to 2022.

Our main findings show that Portuguese SMEs in the agri-food sector with higher financial information quality make more efficient investments. Companies with more transparent information are the ones that make more accurate investments. Exceptions are for the case of conservatism, as to reduce uncertainties, companies with more conservative practices avoid to make investment. Moreover, size and asset structure are two relevant factors to explain investment efficiency.

As an additional analysis we focused on which determinants explain the probability of investment inefficiencies and results confirm that conservatism practice is relevant, corroborating the previous result.

This study makes several contributions to the literature. First, studies focusing on this theme mainly analyse listed companies and using a singular proxy of financial information quality. This study focuses on SMEs, which are the most common type of companies in the world. Second, financial information quality is measured using five

different proxies - earnings smoothing, accruals quality (the proxy most used), earnings persistence, earnings predictability, and conservatism. As far as we know, the last three proxies have not yet been explored to understand their impact on investment efficiency. Even if results only show the significant impact of two financial information quality proxies, it shows that different ways to understand it can impact investments efficiency in different ways.

Third, additionally to investment inefficiency, which is the most common situation analysed, the two specific cases over and underinvestment are also analysed, allowing a detailed analysis of the various situations. Results show that some variables have different impacts on each inefficiency of investment, calling the need to understand it. Forth, additionally to the estimation of the OLS model, the impact on the probability of deviating too far from the expected investment level is also analysed. This is a new approach used in this thematic and results corroborate previous ones.

Besides the contributions to the literature review, this study also contributes to practice. Results are important for managers and other stakeholders who can understand the benefits of presenting financial information with higher quality. More accurate information reduces agency problems between managers and shareholders, as there is less asymmetries of information. This allows to make accurate investments, both avoiding situations of underinvestment and situations of overinvestment to satisfy personal benefits. Additionally, results can support investment decisions and contribute to the stability and growth of companies, particularly in the agri-food sector.

The aim of this work was achieved but as all works, it presents some limitations. First, the period analysed includes years of troubled economic periods, such as the effect of the pandemic caused by Covid-19 and the war in Ukraine, which affected companies' investments. Future research can analyse the impact of these two events (together or separately) on results. Second, it is difficult to generalize the obtained results and their implications for management because the sample involves only small and medium-sized companies from only one sector and one country. Considering the dynamic nature of markets, sectors, and types of firms, and the complexity of investment decisions, future research can focus on other contexts to understand whether results are singular. Finally, we consider SMEs as a whole but small and medium-sized firms can impact results. So for future research this additional analysis can give more detailed information.

Conflicts of interest: All authors declare that they have no conflicts of interest

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