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Abstract

The choice to study **earnings quality** derives from an intensive study of **Eikon**, that is a source of every kind of information about companies; the range goes from the typical financial statement to every press release, price per shares, ownership structure and so on. However, during the studying of all the elements presented by Eikon, the attention was captured by the **StarMine score** for Earnings quality. In fact, Thomson Reuters uses this model to provide a measure for EQ to all the listed companies, and it is updated daily. This method is composed of 4 parts: accruals, cash flows, operating efficiency and exclusion and it is ranked in centiles, moreover each of these 4 components have its own score. Therefore, the curiosity was to compare this model with the ones presented in literature, as **Jones model** (1991), **modified Jones model** (1995), **Dechow and Dichev** (2002), **Francis et al.** (2005), **smoothness** (Leuz et al., 2003) and **earnings persistence**. The **first goal** of the analysis is to provide or not evidence of a possible **correlation** between Eikon and these 7 metrics. In order to evaluate this, we distribute the EQ from literature in quantiles to lead the comparison possible and then we perform several t tests and regressions. The result is of no correlation between StarMine model and the other scores. Moreover, we conduct a regression with the components of the models to test whether they are correlated with Eikon or not. We conclude that the majority of the proxies parts are significantly correlated with StarMine, unless the coefficients are not so high.

Then, the **second goal** of the analysis deals with the **determinants** of earnings quality. In fact, in the first chapter of this work, we introduce all the model presented in literature, and we divide, as proposed by Dechow et al. (2010), papers in determinants and consequences of EQ. Indeed, scholars could analyse how a company choice, or an external factors or other phenomena could affect the final score of EQ or how this latter affects these events. Therefore, in the first case earnings quality is the independent variable and in the second the dependent. Moreover, the important part is to analyse if the different proxy for EQ provide similar evidences under the same determinant/consequence or they are in contrast, namely they give dissimilar results because the metric concentrates on particular feature of a company, so they describe unique part of the entirety.

Therefore, given these assumptions, we identify three determinants that are peculiar in the food processing industry, thus **accounting treatment for inventory, covering or not commodity risk and business model**. In particular, the latter is the innovative part of the analysis as the topic is not well developed in literature. The discrimination under this determinant is whether a company produces **frozen or fresh food**, namely we provide 4 distinctions, the first one is based on segmental reporting in 10-K, for the other three we apply threshold of % revenue derived from frozen foods.

Furthermore, for inventory we discriminate companies from the ones choosing **FIFO** and the ones choosing **LIFO** or **WEIGHTED AVERAGE**.

To assess whether a choice produce more quality, we perform t tests to compare the means and then also robustness checks. We provide evidence that companies that enter into derivative contracts have higher EQ for substantially all the proxies used, whereas LIFO and WEIGHTED AVERAGE vs FIFO is not robust to check proposed, unless from t tests the evidence is to higher quality for the latter. Finally, for business model we underline that companies that produce frozen food have higher quality, even though it suffers a little from cluster effects.

Finally, we determine what features of the companies are described by the different proxies under the three determinants, as even there is the case to same results, the information provided by each score is different.

Chapter 1: Literature review

1.1 Introduction

Researchers have been studying earnings quality during the last thirty years, because it is a useful instrument to analyse a broad spectrum of economics pattern, such as the asymmetry information in the market, the quality of the accounting systems, to compare cross sectional data at industry and country levels, to determine the quality of current and future performances of a company; therefore there are a lot of papers dealing with earnings quality. Nevertheless, there is not a clear and shareble **definition** of the metric in question, because, as stated above, in the literature earning quality are widely used and so the goal of the analysis varies a lot, hence the definition in each study depends on the final object of the paper. Moreover, earnings quality per se is not meaningful, it is necessary to put this concept into a **context under a specific decision model**. Indeed, the results of the scores, that could be positive or negative numbers or taken as absolute value, should be tested, going beyond their value, if these give qualitative information about the financial performance of a firm, considering that most of the time performance is due to unobservable aspects. Finally, earnings quality is a combination of underlying financial performance and the ability of the accounting system to measure it. Therefore, for this aspect earnings quality could be analysed by different perspectives, looking at the representation of financial performance that the author wants to highlight (Dechow et al., 2010).

For the problems of the absence of a common explanation of EQ, the peculiarity described by the metrics, each of these capture different aspects of companies performances, and the limited ability of accounting system to reflect the real nature of business, it is more appropriate to **identify** the metrics of EQ and **define** them, instead of trying to give a unique definition; even though those scores have not been validated by all the researchers. In fact, there are a lot of modification and everyone gives its own **interpretation** of the model; the straightforward example is the Jones Model (1991) that is the base in detecting abnormal accruals, and it has been subject to different interpretations and modifications.

Given the complexity of providing a definition, the right approach to follow now is to present the different metrics of earnings quality most used in the literature and, after that, to provide a deeper analysis of those scores. We follow the distinction provides by Dechow et al. (2010), who have analysed more than 300 papers on earnings quality, to divide the proxies in three different categories:

- **Properties of earnings**: earnings persistence and accruals, earnings smoothness, asymmetric timeliness and timely loss recognition, target beating, earnings management;
- **Investor responsiveness to earnings**: considering the earnings response coefficient or R squared taken by earnings return model as a proxy
- **External indicator of earnings misstatement**: AAERs, restatement and SOX.

For each of the metrics there are different interpretations provided by the authors during the last decades. This is due to the fact that, being huge the spectrum of the analysis, every researcher tries to better design the model to have final results that provide the best explanation of the topic chosen. Therefore, it is **impossible** to determine what is the **best measures** among those presented in the literature. Furthermore, in some cases for the same proxies, see e.g. the case of earnings smoothness, a lower score could indicate a higher quality (Francis et al., 2014), whereas for others (Leuz et al., 2003) a low metrics indicate a lower quality. We would discuss those issues in the next section.

Another problem in literature is the **focus** of the researchers' analysis. Indeed, EQ depends on the financial performance of the company and how the accounting system measures it. There is little empirical evidence of how the fundamental performance influences earnings quality, because the focus is more on distortion associated with implementation errors and earnings management, whereas it would be better to **concentrate on the sources of distortion** that trigger the ability of the accounting system to capture fundamental performance. It would be better to distinguish the contribution of the two components in the finale scores (Dechow et., al 2010).

The question now is how to deal with these two problems presented among all the studies, namely the inability to find the best score and the wrong focus of scholars, who analyse mostly the distortions affecting EQ, rather than the sources of those distortions that influence real performances of firms. The possible solution suggested by Dechow et al. (2010) is to decompose papers into two categories, **determinants and consequences** of earnings quality, and after that analysing the results in the same category of the different proxies provided by the literature. In the first category we find papers that use EQ as the **dependent variable**, whereas in the second it is used as the **independent** one. Using this approach, it is possible to assess if different proxies lead to the same results or have mixed effects. If we take the same determinants or the same consequences of a specific topic, we could determine whether two or more proxies used in different papers would have a convergence results or mixed ones. Indeed, in most papers, researchers use a mix of earnings quality to provide a single measure, but it is not

obvious or demonstrated that using a combination of proxies have a higher validation rather than picking up one. Of course, the use of a multiple model could have a broader spectrum and provide more insight, unless the specification of the model is not necessarily higher than using one proxy. There is no evidence that the proxies capture the same construct, a part of it or even different constructs. (Ewert and Wagenhofer, 2011). As Dechow et al. (2010 pp. 345) states:

> "If earnings quality were a single construct and the proxies just measured it with varying degrees of accuracy, then we would expect to observe convergent validity across EQ proxies for the same determinant and to find that all the EQ proxies would have similar consequences. Juxtaposing the papers against other papers that examine the same determinant or the same consequence draws attention to mixed evidence in the literature. If a particular determinant is not associated with all proxies, or if various proxies do not have the same consequences, then the proxies are measuring different constructs."

Finally, it is common to see the relationship between different measures, the correlation among those, but it should be better to provide a deeper analysis through future researches on this topic, because it would enhance the quality of the analysis or would validate that a compound metric of proxies is better than one or vice versa. The possible development, as we see in next sections, in EQ literature is very ample even if the topic has been treated for more than 30 years.

1.2 Earnings quality measures: models presentation

In the following sections we describe the most used model to calculate the different proxies of earnings quality. The first part deals with properties of earnings that are divided in **earnings persistence, abnormal accruals, earnings smoothness, timeliness and timely loss recognition and target beating**. Among these subgroups, earnings or components of those, such as cash flow or accruals, are taken as dependent or independent variable to estimate the EQ.

Then, we analyse investor responsiveness to earnings. In this case the subject of the analysis is the relation between **unexpected return** and **unexpected earnings**.

After that, the last model concern external indicator of earnings misstatement, that could be **AAERs, restatement or SOX**.

1.2.1 Properties of earnings

1.2.1.1 Earnings persistence

The first property is earnings persistence, that is a simple time series regression of forward earnings on current earnings. The model is:

$$Earnings_{t+1} = \alpha + \beta_1 \times Earnings_t + \varepsilon_t$$

In the equation α is the constant, β is the coefficient that indicate the relation between forward earnings and current ones, while ε is the estimation error that is typical of every regression.

Usually earnings are scaled by average total assets between year t and t+1, but it is possible also to find some papers where they are scaled by sales or number of shares (Dechow et al., 2010). Therefore, the **metric** of quality in this case is **β** from the regression model, higher this value higher the quality, because it means that the transitory errors from **low accruals do not reduce the persistence** of the earnings stream. Of course, there could be some cases in which earnings are persistent because of the economic environment, because of the competition of the market and so on, and not because of the high-quality accruals (Nezloblin et al., 2019). As for most of the models, this equation was enhanced by Sloan (1996) who decompose earnings into cash flow component (CF) and accruals one.

$$Earnings_{t+1} = \alpha + \beta_1 \times CF_t + \beta_2 \times Accruals_t + \varepsilon_t$$

In this case, we have two parameters to assess the relation between earnings and CF and accruals, respectively β_1 and β_2.

Sloan (1996) illustrates that **$\beta_2 < \beta_1$**, so **cash flow is more persistent than accruals**. Moreover, the literature has evolved to take into consideration other elements that could influence the predictability of future earnings, even items that come from the footnotes of annual report.

$$Earnings_{t+1} = \alpha + \delta_1 \times Earnings_t + \delta_2 \times Financial\ statment\ components_t + \delta_3 \times Other\ information_t + \varepsilon_t$$

The possible **evolution** in this field of earnings quality could be to assess whether the persistence is driven by the **accounting system** that measures the performance or **fundamental performances** themselves. There are some contributions in literature that try to isolate the role

of fundamental performance, such as to compare firms that applies a differentiation strategy or cost leadership (Soliman, 2008). Therefore, the path for the future development in earnings persistence is the one just explained (Dechow et al., 2010).

1.2.1.2 Abnormal accruals model

This part of earnings quality is the most developed in literature and we have a lot of contribution in terms of models presented during last decades and studies conducted, most of the time they are cross sectional studies across industries or countries (see Table 3 with the summary of all the most used model and the Appendix for the evolution of these). Before introducing the different methods proposed, it is important to stress the concept of **normal** and **abnormal accruals**. Indeed, the former should represent the **fundamental performance** of a company, while the latter should reflect **misspecifications** produced by the application of **accounting rules or earnings management**. Therefore, researchers endeavour to separate the two components when they analyse the quality of accruals and so EQ, to assess the problem of accounting measurements. Moreover, in literature it is common to see abnormal accruals that are defined as discretionary and normal as nondiscretionary accruals, so they are interchangeable. This could lead to think that discretionary is a voluntary choice of the company rather than an error in the accounting measurement; however, the interchangeably is widely spread among papers. The final observation, before introducing the models, is the **positive correlation** between the level of total accruals and the abnormal part. This is important to underline because if the amount of discretionary accruals is linked to the level of total, it is not easy to determine whether the result of these abnormal accruals derives from the **accounting distortion or from this correlation**; indeed, in the latter case they would reflect a part of fundamental performance rather than a misspecification, so it would be a signal of a not so well specified accruals models (Dechow et al., 2010).

The first model to analyse is the Jones model (1991). Indeed, it is the **starting point** of most analyses and the one subject to more modifications during last year, namely scholars propose their own model usually referring to Jones' contribution and then providing their interpretation. Moreover, the number of citations is growing year by year, as November 2019 the value is more than **8400**, therefore even though the paper is about 30 years old, it is still important and a benchmark in literature. Finally, she was the first to understand that the **economic performance** of firms could affect the level of accruals, both normal and abnormal accruals, as she proposed to control for Property plant and equipment but most important the delta revenues.

In her paper Jones wants to detect the level of earnings management among 5 different industries, automobiles, carbon steel, stainless steel, copper, and footwear, looking at the accounting choices of the company in response of the ITC's injury determination in order to obtain their required level. She started with a sample of 49 companies among the different industries and, after having applied some restricted criteria, such as the time series on data, she restricts the sample to 23 companies. She takes as starting point DeAngelo 1986 model, where earnings management is detected by the annual change in discretionary accruals (DA), while nondiscretionary accruals (NDA) should be stationary.

$$\Delta TA_t = (TA_t - TA_{t-k}) = (DA_t - DA_{t-k}) - (NA_t t - NA_{t-k}).$$

To relax the assumption provided by the DeAngelo that the change in total accruals are due only to abnormal accruals because the NDA are constant, Jones proposed her model, where she also changes the definition of total accruals (**TA**), and controls accruals using change in revenues (**REV**) and gross property plant and equipment (**PPE**) of the year in order to take into consideration the **economic circumstances** of companies and also to state that even nondiscretionary accruals could affect TA. All the elements in the equation are scaled by lagged total assets (**A**).

$$TA_t = [\Delta CurrentAssets_t - \Delta Cash_t] - [\Delta Current\ Liabilities_t] - Depreciation\ and\ Amortization\ Expense_t$$

Therefore, the model is:

$$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}$$

All the elements in the two equation are provided by Compustat.

This model was proposed for detecting earnings management, that is different from earnings quality, but researchers started to use it also to give a measure of quality. Indeed, the measure of EQ is the **residuals** from the equation, typically the absolute value of those one. Despite being the most used method, it is subject to some problems that lead to errors both of Type I and Type II[1].

[1] In statistic we deal with two types of error when we perform a regression, namely Type I and Type II. The analysis is based on the null hypothesis H0 that could be accepted or rejected. Nevertheless, there are cases in which the null hypothesis is true, but the results of the regression bring the scholar to reject it, Type I error, or in the opposite case, H0 is false unless the decision is to accept it. Type I is also called false positive and the Type II is called false negative.

In most researches there are evidence of Type I and Type II errors. Son-Hyon and Sivaramakrishnan (1995) compare the Jones model with another two, one using the instrumental variable IV[2] and the other using the generalized method of moment, to demonstrate that those ones are more powerful than the Jones model in both cases. They use a sample of 2829 companies provided by Primary-Supplementary-Tertiary (PST) file, 1181 firms, and the Research (Merged) file, 1648 enterprises. To test for Type II errors the authors selected 100 companies randomly and they casually add positive accruals to some firms, and they test if the three models could detect earnings management. For Type I, they do the same random analysis, but they do not add new accruals, they only test to see the tendency to yield false rejection, dividing the analysis for all firms, companies with an increasing ROA and with decreasing ROA.

As Table 1 shows, for Type II error the **models proposed by the authors are more powerful** in correctly rejecting the null hypothesis, indeed we pass from 23% to 47%, see the first column. Whereas the tendency to lead to a false rejection is lower in the three cases for IV instrumental variable and GMM model respect to the Jones model, as column 2,3,4 show. (Son-Hyon, Sivaramakrishnan, 1995).

Another critic comes from Xie (2001) who wants to assess the **forecast ability of discretionary accruals** to predict year-ahead stock prices. He uses a sample of 7506 firms and data that range from 1971 to 1992, taken from Compustat. He performs the Mishkin[3] (1983) test to five development of cross-sectional Jones model: the cross- sectional modified Jones model (Dechow et al., 1995); the time-series Jones model; the time-series modified Jones model (Dechow et al., 1995); the Beneish (1997) model; and the Beneish (1998) model.

It is important to underline that the residuals for these five models are highly correlated with the Jones model, therefore the conclusions in the paper are valid also for this model and for this reason we put the conclusion of Xie in this paragraph (Xie, 2001). Indeed, Xie shows that the market overprices abnormal accruals, while there is a correct evaluation for nondiscretionary accruals, therefore it leads to say that discretionary accruals have lower ability to forecast year-ahead earnings rather than normal accruals (Dechow et al., 2010).

[2] The instrumental variable iv is used in statistic when there is the possibility of correlation between the dependent variable is correlated with the error, therefore the estimation of the coefficient under the OLS could be biased. This iv variable, instead, will give consistent coefficient.

[3] Mishkin test leads to the rational estimation of the accounting component in stock markets, moreover it is used for macroeconometrics testing for market efficiency. In the case of Xie's paper there are two regressions, one that estimates the parameter for abnormal accruals in the forecast equation, the second analyse the parameter taken from the pricing equation. Then you should compare the valuation and forecast parameters, in this case of discretionary accruals, to assess if there is an overpricing or underpricing.

Table 1: Type I and Type II error in the three specification. From Son and Sivaramakrishnan.

	5% Rejection Frequencies			
	Positive Manipulation	Zero Manipulation		
	Size = 2% of Total Assets (Case 1)	All Firms (Case 2)	Firms with *ROA* Increase (Case 3)	Firms with *ROA* Decrease (Case 4)
Jones [1991] Model[b]				
The Coefficient on *PART* Is:				
Positive and Significant	23%	2%	9%	2%
Negative and Significant	0%	6%	1%	20%
z-Statistic	8.25	1.37	2.29	7.80
Significance Level*	$p < 0.001$	$p = 0.168$	$p < 0.021$	$p < 0.001$
Standard *IV* Model[b]				
The Coefficient on *PART* Is:				
Positive and Significant	33%	4%	4%	3%
Negative and Significant	1%	3%	3%	7%
z-Statistic	12.84	0.91	0.91	2.29
Significance Level*	$p < 0.001$	$p = 0.358$	$p = 0.358$	$p < 0.021$
***GMM* Model**[b]				
The Coefficient on *PART* Is:				
Positive and Significant	47%	2%	4%	2%
Negative and Significant	0%	3%	0%	5%
z-Statistic	19.26	0.00	−0.45	0.91
Significance Level*	$p < 0.001$	$p > 0.500$	$p > 0.500$	$p = 0.358$

Moreover, Type I error could increase because the correlation between DA and TA is high, so it could be possible to have huge value of abnormal accruals because of high value of total ones, not for earnings management. Furthermore, there is a positive correlation between DA and earnings performance, while it is negative with CF performance, thus the three elements could bias the results obtained in the regression (Dechow et al., 2010).

The biggest contribution for the Jones model comes from Dechow et al. (1995) that propose their modified version of the model. Indeed, they try to overcome the assumption that companies **do not manage revenues**[4], because it is usually that firms manipulate receivables to decide when to collect cash from these revenues. Moreover, the modification proposed by Dechow et al. (1995) leads to consider also companies that manage earnings through revenue recognition, whereas with Jones model these firms could be considered with low or zero manipulation in earnings, thus higher EQ. Finally, there is more discretion in case of recognize a credit sale than cash sale, therefore it is more suitable to manage earnings in the first case. So, another problem not detected by Jones model.

[4] Dechow et al. (1995, pp. 8) state that: "The original Jones Model implicitly assumes that discretion is not exercised over revenue in either the estimation period or the event period. The modified version of the Jones Model implicitly assumes that all changes in credit sales in the event period result from earnings management. This is based on the reasoning that it is easier to manage earnings by exercising discretion over the recognition of revenue on credit sales than it is to manage earnings by exercising discretion over the recognition of revenue on cash sales. If this modification is successful, then the estimate of earnings management should no longer be biased toward zero in samples where earnings management has taken place through the management of revenues."

Therefore, the Jones model is modified taking into consideration the change in receivables (**REC**), as follows:

$$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [(\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}$$

The modification provided by Dechow et al. (1995) could not reduce the issues about Type I, unless it seems to suffer less from Type II errors. The models are very similar as the coefficients in the regression are the same except from $\boldsymbol{\beta_1}$. So, it is straightforward that they share similar pros and cons, however in some circumstances one could be more appropriate than the other.
In fact, Dechow et al. (2010) compare 5 models (Jones model (1991), modified Jones model (1995), DeAngelo model (1986), Healy model (1985) and Industry model of Dechow and Sloan (1991)) to identify the magnitude of Type I error and also Type II. The paper is based on a random selections, the first one is made by 1000 firms among 168771 on Compustat, between 1950 and 1991, the second is also about 1000 companies experienced high performances, in the third one the authors manipulate with a known amount of accruals 1000 firms randomly selected, and finally in the last sample there are 32 firms alleged by the SEC because they overstated earnings.
The main results of the research are:

- All the models are for the first selection are well specified, the incidence of Type I errors is close to the specified level applied;
- In the case of the sample with **high performing firms**, the level of rejection for earnings management <0 is higher than the specified level and the **modified Jones model suffers more the Jones model**. Instead for **low performing firms**, the hypothesis of earning management>0 has the same problem just explained and even in this case the **modified Jones model suffers more**.
- In the case of **voluntary manipulation, the Jones model are biased downward** than the modified one, in detecting earnings management;
- In the last case the modified Jones model is more powerful in detecting earnings management for firms that manage revenues. And the incidence of **Type II errors is higher for the Jones model** (Dechow et al., 2010).

Therefore, the modified Jones model seems to overcome the problem of the Jones model for Type II error, unless, as just shown, in some circumstance the problem for Type I is even marked for this model.

The most important issue for both models is the **high correlation between accruals and performance**, particularly when you should test discretionary accruals on sample experienced non-random performance (Kothari et al., 2005). Therefore, Kothari et al. (2005) focus on controlling accruals on firms' performances, such as **ROA**. They study 94045 firm-year observations from Compustat between 1959 and 1998.
They analyse residuals from Jones model, modified Jones model and an additional model where they add ROA to the Jones model:

$$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \beta_{i3} \times ROA_{it}/A_{it-} + \varepsilon_{it}$$

Moreover, they introduce the "**performance-matched**" residual, namely they find a firm for each company of the same industry that has the closest level of ROA and so they calculate the difference between the residual of the former and the latter. They compute this analysis at year level, three years average and five years average. The results it is a **lower value of Type I error** in their performance-matched model than the other three models. Indeed, the model with the ROA included increase the power of the test looking at Jones model and modified Jones, but it still suffers from high level of misspecification. This trend is equal in the estimation based on time of observation, unless the incidence of Type I error decreases with the increasing number of years analysed, as the Table 2 shows (Kothari et al., 2005, pp.93).

The problem of the matching principle is to find the **right benchmark** for each firm, because if one firms achieves a specific ROA using earnings management, it would decrease the power of the test. To better understand the point, as reported the example by Dechow et al. (2010, pp. 359):

> "For example, assume ROA is 20% for firms A and B, with firm A using discretionary accruals to boost its ROA by 2% to report 20%. Firm B is not manipulating earnings; it has achieved 20% ROA because it has higher non-discretionary accruals than firm A. Matching firm B to firm A would suggest that firm A's level of non-discretionary accruals should be the same as firm B's, but this match is incorrect since the correct match should be a firm with ROA of 18%."

In conclusion, it is a right approach to identify a parameter such as ROA to better match for performances of companies, although scholars should bear in mind to try to be sure that the benchmark is the most appropriate one, because it would diminish the validity of the results and it would be better to use Jones model or modified Jones model.

Table 2: Type I and Type II error in accruals models over three and five years, from Kothari et al.

Panel B. Accruals over three years:[a]	H_A: Accruals < 0									H_A: Accruals > 0								
	All	Book/ Market		Sales Growth		EP Ratio		Size		All	Book/ Market		Sales Growth		EP Ratio		Size	
	Firms	Value	Growth	High	Low	High	Low	Large	Small	Firms	Value	Growth	High	Low	High	Low	Large	Small
Jones Model:																		
Cross sectional within-industry Jones model	10.8	9.2	10.0	12.4	21.6	5.2	30.8	10.0	12.4	1.2	2.0	2.4	2.0	1.6	6.8	0.0	2.8	2.8
Industry median adjusted discretionary accruals	10.8	9.2	9.2	11.2	21.2	6.8	27.6	10.4	11.2	1.6	2.0	4.0	2.4	2.0	5.2	0.4	2.8	2.8
ROA included in accrual estimation equation	11.2	9.6	13.6	14.4	14.8	10.0	18.0	26.0	8.4	1.6	2.8	1.2	1.2	2.0	2.0	0.8	0.0	4.0
Performance matched discretionary accruals	5.6	3.2	5.2	4.4	4.4	6.0	6.0	6.0	2.8	6.8	5.6	6.4	4.8	6.8	4.8	3.2	3.2	7.2
Modified-Jones Model:																		
Cross sectional within-industry Jones model	10.8	9.2	8.8	10.4	25.6	5.2	33.6	11.2	11.6	1.6	2.0	3.6	2.0	2.0	6.4	0.0	2.8	1.6
Industry median adjusted discretionary accruals	8.4	9.2	7.6	10.0	24.8	6.0	28.4	10.4	10.4	1.2	2.0	4.0	2.4	2.4	6.0	0.0	3.2	1.6
ROA included in accrual estimation equation	11.2	9.2	11.6	11.2	16.8	9.6	17.6	25.2	7.6	2.8	3.2	1.2	1.2	2.0	2.0	0.8	0.0	4.4
Performance matched discretionary accruals	6.0	3.6	5.2	4.4	6.0	6.0	5.6	7.2	2.8	6.0	6.0	6.4	4.8	5.2	4.0	3.6	2.8	6.4
Panel C. Accruals over five years:[a]																		
Jones Model:																		
Cross sectional within-industry Jones model	15.2	6.0	16.4	18.8	17.2	11.6	19.6	16.8	13.2	1.6	2.8	2.4	1.6	1.2	1.6	0.4	0.8	0.8
Industry median adjusted discretionary accruals	12.4	6.8	14.4	18.0	13.2	10.0	15.6	14.8	12.4	2.0	3.6	3.2	1.6	1.6	1.6	1.2	0.8	1.6
ROA included in accrual estimation equation	12.4	9.6	21.6	25.2	16.4	10.8	16.4	28.8	11.6	1.2	2.0	0.0	1.2	1.6	2.0	0.8	0.0	0.8
Performance matched discretionary accruals	5.2	3.2	4.8	5.6	8.0	7.6	6.0	6.0	4.0	3.2	4.4	4.8	3.6	2.0	4.4	5.6	2.8	6.4
Modified-Jones Model:																		
Cross sectional within-industry Jones model	15.6	6.4	15.2	16.8	17.6	11.2	20.4	20.4	14.0	1.6	2.0	3.2	1.6	0.8	2.0	0.8	0.4	0.8
Industry median adjusted discretionary accruals	13.6	7.2	12.0	15.2	16.8	8.4	15.2	16.4	12.0	2.4	3.2	4.0	2.0	1.2	1.2	1.6	0.4	1.2
ROA included in accrual estimation equation	10.8	9.6	20.4	20.4	16.0	12.0	12.8	30.8	12.0	1.6	2.0	0.0	2.0	0.8	2.0	0.8	0.0	1.2
Performance matched discretionary accruals	4.8	2.8	4.0	5.6	8.8	8.0	6.4	6.8	4.8	2.8	4.0	5.6	4.4	2.0	4.4	4.4	3.2	6.0

Dechow and Dichev, (DD), (2002) propose another way to evaluate accruals. In that study the key concept is cash flow and they measure how well working capital accruals (**WC**) map into **cash flow realization**. Indeed, when a company book for a receivable, there could happen estimation error, therefore the company must correct the cash collection and they produce noise. These kinds of errors, if repeated, would produce lower accruals quality. Therefore, they create a model where change in working capital is regress on past, current and future cash flow from operations (**CFO**).

The authors argue that the estimation error in working capital accruals could derive from both intentional earnings management and from the firm characteristic. However, they decide to not divide these two components, because they provide the same insight: low accruals quality, therefore there is no need to separate them (Dechow and Dichev, 2002). So, the model presented in their study is:

$$\Delta \mathrm{WC}_t = \beta_0 + \beta_1 \times \mathrm{CFO}_{t-1} + \beta_2 \times \mathrm{CFO}_t + \beta_3 \times \mathrm{CFO}_{t+1} + \varepsilon_t.$$

The variables in question are scaled by average total assets.

They compute change in working capital as: ΔAR – ΔAP + ΔInventory – ΔTP + ΔOther Assets, namely AR is account receivables, AP is account payables, TP is tax payable. Moreover, the cash flow is taken from the cash flow statement required by the Accounting Standard (SFAS No.9, FASB 1987).

The earnings quality measures in this case is **standard deviation of residuals or also the absolute value of the latter**. Higher the value of those measures, lower the accruals quality.

Dechow and Dichev use a sample of 27204 firms taken from Compustat, between the years 1987 and 1999.

They show that changes in current working capital are positively related to future and past cash flow, whereas they are negatively related to current cash flow. Values of β are less than 1 due to the estimation errors in the independent variable (Dechow and Dichev, 2002). Moreover, they provide a **higher value of R-squared** than modified Jones model (Dechow, 2010). Finally, they link accruals quality and firm characteristics, namely they expect that:

- "The longer the operating cycle, the lower accrual quality.
- The smaller the firm, the lower accrual quality.
- The greater the magnitude of sales volatility, the lower accrual quality.
- The greater the magnitude of cash flow volatility, the lower accrual quality.
- The greater the magnitude of accrual volatility, the lower accrual quality.
- The greater the magnitude of earnings volatility, the lower accrual quality.
- The greater the frequency of reporting negative earnings, the lower accrual quality.
- The greater the magnitude of accruals, the lower accrual quality." (Dechow and Dichev, 2002, pp. 46-47).

As all the previous model suffers from Type I and Type II errors and each of these do not capture the entirety of companies economic performances, also in this case we find some limitations. The first one is that the model is **unsigned**, and this could reduce the power of tests when authors would like to forecast an accounting distortion in a specific direction. However, the greater issue is that Dechow and Dichev consider only **short-term component** of accruals, while managers could manipulate also long-term ones, such as PPE. Not considering those items could lead to not capture the full picture of the company, because long-term accruals are important as short ones (Dechow et al., 2010).

As for the Jones model that was enhanced with the modified version, also for the DD model Francis et al. (2005) propose an extension. Indeed, they follow the proposal of McNichols (2002) to add **change in revenue** to take into consideration also the performance of

the firm, but they also extend the regression with **PPE**, therefore they add also the long-term accruals. The model is:

$$\Delta TCA_{\,t} = \beta_0 + \beta_1 \times CFO_{t-1} + \beta_2 \times CFO_{\,t} + \beta_3 \times CFO_{t+1} + \beta_4 \times \Delta REV_t + \beta_5 \times PPE_t + \varepsilon_t$$

First, the dependent variable is different than DD model, indeed there is **TCA** instead of delta in working capital. TCA, namely total current accruals, is ΔCA- ΔCL- ΔCash+ ΔSTDEBT, where CA is current asset, CL current liabilities and STDEBT is short-term debt.

Moreover, they do not use the cash flow taken from the reported one, because they analyse a sample of 91280 firm-year observation that starts from 1970 and goes to 2001 and the effectiveness of SFAS No. 95 start in 1988. So, the CFO is defined as the difference between net income before extraordinary items and total accruals, where the latter are defined the same as in the Jones model. The authors apply the regression to each of the 48 industry of Fama and French's (1997) and their measure of earnings quality is the standard deviation of residuals that comes from the average of residuals over 5 years. Also in this case **a huge value for standard deviation indicates poorer earnings quality** (Francis et al., 2005).

The coefficients of the regressions are the same as for DD model, but now there are two more β.

Furthermore, the contribution of Francis et al. (2005) does not stop here, but they propose a model to decompose the standard deviation of residuals into two components, i.e**. the discretionary part**, reflecting managerial choices, and the nondiscretionary one, also called **innate component**. Thus, they identify some firm characteristics in order to decompose the standard deviation of residuals. Those innate components that influence a firm are taken by Dechow and Dichev (2002), in fact they are: firm size, standard deviation of cash flow, standard deviation of sales, length of operating cycle and incidence of negative earnings realization (Francis et al., 2005). Hence, the model is:

$$AQ_{jt} = \lambda_0 + \lambda_1 \times Size_{jt} + \lambda_2 \times \sigma(CFO)_{jt} + \lambda_3 \times \sigma(Sales)_{jt} + \lambda_4 \times OperCycle_{jt} + \lambda_5 \times NegEarn_{jt} + \nu_{jt}.$$

Therefore, the residuals from the equation are the discretionary component of accruals quality, whereas the predict value of AQ are the innate part that should represent the fundamental performance of the firm.

Even though the division of residuals into the components could enhance the analysis of accruals models, the method should be subject to **Type I error** if the innate component is the results also of estimation errors and not only of performances. There is also room for **Type II error**, hence it should be necessary to further develop the analysis to conduct analysis as accurate as possible (Dechow et al., 2010).

The final consideration about accruals model is that studies are conducted, mostly, at industry level rather than firm levels. Of course, it is easier to gain data at industry level, because with a deeper analysis at company level would impose some restriction, such as survivorship biases. Indeed, a broader analysis would generalize results, and this would come at cost. In fact, the **distinction of industry is blurring** nowadays and putting a firm into a group instead of another could produce some misspecification. Hence, residuals in the regression could be induced by the classification in that industry rather than the fundamental performance of the firm. What could be possible to do is to aggregate firm for homogenous parameter, in order to have homogenous classes (Dechow et al., 2005). A possible solution could be the aggregation for business model, even if the companies are not from the same industry, but they follow the same model of business. This is our approach, that will be discussed in the analysis.

In Table 3 we report the abnormal accruals model describe in this section.

Table 3: summary of the abnormal accruals model, from Dechow et al.

Accrual model	*Theory*	*Notes*
Jones (1991) model $Acc_t = \alpha + \beta_1 \Delta Rev_t + \beta_2 PPE_t + \varepsilon_t$	Accruals are a function of revenue growth and depreciation is a function of PPE. All variables are scaled by total assets	Correlation or error with firm performance can bias tests. R^2 around 12%. Residual is correlated with accruals, earnings and cash flow
Modified Jones model (Dechow et al., 1995) $Acc_t = \alpha + \beta_1(\Delta Rev_t - \Delta Rec_t) + \beta_2 PPE_t + \varepsilon_t$	Adjusts Jones model to exclude growth in credit sales in years identified as manipulation years	Provides some improvement in power in certain settings (when revenue is manipulated)
Performance matched (Kothari et al., 2005) $DisAcc_t - Matched\ firm's\ DisAcc_t$	Matches firm-year observation with another from the same industry and year with the closest ROA. Discretionary accruals are from the Jones model (or Modified Jones model)	Can reduce power of test. Apply only when performance is an issue
Dechow and Dichev (2002) approach $\Delta WC = \alpha + \beta_1 CFO_{t-1} + \beta_2 CFO_t + \beta_3 CFO_{t+1} + \varepsilon_t$	Accruals are modeled as a function of past, present, and future cash flows given their purpose to alter the timing of cash flow recognition in earnings	$\sigma(\varepsilon_t)$ or absolute ε_t proxies for accrual quality as an unsigned measure of extent of accrual "errors." Focuses on short-term accruals does not address errors in long-term accruals
Discretionary estimation errors (Francis et al., 2005a) $TCA_t = \alpha + \beta_1 CFO_{t-1} + \beta_2 CFO_t + \beta_3 CFO_{t+1} + \beta_4 \Delta Rev_t + \beta_5 PPE_t + \varepsilon_t$ $\sigma(\varepsilon_t) = \alpha + \lambda_1 Size_t + \lambda_2 \sigma(CFO)_t + \lambda_3 \sigma(Rev)_t$ $+ \lambda_4 \log(OperCycle)_t + \lambda_5 NegEarn_t + v_t$	Decomposes the standard deviation of the residual from the accruals model into an innate component that reflects the firm's operating environment and a discretionary component (v_t) that reflects managerial choice	Innate estimation errors are the predicted component from $\sigma(\varepsilon)_t$ regression

1.2.1.3 Earnings smoothness

Earnings smoothness is the proxy for earnings quality in which there are different conclusions on the presumption that smoothing earnings is a **good signal for quality or not**. Before dealing with the problem of how to interpret the measure of smoothing, we introduce the models. The goal in the paper of Leuz et al. (2003) is to compare the level of earnings management among 31 countries, taking a sample of 70955 firm-year observation between 1990-1999. The authors propose several measures for earnings management, among them two have become the reference point for future studies in earnings smoothness.

The first one is based on the assumption that managers could manipulate earnings **to cut off fluctuation** therein, namely they work on accruals to manage accounting numbers. Therefore, to catch the degree of this manipulation, Leuz et al. (2003) propose to calculate the standard deviation of earnings to the standard deviation of cash flow from operation, because the latter is a good control for the specific fundamental performance of the firms. The value of cash flow is not taken directly from the statement of cash flow, due to the not availability of this for every country, hence they subtract accruals from earnings.

The calculation of earning smoothness is:

$$\sigma(Earnings_t)/\ \sigma(Cash\ flow\ from\ operation_t)$$

Finally, the researchers state that **lower value** of the ratio, in the same conditions, are considered a signal of manipulation of accounting numbers, thus **smoothing earnings**.

They also report the second method to calculate earnings smoothness. The authors start from the assumption that manager could manipulate how to account for economic shocks, namely in the case of poor performances they could delay the recognition of costs, or they can delay the recognition of huge revenues to have a reserve for the future. Thus, **change in accruals affects the cash flow**. There is a negative correlation between these two components (Dechow et al, 1994), unless the key point is that a huge value "in this correlation indicate, ceteris paribus, smoothing of reported earnings that does not reflect a firm's underlying economic performance" (Leuz et al., 2003, pp. 510).

The other way to calculate smoothness is:

$$Correlation\ (\Delta Accruals_t, \Delta Cash\ flow\ from\ operation_t).$$

The paper of Leuz et al. (2003) focuses on detecting earnings management among countries and the external or internal factor that could lead manager to manipulate earnings, for

example they find that earnings management is negatively associated with legal enforcement and quality of minority's rights, assuming that abnormal value of smoothness is signal of manipulation of earnings (Leuz et al., 2003).

However, the two measures proposed are also the proxy for earnings quality, unless the literature is most focused on studying this measure in earnings management rather than earnings quality (Gaio and Raposo, 2001). Thus, how to **interpret** those figure it is **ambiguous**, because on one hand smoothing earnings is seen as the result of insider to throw away the fluctuation from earnings and to stabilize them, reducing volatility; on the other hand the action to smooth earnings could be seen as an attempt to mask the real performance of a company (Ewert and Wagenhofer, 2011). Therefore, it is a **matter of the researcher** how to evaluate this attribute in his/her study, taking into consideration what kind of consequences or determinants is analysing.

Finally, as proposed by Dechow et al. (2010), it would be necessary to further develop the literature, as the case of accruals, to distinguish from normal smoothness and discretionary one, to provide better evidence on fundamental performances of firms and to have a better understanding of the results given by the models.

1.2.1.4 Asymmetric timeliness and timely loss recognition

In this section we deal with the **conservatism approach**, that requires to account for bad news faster than good ones; therefore, managers are more conservative when they have to assess the impact of good news rather than bad one, that is recognized promptly. This situation leads to a **time difference** between the book entry of a loss and a profit. The most used model is the one proposed by Basu (1997), who uses a sample of firm observation from 1963 to 1990, considering both data from CRSP NYSE/AMEX Monthly files and the missing accounting data from Compustat Annual Industrial and Research files.
The model proposed is:

$$X_{t+1}/P_{t-1} = \alpha_0 + \alpha_1 \times Dt + \beta_0 \times Ret_t + \beta_1 \times Dt \times Ret_t + \varepsilon_t.$$

Where X is earnings per share for each firm in the fiscal year t, P is price per share at the beginning of the fiscal year t, Return (Ret) is calculated as the return of the last 9 month of year t and the first three months of t+1; finally D is a dummy variable where is = 0 if returns during the period are positive, and it is = 1 otherwise.

The aim of this regression is to show that earnings are **more sensitive to bad new than good one**. Indeed, he shows that "the interactive slope coefficient, β_1 , which measures the

difference in sensitivity of earnings to negative and positive returns is significant, and implies that earnings is about four and a half times (4.66 = [-0.216 + 0.059]/0.059) as sensitive to negative returns as it is to positive returns" (Basu, 1997, pp. 13).

Basu (1997) proposes another approach not based on return to measure the timely loss recognition, that is:

$$\Delta NI_t = \alpha_0 + \alpha_1 \times NEGDUM_{t-1} + \alpha_2 \times \Delta NI_{t-1} + \alpha_3 \times (NEGDUM_{t-1} \times \Delta NI_{t-1}) + \varepsilon_t$$

The dependent variables is change in net income between year t and t-1, it is possible to include or exclude extraordinary items, scaled by total assets at the ending of year t-1; NEGDUM is a dummy variable that takes the value of zero if the change in net income in t-1 is negative, and 1 otherwise. To look at the implication of the recognition of bad or good news, we look at the coefficient:

- $\alpha_2 = 0$ means that **gains** are "**persistent**" component of accounting income, in the sense that they are deferred until their underlying increase in cash flow are realized, thus they do not reverse, leading to untimely recognition;
- $\alpha_2 < 0$ happens when there is a timely recognition, hence the component of accounting is "**transitory**" and it reverses;
- a similar pattern of the second point, but with **losses** that reverse and are "**transitory**", is when $\alpha_2 + \alpha_3 < 0$;
- $\alpha_3 < 0$ when **bad news/losses** are recognized **more than positive news/gains** (Shivakumar et al., 2005).

The problem now is to identify a measure for earnings quality from these two models. Indeed, the models are based on the quality of returns or on the response of good and bad news to specify future earnings, but they do not provide an assessment on how it is the quality of the earnings analysed. Moreover, those studies take into consideration sample of different countries or industry and this leads to a classical omitted variable problem, because there are inherent differences among various market and industry on how prices react to information. Furthermore, the model based on returns would catch all the information, without separating the one about earnings, because returns are based on all the information available, even non accounting news. Thus, also in this case there is a big issue in cross-country studies because the structure of the markets and the information flow are different among each state (Dechow et al., 2010).

1.2.1.5 Target beating

We are discussing about the informativeness of accounting numbers, especially for what concern earnings. A lot of developments have been proposed during last decades, because of the low explanation power in interpret returns. Earnings are **subject to transitory effects** that diminish the validity and conclusion of the models based on them. Therefore, literature has evolved to **distinguish the fundamental performance** from those components (Hayn, 1995). Moreover, a story of persistent good performances, thus reporting increasing earnings is rewarded by stock market, with higher price-to-earnings (Barth et al., 1995). Hence, losses are negative from an analyst point of view and even transitory. Companies would not report persistent losses; it would not be reasonable to do so. Indeed, shareholders' aim is to receive dividend or to get a return higher than other safer investment, otherwise they would not have invested in a firm. Therefore, in a negative pattern of persistent losses, they have the option to liquidate the firm, in order to bring back the highest possible amount of money. Shareholders have to compare the value from future earnings streams and the liquidation one, picking the one with the highest amount. For these reasons, **losses should be avoided** (Hayn, 1995).

Furthermore, Hayn (1995) uses Compustat's Primary, Supplementary and Tertiary active and research files to analyses a group of 9752 firms, taking 85919 firm year observation between 1962 and 1990. He wants to analyse the change in models' specification when he uses subgroups with and without losses. However, he finds a particular pattern when he studies the distribution of reported earnings among his group. As reported by Hayn (Hayn, 1995, pp. 132):

> "Interestingly, there is a point of discontinuity around zero. Specifically, there is a concentration of cases just above zero, while there are fewer than expected cases (assuming the above normal distribution) of small losses (i.e., just below zero). The frequency of observations in both the region just above and that just below zero departs significantly from the expected frequency under the normal distribution at the 1% significance level using the binomial test. These results suggest that firms whose earnings are expected to fall just below the zero earnings point engage in earnings manipulations to help them cross the "red line" for the year".

This is the starting point to discuss about target beating. Indeed, firms that would to **avoid losses or to would like to increase earning a little bit are engaged in managing earnings**.

One of the most important contribution in literature in this field is provided by Burgstahler and Dichev (1997).

They use a sample of companies taken from Compustat between 1976 and 1994. They want to investigate 4 hypotheses: existence of earnings management to avoid decreases in earnings, prevalence of earnings management to avoid earnings decreases, existence of earnings management to avoid losses, prevalence of earning management to avoid losses.

The main evidences of their study are that 8%-12% of companies that have pre-managed decreasing earnings manipulate those to increasing them; 30%-44% manage earnings to avoid losses and the major components in which they intervene are cash flow from operations and change in working capital (Burgstahler and Dichev, 1997). These two are **in line with the study previously shown** in the abnormal accruals models, as they are the two components most easily manipulated by managers.

The problem behind this model regards how to use it in the field of earnings quality, as the literature has studied it to assess earnings management, unless there are a few contributions on using this for **EQ**. Indeed, for all the previous model their origination came from earnings management studies, nevertheless they were developed to be used also for earnings quality; but in this case there is not such pattern. The assumption in this case is to study whether there is an unusual clustering in earnings distribution; if yes, the firms close to the targets should have lower earnings quality. However, manager could meet or beat a target through different mechanisms, such as manipulation of accruals, tax expenses, cash flow items and other components; **unless managing one of these leads to different responses in earnings quality**, because it could be higher quality in the case of accruals or lower in the case of tax expenses (Dechow et al., 2010). Therefore, there are various method to reach o beat a target and the influence on earnings quality measure is not known ex-ante and the literature in this field is not well developed. Thus, for those reasons it is not obvious that a company close to the target have lower quality of earnings, also because that company could be close to the benchmark by chance or by fundamental performances, rather than by earnings management. Hence, it would be better to develop models that distinguish kink in earnings due to earnings management and other factors.

1.2.2 Investor responsiveness to earnings

This proxy for earnings quality is based on the so-called earnings response coefficient **ERC** and the **R-squared** from the regression in earnings-return model. These two components give a measure of investor responsiveness to earnings (Dechow et al., 2010). One of the most important paper in this field is that of Liu and Thomas (2000) as they link ERC to earnings quality. The goal of their study is to determine the relation between actual unexpected returns and unexpected earnings that have been subject to forecast revision of future earnings. They state that future earnings strongly depend on information currently available and also if there are unexpected returns they will be reflected in future earnings. Therefore, models that do not consider this issue will suffer from the correlation between the omitted variable and the independent one. Hence, they include more variables in their regression to take into consideration the changes in revision of forecast and discount rate. They show that the ERC and R-squared are higher in the multiple regression model than the simple one.

The model presented in the paper is based on three sources: Compustat for book values and earnings, Center for Research in Security Prices (CRSP) for annual returns and for earnings forecast they use Institutional Brokers' Estimate System (I/B/E/S). They use a sample from 1981 to 1994 of 6743 firm-years observations. They calculate unexpected returns (UR) as return of 12-months minus expected return that is risk free interest rate plus the equity premium multiplied by the beta[5]. For what concern unexpected earnings (UE), they provide three measures. The first one is actual eps given by I/B/E/S minus forecast eps in the previous year of the present period. The second is the difference in earnings before extraordinary and discontinuous operations, given by Compustat. The final is the difference in actual primary earnings per share by I/B/E/S. Finally, they provide four revision terms (RAE2, RAE3, RAE4, RAE5) based on the forecasted earnings in each year and the corresponding book value at the beginning and also the terminal value revision (RTERM).

The two regressions are:

$$UR_t = \alpha_0 + \alpha_1 \times UE_t + \varepsilon_t$$

$$UR_t = \beta_0 + \beta_1 \times UE_t + \beta_2 \times RAE2_t + \beta_3 \times RAE3_t + \beta_4 \times RAE4_t + \beta_5 \times RAE5_t + \beta_6 \times RTERM_t + \varepsilon_t$$

[5] Risk free rate is the yield of Treasury bonds on 1st of April in each year, while equity risk premium is assumed to be 5% and beta is the median beta of all firm in the same decile as the firm analysed.

They test the regression of unexpected return on unexpected earnings, using the three definitions of UE and starting from the simple regression to a multivariable one, where they add the result of all the future revision in future earnings. The result is a **higher R-squared in the model that takes into consideration the revision**, as they expected to find. Moreover, among the three definitions of unexpected earnings, the first one described above seems to be slightly better than the other two, due to a higher explanatory power.

Furthermore, they regress UR on the combined effect of all the variable of the multivariate equation and then decompose it, in order to see the coefficient of each part and because there is a possible correlation among the components that would bias the results of the regression. They find that they obtain a more explanatory power in the simple regression, while adding every time a new part produces lower explanatory power, unless it explains better the coefficients for each variable. Therefore, there is a trade-off between the explanatory power of the model and the value of coefficient that lead the model easier to be interpreted. Finally, they provide that both predicted ERC and R-squared are higher in the case of a strong correlation between the UE and revision forecast.

We could take the value of these two as a proxy of earnings quality, as suggested by the authors (Liu and Thomas, 2000, pp. 73):

> "If high-quality earnings are expected to have large value implications, our results suggest that earnings quality can be measured by the observed relation between current-period unexpected earnings and revisions of forecasts for future-period earnings: a stronger relation implies higher quality".

Finally, the major problem of this model is that controls, thus revisions, are taken from analyst forecast. Therefore, there is **no possibility to determine the result of a specific accounting policy** and we do not have deeper research on the correlation between the forecast and accounting statement (Liu and Thomas, 2000). Moreover, the ERC as a proxy for quality cannot identify what kind of dimension we are dealing with, as persistency, earnings management or lower value of accruals, thus it should not be an accurate measure for EQ (Dechow et al., 2010).

1.2.3 External indicators of earnings misstatements

So far, researchers have used the models just presented to identify measures of earnings quality. However, they could also take into consideration **other sources** to identify EQ, namely there are three external indicators of earnings misstatements:

1. **SEC Accounting and Auditing Enforcement Releases (AAERs);**
2. **Restatements;**
3. **Internal control procedure deficiencies reported under the Sarbanes Oxley Act (SOX).**

In the three cases there is an external party that identifies the misstatement, therefore researchers have not to struggle for choose the right model, apply it and analyse the results given by this one. Nevertheless, the external sources **do not provide the distinction between a discretionary or unintentional misstatement**, therefore it would bias the results of the study. Moreover, firms subject to AAERs or SOX could have similar characteristics that influence the sample taken into consideration and it could lead to misleading results (Dechow et al., 2010).

For what concern the first indicator, AAERs, Dechow et al. (2011) provide a huge database of earning misstatement to be available for future researches, they analyse 2190 AAERs, and they also calculate a F-score, a kind of red flag indicating the increasing possibility to detect earning misstatement. Their study is based on a sample of 676 different firms that, between 1982 and 2005, have reported annually or quarterly misstatement in their financial statements and for this reason the SEC executed enforcement action against them. As stated above, using an external source lead to advantages and disadvantages. Thus, Dechow et al. (2011) illustrate pros and cons of using AAERs. Firstly, SEC persecutes only firms in which is crystal clear there was a manipulation, therefore the **Type I error** is very **low**, also in comparison with other models, see Jones model. Nevertheless, this choice leads to a disadvantage, indeed, SEC has a **limited budget**, therefore there are some firms, that manipulate earnings but in a more hidden way, that are not subject to investigation, because it would be too much costly and the final victory by the SEC is not guaranteed. Moreover, the selection criteria of SEC to select which company to investigate could produce sample bias; unless this problem is common and widespread among other model, such as SOX, discretionary accruals.

The analysis of the author is mostly concentrated on items from financial statement because they want to create a broader setting of analysis feasible for investor, analyst and auditors. They study **"(i) accrual quality, (ii) financial performance, (iii) nonfinancial measures, (iv) off-balance sheet activities, and (v) market-based measures for identifying misstatements**" (Dechow et al., 2011, pp. 19).

Among all results from their analysis, what is important to underline here is their finding on firms engaging in earnings manipulation. Indeed, they show an **unusual high level of accruals quality** during the years of misstatements, even in the years before the manipulation. Moreover, in the final section of the paper, the authors provide a model that takes into consideration all the five variables and try to identify which of those has the best power in detecting earnings misstatement. They create a model step by step, adding the variable in three stages. In the first one they create a model with only (i) and (ii) as variables, then in the second model they also consider (iii) and (iv), while in the third one they put all the variables.

The final model gives the possibility to attribute a probability to each firm to engage in earnings manipulation. For example, they calculate the score for Enron and find that it has 2,76, that it is high than the 1 score that identify a probability of misstatements equal to the unconditional expectation. Then, they cluster firms, the sample is composed by the investigated companies and others, in 5 groups, where in the fifth there is the highest score. Therefore, they should expect to find the sample provided by the SEC in the highest decile.

Hence, they estimate the Type I error and Type II, namely the first occurs when they treat a nonmisstating firm ad misstating one, whereas the second one is the opposite. The percentage for Type I error is **36,31%**, while it is **31,38%** for the second Type error. These results most probably derive from the disadvantages of the SEC sample bias, previously described.

The second external indicator is restatement. Researchers has used two databases to collect data for firms involved in restatement, namely Nexis-Lexis Library and SEC Filing Library, the second is the GAO Financial Statement Restatement Database. The former was used by Palmrose et al. (2004) and the latter, that has been most used during last years (Dechow et al., 2010), by Desai et al. (2006). Thus, I briefly illustrate their study as example of how to use databases for analysing restatement.

Palmrose et al. (2004) use an ample spectrum of key word to identify firms that perform restatement between 1995 and 1999. As stated above, they base their search on Nexis-Lexis **Library and SEC Filing Library** and they find a sample of 403 firms. Their goal is to show the **negative stock performance** after the announcement of restatement. They also examine the magnitude of the market reaction when **restatement is due to auditor**, identified by external party or SEC; and find that the for the first two components the negative reaction is more marked than for the third one. Nevertheless, they know that there are possible sample bias in their analysis, due to the smaller size of the studied companies than the average Compustat sample, and due to the reaction behaviour of the missing companies, that were identified in the

first estimation but the authors do not have all the necessary data for them, so they were not aggregated in the final sample.

Desai et al. (2006), instead, use the **GAO** Financial Statement Restatement Database to study a sample of 477 firms involved in fraudulent or erroneous misstatements from 1997 to 2002. Their paper is based on the behaviour of short seller to the misstatement, namely they show **a huge trading activity** for misstating firms in month **before the announcement**; the authors' hypothesis is that short seller could anticipate the recognition of misstatement before the announcement and therefore they act consequently. Moreover, given the importance of accruals in manipulating earnings, the researchers analyse the link between those and shorting activity. They suggest that **investors are more attractive to firms with high level of accruals** rather than the ones with a low level.

The advantages and disadvantages of using those databases are like the AAERs. In fact, the probability of Type I errors is low, but it is probable to face **sample selection bias**. Moreover, unless the databases provide ample groups of firms, the willingness to have bias is higher for this external indicator, because the GAO Financial Statement Restatement Database contains those companies that had to restate the financial statement for unintentional error. Finally, while for AAERs the source for the restatement is the SEC, in these case the sources are not only the SEC, but also the firm and the firm's auditor; therefore is difficult to provide controls in order to lower the selection bias as for the AAERs (Dechow et al., 2010).

The final indicator is internal control weakness, in particular researchers have focused on the consequence on this after the introduction of Sarbane Oxley regime (**SOX**) in 2002; therefore the contributions in this field deal with the post adoption of SOX, or authors compare period before and after the introduction. In particular, what is important in the Saraban Oxley Act is firstly Section 302, because it is reported that companies must provide in 10-Q2 and 10-Ks certified conclusion about the effectiveness of their internal control procedures. Moreover, under section 404 companies' management should give in annual report their opinion about the effectiveness of internal control procedures and structure, while before the SOX regime companies were obliged to give information in 8-Ks, in the case of important internal control deficiencies, only when they change firms' auditors (Dechow et al., 2010).

The importance of SOX in earnings quality literature derives from the assumption that with **strong internal control companies should provide more reliable information** in their financial statements, namely the willingness to produce intentional or unintentional misstatement should be lower with higher quality of internal control.

Therefore, different studies (Ashbaugh-Skaife et al., 2008, Doyle et al., 2007a) examine the relationship between accruals quality and internal control procedures; the common vision

by those researches is that companies having strong internal control should have **higher accruals quality**. Nevertheless, Kim et al. (2011) underline the typical measurement problem of accruals, namely the models used in literature, as shown before in this paper, give approximations of discretionary accruals, they are not so accurate; unless, even in the hypothetical case of perfect measurement of accruals, there are other elements in annual report, for example the notes of the financial statement, that provide insight about the quality of firms' information system.

1.2.4 Conclusion

In this first section are described the models used in literature that give proxies for earnings quality. The first one is earnings persistence, where the quality measure is the **β of the regression**, thus the forecast accuracy of current earnings for the estimation of future ones. Higher the value of the coefficient higher the quality, thus the β capture the persistency of earnings and it is better to **not have transitory components** that influence earnings. Then we also examine two development of the model, that takes into consideration more information about earnings, such as cash flow from operation, accruals and other parts.

The second proxy deals with abnormal accruals and there are a lot of contribution in this field and a lot of models proposed. Therefore, we examine the most important and most used. Hence, the first one is the Jones model (1991), where total accruals are regressed on change in revenues and PPE. The residuals of the model are **discretionary accruals** and they give a measure of earnings quality. Unfortunately, the model suffers a lot for Type I and Type II error, thus Dechow et al. (1995) propose a modified version, adding **change in receivable** in the equation, namely they subtract this value from the change in revenues because Jones' assumption of nondiscretionary revenues is not plausible in real world. Also in this case, residuals are taken as proxy for EQ. However, the model has similar problem for Type I error as Jones, even higher.

Therefore Kothari et al. (2005) propose performance matched model, specifically they find benchmark companies looking at **ROA** for each company in the study. Their earnings quality measure is the difference between discretionary accruals of a firm and the ones of the target firm, previously identified with the same ROA. Nevertheless, the estimation of the right target lead to some misspecification, because a company could reach a predetermined level of performance using earnings management, therefore it **could not be the right benchmark**.

Another model of abnormal accruals is the one proposed by Dechow and Dichev (2002). In this case they work on **change in working capital accruals** as the dependent variable and they regress this on past, current and future **cash flow from operation**, that could be the one

reported in annual report or the difference between net income before extraordinary items and accruals. The standard deviation of residuals is the proxy for EQ, but sometimes also the absolute value of residuals is taken as measure. The problem of this approach is that it uses only short-term accruals, while managers could manipulate earnings using also **long-term** components, such as PPE. Therefore, Francis et al. (2005) add to Dichev and Dechow (2002) model change in revenues and PPE; moreover they study the standard deviation of residuals and they decompose it into **innate and discretionary component**.

After abnormal accruals, we briefly introduce **earnings smoothness**, that is based on two proxy provided by Leuz et al. (2003); they calculate smoothness as standard deviation of earnings divided standard deviation of cash flow from operation or the correlation between change in accruals and change in CFO. The problem in this case is the interpretation of those measures, because higher level of smoothness is seen both as a good or bad signal for earnings quality.

The final model is asymmetric timeliness and timely loss recognition by Basu (1997), who proposed to regressions to estimate the response of earnings to good and bad news, assuming that conservatism drives manager to account more **promptly for bad news** rather than good one. Nevertheless, the model could not give us the possibility to identify a good proxy for EQ because we only **assess the quality of response to information but not quality itself**. Moreover, the information is about different component, not only accounting one; thus, it is difficult to isolate the impact of accounting in the news.

After that we examine target beating or meeting, that has not a model as other measures, whereas authors study unusual concentration of the earnings distribution around a particular target, most of the time around zero. The common finding is to observe firms to manage earnings in order **to avoid losses or have an increasing bottom line**, because market reward them for these results. Therefore, they conclude that firms close to target have lower earnings quality, unless they could be placed there for a lot of reasons, not only for earnings management.

Then, it is analysed investor responsiveness to earnings. One of the most important contribution is from Liu and Thomas (2000) that regress unexpected return on unexpected earnings using a simple and multiple regression based on revision of forecast earnings. The measure for earnings quality is the **ERC and R-squared** of the model, higher the value higher the score.

Finally, we present the external indicator of earnings misstatements. They are three model: **AAERs, restatement and SOX**. In these three models, researchers use external sources that identify misstatement, therefore they do not have to endeavour in choosing the most appropriate models from the one presented above, unless in both three cases they face sample

selection bias that diminish the quality of their results, but the analysis suffers less of Type I error, therefore we are in front of a trade-off problem.

Table 4: summary of EQ proxies

Proxy for earnings quality	Model
Persistence	$Earnings_{t+1} = \alpha + \beta_1 \times Earnings_t + \varepsilon_t$
	$Earnings_{t+1} = \alpha + \beta_1 \times CF_t + \beta_2 \times Accruals_t + \varepsilon_t$
	$Earnings_{t+1} = \alpha + \beta_1 \times Earnings_t + \beta_2 \times Financial\ statment\ components_t + \beta_3 \times Other\ information_t + \varepsilon_t$
Residuals from accruals model	$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}$
	$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [(\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}$
	$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \beta_{i3} \times ROA_{it}/A_{it-1} + \varepsilon_{it}$
	$\Delta WC_t = \beta_0 + \beta_1 \times CFO_{t-1} + \beta_2 \times CFO_t + \beta_3 \times CFO_{t+1} + \varepsilon_t.$
	$\Delta TCA_t = \beta_0 + \beta_1 \times CFO_{t-1} + \beta_2 \times CFO_t + \beta_3 \times CFO_{t+1} + \beta_4 \times \Delta REV_t + \beta_5 \times PPE_t + \varepsilon_t$
	$AQ_{jt} = \lambda_0 + \lambda_1 \times Size_{jt} + \lambda_2 \times \sigma(CFO)_{jt} + \lambda_3 \times \sigma(Sales)_{jt} + \lambda_4 \times OperCycle_{jt} + \lambda_5 \times NegEarn_{jt} + \nu_{jt}$
Smoothness	$\sigma(Earnings_t)/\sigma(Cash\ flow\ from\ operation_t)$
	$Correlation\ (\Delta Accruals_t, \Delta Cash\ flow\ from\ operation_t)$.
Timely loss recognition	$X_{t+1}/P_{t-1} = \alpha_0 + \alpha_1 \times Dt + \beta_0 \times Ret_t + \beta_1 \times Dt \times Ret_t + \varepsilon_t$
	$\Delta NI_t = \alpha_0 + \alpha_1 \times NEGDUM_{t-1} + \alpha_2 \times \Delta NI_{t-1} + \alpha_3 \times (NEGDUM_{t-1} \times \Delta NI_{t-1}) + \varepsilon_t$
Target beating	Look at earnings distribution to catch unusual clustering and analyse firms around targets (ERC and R-squared of the model).
Inve sto r	$UR_t = \beta_0 + \beta_1 \times UE_t + \varepsilon_t$

	$UR_t = \beta_0 + \beta_1 \times UE_t + \beta_2 \times RAE2_t + \beta_3 \times RAE3_t + \beta_4 \times RAE4_t + \beta_5 \times RAE5_t + \beta_6 \times RTERM_t + \varepsilon_t$
External indicator	AAERs
	Restatement
	SOX

1.2.5 New sources for earnings quality

Earnings quality is subject to different interpretation and thus various model that focus on different features of companies, such as accruals, earnings, meeting target, and also there are external factors that indicate the level of quality. All these models are presented and studied in literature, however as the **necessity of information** about companies is increasing, indeed we know that in perfect market the information available to all participant would be equal (Fama, 1965), so no one would gain, there are **software** that provide lots of tools to analyse firms in their entirety, in order to give to investor all the possible news to evaluate better the performance and stock prices of companies.

Among all the offer, **Eikon** is one of the biggest financial data providers, its market share is close to 21,1%[6]. In fact, it is possible to find also the **StarMine model** for earnings quality, thus a new method to estimate EQ.

The model proposed by Eikon does not refer to the ones presented in literature and also scholars have **not used yet** the score presented in the software. Therefore, the first question of the analysis is how the metric presented by StarMine **is correlated** with the classical earnings quality measures and the second one is how strong the **explanatory power** of the components of each score on Eikon metric is.

[6]http://www.google.com/amp/s/ubesblog.wordpress.com/2019/06/23/Bloomberg-e-i-top-global-financial-data-providers/amp/

1.3 Determinants and consequences of earnings quality

As stated in the introduction, Dechow et al. (2010) give a criterion to divide papers dealing with earning quality. Indeed, they decompose literature into two groups, namely **determinants and consequences** of EQ. In fact, in the first layer earnings quality is the dependent variable of the study, while in the second it is the independent variable. They propose such division to study whether the different proxies provide the same result when they are applied for the same consequences or the same determinants. This approach is important because it is common that scholars use a mix of proxies in their papers, unless it is not proven that a measure made of multiple proxies is better than one or viceversa (Ewert and Wagenhofer, 2011). Thus, it is possible to identify arguments in which the different proxies could behave in the same way or they could give **mix evidence**; so that the scholars could be aware when a combination of proxies could be better or to choose one of those.

Therefore, in the next paragraph, firstly we identify the most studied determinants and consequences in literature, and we analyse the behaviour of the different proxies for each of these.

1.3.1 Determinants of earnings quality

Dechow et al. (2010) analyse more than 300 papers on earnings quality. They identify six categories of determinants: **firm characteristics, financial reporting practices, governance and controls, auditors, equity market incentives, and external factors**. What we propose is to study, if possible, how the proxies identified in the previous section, work in each of the categories; whether they provide the same conclusions or not (Dechow et al., 2010).

1.3.1.1 Firm characteristic

Scholars analyse a lot of firm characteristics; however it is possible to focus on the most important:

- **Firm performance**: this feature mostly focuses on firm showing **poor** performances; indeed, scholars identify that these companies are keener on **managing earnings**. Inside this field of research, EQ proxies seem to behave in the **same direction**. Starting from **abnormal accruals** model, we identify lot of papers (e.g. DeAngelo, 1988, Healy, 1985, Guay et al., 1996) that provide evidence of how poor performing companies manipulate earnings to hide their bad status. Moreover, in the case of low accruals quality we face also **low earnings persistence** (Dechow and Dichev, 2002), therefore it could be said that, even for this proxy, the quality of the score is lower in case of poor performances. Nevertheless,

it is worthy to briefly analyse the relationship of accruals and earnings persistence. Indeed, as stated above, the final result for firms performances of both two metrics mostly goes in the same direction. However, this evidence does not provide an insight of the accruals components of earnings persistence (see the equation in section 1.2.1). Sloan (1996) shows that **cash flows is more persistent than accruals**. This means that in the final score for earnings quality, CF gives the biggest contribution for earnings persistence; thus it is difficult to decompose the level of accruals from its quality value (Dechow and Dichev, 2002). Despite this problem, Dechow et al. (2010) state that earnings are more stable and more persistent than cash flows, therefore the component of accruals in the valuation of earnings persistency is fundamental for enhancing the decision usefulness, even if the accruals quality is low. Moreover, scholars have been studying what type of accruals are more persistent than others, e.g. inventory or receivables (see Lev and Thiagarajan, 1993, Abarbanell and Bushee, 1997). One important finding is from Richardson et al. (2005) who provide evidence of more persistent long-term accruals than short term and the same for financial accruals in comparison with of operating ones.

After this brief explanation, we continue with the other proxies. For what concerns smoothness, Defond and Park (1997) and Fudenberg and Tirole (1995) show that firms engaging in **poor performance have an incentive to smooth earnings** and to bring to the present the benefit of future better performances, therefore they are more active in smoothing earnings than firm with better results. Thus, also in this case we find that this proxy is in line with the others.

In the field of target beating, as examined in the previous section, that companies with poor performances would like to **avoid losses** or try to gain **increasing income** from one year to the following one (Hayn, 1995). However, the problem of this proxy is to identify companies that are close to the target for fundamental performance or for earnings management.

Finally, for external indicators of earnings misstatements, taking into consideration only the case where the misstatements are due to intentional management's behaviours, we could conclude that managers deliberately **manipulate earnings in cases of poor performances**, thus also this proxy gives results similar to the previous ones. Moreover, Li (2008) shows that companies showing bad results present annual report that are more difficult to read and understand. Furthermore, even if they do not study misstatement, the fact of creating difficult report could be seen as a presumption of future restatement. Li also gives evidence of a positive relation between low earnings persistence and "foggy" report.

- **Debt**: the key point for this determinant is the increasing probability for manager to manipulate earnings when the **debt to equity ratio** is very high or when the company is close **to breach debt covenants** (Watts and Zimmerman, 1990). Therefore, the possible manipulation can diminish and affect the quality of earnings, taking into consideration the various proxies for EQ. In this regard, Ghosh and Moon (2010) study the **trend between debt level and accruals quality**, using Dechow and Dichev approach (2002) and its development from McNichols (2002) and Francis (2005). They find a positive relationship when level of debt is low, because company are more prone to disclose qualitative information to creditors, while the **fear for breaching debt covenant** in the case of huge level of leverage makes manager to **manipulate earnings**. For what concerns earnings smoothness, Gassen and Fülbier (2015) analyse more than 700,000 companies among 24 European Countries to investigate the pattern between credit financing and earnings smoothness, focusing on how specific features of those private companies could influence the contracting between them and creditors, but also the influence of the country-level debt infrastructure. Among all their findings, we report the one important for our analysis, namely they find that firms with **high level of debt show huge level of earnings smoothness**, in particular trade credit are most sensitive to smoothness because this type of creditors is less able to monitor and negotiate the debt. Moreover, they are more exposed to firm's performance due to their function of providing input for the production phase. Of course, the typical problem of earnings smoothness is whether a high level is desirable or not; in this case we could state that, as for accruals, managers engages in manipulating the component of earnings to reduce the cost of debt, thus the level of variability of net income is higher and so the ratio. Therefore, high value of smoothness is a bad signal, as for accruals. Nevertheless, taking into consideration the Nikolaev's paper (2010), he studies the relation between **debt covenants and timeliness loss recognition**, and he finds that companies with high value of the former demand more promptly recognition of losses, thus higher the EQ value for this proxy. Bearing in mind all the problems of this metric to measure earning quality, we conclude that this one **is in contrast with the other measures**. Indeed, also in the case of restatement (Efendi et al., 2007) and AAERs (Dechow et al., 2011) high level of leverage is associated with lower EQ.
- Other components commonly analysed by scholars are **firms' growth and investment**. Starting with accruals, we identify that companies, facing **new investment** for growth, show **high level of accruals**. However, those are made of discretionary and nondiscretionary parts. Therefore, if we think that the normal accruals are the result of companies' decision, the **abnormal should not be connected with growth** (Allen et al., 2013). Nevertheless, as

shown in previous section, the ability of current model to decompose accurately accruals is low. However, for the other proxies we identify a negative pattern between growth and quality. For what concerns **persistence** several studies (Nissim and Penman, 2001; Penman and Zhang, 2002) provide evidence of this **negative trend between EQ and growth**. Moreover, Allen et al. (2013) show that the "good" part of accruals is positively related with increasing investment of companies, unless it is less persistent than cash flow, as previously describe by Sloan (1996). Hence, in a context of fixed value of CF, the accruals part would diminish more the persistence of earnings in the case of a pattern of sales growth. Finally, also in the case of target beating (McVay et al., 2006), internal control weaknesses (Doyle et al., 2007b) and AAERs (Dechow et al., 2011) scholars suggest the same results. Only for **restatement**, Lee et al. (2006) **cannot arrive to the same conclusion** of negative relation between firm's growth and restated amounts.

- The final feature is **firm size**. This one is the most controversial aspects because conclusion on the relation between size and EQ is **mixed**. Indeed, a part of literature, especially the older one (Dechow et al., 2010), supports the hypothesis that **big companies do not attempt to smooth or manage earnings**, because they are subject to more control and restriction than smaller firms and they bring attention to other parties, such as investor or analyst, so a lot of external party are involved in controlling their report (Albrecth and Richardson, 1990, Lee and Choi, 2002). Therefore, they have less room to manipulate annual report due to the higher probability to be discovered. However, starting from Moses (1987), **scholars provide evidence of the opposite**, indeed they state that larger firms have more incentive to smooth or manage earnings. Moreover, bigger companies spend a lot of money to maintain adequate internal control procedure, therefore this is positively associated with earnings quality (Doyle et al., 2007a, Ball and Foster, 1982).

These are the most common firms characteristic analysed in literature and we briefly identify whether the different proxies provide the same evidence or not. However, what is important to underline is the link between these four features and accounting choice/method, indeed most of the papers base their analysis on this relation. In fact, when a researcher uses an accounting choice, e.g. inventory, as a determinant for earnings management or EQ to identify in his/her sample companies that are involved in manipulating earnings, he/she must control for fundamental performances prior to conduct the analysis. This previous step is necessary because the result of the analysis could be biased if he/she does not do so, due to the possible influence of innate performance on accounting choice/method (Dechow et al., 2010).

1.3.1.2 Financial reporting practices

The consequence of the conclusion of the last paragraph is to study how financial reporting practices affect EQ, whether possible. Indeed, the contribution in this field is not as developed as for firms' characteristics, because scholars find lot of issues when they analyse this subject. In fact, the accounting standard gives manager the possibility **to use their judgement** to determine some financial items, e.g. inventory using LIFO/FIFO. Therefore, it is difficult to assess whether the choice is made for **opportunism** or for providing **better information** to external parties. Indeed, managers do not want to be detected when they manipulate accounting number for their personal purposes. Moreover, in the case of using mandatory rules it is impossible study cross-sectional variation, the only thing to compare is variation among different country that adopt the same rules, unless this creates the classical omitted variable problem (Dechow et al., 2010). However, despite these problems, there **is a common sense that accounting choices are mostly taken for opportunistic reasons** and so the EQ is lower among all the proxies. Furthermore, to support this hypothesis, some authors find the quality of earnings is increasing in the case of conservative choices by the management (LaFond and Watts, 2008, Ball and Shivakumar, 2008, Ciftci, 2010), taking into consideration that conservatism and manipulation of earnings are at odds.

Instead, scholars have examined the differences in **interim annual reports**. In this case there is more room to detect management's misconduct, because an external party could expect to not find differences among quarterly report, except ones derived for fundamental performances of a firms, e.g. products seasonality. Kerstein and Rai (2007) start from the hypothesis of Hayn (1995) that companies with small losses have more incentives to manage earnings to report a small profit, hence this explains the **kink around zero earnings**. However, the two authors argue on the limitation of his analysis, that is he does not focus on the distribution **pre manipulation**. Therefore, they propose to study annual earnings during the entire year, and they document that firms, that have small aggregate losses in the first three quarterly report, have more possibility to manage earning in the last quarter to report small profits. Moreover, they suggest that companies with losses close to zero have lower costs of earning management than firms with positive earnings, because the probability to be discovered is lower. Thus, they propose that **firms always compare cost and benefit of manipulation, before applying it.**

Jacob and Jorgensen (2007) provide a similar evidence. They study the distribution of earnings in the first three quarters and then they compare it with the one at fiscal year ended. The evidence is a kink around zero in the distribution of annual earnings, suggesting higher earnings management in the last quarter. Moreover, they also provide evidence that this

manipulation is not only for firms around zero, but also for **companies that would to meet a benchmark**. Also McVay (2006) finds that managers use discretion over some expenses classification to report them in categories seen less persistent by analyst, in order to meet their forecast, thus not only around zero earnings.

Nevertheless, Brown and Pinello (2007) find that managers have less possibility to avoid negative earnings surprise or manging upwards earnings at the end of the fiscal year. Indeed, interim reports are not audited therefore managers have more room to decide how to allocate some expenses or some categories; they have less restriction than at the end of the period.

1.3.1.3 Governance and controls

This section about governance and internal control takes into consideration different kind of mechanisms, namely the ones that better describe the principal-agent problem in a firm (Dechow et al., 2010). The first to analyse is **internal control procedures**, that is analysed with a deeper analysis in the section 1.2.3. Indeed, papers dealing with this mechanism show that strong internal control procedures **are always associated with high EQ** and lower possibility to manage earnings (Doyle et al., 2007a; Ashbaugh-Skaife et al., 2008). Therefore, in this case EQ proxies provide same evidences. Nevertheless, **other types of mechanisms behave in the opposite way**, in fact the various proxies suggest mixed evidences. For what concerns characteristic of board of directors (**BOD**), scholars focus on the relation between EQ and the BOD composition, namely the incidence on total of external and independent members and the influence of audit committee. Farber (2005) analyses a sample of 87 firms detected by SEC for committing fraud and he uses AAERs as proxies for his research. He provides evidence that this group of companies have higher number of insider member of BOD, less meeting with audit committee. These results are also shown by Beasley (1996) and other authors, using different features of BOD to analyse fraud pattern, e.g. board turn over (Agrawal et al., 1999). Despite those contributions, Peasnell et al. (2005) find similar conclusion in the relation **between number of external member and the likelihood to manipulate earnings**. They use discretionary accruals as proxy of EQ. Nevertheless, their conclusion is in line with the previous only in the case of avoiding losses, indeed when they study situation of income-decreasing, there are various reason for managers to diminish the value of net income, they do not provide the same results as the case of income-increasing. Moreover, when they analyse with these metrics the role of audit committee, there is no evidence that characteristics of this one is associated with higher or lower probability to manage earnings in order to meet or beat threshold. In addition to this, Larcker et al. (2007) examine 14 features of corporate governance and they use all the proxies for EQ to analyse how they behave for each of those dimensions.

The results found are mixed in term of response for the 14 characteristics in the same EQ proxy, but also the latter have different conclusions for the same dimensions. Hence, he states (Larcker et al., 2007, p. 989): "Consistent with the results in Table 5, there is very mixed evidence that our governance factors explain variation across numerous measures of financial reporting quality".

Furthermore, there is even **more confusion** in the papers that compare the **ownership structure and EQ**. Indeed, in literature there are two effects driving this feature: **the entrenchment effect and the alignment one**. The former indicates the behaviour of owners to extract compensation from the firm for private benefits and this comes at cost for minorities, whereas the latter is the demand to share the same interest between family members and other shareholders. Scholars, using different proxies of EQ in their analysis, provide **mixed evidences** within these two effects. Starting with the entrenchment, Fan and Wong (2002) use ERC to demonstrate how the higher the ownership concentration the lower the quality of earnings for firms, unless they limit the study for family-owned companies based in East Asian countries. Therefore, it is not possible to extend this result for other countries due to the uniqueness of the region. However, Francis et al. (2005) finds that in United States dual class companies are less transparent than one class, namely the former show more concentration than the latter, thus Wang (2006) conclude that is a point in favour of the entrenchment effect for family companies. Although these two studies, Wang (2006) states that external users of financial statement, bearing in mind the possibility of opaqueness of report in family business, demand more quality than non-family firms. Therefore, for contracting purposes, such as lowering cost of capital, family firms would issue annual report more transparent and produce more EQ.

For the second hypothesis, studies based on ERC and discretionary accruals (Warfield et al., 1995, Gul et al., 2003) support the hypothesis that family members are more interested in long-term performances and more able to monitor employees and to create a trustful relationship with them (Weber et al., 2003). Thus, the incentive to manage earnings is lower than non-family firms. But, the evidence of strong corporate governance in these firms could also allow to report low earnings quality. Indeed Wang (2006, pp. 627) states:

> "Shareholders may rely less on public financial information to monitor managers if the interests of insiders and outsiders are better aligned. As such, shareholders of family firms may have less incentive to demand high-quality financial information because family member managers, who may also be influential shareholders, have access to family firms' private information. Similar arguments can be made for creditors. If creditors believe that family ownership is associated with stronger corporate governance, the debt contracting terms for family firms will be less sensitive to earnings

quality because creditors may assume that financial statements of family firms are prepared in good faith. Overall, the alignment effect implies that family ownership reduces the demand for quality financial reporting".

Overall, governance and controls create a lot of mixed evidences, therefore studying the differences among proxies would be useless due to the possibility to find discrepancies within the same metric.

1.3.1.4 Auditors

Auditors are taken as determinants for earnings quality due to their role of detecting intentional or unintentional misstatements. Thus, scholars try to study what **elements affect their ability to find and correct misstated report**. However, the probability of detecting such errors is based mostly on auditors' efforts and incentives, unless they are **not observable** (Dechow et al., 2010). Nelson et al. (2002) investigate the conduct of managers and auditors in case of earnings management, namely in what areas and situations the formers have the incentives to manipulate earnings and the relatively auditors' responses. They interview 253 audit partners, who were involved in 515 earning management actions. The overall results are: 44% of attempts are adjusted from auditors, 21% was considered in line with GAAP, in 17% of cases auditors was not so secure of misstatements thus they do not provide corrections, the remaining 18% is considered not material. Moreover, they state that:

> "when transaction structuring is involved, managers are more likely to make attempts (and auditors are less likely to adjust attempts) that are governed by precise standards, and when transaction structuring is not involved, managers are more likely to make attempts (and auditors are less likely to adjust attempts) that are governed by imprecise standards. Managers tend to make attempts that increase current-year income, but auditors are more likely to adjust these attempts. Managers are more likely to make attempts that decrease current-year income when standards are imprecise and/or with unstructured trans- actions. Auditors are more likely to adjust attempts they consider material and attempts made by small clients".

The relation between auditors and EQ depends on factors not directly measurable, as stated before, such as efforts and incentives. Of course, the higher the auditors put themselves in the work the higher the probability to detect misstatement and produce high quality report. Unfortunately, the attempt could be measured as hours spent in auditing the firm or the auditors' expertise, unless these elements indirectly produce a **measure of effort that could not be the true one**, e.g. more hours dedicated does not mean a better job than less hours.

The feature mostly analysed is **auditors' tenure**, to analyse the duration with earnings quality. Going beyond the association of this with a specific proxy, the results, even for the same metric, are **mixed**. Indeed, scholars provide evidences that long tenure is associated with declining earnings quality and they suggest that it would be better for firms to change more times auditors on the other side (Chi and Huang, 2005); other authors show that EQ increase with the increasing years of tenure, because auditors will increase their knowledge of the firm and would be more able to detect more misconduct (e.g. Chen et al., 2008, Johnson et al., 2002). In the majority of papers, the **proxy used is discretionary accruals**, however Myers et al. (2004) use **restatement** to verify whether or not the probability to find restated report increases with the tenure; their conclusion is that it decreases. While Ghosh and Moon (2005) use **ERC** and they provide evidence of a positive relation between this proxy and audit tenure.

Finally, another feature analysed by researchers is auditor size, namely they concentrate on Big 6 firms and mostly the provide evidence that discretionary accruals are lower in value in the case of companies audited by these big auditors. However, there are mixed conclusions when scholars use in their study the type of fees (Dechow et al., 2010).

1.3.1.5 Capital market incentives

Capital market is key during companies life. Indeed, it provides various sources of financing, a lot of figures (e.g. investors, analyst, hedge funds, rating agencies etc..) are involved and they analyse firms performances, evaluating the soundness of them, whether to invest or not. Therefore, because capital market incentives derive from different layers of institutions, people, the likelihood that companies manipulate earnings and choose ad hoc accounting method is high. Hence, **capital market provides a lot of incentives for managers to manage earnings**, depending on the situation and time life of the company.

It is possible to divide two classes of incentives within the context of capital markets. The first one is when companies have to raise money. The first step in the capital market for a company is the **IPO**. This is a crucial phase because it represents the transition from private company to public one, taking within all the consequence of this change, namely the most important is the disclosure of information, as there are big differences in this term between pre and post IPO. Therefore, this transaction could provide a **lot of incentives for earnings management**, unless the **increasing quality**, required by users of companies report, could enhance the information provided by the firm, hence the EQ. Thus, there are **two streams of thinking** about how IPO could influence positively or negatively earnings quality. Teoh et al. (1998) provide evidences that current discretionary accruals are higher in the period close of the IPO for firms going public than the private one. Moreover, they show the negative relation

between high accruals and stock performances. Thus, we could conclude that IPO is a process that could produce lower EQ. However, Ball and Shivakumar (2008) demonstrate the opposite case, indeed they conclude that companies close to IPO have higher EQ, namely lower accruals. They support the hypothesis that firms should report more qualitative information close to IPO. They provide explanation against Teoh et al. (1998), specifically they compare pre and post IPO annual report and they find that restatements occur in years prior to IPO, but less in the year before; moreover, those restatements provide more conservative report; thus they do not find evidence of earnings management. Furthermore, they compare companies going public with private one, showing that the accruals are more conservative for the formers. Therefore, they conclude that: "estimating ''discretionary'' accruals around the time of IPOs requires careful controls for the accruals resulting from substantial pre-IPO growth and from the use of IPO proceeds to alter working capital".

Nevertheless, studying IPO leads to **two problems**. The first one is the impossibility to conduct researches among different countries, due to the **classical omitted variable problem** (Ball and Shivakumar, 2008). The second is that IPO is one shot event that could produce **consequences for a long time**, therefore scholars should take into consideration in their papers also these long-time effects, unless they focus only in period close to this transaction (Dechow et al., 2010).

Of course, there are **other situations and motivations for companies to raise money during their life**. Literature is not so developed and as we have just showed, scholars concentrate on **accruals quality**, therefore other proxies are not taken into consideration in their studies. Nevertheless, some researchers use **AAERs and restatement** as metric to demonstrate that companies raising money are more prone to manipulate earnings (Efendi et al., 2007, Dechow et al., 2011).

Other than raising money, companies give lot of credits to **analysts' forecast**; therefore, they strive to meet or beat benchmarks. The actions pursued by companies to **follow market** expectation are associated with earnings management and then **EQ** proxies in their entirety are **lower**. But, Barton and Simko (2002) provide evidence that there could be constraint for companies that restrict the possibility to manage earning in order to meet forecast expectation. They focus on the level of net assets, that is associated with earnings management actions. This value is a consequence of companies previous choices, thus if in past year firms were involved a lot to manipulate earnings, in present it would be more difficult to replicate this behaviour, then meeting ore beating a benchmark would be less realizable. Moreover, companies that follow analysts' expectation are driven by what analysts do, thus there are cases that meeting or beating targets derive from these **external actors**. Therefore, Dechow et al. (2010) conclude

that, despite the great evidence of lower EQ values in this specific determinant, scholars should bear in mind this final issue. In addition to this, they state that scholars do **not provide evidence on why** companies decide to choose that particular accounting choice in meeting or beating target. They only describe earnings management, but a deeper analysis on the motivation behind the choice would be better to describe this matter.

1.3.1.6 External factors

The final group of determinants is external factors, such as **capital requirements**, **tax regulations**, **political influences**, that could affect accounting choices (Dechow et al., 2010). For what concerns capital requirements, scholars have been focusing on banking industry, namely they use loan loss provision (**LLP**) as the most important accruals used to achieve financial stability. Moreover, the importance of LLP nowadays for countries adopting IFRS is even more pronounced than in the past, because IFRS 9 has brought new accounting treatments for loans, e.g. impairment and the definition of three stages. Thus, even if scholars (see Leventis et al., 2010, Barth et al., 2008) provide evidences that the adoption of IFRS leads to more transparent information in annual report and less room for earnings management, authors should now concentrate on the effect of this new standard. However, what is generally accepted and demonstrated is that **LLP is used for manipulating earnings**, hence lowering earnings quality (Dechow et al., 2010). Nevertheless, this conclusion could not be transferred to other industries, due to the specific and unique feature of banking sector. In addition, there is a direct link between LLP and capital requirements, given more possibilities for scholars to concentrate on this to detect earnings management with more powerful tests (Dechow et al., 2010).

The other factor is taxation. It is well-known that companies endeavour to reduce their taxable income. However, there could be that tax choices would go in contrast with accounting ones. Therefore, managers face **trade-off** between increasing accounting income or decreasing taxable income (Erickson et al., 2004). One of the most studied examples of this is the adoption of LIFO instead of FIFO and the tax consequences. Scholars (see for example Davis et al., 1984, Abdel-khalik, 1985, Shackelford and Shevlin, 2001) show that some companies decide to bear tax costs in order to increase accounting earnings. Unfortunately, the relationship between this tax choices and EQ is limited, therefore we could not provide any conclusion on this.

Finally, the last external factor is SOX. As Dechow et al. (2010, pp. 385) state:

> "Preliminary evidence suggests that earnings management activities using accruals declines following SOX, but that firms substitute other mechanisms such as real earnings management activities and ''expectations management'' (Cohen et al.,2008; Koh et al.,2008). Thus, the overall effect of SOX on the decision usefulness of

earnings is ambiguous… accruals management, ceteris paribus, may impair earnings quality, but it represents only one choice within the firm's portfolio of financial reporting choices."

1.3.1.7 New determinants

The determinants just analysed are grouped into six categories: firm characteristics, financial reporting practices, governance and controls, auditors, equity market incentives, and external factors. In particular, we focus on **firm characteristics and financial reporting practices**.

Indeed, the second goal of this study is to examine three determinants, namely **business model, accounting principle of inventory and the choice to cover or not the commodities risk**. The choice of these three features derives from the peculiarity of the industry chosen in the analysis, the food processing. Indeed, it is important to divide companies not looking at what kind of product they produce or sectors they belong, but to assess the business model chosen at the beginning. In fact, there could be a lot of differences between two firms that process, for example, vegetables but one decides to concentrate only on **frozen** products and the other on **fresh** ones. Therefore, we bring a new determinant under the firm characteristics, that is business model. This is extremely important as the industries are not demarked as in the last decades, and because it is a more appropriate principle to distribute firms, because the choice of how to run a business impact the company in its entirety. Moreover, it is a subject not so developed in literature, so it could be a starting point for future analysis. So, the first question is to see whether the choice of a business model instead of the other lead to higher EQ.

For what concerns accounting treatment, this determinant goes under the group of financial reporting practices. Furthermore, it is not an innovation in this field, as the choice between FIFO vs LIFO is presented in other papers. However, dealing with food processing firms, where management inventory is crucial to not waste products and to maximizes it, the accounting methods of inventory has more peculiarity than for other industries. Moreover, under **U.S GAAP** there is the possibility to apply also LIFO, which is not suitable under **IFRS**. Then, the second question is to assess whether choosing FIFO could produce more earnings quality or not.

Finally, linked to inventory, there is **commodity risk**, as companies in food processing buy products quoted in the market, so subject to fluctuation. Therefore, it is interesting and also innovative to analyse whether covering risk with derivatives could determine more or lower EQ. Even in this case, this is a peculiarity of the industry.

In conclusion, there are six groups of determinants, however not everyone has the same important as other, so we decide to investigate the ones more appropriate for food processing.

1.3.2 Consequences of earnings quality

In this section earnings quality is the **independent variable** and, as for the determinants, we provide whether the same consequence leads to the same results across the different proxies.

One of the most studied consequence is **return**, namely authors attempt to link this one with earnings persistence. Therefore, the analysis of this consequence is limited to only one proxy. However, trying to explain returns in the market is crucial for investors, firms, analysts and also scholars; thus it is important to discuss about it, even if literature have examined only the relationship with return on this metric.

The first contribution is the Sloan's paper (1996) who analyses how stock prices are influenced by accruals component and cash flow component of earnings and the ability of these two to predict future earnings, namely their persistency. He shows that **investors are not fully aware of the different persistence between accruals and CF**. Moreover, he provides evidence about this investors' inability, namely he shows the so-called **accruals anomaly** that is the hedging strategy to be long on firms with low accruals and short with high accruals firms. This portfolio leads to abnormal returns close to 12% per annum. This finding brings other authors to explain the reason behind this phenomenon. **Xie** (2001) studies the different persistence of normal and abnormal accruals, indeed he performs the Mishkin (1983) test and the hedge-portfolio test. He finds out that the **abnormal accruals** in both test result to be mispriced by the market, precisely they are **overpriced**. Therefore, he attributes the accrual anomaly to this component. Conversely, **Richardson et al.** (2005) focus on reliability of accruals. They provide evidence that lower level of reliability in accruals are associated with less persistency. Moreover, they explain that investors are **not aware of the lower persistency of less reliable accruals**, thus abnormal returns in Sloan (1996) are explained by this inability. **Desai et al.** (2004) try to give a third explanation of this anomaly. They study not only the accrual one but also the so-called **value glamour**, that is the behaviour of investor to have higher expectation for firms showing strong fundamental, namely **low past sales growth, high book-to-market ratio, high earnings-to-price and cash-to-price**, than for companies showing the opposite pattern. Desai et al. find a **positive relation with these components and the ones for accruals anomaly**, e.g. the positive relation between sales growth and accruals, thus they analyse the two phenomena at the same time. They provide evidence that investors **do not capture how growth is reflected in accruals**, thus this is one of the reasons behind the accruals anomaly. Finally, **Khan** (2008) focuses on the models used in previous literature to determine the phenomenon. Therefore, he uses a four factors models and he shows that is better than the models used by previous scholars because it has an aggregate error close to zero, while the other are statistically significant from it, i.e. the CAPM, the Campbell–Vuolteenaho two-

factor model, the Fama–French three-factor model and the Vassalou and Xing (2004) model. Using its model, he finds that the **anomaly between low accruals firms and high accruals is due to risk premium**. Thus, the accruals anomaly is the results of research design.

The topic of accruals and persistence has been developed with deeper analyses that disaggregate the former into various components, such as write-off or industry-specific accruals (Dechow et al., 2010). However, we would not examine all these studies because they rely on the only proxy of persistence and it is beyond the aim of this section.

Therefore, there are several consequences studied in literature, some of them are also determinants, so it is important to fully understand the causality when authors perform an analysis on those topics. Dechow et al. (2010) identify nine different consequences: **litigation propensity, audit opinions, market valuations, real activities, executive compensation, labor market outcomes, firm's cost of equity capital, firm's cost of debt, analyst forecast accuracy.**

1.3.2.1 Litigation propensity

Litigation propensity as consequences in EQ is limited only in two proxies: **restatement and abnormal accruals** (Dechow et al., 2010). For the first metric, Palmrose et al. (2004) focus on the effect of restatement that affects **historical earnings**, therefore they do not concentrate only in period close to the announcement of restatement, as mostly scholars do, but they **analyse the consequences for investors to change past numbers**. Taking the same perspective, Lev et al. (2008) provide evidence that restatement that affect the historical pattern of earnings increases the likelihood to have litigation.

For what concerns **abnormal accruals**, authors concentrate on **events with high risk** of misstatement, such as pre-merger, IPO or SEO, where managers have the incentive to inflate income or to meet benchmark in order to increase their final compensation. In such cases, they find that higher value of abnormal accruals, hence **lower EQ, are strongly associated with lawsuits** (Gong et al., 2008, Ducharme et al., 2004). Therefore, these two proxies give the same insight on litigation propensity, unless there are not studies that provide evidence using other proxies to corroborate this conclusion (Dechow et al., 2010).

1.3.2.2 Audit opinions

For audit opinion scholars have concentrated only on **abnormal accruals** proxies. This is due to the impossibility to link the other metric with this pattern. Indeed, auditors' job is to challenge whether financial statement are correct under GAAP, thus using proxy such as earnings persistence or earnings meeting could not be meaningful to describe their attitude, because it would be time difficult to link a poor metric with financial statement that could be

attempt by auditor. Whereas, in case of abnormal accruals, that involved directly items of annual report, is straightforward to study if they could lead to audit opinions. Hence, there is **mixed evidence** about this proxy. In fact, Francis and Krishnan (1999) state that high accruals firms have more possibility to receive a qualified opinion. On contrary, Butler et al. (2004) support this hypothesis, unless when they add for control, such as distress situation, they change their mind. Therefore, it is important to take into consideration the **life cycle of a company** when analysing its accruals level, because high level could derive from this instead of earning management (Butler et al., 2004). Finally, Bradshaw et al. (2001) argue that auditors could **not judge the quality** of earnings or give opinion about it, they only concentrate on GAAP violations.

1.3.2.3 Market valuations

Valuations usually are based on numbers provided by companies in their annual or interim report, and they also take into consideration other elements that could be external, e.g. market future growth rate, country risk, but also other firms specific feature as possible lawsuits, launching of new products and so on. However, the major drivers derive from financial statement, in particular **EPS** are extremely important. Therefore, Myers et al. (2007) provide evidence that companies with a strong pattern of **increasing EPS are rewarded by market with higher stock prices**. Nevertheless, they strive to report slightly higher earnings from one period to the other, because when the pattern of growth stop, the losses incurred are huge. Hence, those companies **manage earnings or smooth** them in order to continue to be recognized by investors. Moreover, also **meeting or beating target** lead to received high recommendation by the market. So, these three proxies corroborate the hypothesis that manager exploit all the opportunities to manipulate earnings for their interests. To meet benchmark or to continue to increase income, **managers work on different items**. Taking into consideration **abnormal accruals**, Defond and Park (2001) suggest that investors could perceive that earnings surprise derive from these items, thus they revise their forecast due to the limited time effect of accruals. They are **not long lasting**, so the authors state that if income increasing abnormal accruals augment the level of good news, investor would decrease their expectation, because they know that the underlying earnings surprise is lower. Moreover, Petroni et al. (2000) demonstrate that discretionary revision on loss reserves are related to lower future profitability and perceived high risk. Thus, Dechow et al. (2010) suggest that **investors' response to different accruals component is variegated**, it could be positive or negative, it is not one way. Finally, they state that for what concern AAERs, firm subject to misstatements are penalized in

market valuation due to reputational penalties. So, we can conclude that for this consequence EQ proxies provide **mixed results**.

1.3.2.4 Real activities

In this section the analysis deal with investments decisions related to EQ proxies. Indeed, outside investors consider lot of elements before providing capital to one firm instead of one other; earnings quality is a component in the decision-making process of investing. Biddle et al. (2009) provide evidence **that higher financial reporting quality reduces moral hazard and adverse selection**, thus it improves the allocation of capital and investment efficiency. They also demonstrate, using discretionary accruals as proxy for their analysis, that accounting quality could produce **both over and under investment**, it depends on firm specific characteristics. Instead, McNichols and Stubben (2008) focus on how intentional activities, such as earnings management, could affect investment decisions. They analyse a group of companies that intentionally misstate earnings, or they were subject to SEC enforcement. They find that these firms, during the **period of earnings manipulation, over invest**. Nevertheless, they do not analyse external user as Biddle et al. (2009) do, therefore they cannot assess how they are affected by these actions.

1.3.2.5 Executive level compensation

Earnings, but also other ratios provided by financial statement, are used by the Board to set CEOs' compensation, the variable part of their wages. Thus, managers have big and personal **incentives to manipulate** these measures in order **to get rewarded**. Of course, this could lead to lower earnings quality and higher earnings management. One of the most proxy used within this consequence of EQ is earnings persistence (Dechow et al., 2010). Indeed, when CEOs use extraordinary item to meet the compensation level required, **earnings persistence would decrease** due to these special items. The response of the Board **is twofold**: it could take away from the compensation the positive influence of these components, to assure a more consistent compensation for the CEO (Dechow et al., 1994), or it could not be able to identify these or consider them not an extraordinary event (Dechow et al., 2010). These two visions are based on two papers that analyse different source of non-recurring gains; for the former restructuring charges and the latter securitization. The common limit in both studies is that they focus on only one situation, while the group of possible sources for manipulate upward earnings is ample. Therefore, even if is straightforward that in both cases earnings persistence is lower, **the consequences on compensation is not**.

Finally, for what concern other proxies the literature is limited on restatement and timeliness, the result provided by Dechow et al. (2010, pp. 388) that analyse more than 300 papers on EQ is:

> "Studies also suggest that expected earnings quality, measured primarily by timeliness, is associated with ex ante compensation contract design, while changes in earnings quality, measured by the incidence of restatement, are associated with ex post recontracting".

1.3.2.6 Executive level labor market outcomes

Earnings are not only the benchmark used for compensation, they give a signal of companies performances. In a situation of poor performances, the likelihood for managers to be fired is higher. Moreover, in these cases the quality of earnings is mostly poor, hence **replacing managers could be a consequence of lower EQ** (Dechow et al., 2010). Nevertheless, it is not obvious that when companies engage in poor performances or poor earnings quality, CEO or CFO are replaced. Indeed, Agrawal et al. (1999) provide evidence that firms committing fraud are not keener in changing managers than a sample of firm noncommitting fraud. Furthermore, Beneish (1999) analyses companies alleged by SEC of overstating earnings. He finds that in this sample of 64 firms the turnover of CEO after the discovery of restatement is similar than the period before this event.

Instead, Desai et al. (2006) finds that about 60% of companies that restate earnings between 1997-1998 change at least one top manager. Moreover, Menon and Williams (2008) provide evidence that companies that experienced audit resignation are more likely to replace top managers.

All these studies, as Dechow et al. (2010) suggest, take into consideration event of extreme lower EQ and they work on situation where earnings management is crystal clear. On the contrary, Engel et al. (2003) focus on accounting information in situation not extreme as the previous studies. They analyse more than one thousand CEOs turnover, using timeliness as proxy. They provide evidence that, when earnings timeliness is high or there is less noisy in earnings, director rely more on accounting number when deciding on turnover than stock prices.

The conclusion on this topic is a **mix of evidences, therefore it is important to have clear in mind the decision context in which scholars are operating**, because every situation is different as the consequences therein. Thus, also the proxies used could not be perceived as substitutes, because they capture different aspect of the same topic (Dechow et al., 2010).

1.3.2.7 Cost of equity capital

Information presented in financial statement are fundamental for investors when they decide to choose where to put their money. Indeed, the bottom line is the most important line item considered by these persons. Therefore, earnings quality is crucial in determining the cost of equity capital, because it could play a key role. However, there are different proxies of EQ and the magnitude differs among them. Francis et al. (2004) compare cost of equity for investors who want to provide capital to companies and the effect on seven metrics on this. They divide proxies into **accounting-based and market-based**. The former is composed by accrual quality, **persistence, predictability and smoothness**; whereas the latter by **value relevance, timeliness, and conservatism**. They analyse data for 27 years, 1975-2001, and they test these seven measures to assess which one has the biggest influence on cost of capital. They also conduct control test using firms specific attribute in order to take away innate factor that could influence the overall result. They find that **accounting-based proxies have bigger impact than market-based**; moreover, accruals quality is the one that seem to have the most powerful influence on cost of equity. Moreover, Francis et al. (2005, pp. 315) provide evidence that: "accruals quality plays a statistically and economically meaningful role in determining the cost of equity capital".

Of course, all the measures are inversely associated with this consequence. In fact, higher the quality of the metric lower the cost for investors. Finally, they also use different calculation for cost of capital to validate their finding, and they provide evidence of robustness among all the measurements.

For what concerns smoothness, McInnis (2010) provide evidence that higher smoothness is not associated with lower cost of capital; instead he proves that these results documented in previous literature are driven by the bias optimism in analysts' forecast.

Furthermore, Core et al. (2008, pp. 20) replicate and challenge test used by Francis et al. (2005) and they state that:

> "First, we point out that the time-series regressions of contemporaneous excess returns on risk factor returns conducted by FLOS do not provide evidence that a candidate asset (e.g., the AQ factor) is a priced risk. Thus, these tests do not update beliefs about whether or not accounting quality, though important and interesting, affects expected returns. Second,we test whether AQ is a priced risk factor using both cross-sectional and time-series regressions shown to be appropriate for this purpose in the finance literature. For completeness, we also examine cross-sectional regressions of returns on AQ as a characteristic (instead of covariance). Using these traditional tests, we find no evidence consistent with the hypothesis that AQ is a priced risk factor."

For the remaining proxies, Dechow et al. (2010) suggest that AAERs is associated with higher cost of capital, while there is a mixed evidence on the consequences of internal control deficiencies under SOX 404 on cost of equity capital.

1.3.2.8 Cost of debt capital

Literature for this topic is limited, unless the common view is the same as for cost of equity capital; indeed, lower earnings quality reverses into higher cost of debt (Dechow et al., 2010). Francis et al. (2005) calculate accruals quality for 31 years with samples that ranges from 1500 firms to 3500 per year. They estimate abnormal accruals using Dechow and Dichev (2002) model, the Jones model (1991), and the modified Jones model (1995). Using all these data, they provide evidence that companies with **lower accruals quality have higher cost of debt**, namely a higher ratio of interest expense to interest-bearing outstanding debt. Graham et al. (2008) use restatement as the proxy for their analysis, namely they focus on term loan contracting after restatement. They concentrate on spread basis over Libor and they find that contracts made after fraudulent restatement show higher spread, thus higher cost of debt, shorter maturity, more covenants restrictions and the number of lenders decreases after this event, thus the contracting power of those companies goes down.

Therefore, it is possible to say that **cost of debt and equity suffer from lower EQ**. Hence, scholars could develop the former in order to validate even more the latter. Moreover, Dechow et al. (2010, pp. 389) suggest two points: "1) to examine accounting choices that are irrelevant to quality characteristics of interest to equity markets, and 2) to assess trade-offs between multiple incentives for producing high-quality earnings".

1.3.2.9 Analyst

Also in this case literature is not so developed. The most important **issue** derives from the assumption of **analyst efficiency**, namely analysts are assumed to give unbiased and corrected forecast of future earnings. Therefore, forecast variation is driven by changing in EQ. The advantage in respect of studies based on market return, that requires market efficiency similar to the analyst efficiency, is that the **forecast rely only on earnings**, while market takes into consideration other elements, that could affect the accuracy of the test on earnings quality because it capture other information not contained in them. Nevertheless, the analyst efficiency, as the assumption of market efficiency, **is questionable** (Dechow et al., 2010). However, scholars are divided into positions: there is a group that provide evidence that in cases of earnings management (see Coles et al., 2006), analyst could anticipate this misconduct and

properly take into consideration it in their forecast; thus, they are not affected by earnings manipulation. Whereas, other authors (see Teoh and Wong, 2002) state that analyst could not fully detect and be aware of this action, therefore they forecast are biased.

Chapter 2.

2.1 Introduction

In this section, it is developed the empirical part of the thesis. In the literature revision it is underlined the problem presented in most of the papers, that are biased in their analysis due to the inability of accounting system to report the fundamental performances of a company. This issue creates an initial biased that cause studies to be less accurate. Moreover, there is another factor that is not well developed in literature, that is the business model of a company. Indeed, within an industry there could be more than one way to do business and this choice could have a big impact in profitability of firms, but also it could be a determinant for increasing or decreasing EQ. In fact, most of the paper are based on the analysis between different industries or cross countries, unless this division could be distorted because of the business model factor that is not take into consideration in their analysis. Of course, studying the EQ within an industry in a specific region lead to other problems, such as the lower number of observations or some factors that are connected with that specific region.

Despite these possible problems, we decide to investigate the importance of business model, that is the innovative part of the study, but also to concentrate on peculiar accounting choice of the industry chosen, that is one typical way to study a topic.

The first goal of this research is to verify whether the Eikon score for EQ is somehow correlated with the models used by scholars in their analysis and to calculate, within those measures, the components that mostly explained the Eikon metric. This is important because Eikon measures could be a new model to be analysed for future analysis in earnings quality, unless the correlation with one or more models is so high that it would be possible to substitute the former with the latter. After that, the study concentrates on the influence of **business model** on EQ, therefore this is in the field of **earnings quality determinants**. This topic is not well developed in literature; therefore it is a good opportunity to give an initial boost for it. Indeed, business model could be an innate factor that would have consequences on the final EQ, despite the model used, therefore it is important to verify the influence of this on the scores, whether discriminating with this would lead to big differences in the final metrics or not. Furthermore, we verify also the impact on earnings quality by the **accounting choice**, namely LIFO and WEIGHTED AVERAGE vs FIFO, and whether the use of **derivatives for commodities** could be a discriminant for higher or lower EQ.

Finally, studying different topics as business model, accounting choice and risk attitude, under different method for EQ, gives us the possibility to **compare these proxies**, whether they

behave in the same way or not, if they describe the same characteristic under that specific contest, or if they behave in the same way but catching different pattern of the topic.

2.1.1 Hypothesis

The first part of the analysis deals with the examination of Eikon metric and the possible correlation with some of the models presented in literature. Indeed, the focus is on proxies referring to **accounting numbers**, so external factors, target beating, timely loss recognition are not taken into consideration.

The importance of this first step is to verify whether or not scores presented by software, then a new "generation" for earnings quality measures, could be **correlated with the literature** and so they do not differ from what has been studying in last decades. On contrary, in case of lower or absence relation, this new form of proxy could be integrated in the analysis. Moreover, we concentrate also on the components of the different models equation, as there could be possible to have correlation of them, without having it at proxy level. This would happen because StarMine and models base their measure on similar accounting number, whereas the calculation of the final score is different.

Therefore, the first hypothesis is twofold:

H1 a: There is a positive correlation between Eikon score of EQ and models chosen from literature.

H1 b: The components of earnings quality measures are determinants of Eikon score.

Then, the analysis concentrates on **three determinants**, that are peculiar for the food processing industries, namely **business model, accounting treatment of inventory and covering commodities risk**. The business model could be a new way to divide companies other than the typical industry division; moreover, in food processing we identify the choice of producing frozen or fresh food to determine how to run the business.

For what concerns accounting principle, we focus on inventory because this item is very important for the companies analysed, as they have to manage it at their best to extrapolate the maximum. Moreover, firms chosen are based in U.S.A so they applied U.S GAAP, where it is possible to apply also **LIFO**. Therefore, this second determinant become even more interesting, even though it has already studied by scholars.

Finally, in their inventory firms have raw materials that are quoted in the market, as corn, pork or coffee. So, the value of their expenses but also revenues and inventory could fluctuate during the annual year, as the price of these materials moves. So, commodities risk is typical in food processing, therefore it is interesting and not so presented in literature, to analyse the effect on EQ when companies decide to cover commodity risk with derivatives or not.

The hypotheses for this second step are:

H2a: Business uncertainty is associated with lower earnings quality. To test that we use business model based on frozen vs fresh.

H2b: Accounting criteria have effect on earnings quality. To test that we compare FIFO vs LIFO or WEIGHTED AVERAGE.

H2c: Covering commodities risk determines higher quality of earnings.

In conclusion, the importance of this second part is also to test whether the proxies provide the same results or mixed evidences under the same proxy, and what feature of the determinant are capturing with their score.

2.2 Structure of the analysis

The sample of the companies is provided by Eikon, precisely we search companies in the **food processing** sector based in the USA. The group is made of 50 listed companies and the observation goes from 2009 to 2018; all the elements for the analysis are provided by Eikon that gives the possibility to download in Excel: Balance Sheet, Income Statement and Statement of Cash Flow. Furthermore, 10-Ks for each company, that are fundamental to gather the information about business model, accounting method for inventory and commodities derivatives, derive from different sources: the site of a company, Eikon and last10K.com.

The structure of the analysis is twofold, firstly we compare the earnings quality measures provided by Eikon with 7 measures of earnings quality most used by researchers: **Jones model (1991) (EQ1), modified Jones model (1995) (EQ2), Dechow and Dichev approach (2002) (EQ3), Francis et al. (2005) (EQ4), earnings persistence (EQ7) and the two ratios for earnings smoothness (EQ5 and EQ6)**. The goal of this first step is to find a possible correlation between the StarMine model and the literature and to see what components of the different models specify better the Eikon EQ. After having completed this first analysis, we decompose the companies in our sample using different parameters. The most important and the core of the study is the Business model approach, indeed we divide the sample looking whether the company manufactures frozen or fresh food, because the management of the process in the value chain is different in these two cases and therefore the business model at the inception is different. Of course, the majority of the companies produce both frozen and fresh food, so we perform the analysis more times using different thresholds to define a company business model, in order to provide more robust results.

Moreover, we provide other distinctions based on the accounting method chosen by the companies to calculate inventory, namely first-in first-out (FIFO) vs others (last-in last-out (LIFO) and WEIGHTED AVERAGE), if the company hedge commodities risk, this is

important because in this sector every enterprises deal with raw materials such as coffee, corn and others, that have their own quotation in the market, therefore the price of such items can change over time and triggers losses.

2.3 Possible correlation between Eikon and literature

The StarMine model presented in Eikon provides a rank for earnings quality measures for every companies in the sample. The score varies between 0 and 100, where 100 means the highest value for quality, whereas 0 is the lowest. Therefore, the **score provides a centiles distribution for companies**, there is not an absolute value of EQ, as in the literature models. The score is made of different components, each of them has its own quality measures; the final earnings quality metric is the weighted average of them, but unfortunately we do not have the specification of the weightiness for each part of the measure. The components are **accruals, cash flows, operating efficiency, exclusions**. Even if we do not have a deeper specification of the model, we know that the model rewards more companies backed by sustainable cash flows, whereas **penalizes the ones backed by accruals**. Moreover, the rank between 0 and 100 takes into consideration the geographical areas, because every scores is compared to a benchmark that is not specific for every sub-industry, but at geographical level. Therefore, it is subject to some misspecification, indeed the measure could not be optimal for the analysis in the second step. However, it is possible to have high correlation with the scores provided by different models in the literature or by the various components of them, so it makes sense to analysis the StarMine model. Takes the case in which, for example, we would find 85% of positive correlation with the Jones model; in this case we would use directly the Eikon score instead of calculating them with this model, because of the high correlation.

This model is usually used for investors, because it provides a **daily change in the metric**, therefore it is possible to set a strategy based on how the score behaves. For example, to go short on those companies that decrease the earnings quality and long on those that increase it, or vice versa. Moreover, another possibility would be the one to study the trend between the stock price movement and EQ scores movement, but this goes beyond this analysis, as the picture 1 shows. The model proposed gives a multiple factor approach for investors to evaluate a company.

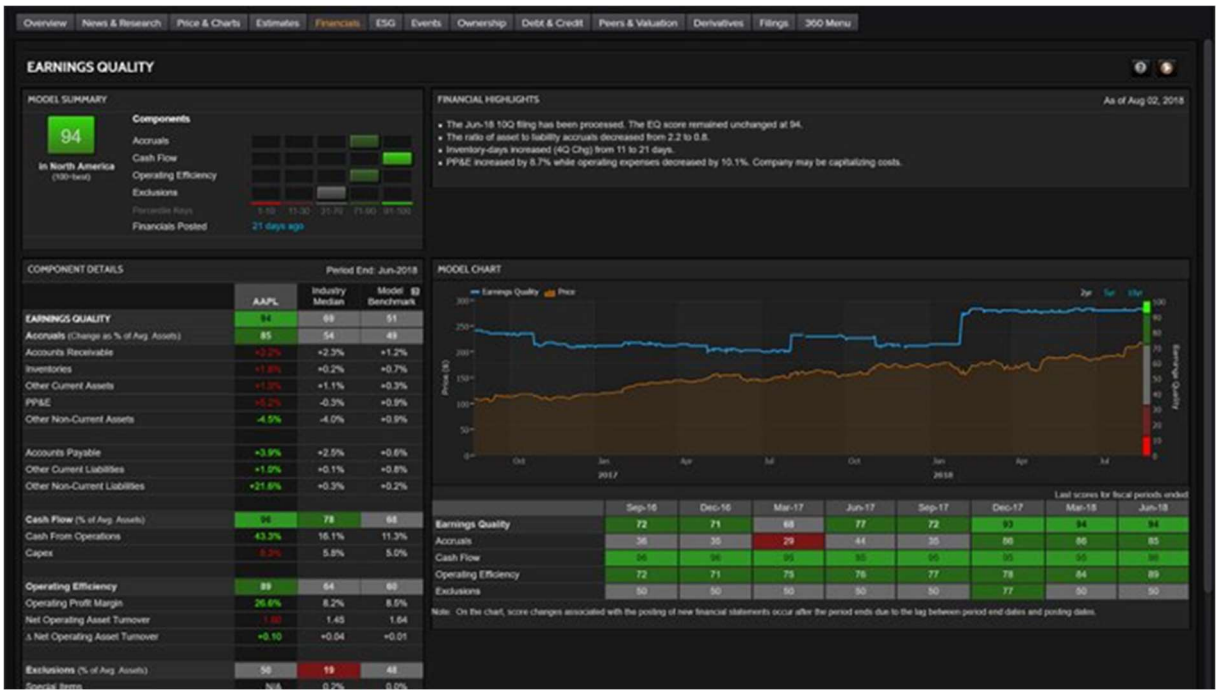
The initial problem of this first step analysis is to determine **how to compare** Eikon score with the other metrics. Indeed, the models presented in literature do not provide a centiles distribution of the company, scholars take the absolute value provided by the equation, e.g. absolute value of nondiscretionary accruals. Therefore, to let the comparison possible, we

divide in **quintiles, deciles, ventils** the Eikon scores and the other EQ measures. To evaluate whether Eikon is comparable with the seven model, we perform a **t test** for each year and then for the total number of observations; this procedure is repeated for every quantiles division. Moreover, we also conduct simple **linear regression** after the t test. After that we also perform this process among the seven measures, typically scholars study the relationship between the different metrics. This step analysis could give the possibility to verify at annual level the trend between Eikon and the models, to provide robustness, because the results could be influenced by how we divide the companies in quantiles, but using four distributions gives us the possibility to confirm or not the correlation between the models; indeed the quintiles distribution could give different insight than the deciles.

Finally, even if the t tests among the four quantiles provide the same evidence and to overcome the limitation of t test, regressing the Eikon quantiles on the other metrics quantiles would provide even more evidence of the relation previously obtained with the t test, or it could demonstrate that the previous results are not satisfied with the linear regression.

The results are consistent among the different quantiles distributions; therefore this gives more robustness to the analysis. So, in the following part we propose only results derived from the ventils and in the case there are significant differences between quintiles and deciles we specify that in the notes.

Picture 1: representation of EQ in Eikon from https://www.refinitiv.com/en/products/starmine-financial-modeling/starmine-investment-research-analytics.



2.3.1 Jones model and Eikon.

The first model analysed is the Jones model (1991):

$$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}.$$

In the analysis, the definition of Total accruals is a little different from the one proposed in the Jones paper, because we use the one provided by Dechow et al. (1995), who adds the delta in short term debt to the equation provided by Jones, therefore we compute them as:

$$TA_t = [\Delta CurrentAssets_t - \Delta Cash_t] - [\Delta Current\ Liabilities_t] - Depreciation\ and\ Amortization\ Expense_t + \Delta Short\ term\ debt_t$$

All the items are taken by the Balance Sheets provided by Eikon in standard format for all the companies. We compute the residuals of the model, that are discretionary accruals, for every companies from 2010 to 2018. The value of abnormal accruals is taken in absolute form and, because the higher the Eikon score the higher the quality, whereas the higher the discretionary accruals the lower the EQ, we introduce a minus before the absolute value to match the two metrics. After that, we compute the quantiles distribution for the two measures for every year and we conduct several t tests. The results are consistent year by year, and also among the different quantiles distributions. They indicate that there is no material difference between the mean of the two proxies.

However, when we perform a regress analysis the results do not provide the same evidence, as the p value is too high. Indeed, in Table 5 is presented the Pearson correlation and the Spearman correlation, and it is shown that in both cases the coefficient is only 0,05 and the p-values are close to 0,30, so not statistically significant. Therefore, **t test is unable to explain** that the two models provide the same results because it concentrates on the mean of the differences by the two, so it could be possible that this one is close to 0, but the differences for each Company are high and there is no trend between the two measures.

The conclusion is that the Jones model and the StarMine model for EQ do not provide the same results, **they are independent** because the Pearson and Spearman coefficient are close to 0, even if the latter penalize companies backed by huge value of accruals. However, the calculation of the first one concentrates on residuals of the equation, in Eikon there are annual deltas for specific accruals, so the estimations are different and so scores. Moreover, Eikon takes into consideration other three factors for the final proxy, therefore also this condition could determine more divergency from Jones model.

2.3.2 Modified Jones model

The second model is the modified Jones model (1995).

$$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}$$

The definition of TA is the same as for the previous analysis and all the elements are from the Balance Sheets provided by Eikon in standard format. Even in this case, discretionary accruals are the residuals of the model and we take the absolute value multiplied minus one. Then these ones are distributed in quantiles and the t tests for each of them for every year is computed. The results, not surprising, are close to the ones of Jones model. In fact, t tests from year 2010 to 2018 provide no evidence of differences between the mean of the two proxies, even in the case of the t test that compare all the observations of the ten year together.

Nevertheless, as Table 5 shows, the Pearson and Spearman correlation are 0,05 as for the Jones model and they are not statistically significant. Therefore, the conclusions are the same as the previous one. The modified Jones model and Eikon EQ measures **do not provide the same distribution**, they are independent due to the different method on how estimate accruals and the influence of the other components presented in the StarMine metric.

2.3.3 Dechow and Dichev approach

The other model for accruals is the Dechow and Dichev approach (2002).

$$\Delta WC_t = \beta_0 + \beta_1 \times CFO_{t-1} + \beta_2 \times CFO_t + \beta_3 \times CFO_{t+1} + \varepsilon_t.$$

In this case all the elements are taken from the Statement of Cash flow. Also for this equation residuals of the model are the discretionary accruals, taken in absolute value and matching with the Eikon scores, multiplying them by minus 1. The distribution in quantiles are compared with Eikon and we conduct t tests for each year and for all the total observation. Even in this case, there is no difference between the mean of Dechow and Dichev score and StarMine model, unless the Pearson and Spearman correlation demonstrate that the relationship of the two metrics is only 0,04 and not even statistically significant. Then, **they seem to be independent**.

Even in this case, the difference is due to the calculation of the metric. Indeed, Eikon rewards companies backed by sustainable cash flows, unless the estimation is based on the annual change in cash flow from operation and working capital. The latter is the dependent variable in the Dechow and Dichev approach, whereas the independents are CFO in year t +1, t and t-1, so there is no variable for change in annual CFO as for the StarMine models. However, it is possible to expect a possible correlation between the methods because of the same

parameter used. Nevertheless, the final score also in this case is provided by residuals of the model, therefore this could lead to different quantiles distribution.

Finally, as for the previous results, Eikon is composed by 4 parts, and CFO is only one of them.

2.3.4 Francis et al. model

Francis et al. (2005) start from the modification by McNichols (2002) of the Dechow and Dichev (2002) equation, who propose to take into consideration also delta revenues in order to control for companies performances. They suggest analysing all the accruals and not only the short-term ones, therefore they use Total current accruals instead of WC and they add the contribution of long term accruals to the model, that are PPE.

$$\Delta TCA_t = [\Delta CurrentAssets_t - \Delta Cash_t] - [\Delta Current\ Liabilities_t] + \Delta Short\ term\ debt_t$$

$$\Delta TCA_t = \beta_0 + \beta_1 \times CFO_{t-1} + \beta_2 \times CFO_t + \beta_3 \times CFO_{t+1} + \beta_4 \times \Delta REV_t + \beta_5 \times PPE_t + \varepsilon_t$$

The scores for earnings quality derive from the residuals of the model, that are taken in absolute value and multiplied for minus one, as in the previous model for abnormal accruals. This procedure gives the possibility to compare the two proxies. Another time, the discretionary accruals for the companies are distributed in quantiles and t test are performed at annual level and for all the observations. Even in this case, there is no differences between the mean of the two metrics, unless the Pearson and Spearman correlation provide evidence of **a statistically significance relationship between Eikon and the Francis et al. model**. Indeed, the coefficient are 0,1344 and 0,1355 and significant (p-value <0.05). Therefore, we could conclude that Francis model is correlated at 13% with the StarMine score.

The possible reason is the specification included by Francis et al. of ΔREV and PPE, that takes into consideration also long-term accruals and performances of companies, but also they change the dependent variable from WC to TCA. So, this different approach shares more input between the two model, as in TCA there are change in accruals presented also in the accruals part of Eikon, PPE are in common, but also CFO in some way are linked. Therefore, this model touches two components of the StarMine proxy, the accruals and cash flow ones, so this could be the possible explanation why there is a significant correlation and why this is significant and the Dechow and Dichev (2002) is not. Of course, the coefficient is low, because

the calculation of accruals, as for the other abnormal accruals model, is based on residuals and not annual change as for Eikon.

2.3.5 Smoothness

For what concerns smoothness, we use the two ratios proposed by Leuz (2003):

$$\sigma(Earnings_t)/\sigma(Cash\ flow\ from\ operation_t)$$

$$Correlation\ (\Delta Accruals_t, \Delta Cash\ flow\ from\ operation_t).$$

Accruals are considered as defined by Dechow et al. (1995), CFO is taken directly from the Statement of Cash flow and for Earnings, provided by the Income Statement, we consider Earnings before extraordinary items; all the elements are downloaded from Eikon.

For the first ratio, we take group of three years, therefore to calculate smoothness at year t we consider the standard deviation of earnings going from year t-2 to t, therefore we stop at year 2011. The same reasoning for Cash flow from operation.

For the second, accruals are the same used in Jones model, so we calculate the annual change for them and for CFO and then the correlation is made of observation for three year, so from year t-2 to year t, stopping at year 2013 because we do not have accruals in year 2009 and so change in accruals for year 2010. This reduce the observations. Moreover, as Leuz et al. (2003) state, the correlation between these two components is negative.

However, before starting the same procedure to divide the companies in quantiles, as for the other proxies, it is fundamental to provide the personal interpretation of the ratio. As Ewert and Wagenhofer (2011) state, smoothing earnings could be seen as an intention to mask the real performance of the companies, thus earnings management and lower EQ, but also it could be a method to reduce volatility. The approach in this analysis is aligned with the former explanation, **therefore higher value of the ratio in both cases is connected with higher earnings quality**, because the companies do not have manipulated them for any reasons, so earnings could be the closest as possible to real performances.

After having proposed our interpretation, it is possible to compare the two ratios with Eikon. So, the distribution in quantiles is compared with the one of StarMine model, using t test for each year and for the total sample. Also in this case there is no significant difference between the mean of the two ratios in ventils and the Eikon scores in ventils. Therefore, it is fundamental to estimate the Pearson and Spearman correlation to give the final consideration.

For the first ratio, the coefficients are negative and equal to -0,0596, so very low and without statistically significance. For the second one, the coefficients are 0,0180 and 0,0188 and not significant. Thus, the **two smoothness are totally independent from the Eikon score**.

2.3.6 Earnings Persistence

The procedure for this proxy is different, because persistence is usually calculated at industry level, or for the entire group of companies. Therefore, it **is not possible to calculate it year by year and derive the quantile distribution**. So, the approach proposed is to use the basic equation for persistence to verify whether there are differences between companies with different business model, accounting treatment or risk attitude, and compare the results in the second step analysis with Eikon. This could lead us to provide a relationship with the Eikon measure, even if it would be less accurate than the procedure used for the other models.
The model used in the analysis is:

$$\text{Earnings}_{t+1} = \alpha + \beta_1 \times Earnings_t + \varepsilon_t$$

Where Earnings are the ones before extraordinary items, and they are scaled by total assets.

2.3.7 Correlations between the models

The conclusion in this first part is that only the model by Francis et al. (2005) is correlated with Eikon. Therefore, the next step is to compare, as mostly papers do, the **Pearson and Spearman correlation among the other proxies** and to evaluate whether there are significant differences between these results and the one provided by scholars.

Starting from abnormal accruals model, the expectation is to find a significant relationship between the models, because they focus on accruals, even if the equations are different. Moreover, considering that the choice in the analysis is to use the absolute value of residuals also for the Dechow and Dichev (2002) and Francis et al. (2005), instead of standard deviation of residuals, the correlation could be higher among these measures.

As Table 5 shows, there is a **strong linear correlation between Jones model and modified Jones model**, indeed the coefficient are more than 0,98 and statistically significant. This result is not surprising because the two models differ only in one term, namely delta revenues are adjusted with delta receivables. Indeed, Jones et al. (2005) find out a Pearson correlation of 0,996 and Spearman correlation of 0,990, both statistically significant.

This correlation close to 1 brings that the correlation of Jones model and modified Jones model with the other proxies would be close in each case, with the maximum difference up to 0,02, as Table 5 shows. Therefore, we could concentrate on the interaction between Jones model and the other proxies.

For what concerns Dechow and Dichev model (2002), the Pearson and Spearman coefficients are 0,28 and 0,27, with p-value of 0.000. Therefore, there is **a correlation between the model and the Jones model**, unless is not so high as with Francis et al. (2005), where the coefficients are both close to 0,44 and statistically significant. This means that the adjustments provided by Francis et al. (2005) at the Dechow and Dichev (2002), delta revenues and PPE, **enhance the dependency between the models**. Indeed, these modifications are presented as term of the Jones model and modified Jones model, so it is reasonable to have higher coefficient.

Jones et al. (2008) find similar coefficients for Francis et al. and Jones model, 0,46 for Pearson correlation and 0,40 for Spearman one, unless the value for the Dechow and Dichev (2002) is higher than what is shown in Table 5 and it is closer to the value of Francis et al (2005), in fact they obtained 0,44 and 0,40 (the value for the modified Jones models are similar).

The possible reason is due to **the lower correlation** between Dechow and Dichev (2002) and Francis et al. (2005). Indeed, Table 5 shows that both the coefficient are close to 0,24, whereas in the paper of Jones et al. (2008) the Pearson coefficient is 0,88 and the Spearman is 0,99. The reasonable explanation behind the lower correlation could be the **firm specific characteristics that could give different results than studies based on cross countries or by industries**. Furthermore, Jones et al. (2008) use McNichols (2002) equation, where the dependent variable is delta working capital, whereas we use delta in total current accruals, as proposed by Francis et al. (2005). This could change the results of the model and so the correlation.

After the abnormal models, there are the two ratios for earnings smoothness. As Table 5 shows, the correlation is close to 24% and highly significant. However, if compared with the Spearmen correlation table proposed by Dechow et al. (2010), this coefficient is too low, because in that paper the coefficient is close to 70%. Moreover, the results by Dechow et al. (2010) takes into consideration a sample of paper that goes from 1987 to 2007, therefore it could be the best precise in literature. Nevertheless, the lower value obtained could be the results of the small sample analysed and also the method chosen of taking into consideration three years to calculate the ratios; maybe using four or five years could lead to better results. On the other hand, this choice would have reduced the number of observations, that are already stopped to year 2013 for the second ratio of smoothness.

However, the **big difference is on the correlation between smoothness and all the four abnormal accruals models**. In fact, whereas Dechow et al. (2010) provide evidence of statistically significant coefficient between residual and smoothness, Table 5 behaves in the opposite direction, as the coefficient are low and not significant at all.

Table 5: Pearson correlation on lower left and Spearman correlation[7] on upper right between Eikon and EQ models distributed in ventils, without persistence.

	Eikon	EQ1	EQ2	EQ3	EQ4	EQ5	EQ6
Eikon		0.0519	0.0519	0.0409	0.1355**	-0.0596	0.0188
		0.2960	0.2953	0.4389	0.0102	0.2525	0.7563
Jones model	0.0510		0.9821**	0.2661**	0.4362**	-0.0450	0.0453
	0.3039		0.0000	0.0000	0.0000	0.3830	0.4523
Modified Jones model	0.0512	0.9819**		0.2805**	0.4170**	-0.0444	0.0544
	0.3026	0.0000		0.0000	0.0000	0.3891	0.3663
Dechow and Dichev	0.0400	0.2655**	0.2797**		0.2407**	0.0033	0.1067
	0.4484	0.0000	0.0000		0.0000	0.9529	0.1081
Francis et al.	0.1334**	0.4358**	0.4166**	0.2399**		-0.1465**	-0.0333
	0.0115	0.0000	0.0000	0.0000		0.0079	0.6171
Smoothness 1	-0.0596	-0.0443	-0.0441	0.0037	-0.1464*		0.2629**
	0.2528	0.3909	0.3926	0.9469	0.0079		0.0000
Smoothness 2	0.0180	0.0442	0.0534	0.1073	-0.0326	0.2631**	
	0.7665	0.4633	0.3753	0.1061	0.6245	0.0000	

Even in this case the explanation of this matter could be due to the sample size analysed and also the choice done during the analysis, such as taking CFO directly from the Statement of Cash Flow instead calculating it as some scholars do, or also for what concern the modified version of Dechow and Dichev (2002), and finally, as just explained, the calculation of earnings smoothness. Moreover, the models are taken using the ventils distribution, that could diminish the quality of results.

So to provide more robustness, we perform the same **correlation matrix using the absolute term of the model, instead of the quantiles distribution**. In this case we do not take into consideration Eikon proxy and persistence as in the previous case.

As Table 6 demonstrate, there are some differences in coefficients between the correlation in quantiles and with terms taken as they are. Indeed, the Pearson coefficient between EQ3 and EQ1/EQ2 is lower for about 8% than in Table 5, but the significance level remains the same. On the other hand, the Spearman parameter are different for less than 2%. **The major differences are presented for the EQ4**. In fact, the Pearson correlation with Jones model is

[7] ** when p value is significant at <0,05, * when it is <0,10.

0,61 and with the modified Jones model is 0,58, whereas in the quantiles distribution the two parameters are 0,44 and 0,42, almost 20% less. Also the correlation between EQ3 and EQ4 is higher in this case, 0,36 in respect of the previous 0,24; therefore a value closer to the one found by Jones et al. (2008). Nevertheless, the Spearman coefficients are close to the one of the quantiles distributions.

The reason of these big differences could be explained by the choice to distribute the proxies in quantiles to be comparable with the Eikon score, but this would produce less accurate results among the proxies. On the other hand, the Spearman results are similar in both tables because this type of correlation measures the association between two ranked variables and in the quantiles distribution the values are already ranked, therefore it is highly probable to have similar results.

Finally, for what concern smoothness the only differences are in the coefficient values, as the relationships with EQ1 EQ2 and EQ3 remain not statistically significant. Indeed, the value between smoothness1 and EQ4 is lower for 3% in respect of the one in table 5, but also the parameter between the two smoothness is only 20%, whereas in the previous case is 26%; therefore is even more far from the value proposed by Dechow et al. (2010).

In conclusion, there are **no material discrepancy** between the two tables, therefore the distribution in quantiles is a good estimation because it does not differ too much from the table with absolute term.

Table 6: Pearson correlation[8] on lower left and Spearman correlation on upper right between the six proxies of EQ

	EQ1	EQ2	EQ3	EQ4	EQ5	EQ6
Jones model		0.9841**	0.2570**	0.4383**	-0.0509	0.0410
		0.0000	0.0000	0.0000	0.3234	0.4958
modified Jones model	0.9825**		0.2666**	0.4199**	-0.0522	0.0623
	0.0000		0.0000	0.0000	0.3116	0.3003
Dechow and Dichev	0.1878**	0.2087**		0.2972**	0.0180	0.0986
	0.0000	0.0000		0.0000	0.7449	0.1377
Francis et al.	0.6099**	0.5817**	0.3599**		-0.1405**	-0.0160
	0.0000	0.0000	0.0000		0.0108	0.8097
smoothness 1	-0.0664	-0.0752	0.0139	-0.1132**		0.2677**
	0.1976	0.1444	0.8014	0.0405		0.0000
smoothness 2	0.0399	0.0329	0.0325	0.0272	0.2075**	
	0.5075	0.5853	0.6259	0.6827	0.0005	

[8]** when p value is significant at <0,05, * when it is <0,10.

2.3.8 The effect of the EQ measures components on Eikon score

Furthermore, we estimate for each of the six models **the effect of their components** on Eikon score and their explanatory power. The procedure consists in calculating the difference, for every part of the various measures, between the value at company level and the mean value of the sample. Then the results are taken in absolute value and, as before, distributes in quantiles to lead the regression meaningful. The analysis is initially computed for each year and singularly for every model, then, continuing the year division, the Eikon scores in quantiles is regressed on all the components. Finally, the regression takes into consideration all the year observations. Also in this case there are two steps, the first is at model level and then for all the proxies together.

As the Table 7 shows, the three components of the Jones model and modified Jones are significant with p-value less 0,001, the t statistics in brackets are very high. The coefficients are between 0,25 and 0,36, therefore it seems that these components could affect in part the Eikon score. Furthermore, this provides more evidence that the **calculation methodology for earnings quality is crucial**, because the abnormal models calculate residuals from the regression, whereas the StarMine method concentrates on deltas in respect to a benchmark, unless the items from financial statements taken into consideration are the same. Finally, the constant is not considered for the two models, because part 1 is already the intercept of the regression

A similar reasoning is for the Dechow and Dichev approach (2002) and the Francis et al. model (2005). The first part, that is CFO of t +1 is not meaningful, but this is predictable because in StarMine methods there is not this component; whereas, Eikon considers delta in cash flow from operation, therefore the other two parts are statistically significant, even if the coefficient is lower than for the Jones model components. Furthermore, for what concerns Francis et al. (2005) the two adjustments to the Dechow and Dichev approach (2002) result different from 0, because these two additional components are presented also in Eikon method. For both proxies we calculate the constants, that are statistically significant and equal to 6,8 and 10,0 respectively. This is important because in the hypothetical case of a value of 0 for the components the Eikon quantiles would be 6 or 10, thus even if the coefficient are positive and significant, the huge value of the constant means that there are a lot of information not taken into consideration. Indeed, StarMine derive the metric from four different characteristic, whereas in this case we are dealing with only one, cash flow part and in part with accruals for Francis et al. (2005), despite its constant has a bigger value than the EQ3 one. The best scenario would be a parameter close to 0.

For what concerns the two ratios for earnings smoothness, the coefficients are 0, so there is no effect on Eikon score.

Finally, we provide a **regression with all the components in two ways**: one considering the **constant and the other without constant**, because the part1 of Jones model is already the intercept of the model, so we use these two approaches.

Table 7: Regression[9] of the EQ components taken in ventils on Eikon score in ventils, singularly and together.

	EQ1	EQ2	EQ3	EQ4	EQ5	EQ6	Total	Total no constant
part 1 Jones model	0.3582** (7.35)	0.3549** (7.28)					-0.1057 (-1.65)	0.0134 (0.20)
part 2 Jones model	0.2453** (4.76)						-0.0456 (-0.20)	0.0589 (0.24)
part 3 Jones model	0.2857** (5.90)	0.2821** (4.86)					0.4478** (3.07)	0.5483** (3.43)
part 2 modified Jones model		0.2516** (5.83)					-0.0185 (-0.08)	-0.0281 (-0.11)
part 1 Dechow and Dichev			-0.0453 (-0.68)	0.0045 (0.07)			-0.0251 (-0.30)	-0.0065 (-0.07)
part 2 Dechow and Dichev			0.2391** (3.49)	0.2319** (3.52)			0.1424* (1.68)	0.2493** (2.72)
part 3 Dechow and Dichev			0.1364** (2.13)	0.1555** (2.53)			0.3074** (3.87)	0.3633** (4.18)
part 4 Francis				-0.1822** (-3.70)			-0.6180** (-4.21)	-0.5323** (-3.30)
part 5 Francis				-0.1908** (-3.88)			-0.1561** (-2.46)	-0.0547 (-0.81)
smoothness 1					-0.0431 (-0.83)		0.0665 (1.08)	0.2215** (3.50)
smoothness 2						0.0264 (0.44)	0.0089 (0.15)	0.1315** (2.04)
constant			6.827** (9.98)	10.0403** (10.90)	10.6671** (17.40)	10.0683** (14.20)	10.3327** (6.81)	
observations	410	410	361	360	370	275	225	225

In the case of the regression with constant, the first two parts of the Jones model and the adjustment of modified Jones model are not statistically different from zero. This happens also in the case of not considering the constant, however the coefficients of the first two part in the Jones model in the second case are negative, but not significant. Whereas the 3 part, PPE over total assets, increases the value in both cases, from 0,28 to 0,45 and 0,55.

Cash flow from operation in t+1 are still not different from 0 as in the case of the stand-alone regression of EQ3 and EQ4. On contrary, CFO in t and CFO t-1 are still significant at 0,05 level, namely the values are higher in regression without the constant, whereas for the part 2 is

[9] ** when p value is significant at <0,05, * when it is <0,10.

higher in the case of the singular regression, while part 3 increases when all the component are regressed.

For what regards the modification proposed by Francis et al. (2005), the coefficient of delta revenue received a huge boost in the total regression, from -0,18 to -0,62 and -0,53 respectively.

On the opposite side, delta revenues over total assets are not significant in the regression without constant.

However, the most meaningful results are the ones dealing with smoothness. Indeed, for both ratios, the regression with constant provide evidence of statistically significant coefficient, namely 0,22 for smoothness 1 and 0,14 for smoothness 2.

In order to explain the differences between the coefficient of the components in the solo regression of the six EQs and the two versions of the total components, we analyse the correlation between each part of the models, because it possible that some components become not significant due to the high correlation with other elements, that, on contrary, are still significant.

Starting with the first part of Jones model, we observe in Table 8 a correlation with the third part of the Jones model, the first part of Dechow and Dichev, the two adjustments proposed by Francis et al., and also the first ratio for earnings smoothness. Therefore, when we use the total regression, the coefficient is not significant, and in the case of using the constant it becomes even negative due to the possible correlation with the intercept itself, as the Jones model does not require the constant in the regression.

Then, the second part of Jones model is strongly correlated with the modified version, 96%, and also with CFO in year t+1, CFO in year t and delta revenue over average total assets. So, it is straightforward that this coefficient become equal to zero. Moreover, in the regression with the constant, the parameter becomes negative due to the addition of the intercept.

PPE over total assets in year t-1 increases its coefficient in the regression with all the components. It is strongly correlated with the first modification of Francis et al., 89%, of course they share the same numerator, it changes only the denominator. Moreover, there is a correlation about 9% with the first part of Dechow and Dichev.

For the modified version of the model the reasoning is the same as for the version of the Jones model, so it is no more significant due to the correlation with other components of the six proxies.

CFO in t+1 remains not statistically different from zero, whereas CFO in year t remains statistically significant in both versions of the total regression, unless in the case of the constant the coefficient is lower than in EQ3 and EQ4 models and in respect of not using the intercept.

Maybe this is due to the correlation with the latter that could diminish the value of this parameter.

Finally, CFO in t-1 more than doubles in both total regressions. As Table 8 shows, these three components are all correlated one with the others.

The biggest increase in absolute value is the one of part 4 of the Francis et al. model, that is correlated with part 1 and 3 of Jones model and modified Jones. So it possible that a part of the information contained in the first part of Jones that is not more significant is gathered by this component, because part 3 is still statistically different from 0.

The second adjustment of Francis, delta revenues over average total assets, is correlated with all the other element, except from part 3 of Jones and the second ratio for earnings smoothness. However, if in the case of using the constant, this coefficient remains statistically different from zero, as in the regression of EQ4, in the case of not using the intercept, the parameter becomes equal to 0. Therefore, there is a possible correlation with the constant that is presented in both the EQ4 regression and the first method of total regression, thus removing the intercept has an influence on the value of part 5.

For the last two ratios of earnings smoothness there is an opposite situation of the one just described above. Indeed, in the case of the regression without the constant, the two coefficients become statistically different from 0. Maybe the reason behind this change is the intercept removal that makes them statistically significant.

The conclusion is that **the correlations among the various components of the models make some of them no more significant**, and this is predictable as they are similar in the composition. However, the important part of the analysis in this step is the effect of the constant on some elements, that from not significant, as for earnings smoothness, become different from 0, but also vice versa, as for the 5 part of EQ4. So, what of the two formats should we use it is an interesting point, and there is not a definitive response. On one side, Jones model and modified do not require the constant, but also the two ratios are regressed on Eikon considering the intercept, while they are simply ratios. Moreover, the value of the constant is very high considering that we are dealing with ventils distribution.

On the other side, the intercept is presented in Dechow and Dichev and Francis et al.; furthermore it is statistically significant and it gather an important information: the different component of the proxies could be effective on the StarMine score, unless in case of their increase would be 0, Eikon would provide a ventils of 10. While if the components would be able to provide more information about the model, the constant should be closer to 0.

Table 8: Pearson correlation[10] on lower left and Spearman correlation on upper right between each component of the six earnings quality scores.

	1	2	3	4	5	6	7	8	9	10	11
part 1 Jones model		0.0465	-0.0840**	0.0554	0.0948*	0.0632	0.0460	-0.1034**	0.1625**	0.1614**	0.0281
		0.3404	0.0843	0.2560	0.0673	0.2234	0.3753	0.0459	0.0017	0.0016	0.6409
part 2 Jones model	0.0468		0.0488	0.9600**	0.1183**	0.0934*	0.0416	0.0543	0.2210**	0.0804	-0.0098
	0.3375		0.3169	0.0000	0.0224	0.0719	0.4242	0.2966	0.0000	0.1179	0.8709
part 3 Jones model	-0.0845*	0.0489		0.0573	0.0901*	0.0411	0.0515	0.8927**	-0.0122	-0.0172	0.0931
	0.0827	0.3165		0.2398	0.0822	0.4291	0.3210	0.0000	0.8145	0.7387	0.1216
part 2 modified Jones model	0.0559	0.9603**	0.0576		0.1336**	0.1010*	0.0620	0.0522	0.2388**	0.0713	0.0130
	0.2523	0.0000	0.2380		0.0099	0.0517	0.2330	0.3152	0.0000	0.1662	0.8294
part 1 Dechow and Dichev	0.0966*	0.1196**	0.0905*	0.1347**		0.6212**	0.5464**	0.0499	0.1943**	-0.0468	0.0145
	0.0624	0.0210	0.0808	0.0093		0.0000	0.0000	0.3355	0.0002	0.3962	0.8277
part 2 Dechow and Dichev	0.0652	0.0949*	0.0414	0.1021**	0.6216**		0.5667**	0.0364	0.1065*	-0.0604	0.0266
	0.2089	0.0676	0.4248	0.0491	0.0000		0.0000	0.4823	0.0399	0.2735	0.6891
part 3 Dechow and Dichev	0.0469	0.0424	0.0523	0.0625	0.5465**	0.5672**		0.0488	0.1113**	-0.0507	0.1541**
	0.3660	0.4145	0.3141	0.2288	0.0000	0.0000		0.3465	0.0316	0.3581	0.0199
part 4 Francis	-0.1043**	0.0546	0.8923**	0.0527	0.0501	0.0369	0.0495		-0.0402	-0.0759	0.1214*
	0.0442	0.2936	0.0000	0.3104	0.3341	0.4773	0.3397		0.4386	0.1688	0.0672
part 5 Francis	0.1614**	0.2219**	-0.0125	0.2396**	0.1947**	0.1063**	0.1120**	-0.0405		0.1140**	-0.0715
	0.0018	0.0000	0.8104	0.0000	0.0002	0.0401	0.0306	0.4352		0.0388	0.2820
smoothness 1	0.1617**	0.0803	-0.0172	0.0711	-0.0470	-0.0602	-0.0506	-0.0759	0.1149**		-0.0070
	0.0016	0.1187	0.7380	0.1674	0.3936	0.2746	0.3589	0.1691	0.0373		0.9073
smoothness 2	0.0306	-0.0094	0.0936	0.0134	0.0142	0.0274	0.1553**	0.1211*	-0.0719	-0.0069	
	0.6119	0.8757	0.1193	0.8245	0.8312	0.6812	0.0190	0.0680	0.2797	0.9083	

Moreover, we provide **two robustness checks** to the two total regressions in order to validate more what we have just described. Indeed, we calculate **year dummies** to verify whether there is a possible year effect on the variable. In fact, we should expect a constant pattern, namely to have results very similar year by year, not having huge differences due to effect of specific year factors that would decrease the results obtained in the total regression that consider all the year together.

Furthermore, the other control is the **cluster by companies**, because the expectation is that a company should remain in the same quantiles year by year, or not differs too much. The same for the parts of the proxies. For example, if the earnings smoothness ratios for company x is in the 18 ventils, it should stay 18 each year or not fluctuate too much.

Therefore, the first control is with cluster. As table 9 shows, there is no material effects, because the coefficients remain the same, the only thing is that t statistics are lower, but this could derive from the cluster analysis. So, the total regression does not suffer from companies effects.

Instead, there are year effects in the case of the regression without constant, while there is no effect in the case of the regression with the intercept. The bigger changes are on CFO in year t that becomes less significant and the coefficient is the same as in the case of using the

[10]** when p value is significant at <0,05, * when it is <0,10.

constant, as Table 9 shows. While the two smoothness ratios are no more significant and they return to the level of total regression with the constant. Therefore, being strongly significant the year dummies in the second regressions, the intercept is even more determinant in this case.

Table 9: Regression[11] for all the components with two controls: clustering for each company and by year dummies, with and without the intercept.

	Total	Cluster	Control	Total no constant	Cluster no constant	Control no constant
1	-0.1057 (-1.65)	-0.1057 (-1.31)	-0.1057 (1.30)	0.0134 (0.20)	0.0134 (0.17)	-0.1057 (-1.30)
2	-0.0456 (-0.20)	-0.0456 (-0.21)	-0.0512 (-0.23)	0.0589 (0.24)	0.0589 (0.23)	-0.0512 (-0.23)
3	0.4478** (3.07)	0.4478** (2.55)	0.4501** (2.58)	0.5483** (3.43)	0.5483** (2.49)	0.4501** (2.58)
4	-0.0185 (-0.08)	-0.0185 (-0.08)	-0.0143 (-0.06)	-0.0281 (-0.11)	-0.0281 (-0.11)	-0.0143 (-0.06)
5	-0.0251 (-0.30)	-0.0251 (-0.29)	-0.0259 (-0.31)	-0.0065 (-0.07)	-0.0065 (-0.07)	-0.0259 (-0.31)
6	0.1424* (1.68)	0.1424 (1.56)	0.1419 (1.51)	0.2493** (2.72)	0.2493** (2.93)	0.1419 (1.51)
7	0.3074** (3.87)	0.3073** (3.52)	0.3090** (3.44)	0.3633** (4.18)	0.3633** (3.97)	0.3091** (3.44)
8	-0.6180** (-4.21)	-0.6180** (-3.30)	-0.6198** (-3.31)	-0.5323** (-3.30)	-0.5323** (-2.37)	-0.6198** (-3.31)
9	-0.1561** (-2.46)	-0.1561 (-1.95)	-0.1567* (-1.92)	-0.0547 (-0.81)	-0.0547 (-0.61)	-0.1567* (-1.92)
10	0.0665 (1.08)	0.0665 (1.29)	0.0678 (1.30)	0.2215** (3.50)	0.2213** (3.65)	0.0678 (1.30)
11	0.0089 (0.15)	0.0089 (0.13)	0.0091 (0.14)	0.1315** (2.04)	0.1315* (1.68)	0.0091 (0.14)
year 2013			-0.6621 (-0.72)			10.0797** (3.86)
year 2014						10.7408** (4.22)
year 2015			-0.7321 (-0.77)			10.0087** (3.97)
year 2016			-0.4782 (-0.46)			10.2626** (3.78)
year 2017			-0.1934 (-0.19)			10.5474** (4.08)
constant	10.3327** (6.81)	10.3327** (4.14)	10.7408** (4.22)			
observations	225	225	225	225	225	225

Year 2009, 2010, 2011, 2012 and 2018 are not presented because of omitted variable as for some ratios we could not provide scores for each year.

[11]** when p value is significant at <0,05, * when it is <0,10.

So, omitting the intercept could induce to state that there is a year effect on the components, unless the dummies values are big as the constant. Moreover, there is no differences in the coefficients between the model with control and constant and model without constant and controls. This is a strange results, it provides evidence of a correlation between year dummies and the constant, because when we regress using both parameters only the intercept is statistically significant with a value of 10, whereas when we omit it, year dummies become significant with values around 10; while, the other components have the same value.

Then, without controlling for year, using the regression with and without constant, even with clustering, lead to dissimilar results, while controlling for years gives the same values.

Therefore, the possible conclusion **is to adopt the regression with constant** when analysing all the components, because it is robust to the controls applied and at the end the results are equal with the regression without intercept and controlled by year and cluster.

Nevertheless, when there are the analysis of Jones model and modified Jones model, the constant should not be added as the methods state.

2.4 Business model as a determinant for earnings quality

In the business model canvass Osterwalder and Pigneu (2009, pp. 14) give the definition of business model: "A business model describes the rationale of how an organization creates, delivers, and captures value". The logic behind this sentence is that a company could employ a variate and unique way to create value for customers, it could concentrate on the products, on the distribution channels, on niche segments etc… What is important about the statement is that **the choice of the specific business model impact all the company in its entirety**, therefore the accounting system is not unable to detect this complexity, but also the classification based on industry is not sufficient to explain this fact. Moreover, the barriers between industries nowadays are not demarked as in the previous years, due to the internet expansion and the possibility to be transversal among different industries or to move among them (Kotler et al., 2017).

The reason of performing the analysis using the business model derives from these changing in the definition of industry and also because it is a topic not so developed by scholars. The choice of frozen versus fresh it is easy to understand and maybe too simple to catch all the complexity, but it is a starting point. Moreover, in food processing it is a good method to divide companies, because the supply chain would be different due to the problem of guaranteeing the right temperature for frozen products, but also the inventory system should be different, and the machineries used in plants.

Furthermore, to provide robustness to the study, but also because there is not a straight definition to determine that a company it is frozen based or fresh based, we provide a **fourfold classification**. The first one simply divides company between the companies that have no frozen products with the firms with at **least one**. The second and the third fix a threshold to identify whether a company is considered frozen based, namely **10%** and **20%** of total revenue should derive from not fresh food. The quarter, instead, is based on the **segment analysis** presented in Annual Report, namely if a company report a frozen segment or not. This latter is the key definition for the analysis, as we would present results only under this distribution. But, also because it an objective choice, because the other three suffer from threshold defined, whereas the segmental reporting is provided by companies, thus it is not subject to subjectivity.

So, the procedure to determine if there are differences between the two business model is straight forward, indeed we perform a t test for each of the EQ proxies, in this case also for earnings persistence, and we analyse whether the mean difference between the two options is significant different from zero, but also which of Frozen and Fresh has the higher value in earnings quality. Moreover, this could lead to compare the results among the proxies, if they are in the same direction or if they differ.

The analysis is conducted twice, firstly using absolute values of the proxies and then using the quantiles distribution, in order to test whether there could be significant difference in the two cases and to provide robustness to what we find. Of course, for the second version we exclude earnings persistence as it is a measure for to all the sample.

Table 10: T test[12] for frozen based and fresh based companies, distribution considered in absolute values.

	FROZEN	FRESH	DIFFERENCE	P-VALUE
EIKON	**55.2121**	48.8008	6.4113**	0.0289
EQ1	**-0.0442**	-0.0616	0.0175**	0.0149
EQ2	**-0.0447**	-0.0612	0.0165**	0.0155
EQ3	**-0.0234**	-0.0274	0.0039	0.1828
EQ4	**-0.0470**	-0.0599	0.0129*	0.0911
EQ5	**2.4713**	1.3675	1.3675**	0.0332
EQ6	**-0.2482**	-0.4382	0.1900**	0.0204
EQ7	**0.6193**	0.5988	0.0205	0.9131

[12] ** when p value is significant at <0,05, * when it is <0,10.

As Table 10 shows, the mean difference is more than 0 for all the cases, therefore companies with **at least one frozen segment have higher earnings quality**. Moreover, despite EQ3 and EQ7, p values are less than 0.10, namely except for EQ4, the significance value is lower than 5%.

The same results are shown in Table 11, so even quantiles distribution provide evidence that processing frozen food is a determinant for more EQ under different proxies. In addition, EQ5 and EQ6, so smoothness, are significant with a value lower than 0.01. Only EQ4 seems to not provide evidence of differences between the two business models, however in the absolute distribution the results describe more quality for frozen based companies.

Table 11: T test for frozen based and fresh based companies, distribution considered in ventils.

	FROZEN	FRESH	DIFFERENCE	P-VALUE
EIKON	**10.9697**	9.7195	1.2502**	0.0302
EQ1	**11.12941**	9.800	1.3294**	0.0200
EQ2	**11.0647**	9.844	1.2207**	0.0326
EQ3	**10.9470**	9.9378	1.0092**	0.0945
EQ4	**10.3400**	10.3227	0.0173	0.9775
EQ5	**11.9677**	9.2826	2.6851**	0.0000
EQ6	**11.4336**	9.5636	1.8699**	0.0076

*T test are performed using also the other three methods to distributed frozen and fresh companies, using also quintiles and deciles. Results are in line with those presented. Values in bold identify higher EQ.

These proxies provided capture different insight of the topic in question. Indeed, Eikon score shows that frozen companies are closer to the benchmark of 100 quality, thus they are **backed by more sustainable cash flows and not have higher value of accruals**. This latter aspect is capture by EQ1, EQ2, EQ3 and EQ4, the abnormal accruals model; indeed the residuals of the model are lower in case of frozen based companies.

Finally, the two ratios for earnings smoothness provide evidence that companies that produce only fresh food are more active in smoothing earnings, thus they mask their volatility and maybe they do not provide the real performances.

2.5 Accounting choice as a determinant for earnings quality

The peculiarity of the U.S. GAAP for the accounting method is the possibility to estimate the inventory using last-in first-out (LIFO), in addition to the first-in first-out (FIFO) and WEIGHTED AVERAGE. Indeed, under IFRS, the **IAS2** does not allow companies to choose the LIFO, whereas under the **ASC 330** this is possible. The reason behind this choice is explained in ASC 330-10-30-9, that states: "The major objective in selecting a method should be to choose the one which, under the circumstances, most clearly reflects periodic income". A possible interpretation of this sentence is that the accounting choice should be influenced by the industry (Flood, 2016). Therefore, the normal expectation is to have companies adopting the same accounting treatment for inventory within the same industry, because **the "circumstances" should be the same under an industry in the same region**.

However, the sample in the analysis shows that only 60% adopts FIFO, the other 40% uses LIFO or WEIGHTED AVERAGE. So, it is important to verify whether the accounting choice could be a factor that determine a different EQ. As Flood (2016) suggests, **LIFO is more a tax income concept**, therefore a company could evaluate inventory at LIFO for tax purpose, unless it does not match the physical flow of material.

Moreover, this method is not allowed under IFRS, so it could be possible that choosing LIFO or WEIGHTED AVERAGE instead of FIFO could be for earnings management, target beating, income smoothing etc…

The goal of this part is to verify these last assumptions, using all the seven models from literature and also Eikon scores. Therefore, the group of 50 companies is divided into two layers. The first one is composed by companies adopting the FIFO category as the only accounting treatment and by companies that in a mixed situation, namely they use two or three methods for different items, FIFO is the most used[13]. The other category, instead, is composed by companies that for the majority used LIFO or WEIGHTED AVERAGE, so it is a residual category.

In order to evaluate whether there are differences in EQ between these two groups, and also which group has the higher earning quality, we develop a series of t tests for the quantiles previously adopted and for each of the models in question, to verify if all the models behave in the same way or not, and what aspect of the topic one model catches.

Table 12 and Table 13 provide evidence that companies adopting **FIFO have lower earnings quality**, unless EQ6 is the only measures that goes in the opposite direction (as EQ3 is not statistically different from 0, in particular for what concerns the ventils distribution).

[13] To estimate the most used, we calculate the percentage of inventory accounted using FIFO on the total value of inventory.

Table 12: T test[14] for companies applying FIFO and companies applying LIFO or WEIGHTED AVERAGE, distribution considered in absolute values.

	OTHER	FIFO	DIFFERENCE	P-VALUE
EIKON	**55.6954**	48.2025	7.4929**	0.0088
EQ1	**-0.0431**	-0.0628	0.0196**	0.0066
EQ2	**-0.0441**	-0.0621	0.0181**	0.0083
EQ3	-0.0261	**-0.0256**	-0.0005	-0.1795
EQ4	**-0.0454**	-0.0615	0.0161**	0.0372
EQ5	1.3723	**2.1178**	-0.7455*	0.0718
EQ6	**-0.3511**	-0.3682	0.0171	0.8319
EQ7	**0.6593**	0.5918	0.0675	0.7303

Table 13: T test for companies applying FIFO and companies applying LIFO or WEIGHTED AVERAGE, distribution considered in ventils.

	OTHER	FIFO	DIFFERENCE	P-VALUE
EIKON	**11.0115**	9.6414	1.3701**	0.0151
EQ1	**11.0454**	9.8279	1.2176**	0.0316
EQ2	**10.9432**	9.9016	1.0415*	0.0660
EQ3	**10.3589**	10.3318	0.0272	0.9641
EQ4	**10.7500**	10.0233	0.7266	0.2375
EQ5	9.7278	**10.8062**	-1.0783*	0.0693
EQ6	**10.4701**	10.2174	0.2527	0.7189

*Decile and quintiles parameter do not provide significantly different coefficients from the ones presented. Values in bold identify higher EQ.

In addition, Eikon, EQ1, and EQ2 present p value less than 1% in the case of t test with absolute term, whereas under quantiles distribution the p value goes a little up. Furthermore, EQ3, EQ6 and EQ7 are not statistically significant from 0. Therefore, 3 out 8 models provide evidence of more quality in companies applying LIFO or WEIGHTED AVERAGE, in one method is goes in the opposite direction, two methods describe no difference between the accounting treatment and Francis et al. differs between the result in absolute term and in ventils. The situation in this case is more complex than before due mixed results. The majority of them would provide evidence of higher EQ for companies that do not decide to use FIFO for inventory, however it is not possible to affirm that in every situation applying LIFO of WEIGHTED AVERAGE determines higher quality. Thus, it is important to analyse the

[14]** when p value is significant at <0,05, * when it is <0,10.

meaning behind the results for Eikon, EQ1, EQ2 and EQ5. The results found for Eikon EQ1 and EQ2 are in line with Krishnan et al. (2008) who analyse the relation between FIFO and LIFO and accruals quality, under Francis et al. models. They provide this explanation to what they found:

> "An intuitive understanding of how inventory policy affects earnings variability and accruals quality can be obtained by the following reasoning. Under LIFO (assuming no dipping into reserves), the cost of good sold is better matched in time with the revenue and therefore, the variability of the cost of goods sold reflects the variability of input material price in a short period between the assumed purchase date of the material and the sale date of the finished product. However, under FIFO, the variability of cost of goods sold reflects the variability of input material price over a longer period over which the material is assumed to be held. Furthermore, because the LIFO cost of goods has lower variability, it becomes more risky for managers to deliberately insert opportunistic discretionary accruals in the LIFO cost of goods sold account. This increased risk faced by managers under LIFO inhibits the insertion of such accruals. Both these factors point towards a lower variability of LIFO earnings. If we assume that the inventory policy does not affect sales and other firm-specific sources of variability, the lower variability in LIFO earnings will be reflected as a lower AQ, i.e., a better accruals quality".

Thus, **using LIFO provides less accruals and then discretionary ones**, so these bring to have higher quality for Eikon, EQ1 and EQ2, namely in Jones and modified Jones model the score is residuals from the model, so abnormal accruals; whereas also Eikon has the accruals components and it penalize companies with huge value of these.

Of course, this explanation is reductive as the companies apply also WEIGHTED AVERAGE in the sample, so the results are less robust than paper of Krishnan et al. (2008).

For what concerns smoothness, **FIFO is an income increasing method**, whereas LIFO is more for tax purpose, because it reduces taxable income. Thus, the reason behind higher quality for companies that decide to choose FIFO instead of LIFO or WEIGHTED AVERAGE is because these firms should have more volatile income than the second one, all the other elements fixed. Therefore, **higher volatility higher ratios and so higher earnings quality and less earnings smoothing**. Of course, inventory is one of the multiple factors that influences the bottom line, so this reason is too much simple as there could be other elements that increase or decrease income standard deviation and thus determine higher or lower ratio.

In conclusion, this case provide evidence that the different model presented in literature capture different insight of the same determinant, and so it is not possible to univocally affirm that FIFO vs other decreases earnings quality, while it is possible to analyse the different results

of the same determinant under different quality aspects, because the models used focus only on one part of the entire topic.

2.6 Commodity risk as a determinant for earnings quality

In food processing one of the risks faced by companies is surely commodities risk. Indeed, they buy agricultural products, such as wheat or coffee, whose price fluctuates in the market, causing losses but also gaining. Even the value of inventory, despite of the accounting treatment, suffers from this type of risk. Therefore, a company, in order to diminish it, could buy some derivatives to fix the future income or expenses, so to reduce volatility or to avoid future losses.

Nevertheless, derivatives are complex instrument and they are costly, sometimes they could not be able to cover appropriately the risk. Furthermore, there is the possibility for natural hedge when the value of what you will have to buy in future is close to what you will sell, therefore the two positions automatically match each other, without be necessary to hedge risk. Unfortunately, this does not happen so frequently in the real world. Finally, a company could also decide to bear the risk and not enter into a derivative contract.

For the analysis, we want to identify whether decide to **cover the risk or not could determine higher or lower earnings quality**. As for the previous analysis, we perform several t tests with value in absolute term and for robustness we provide also the distributions in quintiles, deciles, ventils for each model.

Table 14 and Table 15 provide evidence that the mean of companies that decide to cover commodities risk is higher, despite the ventils distribution for EQ5, however the p value is high, so the result is not statistically significant.

For this determinant, the Eikon score describe that there is no difference between the means, whereas all the other proxies, except for earnings persistence, provide a strong evidence of **higher earnings quality in case of deciding to cover the risk**. In fact, EQ1, EQ2 and EQ4 show a significance level lower than 1% in both Table 12 and Table 13, whereas EQ3 is at 5% level in the distribution with absolute term and at <0.001 in ventils. Finally, the second ratio for earnings smoothness is significant at 0.10 level.

Furthermore, it is possible to state that covering commodities risk is reflected in higher value, both for what concern discretionary accruals, as they are lower, and smoothness, as it is higher. The reason for these results could be the **lower cash flow variability**, because with the use of derivative the companies is aware of the future outcome, thus the volatility is reduced.

Table 14: T test[15] for companies covering commodity risk and companies not covering, distribution considered in absolute terms.

	NOT COVER	COVER	DIFFERENCE	P-VALUE
EIKON	50.4123	**52.39**	-1.9777	0.4939
EQ1	-0.0685	**-0.0395**	-0.0290**	0.0002
EQ2	-0.0681	**-0.0399**	-0.0282**	0.0001
EQ3	-0.0286	**-0.0228**	-0.0058**	0.0495
EQ4	-0.0725	**-0.0357**	-0.0369*	0.0000
EQ5	1.6536	**1.9885**	-0.3349	0.4713
EQ6	-0.4308	**-0.2871**	-0.1437*	0.0712
EQ7	**0.6011**	0.5961	0.0049	0.9810

Table 15: T test for companies covering commodity risk and companies not covering, distribution considered in ventils.

	NOT COVER	COVER	DIFFERENCE	P-VALUE
EIKON	10.0142	**10.4400**	-0.4258	0.4536
EQ1	9.4037	**11.3465**	-1.9429**	0.0005
EQ2	9.4541	**11.2921**	-1.8379**	0.0011
EQ3	9.5969	**11.1556**	-1.5586**	0.0088
EQ4	9.000	**11.7486**	-2.7486**	0.0000
EQ5	**10.6847**	10.0055	0.6792	0.2519
EQ6	9.7133	**10.9704**	-1.2571*	0.0704

* Decile and quintiles parameter do not provide significantly different coefficients from the ones presented. Values in bold identify higher EQ.

Moreover, the choice of covering risk could induce to smoothing earnings, because the volatility of CFO is reduced, unless EQ5 provide evidence that this not happens because the differences is equal to zero, rather, even if not statistically significant, the coefficient is higher for covering. Indeed, the second ratios for smoothness concentrate on correlation with accruals and CFO and it is higher for companies covering risk, so they do not use abnormal accruals to mask real performances.

For this determinant the proxies go in the same directions and describe similar characteristics.

[15] ** when p value is significant at <0,05, * when it is <0,10.

2.7 Earnings persistence and Eikon

In the analysis of the three determinants, accounting treatment, business model and covering commodities risk, we introduce earnings persistence, as it refers to value at industry or sample level. We demonstrate that there are no differences for this measure under the three determinants. The possible reason is due to the **sample methodology adopted**, as for all the year every companies remain within the same layer, namely Company X, for example, adopting FIFO from year 2009 to 2018, covering risk from 2009 to 2018 and has a frozen segment from 2009 to 2018. Thus, there are no change from one group to the other. The consequence of this is that there are no reasons to have more persistence in one group or in another, because there are **no changings during years**. There are no expectations to find more constant earnings for firms that cover risk than ones that do not do so, because they follow their choice consistently year by year. And this is true for business model and accounting treatment. It would be better to analyse the pattern of companies shifting from one method or model to the other and to calculate the persistence of these groups for a considerable amount of year. But this goes beyond the analysis.

Nevertheless, the point is how to estimate a possible correlation with Eikon score. Indeed, the latter provide evidence of difference in earnings quality for the two determinants: accounting treatment and business model. Moreover, in the composition of the final measure, the StarMine method does not take into consideration the item earnings at all, unless it stated that: "StarMine EQ employs a quantitative multi-factor approach to predict the persistence of earnings". Therefore, **earnings persistence is the key point in Eikon score, but it is treated in a different way from the model proposed that simply regresses current earnings of future ones**.

Taken all this information, the conclusion is that the model for earnings persistence is not correlated with Eikon. However it could be a future development, starting from the statement reported above, to study the correlation with the equation proposed by Sloan (1996):

$$Earnings_{t+1} = \alpha + \beta_1 \times CF_t + \beta_2 \times Accruals_t + \varepsilon_t$$

It would be interesting to study it because it takes into consideration the cash flow and accruals components of earnings, two parts presented also in Eikon scores.

2.8 Robustness check

The final step of the analysis is to provide more robustness to the results found for each determinant, using the t test to compare the means. Therefore, the reasoning is to regress each of the measure for earnings quality, except for persistence as it gives no difference among the three determinant options and because it is a sample level, using three dummies. The first one

is called **FIFO** and it is equal to 1 if companies applied this method for inventory or 0 if they do not. The second one is called **COVERING**, that is 1 if companies use derivatives or 0 if they do not cover the commodities risk. The third one is **FRESH** and it is equal to 1 in case of no frozen segment and 0 otherwise. Moreover, we introduce also the combination of the dummies, so **FRESH x COVERING, COVERING x FIFO and FIFO x FRESH** as it could be the case that the combination of the determinants would provide significant results and because there could be some correlation between these.

Moreover, we apply the same controls as done for the components part of the different EQ proxies, namely **clustering by companies and year dummies**, in order to verify whether there are year effects, therefore it could be the case that one or more years provide different pattern in quality results, and with the cluster we control for companies trend. Indeed, the expectation is to find, for example, that covering is qualitative superior in each year, so the dummies should be equal to zero. For the other control, we know that cluster would reduce the p value of the three dummies, nevertheless the meaning behind the use of this is that one companies, under one of the three dummies, should not change the quantiles year by year, but should remain the most constant possible. Because, if the companies change year by year the quality, results in the previous step would be biased by this trend. This reasoning is valid also for the case of term in absolute value and not only for quantiles regression; in fact, we test also this second case to provide more robustness.

Therefore, **the expectation prior to check with these controls is to find the same coefficient as in the t test analysis**, namely, for example, if FIFO has lower earnings quality under EQ1, the coefficient of the regression within EQ1 should be negative; this replied for all the proxies and the three determinants.

For what concern Eikon score, the t tests provide evidences of better quality for companies applying LIFO or WEIGHTED AVERAGE and for companies with one frozen business segment; whereas there was no statistically difference for cover or not cover the risk. Table 16, indeed, shows that the two dummies FIFO and FRESH are negative, however the p value is lower, but this could be due to the **cluster effects**. Moreover, the year dummies are not significant, so there is no influence by year trend. For what concerns the distribution with absolute term, results are similar, unless there is a year effect in 2012, that is statistically significant at 10%. Even in this case covering is not significant.

The results change when we apply the regression with cross dummies. Indeed, the coefficients become positive, but p values go down. Instead, the cross dummies are negative and with high p value, considering the clustering effect. In fact, the FIFO x FRESH has a significance value of 10%. This finding is in line with t test because that cross dummies

demonstrate negative correlation when companies choose FIFO and have no frozen segment. Furthermore, the other two cross dummies are negative with high t statistic; these could explain why the first three dummies are in this case positive, because the correlation between the dummies reduce the value for the dummy taken singularly. The same situation is provided with absolute term, where FIFO x COVERING is significant at 10%, however there is still the year effect in 2012.

Therefore, we could **give robustness to the results** of the previous t tests as the change in the sign of FIFO and FRESH could be due to the introduction of the combined dummies, that are negative so in line with the expectation to find less quality for them; moreover the p value are not significant. Indeed, the expectation of dummy 1 x dummy 3 would be with positive sign, due to the combination of two negative effect, unless there could be possible correlation with the stand-alone dummies.

The second model is the Jones model, where covering, using LIFO/WEIGHTED AVERAGE and being a frozen based company produce higher earnings quality. Indeed, the coefficient are negative, positive and negative, so we find the results expected in the t tests. However, the p values are lower, due to clustering. Only cover dummies is significant with p value <0.1 in quantiles distribution, while in the absolute term the p value is lower than 5%. Also in this case, quantiles distribution do not suffer from year effects, whereas in Table 17 we find that year 2017 has a negative coefficient with an high t statistics. Nevertheless, we could conclude that there are no material change year by year.

Then, the further step is to apply the cross dummies. In this case, in Table 16 we find that cover dummy increases its significance in ventils distribution, unless in the other Table is the opposite. Moreover the fresh dummy, that does not change the sign of the coefficient, reduces significantly the t statistics in both cases. While, the coefficient of the first dummy become positive and also with p value <0,10. This could be due to the cross dummy nr 1, that is negative and statistically significant. In fact, the negative effect of FIFO dummy could be intercepted by this one that is statistically significant at <0,10 as we expect that the combination between the positive effect of cover and negative of LIFO becomes with negative sign. Furthermore, also the second cross dummies, FIFO x FRESH, is negative and, being both with a negative sign, another part of the coefficient is capture by 1 x 3. For the distribution with absolute value the results are different for cross dummies, namely the coefficients are equal in sign, but in this case the 1 x 3 is significant at 10%, and not the 1 x 2. But this could not change the reasoning applied for quantiles regression.

However, while for covering and business model Table 16 and Table 17 **support the evidences of the precedent t tests, we could not affirm with the same certainty for FIFO**.

Similar results are for modified Jones model, so we could refer to what just described for Jones model.

For Dechow and Dichev model, the results describe an absence of difference in earnings quality for companies when they choose FIFO or LIFO/WEIGHTED AVERAGE, whereas there is more quality when a company decides to cover commodity risk or one it has at least one frozen segment. Indeed, in both Table 16 and 17 only covering risk is in line with the results of t test, as FIFO dummy is positive and it has the same t statistics of FRESH dummy, unless this one is negative. Thus, the first conclusion is that the previous relationships are confirmed, but it appears that choosing FIFO results in higher value of EQ. Therefore, it is important to study the coefficient response to control for cross dummies. In fact, FIFO dummy increases the coefficient and also the significance, while covering diminishes its t statistics, but it is not a problem. However, the most important problem is driven by business model, indeed in the quantiles regression it become equal to 0, while in Table 16 from negative becomes positive. The possible explanation is the negative coefficient of the dummy FIFO x FRESH that could capture some information contained in the fresh dummies and it is in line with the assumption that companies choosing FIFO and fresh food would diminish the quality, as the starting point is a neutral position for the first choice and negative for the second; unless the p value is higher than 10%.

Finally in both Table 16 and Table 17 there is no year effect.

So, the first conclusion is that **covering risk remains significant** even after the controls, while **business model diminishes its validity** and **FIFO seems to determine higher earnings quality** as the significance is higher than FRESH dummy. Therefore, on one hand results from t test about using derivatives means higher quality, on the other FIFO could determine more earnings quality under EQ3, while there is no absolute certainty to confirm the previous results on business model, so fresh equal to lower quality. The possible explanation of the differences between the t tests is that **Dechow and Dichev is not robust to cluster effect**, so the companies trend could bias the final scores for these two determinants.

For EQ4 there are differences between quantiles and absolute term distribution, as for the former only covering risk produces higher quality and the other two determinants has no statistically mean differences, whereas for the latter, FIFO, not covering and fresh are translated into lower quality. Thus, the expectation is to find a trend for the three dummies as negative, positive and negative, at least the second dummy should be statistically significant in both Table 16 and Table 17.

In fact, this latter hypothesis is the one realized, indeed only the covering dummies is positive and statistically significant at 5% in both distributions. Nevertheless, while in the

quantiles distribution there are no year effects, in Table 16 there are three year out of seven that are significant at 5%, year 2013-2014-2017. Therefore, there is a strong year incidence for this distribution.

The most important results, however, is found when control with cross dummies, indeed in both Table 16 and Table 17, FIFO dummy coefficient is positive, especially for the quantile distributions. Thus, remaining under this case where there are no year effects that could bias other coefficients, we concentrate on the controls added to try to explain the behaviour of the FIFO dummy. Indeed, FIFO x COVER has a negative coefficient that is significant at 5%. So, considering that covering has positive effects, it could be that the choice of FIFO brings the negative score for earnings. However, also fresh dummy increases the coefficient when adding the control, unless FRESH x COVER is negative and also FRESH x FIFO. Therefore, the same reasoning of FIFO could be valid for fresh, as business model is not statistically significant as a determinant for EQ4.

The complexity of this metric is high; thus we could conclude that cover risk provide more earnings quality, what the trend of the other two determinants is not easy to define under this model as results are at odds.

For the first ratios of earnings smoothness we expect to find such coefficient: positive, both negative and positive but not significant, and negative, as t tests provide evidence of more quality when companies choose FIFO, no difference between use derivatives or not, and higher scores in case of companies with one frozen segment.

Indeed, the results for FIFO dummies are both positive between the two tables, for covering one is negative and the other is positive, but t statistics are low and for fresh they are both negative and with p value at <0,10 and <0,05. Moreover, there are no year effects. There is possible cluster effect on FIFO as the t statistics are not as higher as for fresh.

In column b Table 17, so adding controls, we find that FIFO coefficient becomes negative, however in FIFO x COVER and FIFO x FRESH the coefficients are positive, therefore a possible explanation is that the information included in the solo version is captured by these new dummies.

While in Table 16, the fresh dummy becomes positive, but not significant at all, therefore the reason could be that the information is translated in the new dummies.

Therefore, **we could affirm that in this case results of t test are confirmed and robust to cluster and year**.

Finally, for what concerns EQ6 the expectation from t test is to find this pattern: positive/negative, positive, negative.

Table 16 and 17 provide evidence that the coefficients follow the expectation, as FIFO is not statistically different from zero, cover is positive, but the t statistics is not high as for Fresh that is negative, this could be due to cluster effect, however what is important is the sign of the dummies that are in line with the t tests. Moreover, there are no year effect in both quantiles and absolute term distributions. Then, when the cross dummies are introduced, the sign of the coefficients do not change for fresh and cover, the latter become less statistically significant and the former increases; while the value for FIFO becomes negative, but not significant. The possible reason for the lower significance level for the dummy cover is due to the introduction of the cross dummies that reduce the information contained in the single dummy. So, **we could conclude that the robustness checks for EQ6 confirm what found in the previous analysis**.

The conclusions after the checks are:

- T tests provide evidences with 5 over 7 metrics of more earnings quality when companies apply LIFO or WEIGHTED AVERAGE; unless **after robustness check we could not be as sure as before**, because the cross dummies change the coefficient of this value to higher value and there is cluster effect on EQ3, EQ4 and EQ5.
- **Covering is the only determinant to be robust in every proxy**, so we could strongly affirm that companies that choose to cover commodity risk produce higher earnings quality.
- For business model there are cluster effects that **diminish the significance** of the coefficient found, unless the sign is in line with the expectation. Therefore, we could not be in the same case as for covering, but we quite state that companies with at least one frozen segment determine earnings quality. Moreover, we **replicated the analysis using different threshold**, even if they are subjective, to determine the case of frozen or fresh companies, and we find results in line with the one proposed, so this add more **robustness** to the analysis.

The quantiles regressions were replicated with deciles and quintiles, but there are no significant differences from the one just presented.

Table 16: Regression[16] for each EQ proxies considering the three dummies of FIFO, COVER and FRESH, year dummies and clustered by companies in column a, while in column b it is considered also the intersections between dummies. The distributions considered are in ventils.

	EIKON		EQ1		EQ2		EQ3		EQ4		EQ5		EQ6	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
FIFO (1)	-1.6134	1.9829	-0.5479	2.5426*	-0.3752	2.7594**	0.7658	1.5461	0.6687	3.9413**	0.6871	-1.4921	0.1868	-0.2042
	(-1.47)	(0.80)	(-0.63)	(1.63)	(-0.43)	(1.81)	(0.78)	(1.01)	(0.65)	(2.48)	(0.81)	(-0.93)	(0.20)	(-0.09)
COVER (2)	-0.4227	2.2589	1.5719*	3.7413**	1.5562*	3.6864**	1.8041*	1.6279	3.0892**	5.9555**	-0.7358	-0.7876	1.1402	0.5219
	(-0.38)	(0.97)	(1.78)	(2.43)	(1.77)	(2.45)	(1.83)	(1.00)	(3.08)	(3.62)	(-0.85)	(-0.50)	(1.22)	(0.23)
FRESH (3)	-1.3652	1.5433	-1.1585	-0.61529	-1.0461	-0.4878	-0.7531	-0.0071	0.3671	1.8949	-2.7749**	-2.9192*	-1.7261*	-2.4879
	(-1.22)	(0.70)	(-1.39)	(-0.40)	(-1.24)	(-0.33)	(-0.79)	(-0.00)	(0.43)	(1.04)	(-3.12)	(-1.75)	(-1.79)	(-1.18)
1 x 2		-3.0814		-4.0087*		-4.0046**		0.0135		-3.9853**		1.8339		0.2665
		(-1.53)		(-2.68)		(-2.71)		(0.01)		(-2.16)		(1.10)		(0.14)
1 x 3		-3.6117*		-1.4966		-1.5706		-1.3745		-2.0343		1.8124		0.5626
		(-1.86)		(-1.00)		(-1.07)		(-0.67)		(-1.15)		(1.13)		(0.30)
2 x 3		-2.0673		0.1473		0.2034		0.1037		-1.2106		-1.6165		0.9086
		(-1.03)		(0.10)		(0.14)		(0.05)		(-0.69)		(-1.04)		(0.48)
year 2010			0.0352	0.0175	0 .0353	0.0176	0.0000	-0.0000						
			(0.03)	(0.01)	(0.03)	(0.01)	(0.00)	(0.00)						
year 2011	0.0628	0.05077							-0.0445	-0.0366	0.0000	0.0000		
	(-0.05)	(0.04)							(-0.04)	(-0.03)	(0.00)	(0.00)		
year 2012	0.1481	0.1347	0.0739	0.0706	0.0709	0.0682	0.0000	-0.0000	0.0203	0.0219				
	(0.13)	(0.12)	(0.07)	(0.07)	(0.07)	(0.07)	(0.00)	(0.00)	(0.02)	(0.02)				
year 2013	-.0032	-0.0137	0.1251	0.1158	0.1166	0.1087	-0.0103	-0.0052	0.0545	0.0443	-0.0446	-0.0698		
	(-0.00)	(-0.01)	(0.12)	(0.11)	(0.11)	(0.10)	(-0.01)	(-0.01)	(0.05)	(0.04)	(-0.05)	(-0.08)		
year 2014	0.1210	0.1062	0.0794	0.0665	0.0746	0.0641	-0.0369	-0.0201	0.0269	0.0089	-0.0572	-0.0546	0.0669	0.0689
	(0.10)	(0.09)	(0.06)	(0.05)	(0.06)	(0.05)	(-0.04)	(-0.02)	(0.02)	(0.01)	(-0.05)	(-0.05)	(0.08)	(0.09)
year 2015	0.1428	0.1279	0.1213	0.0858	0.1163	0.0824	0.0007	0.0089	0.0925	0.0587	0.0301	0.0182	0.1050	0.1107
	(0.13)	(0.11)	(0.09)	(0.06)	(0.09)	(0.06)	(0.00)	(0.01)	(0.08)	(0.05)	(0.03)	(0.02)	(0.09)	(0.09)
year 2016	0.0833	0.0717	0.2466	0.2068	0.2364	0.1990	0.1018	0.1189	0.2011)	0.1578	0.0301	0.0182	0.0659	0.0738
	(0.09)	(0.08)	(0.22)	(0.18)	(0.21)	(0.18)	(0.09)	(0.10)	(0.17)	(0.14)	(0.03)	(0.02)	(0.05)	(0.06)
year 2017	0.1167	0.1025	0.2466	0.2068	0.23644	0.1990	0.1018	0.1189	0.2011	0.1578	0.0301	0.0182	0.0899	0.0953
	(-0.12)	(0.11)	(0.24)	(0.20)	(0.23)	(0.20)	(0.10)	(0.12)	(0.16)	(0.13)	(0.03)	(0.02)	(0.07)	(0.08)
year 2018	0.1851	0.1556	0.2466	0.2068	0.23644	0.1990					0.0301	0.0182	0.2041	0.2127
	(0.18)	0.15	(0.21)	(0.18)	(0.20)	(0.17)					(0.03)	(0.02)	(0.17)	(0.17)
constant	12.0764**	9.2589**	10.4542**	8.4607**	10.3005**	8.2996**	9.4608**	9.0766**	8.1564**	5.6614**	11.9611**	12.8329**	10.5951**	11.0992**
	(6.78)	(3.68)	(7.34)	(4.87)	(7.31)	(4.91)	(6.78)	(7.11)	(5.62)	(3.26)	(8.95)	(7.14)	(8.06)	(4.74)
observations	411		420		420		376		370		385		278	

16 ** when p value is significant at <0,05, * when it is <0,10.

Table 17: Regression[17] for each EQ proxies considering the three dummies of FIFO, COVER and FRESH, year dummies and clustered by companies in column a, while in column b it is considered also the intersections between dummies. The distributions considered are absolute term.

	EIKON		EQ1		EQ2		EQ3		EQ4		EQ5		EQ6	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b
FIFO (1)	-8.8806	10.2249	-0.0093	0.0222	-0.0076	0.0241	0.0036	0.0115	0.0001	0.0452*	1.0469	0.2398	0.0390	-0.1283
	(-1.61)	(0.85)	(-0.87)	(1.03)	(-0.73)	(1.14)	(0.65)	(1.18)	(0.00)	(1.67)	(1.38)	(0.20)	(0.36)	(-0.54)
COVER (2)	-2.8326	12.0481	0.0227**	0.0289	0.0227**	0.0293	0.0071	0.0122	0.0001**	0.0540**	0.6609	1.1189	0.1399	0.0398
	(-0.50)	(1.06)	(2.15)	(1.35)	(2.21)	(1.41)	(1.31)	(1.20)	(2.55)	(2.01)	(0.87)	(0.90)	(1.32)	(0.17)
FRESH (3)	-7.0385	7.8614	-0.0149	-0.0005	-0.0138	0.0013	-0.0029	0.0046	-0.0084	0.0179	-0.9948*	0.1121	-0.1733	-0.3422
	(-1.27)	(0.73)	(-1.38)	(-0.02)	(-1.33)	(0.06)	(-0.61)	(0.42)	(-0.63)	(0.66)	(-1.69)	(0.09)	(-1.61)	(-1.52)
1 x 2		-17.2889*		-0.0216		-0.0214		-0.0054		-0.0343		1.1618		0.0994
		(-1.75)		(-1.10)		(-1.12)		(-0.47)		(-1.32)		(0.97)		(0.47)
1 x 3		-18.2938*		-0.0334*		-0.0339*		-0.0094		-0.0466*		-0.0238		0.2134
		(-1.92)		(-1.79)		(-1.87)		(-0.84)		(-1.94)		(-0.02)		(1.00)
2 x 3		-11.0235		0.0072		0.0063		-0.0048		-0.0032		-2.0736		0.1046
		(-1.12)		(0.37)		(0.34)		(-0.43)		(-0.13)		(-1.49)		(0.50)
year 2010			0.0067	0.0068	0.0069	0.0069	0.0049	0.0049						
			(0.75)	(0.75)	(0.77)	(0.77)	(0.93)	(0.92)						
year 2011	-1.0741	-11.4076							-0.0130	-0.0131	-1.7271	-1.72701		
	(-0.18)	(-0.19)							(-1.51)	(-1.52)	(-1.26)	(-1.25)		
year 2012	10.2901*	10.2105*	0.0012	0.0013	0.0013	0.0014	0.0048	0.0048	-0.0018	-0.0017				
	(1.84)	(1.83)	(0.12)	(0.13)	(0.13)	(0.14)	(1.03)	(1.03)	(-0.19)	(-0.18)				
year 2013	4.5679	4.5149	-0.0096	-0.0093	-0.0093	-0.0089	-0.0029	-0.0029	-0.0482**	-0.0479**	-1.5684	-1.5811		
	(0.76)	(0.75)	(-0.86)	(-0.84)	(-0.85)	(-0.83)	(-0.60)	(-0.59)	(-4.15)	(-4.17)	(-1.25)	(-1.26)		
year 2014	-0.4268	-0.5187	0.0052	0.0057	0.0059	0.0065	-0.0069	-0.0069	-0.0489**	-0.0484**	-1.4308	-1.4251	0.0679	0.0677
	(-0.07)	(-0.08)	(0.54)	(0.59)	(0.64)	(0.70)	(-1.10)	(-1.09)	(-2.79)	(-2.81)	(-0.93)	(-0.92)	(0.82)	(0.82)
year 2015	2.0732	1.9813	0.0006	0.0008	0.0003	0.0005	0.0086	0.0086	-0.0071	-0.0070	-1.9660	-1.9688	0.1547	0.1542
	(0.36)	(0.34)	(0.05)	(0.08)	(0.03)	(0.05)	(1.44)	(1.44)	(-0.86)	(-0.84)	(-1.27)	(-1.27)	(1.09)	(1.08)
year 2016	1.6509	1.5649	0.0026	0.0029	0.0023	0.0027	0.0092	0.0092	-0.0015	-0.0012	-1.7593	-1.7621	0.1353	0.1342
	(0.35)	(0.33)	(0.30)	(0.34)	(0.28)	(0.32)	(1.60)	(1.59)	(-0.28)	(-0.23)	(-1.14)	(-1.14)	(0.86)	(0.85)
year 2017	-4.7301	-4.8392	-0.0527**	-0.0523**	-0.0545**	-0.0541**	0.0046	0.0046	-0.0380**	-0.0378**	-1.2963	-1.2991	-0.0068	-0.0072
	(-0.92)	(-0.94)	(-2.02)	(-2.02)	(-2.36)	(-2.36)	(0.82)	(0.82)	(-2.33)	(-2.36)	(-0.79)	(-0.79)	(-0.05)	(-0.05)
year 2018	-6.7099	-6.8977	0.0067	0.0071	0.0066	0.0069					-1.7789	-1.7817	-0.0123	-0.0129
	(-1.28)	(-1.32)	(0.63)	(0.67)	(0.63)	(0.67)					(-1.19)	(-1.20)	(-0.09)	(-0.09)
constant	61.6045**	46.5415**	-0.0465**	-0.0635**	-0.0479**	-0.0652**	-0.0324**	-0.0386**	-0.0468**	-0.0753**	2.9313**	2.8639**	-0.4045**	-0.2738
	(6.78)	(3.72)	(-2.90)	(-2.63)	(-3.05)	(-2.80)	(-3.61)	(-3.60)	(-2.54)	(-2.62)	(2.46)	(2.18)	(-2.58)	(-1.16)
observations	411		420		420		376		370		385		278	

[17]** when p value is significant at <0,05, * when it is <0,10.

3 Conclusions

In this work are firstly illustrated the most used model for earnings quality in literature. We propose to cluster these measures in three groups, following Dechow et al. (2010): **properties of earnings, investors responsiveness to earnings and external indicator of earnings**. For each proxy we describe the scholars' papers that introduce them and also the modifications proposed by other authors, as for Jones model (1991) and modified Jones model by Dechow et al. (1995). Moreover, we identify the robust part for every method and also all the limitations.

Furthermore, we classify papers based on whether earnings quality is the dependent or independent variable, thus in **determinants or consequences** of EQ (Dechow et al., 2010). Then we identify the most studied determinants and we illustrate if the proxies behave in the **same way or in the opposite directions**, because every measure captures a specific insight of the topic in question, so it is wrong that one metric could be a substitute for the others. In addition, the possibility that one measures provide higher quality and another lower is due to the aspect of quality analysed by these proxies, because they concentrate on different items of annual reports or they have divergent focus. The same reasoning for consequences.

The second part of the analysis is divide in two parts, one focuses on introducing a new score for EQ, namely **StarMine model presented in Eikon**; the second one concentrates on three determinants and how they influence earnings quality: **business model, accounting treatment for inventory and covering commodity risk**.

For what concerns Eikon metric, the analysis provide evidence that, despite Francis et al. (2005) model, this measure is not correlated with the ones used in literature, namely the proxies under the category properties of earnings(Jones model, modified Jones, DD, earnings persistence, smoothness). Whereas, we demonstrate that **components of the methods are correlated with the StarMine methods**. The reason behind this is that literature proxies and Eikon share several items, unless the procedure for the final score differ and this is why the metric are not correlated. Indeed, Eikon takes into account four parts and for each of them provides an EQ that are subsequently united to bring the final score, precisely accruals, cash flows, operating efficiency, exclusions. Furthermore, we show the Pearson and Spearman correlation among the components of the models and we find some similarities with scholars but in major part the coefficients are lower than other papers due to the sample size. Indeed, we focus on **50 companies within an industry**, while most studies are **cross countries and cross industries**, thus this is a big limitation of this analysis.

Finally, we demonstrate that companies choosing FIFO instead of LIFO or WEIGHTED AVERAGE could have in first step with **lower earnings quality** (only smoothness t test

provide evidence of higher quality of FIFO, but this is expected) , unless the **robustness checks** (companies cluster, year dummies and cross dummies) **reduce the validity** of t tests, so we would not affirm with 100% accuracy that this accounting choice is always linked with lower quality. Furthermore, having a discrepancy between abnormal accruals proxies and smoothness, we could support the hypothesis that each proxy focuses on specific characteristic of the determinant in question and they describe a part of the entirety, thus is reasonable to have also results going in different directions.

Instead, the **use of derivatives to cover commodities risk is a determinant for higher earnings quality and this result is valid also after robustness checks**. Therefore, we are quite sure that cover risk is equal to higher EQ. For this proxy the models provide evidences of lower use of nondiscretionary accruals by companies, because the ratios of smoothness, the correlation between delta accruals and delta CFO, is higher for these firms. Thus, it seems that they describe the same picture of this characteristic.

Finally, the third determinant under this second part is the business model. Indeed, this analysis is a starting point for future development of this topic, as literature is little. The study demonstrates that, under the 4 definitions of business model provided, companies producing **fresh food are lower in EQ**. Moreover, the results of t test are robust to year effects, while the coefficient diminish the significance due to cluster effects.

In the end, we show that earnings persistence is not correlated with Eikon and does not provide evidence of differences in the determinants. Nevertheless, this model is not accurate for this analysis because it is used for industry analysis and not at company level, thus it reasonable that suffers from the sample size. But also, there are no year shifting at company level form one choices to other, so there are no reasons to expect more persistence in one group rather than in the other.

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Appendix

The first part of appendix deals with the evolution of abnormal accruals models, indeed we provide the reference model for each of them, the modification/innovation introduced in respect of their starting point and their limitations.

Model	Equation	Reference	Modification	Limitations
DeAngelo model (1986)	$\Delta TA_t = (TA_t - TA_{t-k}) = (DA_t - DA_{t-k}) - (NA_t t - NA_{t-k})$			She considers that delta in total accruals is due only to the annual difference of DA, as NDA are stationaries
Jones model (1991)	$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}$	DeAngelo model	She continues to consider that TA are composed by NDA and DA, but she states that even normal accruals could change and they affect the level of total accruals. Therefore, she proposes to regress TA on two components reflecting the economic circumstances of a firm, PPE and delta revenues. Finally, the residuals from the regression are the DA and give a value for earnings management.	This model suffers from Type I and Type II errors. High correlation between TA and DA could bias the results obtained, indeed increasing Type I error. Even the positive and negative relation between residuals and economic performance and CF performance could reduce the power of the test. Finally, she assumes that revenues are not manipulated by managers.
Modified Jones model (1995)	$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [(\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \varepsilon_{it}$	Jones model	Dechow et al. want to overcome the assumption of no earnings management in earnings, therefore they introduce delta receivables to control for this hypothesis. The other coefficients in the equation are the same as for the previous model.	Despite the lower percentage of Type II errors, the modified Jones model suffers more for Type I errors. In particular, it is strongly influenced by firms performances.

Francis et al. (2005)	Dechow and Dichev (2002)	Performance matched (2005)
$\Delta TCA_t = \beta_0 + \beta_1 \times CFO_{t-1} + \beta_2 \times CFO_t + \beta_3 \times CFO_{t+1} + \beta_4 \times \Delta REV_t + \beta_5 \times PPE_t + \varepsilon_t$; $AQ_{jt} = \lambda_0 + \lambda_1 \times Size_{jt} + \lambda_2 \times \sigma(CFO)_{jt} + \lambda_3 \times \sigma(Sales)_{jt} + \lambda_4 \times OperCycle_{jt} + \lambda_5 \times NegEarn_{jt} + \nu_{jt}$	$\Delta WC_t = \beta_0 + \beta_1 \times CFO_{t-1} + \beta_2 \times CFO_t + \beta_3 \times CFO_{t+1} + \varepsilon_t$	$TA_{it}/A_{it-1} = \alpha_1 \times [1/A_{it-1}] + \beta_{1i} \times [\Delta REV_{it}/A_{it-1}] + \beta_{i2} \times [PPE_{it}/A_{it-1}] + \beta_{i3} \times ROA_{it}/A_{it-1} + \varepsilon_{it}$
Dechow and Dichev	Jones model	Jones model
They suggest controlling for long-term accruals, namely they provide the same component presented in Jones model, delta revenues and PPE. Moreover, they take as dependent variable TCA instead of WC. Furthermore, they decompose the standard deviation of residual into the discretionary part and innate one.	They start to the same reasoning of Jones to provide a model that divide DA and NDA through a regression where residuals identify the abnormal accruals. However, they want to analyse how WC maps into cash flow realization, thus they regress WC on CFO. They know that accruals are subject to estimation errors, so they change the focus. Residuals of the model are taken in absolute value or they use the standard deviation of these to calculate the level of	Kothari et al. propose to take into consideration also performances of companies. To do so, they propose to control for ROA and find the right benchmark for firms.
There is possibility to face high level of Type I errors when the innate component of residual is due to estimation errors and not performances. Moreover, there is room also for Type II errors.	They do not provide a distinction between NDA and DA. Moreover, the results are unsigned, so it is not possible to determine in whether direction goes a possible distortion. Moreover, they focus only on short-term accruals, when even long-term are important.	The Type I errors decrease, unless it is difficult to identify the correct benchmark, in particular when this one masks its performances, thus the reliability of the test decreases.

In this section are illustrated the criteria applied to determine the business model, the accounting treatment and hedging.

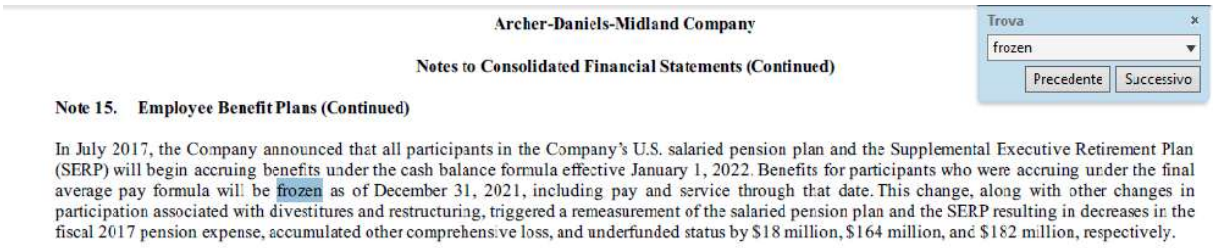
So, start with the first one determinant, we bring some examples that describe the different situation under the 4 divisions proposed to provide more robustness to the analysis. The first one is the segmental reporting, where we search in the annual report the section segment descriptions, and we look whether one of the segments contain the word frozen or deal only with frozen food.

As the picture describes, in the case of Archer Daniels Midland there are no frozen segment, because no one contains the word in question or is made of only frozen food.

Segment Descriptions

The Company's operations are organized, managed, and classified into four reportable business segments: Origination, Oilseeds, Carbohydrate Solutions, and Nutrition. Each of these segments is organized based upon the nature of products and services offered. The Company's remaining operations are not reportable business segments, as defined by the applicable accounting standard, and are classified as Other. Financial information with respect to the Company's reportable business segments is set forth in Note 17 of "Notes to Consolidated Financial Statements" included in Item 8 herein, "Financial Statements and Supplementary Data" (Item 8).

Moreover, to check the last hypothesis we search whether in the 10-K is reported the word froze, in order to provide evidence to the fact that this company process only fresh food. Indeed, the word is only used as a verb and not as an adjective. So this leads to the conclusion that Archer Daniels Midland produce only fresh food under the 4 definition given in the empirical part.



Archer-Daniels-Midland Company

Notes to Consolidated Financial Statements (Continued)

Note 15. Employee Benefit Plans (Continued)

In July 2017, the Company announced that all participants in the Company's U.S. salaried pension plan and the Supplemental Executive Retirement Plan (SERP) will begin accruing benefits under the cash balance formula effective January 1, 2022. Benefits for participants who were accruing under the final average pay formula will be frozen as of December 31, 2021, including pay and service through that date. This change, along with other changes in participation associated with divestitures and restructuring, triggered a remeasurement of the salaried pension plan and the SERP resulting in decreases in the fiscal 2017 pension expense, accumulated other comprehensive loss, and underfunded status by $18 million, $164 million, and $182 million, respectively.

On the other hand, Brigford Foods Corporation is considered a frozen based company, because it issues a segmental reporting based on frozen and fresh products, the percentage of the former is more than 20%, so it respect the threshold in both definition 2 and 3, and of course it has almost one frozen product so it is in line with definition 1.

Description of Business

Bridgford Foods Corporation currently operates in two business segments - the processing and distribution of frozen food products and the processing and distribution of snack food products. For information regarding the separate financial performance of the business segments refer to Note 7 of the Notes to Consolidated Financial Statements included in this Report.

The following table shows sales, as a percentage of consolidated sales, for each business segment during the last two fiscal years:

	2018	2017
Frozen Food Products	27%	29%
Snack Food Products	73%	71%
	100%	100%

Then, for what concerns accounting treatment we search in the notes the accounting principle applied for inventory. In the case of Archer Daniels and Midland there is a mix of methods to calculate the inventory, thus we calculate whether FIFO is more than 50% or not. In this case, this does not happen, so the company is considered in the other accounting treatment group.

Inventories

Inventories of certain merchandisable agricultural commodities, which include inventories acquired under deferred pricing contracts, are stated at market value. In addition, the Company values certain inventories using the lower of cost, determined by either the first-in, first-out (FIFO) or last-in, first-out (LIFO) methods, or net realizable value.

The following table sets forth the Company's inventories as of December 31, 2018 and 2017.

	December 31, 2018	December 31, 2017
	(In millions)	
LIFO inventories		
FIFO value	$ 1,011	$ 1,056
LIFO valuation reserve	(55)	(73)
LIFO inventories carrying value	956	983
FIFO inventories	2,908	2,906
Market inventories	4,547	4,886
Supplies and other inventories	402	398
Total inventories	$ 8,813	$ 9,173

On contrary, there are case in which only FIFO is applied, as for Dean Food Company.

Inventories — Inventories are stated at the lower of cost or market. Our products are valued using the first-in, first-out method. The costs of finished goods inventories include raw materials, direct labor and indirect production and overhead costs. Reserves for obsolete or excess inventory are not material.

But also there are situations where FIFO is not considered at all, as for Kellogg Company.

Inventories

Inventories are valued at the lower of cost or net realizable value. Cost is determined on an average cost basis.

Finally, we analyse whether a company decide or not to cover commodity risk. To do so, we search in 10-Ks the part relative to derivative instruments and hedging activities. In fact, in this note is provided by companies if they cover this type or risk or not. In the case of Archer Daniels Midland is presented the choice to use derivatives to hedge the fluctuation of agricultural prices.

Note 5. Derivative Instruments & Hedging Activities

Derivatives Not Designated as Hedging Instruments

The majority of the Company's derivative instruments have not been designated as hedging instruments. The Company uses exchange-traded futures and exchange-traded and OTC options contracts to manage its net position of merchandisable agricultural commodity inventories and forward cash purchase and sales contracts to reduce price risk caused by market fluctuations in agricultural commodities and foreign currencies. The Company also uses exchange-traded futures and exchange-traded and OTC options contracts as components of merchandising strategies designed to enhance margins. The results of these strategies can be significantly impacted by factors such as the correlation between the value of exchange-traded commodities futures contracts and the value of the underlying commodities, counterparty contract defaults, and volatility of freight markets. Derivatives, including exchange traded contracts and physical purchase or sale contracts, and inventories of certain merchandisable agricultural commodities, which include amounts acquired under deferred pricing contracts, are stated at market value. Inventory is not a derivative and therefore fair values of and changes in fair values of inventories are not included in the tables below.

On contrary, there are companies, such as Brigford Foods Company, that are aware of the negative impact of the raw material price fluctuations in the market, but they do not enter into derivatives contract and try to pursue other strategy.

Most flour purchases are made at market price without contracts. We also purchase bulk flour under short-term fixed price contracts at current market prices. The contracts are usually effective for a month or less and are not material to our operations. These contracts are settled within a month's time and no significant contracts remain open at the close of the reporting period. We monitor and manage our ingredient costs to help negate volatile daily swings in market prices when possible. We do not participate in the commodity futures market or hedging to limit commodity exposure.