Revista de Contabilidad Spanish Accounting Review 22 (1) (2019) 41-60

REVISTA DE CONTABILIDAD

SPANISH ACCOUNTING REVIEW

revistas.um.es/rcsar

A Review on the multidimensional analysis of earnings quality

Ana Licerán-Gutiérrez* **and Manuel Cano-Rodríguez**

Departamento de Economía Financiera y Contabilidad, Universidad de Jaén, Jaén ,España

ARTICLE INFO

Article history:
Received 16 March 2018
Accepted 8 Nobember 2018
Available online 31 December 2018

JEL classification:

Keywords:
Earnings quality
Earnings management
Earnings smoothing
Predictability
Conservatism
Structural equation models

ABSTRACT

There is a generalized consensus among accounting researchers about the multidimensional nature of earnings quality: Earnings quality depends on a series of characteristics that enhance the usefulness of the earnings figure for decision making. In this paper, we undertake a literature revision on empirical research on earnings quality that reveals that, although earnings quality is probably the most recurrent topic in accounting, empirical research that have treated earnings quality as a multidimensional concept is almost inexistent. In this sense, we document that: (1) Most of the empirical papers on earnings quality deal with just one earnings characteristic, not including the potential effect of the other characteristics related to earnings quality. (2) Some characteristics (particularly, accruals quality and, in a lesser way, conservatism) are widely employed for representing earnings quality, whereas other characteristics (smoothness, persistence) are much less used by researchers. (3) The research on the relationships among the different earnings quality characteristics is scant and with mixed results. (4) Only a few papers develop multidimensional measures of earnings quality, but these measures are based on too restrictive assumptions and there is no evidence of superiority over single-dimension measures. We complement our bibliometric analysis by discussing the limitations of both the single-dimension approach and the multidimensional approaches used to date, illustrating our arguments with a simulation process. Henceforth, this review contributes to prior literature highlighting the main problems in prior literature for earnings quality measurement.

Una revisión del análisis multidimensional de la calidad del resultado contable

Códigos JEL:

Palabras clave:
Calidad del resultado contable
Manipulación del resultado
Alisamiento del resultado
Previsibilidad
Conservadurismo
Modelos de ecuaciones estructurales

RESUMEN

Hay un consenso generalizado en investigación sobre la naturaleza multidimensional de la calidad del resultado: Ésta depende de una serie de características que aumentan la utilidad de la cifra del resultado para el proceso de toma de decisiones. En este trabajo, de revisión de literatura sobre investigación empírica de calidad del resultado, revelamos que, aunque calidad del resultado es probablemente uno de los temas de investigación más recurrentes en contabilidad, la investigación empírica que lo ha tratado de manera multidimensional es prácticamente inexistente. Así, documentamos que: (1) La mayoría de estudios empíricos de calidad del resultado considera únicamente una de sus características, sin incluir el efecto potencial de las otras características relacionadas. (2) Algunas características (en particular, calidad de ajustes por devengo y, en menor manera, conservadurismo) se emplean ampliamente como representación de calidad del resultado, mientras que otras características (alisamiento, persistencia) son mucho menos usadas en investigación. (3) La investigación sobre las relaciones entre las diferentes medidas de calidad del resultado es escasa y con resultados contradictorios. (4) Sólo algunos estudios desarrollan medidas multidimensionales de calidad del resultado, pero estas medidas se basan en premisas muy restrictivas y no hay evidencia de su superioridad con respecto a las medidas de una única propiedad. Complementamos nuestro análisis bibliométrico mediante una discusión de las limitaciones de los enfoques tanto unidimensionales como multidimensionales usados hasta la fecha, ilustrando nuestros argumentos con una simulación. Por tanto, esta revisión contribuye a la literatura señalando los principales problemas para la medición de la calidad del resultado en literatura previa.

* Corresponding author.
E-mail address: aliceran@ujaen.es (A. Licerán-Gutiérrez).

https://www.doi.org/10.6018/rcsar.22.1.354301
1988-4672 (online) / 1138-4891 (printed)

Introduction

Earnings quality is one of the most common topics in accounting research, as evidenced by previous research reviews (Dechow, Ge, & Schrand, 2010; Dechow & Schrand, 2004; Francis, Olsson, & Schipper, 2006; Schipper & Vincent, 2003). These review papers evidence the great variety of empirical proxies that researchers have associated to several earnings characteristics or properties[1] that are expected to increase earnings usefulness for decision making. Some examples of these characteristics are accruals quality, conservatism, smoothness, predictability, persistence of reported earnings, investor responsiveness to accounting information, value relevance of earnings or book values, etc. (see for example Dechow et al., 2010; Dechow & Schrand, 2004; Ewert & Wagenhofer, 2011; Francis, LaFond, Olsson, & Schipper, 2004; Perotti & Wagenhofer, 2014; Schipper & Vincent, 2003). As none of these measures has emerged as superior for all decision models (Dechow et al., 2010), it can be concluded that earnings quality depends on these different characteristics and, therefore, it is a multidimensional concept.

The aim of this paper is to review the literature on earnings quality but, different from previous studies, we focus on how the empirical research has addressed the multidimensional nature of earnings quality. The revision of the literature is analyzed from both a narrative and a systematic point of view. Basing on the narrative review, we describe the different earnings-quality dimensions studied by the empirical researchers, as well as the two approaches regarding the multidimensional nature of earnings quality (single-dimensional and multidimensional). To assess the popularity of each earnings-quality dimension, as well as the relevance of the two approaches, we undertake a systematic review in which the number of studies for each dimension and approach are summarized.

Our review reveals that the empirical research on earnings quality that adopts a multidimensional approach is sparse, as the vast majority of empirical works represent earnings quality using just one of its characteristics. Moreover, this unidimensional approach has been highly concentrated on some specific characteristics, especially on earnings management. Regarding the research that adopts the multidimensional approach, we first review the papers that study the relationships among the different earnings-quality dimensions, showing that they exhibit mixed conclusions. Finally, just a few papers do try to develop a multidimensional measure of earnings. These multidimensional measures, however, present their own limitations, including the lack of control for complementarity or substitution effects among different measures, the use of equal weights for all the included proxies (Leuz & Wysocki, 2016), or the absence of some earnings-quality dimensions. Moreover, no paper evidences the superiority of these multidimensional measures over the single-dimension measures.

We complement the results from the literature review by showing the limitations of the unidimensional approach using an analytical approach, as well as of the multidimensional measures of earnings quality used so far, using a simulation process.

This paper contributes to the empirical research on earnings quality in several ways. First, we evidence the existence of a gap between the theoretical concept of earnings quality – earnings quality is multidimensional and depends on several characteristics– and the extant empirical research, as the multidimensional measures of earnings quality are almost inexistent. Additionally, we show that single-dimension measures of earnings quality can produce biased estimates of the relationships between earnings quality and its causes and consequences, being therefore advisable the use of multidimensional measures. Second, we also reveal that the research on the multidimensional nature of earnings quality is still sparse. Thus, just a few papers study the relationships among the different characteristics, reaching mixed conclusions. Additionally, we show that the multidimensional measures used so far in empirical research –based on additive indices or factor analyses– present important limitations that do not grant that their estimates are superior to the single-dimension studies.

The remainder of the paper is structured as follows: Section 2 describes the bibliometric review. Section 3 reviews the dimensions of earnings quality and analyzes the empirical proxies commonly used in prior literature to measure them. Section 4 presents an analysis of two approaches: Subsection 4.1 contains a review of the empirical research analyzing earnings quality unidimensionally (defined as using just one dimension) and the description of the limitations of this approach. Sub-section 4.2 reviews those papers addressing earnings quality multidimensionally, differentiating between papers analyzing the inter-relationships among earnings dimensions, and papers using composite measures of earnings quality, analyzing the limitations of these composite measures. Section 5 presents the conclusions and the suggestions for future research.

Description of the bibliometric review

All articles in 18 issues of the *Journal of Citation Reports* (*JCR*) 2014[2] published between 2000 and 2014 were examined. Those meeting three criteria were included in this review. (1) The title, abstract, or keywords must reflect earnings-quality content[3]. (2) The article must report on an empirical or methodological study. (3) The article must deal specifically with earnings quality, not merely with similar topics as audit quality, forecast quality, voluntary disclosure, or quality of management accounting system. Thus, 6214 articles were reviewed.

We found 618 papers on earnings quality (9.9% of reviewed articles), indicating that earnings quality is one a common issue in accounting research. Furthermore, the interest in earnings quality has grown across years; in 2000 there were 13 earnings-quality articles (4.2% of reviewed articles from 2000), and by 2014 there were 112 (22.8%).

Of the 618 reviewed articles on earnings quality, 572 (92.6%) were empirical works; the remaining 46 (7.4%) are methodological papers, which provided no empirical measure of earnings quality but theoretically analyzed such aspects of earnings quality as the relationships among various properties of accounting information or their determinants or consequences. As the aim of this paper is the analysis of mul-

[1] In this paper, we use the terms earnings characteristics, earnings properties, and earnings quality dimensions indistinctly.

[2] The reviewed journals are *Abacus*, *Accounting and Business Research*, *Accounting and Finance*, *Accounting, Auditing and Accountability Journal*, *Accounting Horizons*, *Accounting, Organizations and Society*, *Accounting Review*, *Asia-Pacific Journal of Accounting and Economics*, *Australian Accounting Review*, *Contemporary Accounting Research*, *European Accounting Review*, *Journal of Accounting and Economics*, *Journal of Accounting and Public Policy*, *Journal of Accounting Research*, *Journal of Business Finance and Accounting*, *Journal of International Financial Management and Accounting*, *Management Accounting Research,* and *Review of Accounting Studies*.

[3] The following (or similar) expressions reflect earnings quality content: earnings quality, accounting quality, financial-reporting quality, earnings management, predictability, persistence, smoothing, conservatism, earnings response coefficient (ERC), and restatements.

tidimensionality in earnings-quality measurement, the focus is on the 572 empirical papers.

Because earnings quality is an unobservable variable, empirical researchers have used a variety of empirical proxies that are expected to be associated with desirable properties of accounting information (Perotti & Wagenhofer, 2014). These properties are indicative of earnings quality according to the usefulness of accounting information in a specific decision-making process (Dechow et al., 2010). Consequently, there is a theoretical consensus on the multidimensional nature of earnings quality (Dechow et al., 2010; Demerjian, Lewis, Lev, & McVay, 2013; Fields, Lys, & Vincent, 2001; Francis et al., 2004; Schipper & Vincent, 2003).

Despite this consensus on the existence of multiple dimensions that conform earnings quality, there is no common agreement about the list of such dimensions. For instance, Schipper and Vincent (2003) include persistence, predictability, variability, abnormal accruals, association of accruals and cash flows, comparability, relevance and judgements of experts; Dechow and Schrand (2004) mention persistence, association of accruals and cash-flows, earnings management, conservative accounting, investor response to earnings (ERC), relevance, audit opinion, voluntary disclosure, and forecast accuracy; Francis et al. (2004) consider accruals quality, smoothness, persistence, predictability, conservatism, timeliness and value relevance; Dechow et al. (2010) consider accruals quality, absence of irregularities in the cross-sectional distribution of earnings, smoothness, persistence, conservatism, investor responsiveness and other indicators of earnings misstatements (opinion of experts).

The aim of this paper is not to discuss the composition of the list of earnings quality dimensions, but to analyze how the empirical research on earnings quality has dealt with this multidimensionality. Consequently, for our revision of the literature, we adopt a classification of earnings quality properties based on that proposed by Dechow et al. (2010), because it is the most recent review on the topic and it has become a reference in earnings quality research.

Dechow et al. (2010) classify the empirical proxies of earnings quality in three groups: accounting properties of earnings, measures of the investors' response or market response to earnings, and other external indicators of earnings misstatements. *Accounting properties of earnings* comprises a set of measures that are based exclusively on the information content of the financial statements. We include in this group four characteristics of reported earnings that are expected to increase its usefulness for the decision-making process: absence of earnings management (abnormal accruals, accruals quality, and target beating), earnings smoothness, time-series properties of earnings, and conservatism. *Investor or market reactions to reported earnings* are based upon the idea that higher-quality earnings provide useful information for equity valuation and, therefore, there will be a tighter relationship between accounting information and investors' decisions when the quality of that information is high (Dechow et al., 2010; Holthausen & Watts, 2001). The empirical proxies considered in this group are the earnings response coefficient (ERC) and the R^2 from the earnings-returns model. *Other external indicators* include SEC enforcement releases, restatements after negative audit opinions, and internal control weaknesses. Independent experts' negative opinions of a firm's financial statements (eventually resulting in restatements or modified audit opinion), or weaknesses in a firm's internal control system can be indicative of poor earnings quality.

The distribution of the revised papers among these three groups is outlined in Figure 1. The vast majority of empirical papers on earnings quality (472/572: 82.5%) can be classified in the accounting properties group; 81 articles (14.2%) measure earnings quality through market (investors') reaction measures, and only 19 (3.3%) use other external indicators. Thus, the most common empirical proxies for earnings quality are those related to the accounting properties of reported earnings. Consequently, the analysis in the remainder of this paper centers on the 472 empirical studies measuring earnings quality using accounting properties of earnings.

Accounting properties of earnings

We classify the 472 empirical articles in four different groups that represent different facets or dimensions of the earnings-quality construct. These groups are earnings management, earnings smoothing, time-series properties of earnings, and conservatism[4].

Earnings management

Earnings management can be defined as the disclosure of unreliable financial information to influence stakeholders' decision-making, achieving benefits only for the firm's managers (Dechow & Skinner, 2000; Healy & Wahlen, 1999). Earnings management, therefore, may lead stakeholders to make decisions based on unreliable information, eventually leading to investment inefficiencies (Biddle & Hilary, 2006). Consequently, earnings management is expected to be inversely related to earnings quality because manipulated earnings worsen decision-making process.

Accounting researchers distinguish between accounting-based and real-earnings management. The accounting-based approach analyzes how managers manipulate reported accounting numbers to their benefit. Real earnings management consists of manipulating the earnings figure through real investment decisions made by managers, irrespective of accounting (e.g. reducing capital expenditures or discretionary expenses). Consistent with the aim of analyzing earnings quality through accounting system quality, the analysis focuses on accounting-based earnings management.

Empirical research on accounting-based earnings management has followed two main approaches: an estimation of discretionary or abnormal portions of accruals[5] and detection of irregularities in earnings distribution.

Abnormal accruals estimation.

Researchers investigating abnormal accruals assume that earnings can be manipulated through incomes or expenditures whose cash-flow counterpart is recognized not in the analyzed period, but in subsequent periods. The temporal matching of these incomes or expenditures in accounting is recognized using accruals. Total accruals would comprise accruals generated by the company's normal activities (normal or non-discretionary accruals) plus accruals resulting from

[4]These four groups are similar to those mentioned in Dechow et al. (2010), but with some differences for the sake of clarity. Thus, we have grouped Dechow et al.'s "accruals quality" and "(absence of) earnings distribution irregularities (target beating)" in the same group "earnings management", because these measures are typically used in earnings management research. Additionally, we have preferred the term "time-series properties of earnings" –as in Schipper and Vincent (2003)– rather than "persistence" –as in Dechow et al. (2010)– to refer to the constructs that are representative of earnings quality derived from the analysis of time-series properties of earnings. This term is wider, for it includes persistence, predictive ability and variability of earnings.

[5]Also referred as "accruals quality" studies.

Figure 1
DISTRIBUTION OF THE SAMPLE ACCORDING TO THE ANALYZED PROXIES.

NOTE: A single paper may be classified in more than one earnings quality proxy and more than one accounting property, as it may measure more than one proxy and category of earnings quality.

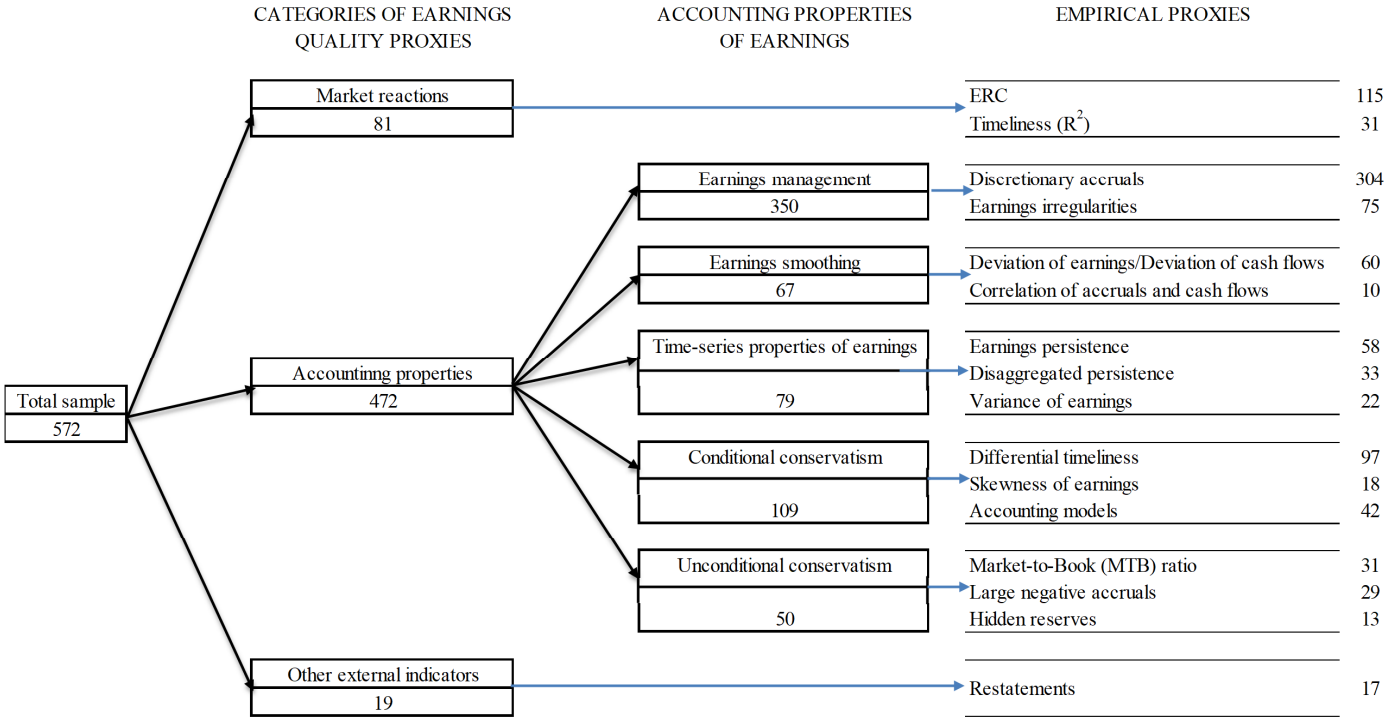

Figure 1 summarizes the number of empirical papers analyzing earnings quality at three levels: the categories of earnings quality proxies, accounting properties of information, and the different proxies for each of these categories/properties. *Category level* includes the number of papers in which each of the three categories of earnings quality proxies has been analyzed. *Accounting-properties level* includes the number of papers in which the different earnings properties have been analyzed. *Proxy level* includes the number of papers in which the different earnings-quality proxies have been analyzed. For the three levels, the number of papers includes measurements of earnings quality that are both unidimensional (one property/category) and multidimensional (various properties in separate regressions, analysis of correlation, and composite indices).

managers' manipulations (abnormal or discretionary accruals)[6].

Abnormal accruals are the most commonly used method of measuring earnings management; this method consists on the estimation of a prediction model of non-discretionary accruals, computing abnormal accruals as the difference between actual total accruals and the expected value of accruals according to the estimated model. Other papers, though, have analyzed the amount of total accruals or specific accruals as evidence of earnings management.

The literature demonstrates that the validity of conclusions resulting from those models depends on the ability of the model's methodology to estimate normal accruals precisely. Despite the generalized use of this approach, previous research has highlighted that it presents various limitations. Thus, the 304 empirical studies reviewed show low estimation power. Particularly in papers that analyzed the estimation power of these models, only induced manipulation of a great magnitude (>4–5% in total assets) was detected (Dechow, Sloan, & Sweeney, 1995; Kothari, Leone, & Wasley, 2005). In other studies, discretionary accruals models showed worse results than ingenuous models of average total accruals did (Thomas & Zhang, 2000), and were unable to detect cases of extreme manipulation in firms with earnings restatements (K. Jones, Krishnan, & Melendrez, 2008). In short, much empirical evidence questions the validity of these models. Additionally, there is a great variety of accruals estimation models in extant research (for example, Dechow & Dichev, 2002; Dechow et al., 1995; Jones, 1991; Kothari et al., 2005; McNichols, 2002), but there is no clear evidence of the superiority of any of them. Consequently, in addition to the low power of these models, the researchers face the problem of choosing the right estimation model.

Earnings distribution irregularities.

Studies on earnings distribution irregularities have focused on the few observations with earnings below a certain target (primarily zero earnings, prior-year earnings, and analysts' forecasts) compared to the number of observations just beating that target (Burgstahler & Dichev, 1997; Degeorge, Patel, & Zeckhauser, 1999). This difference (irregularity) in the distribution of the number of observations (representing earnings in the X-axis) may indicate the existence of earnings management. Managers have incentives to meet or beat those earnings targets for several reasons such as the firm's credibility or managers' target-based remuneration. Thus, if managers observe that accounting numbers do not reach the target, they may decide to boost earnings to make them beat the target. For that reason, there will be few observations below the target but many observations beating the target slightly.

The study of earnings irregularities for measuring earnings quality, however, is not problem-free. Some researchers have noted causes other than earnings management producing such irregularities, including the effect of the normalization factor (Durtschi & Easton, 2009), and the asymmetry produced by taxes or conservatism policies (Beaver, McNichols, & Nelson, 2007). Because this method can be used to estimate earnings management in a sample of companies, it cannot be used to produce a firm-year-specific measure of

[6]Some authors, however, point that abnormal accruals may arise by other reasons different from earnings management, such as the effect of accounting standards or accounting errors. The distinction between earnings-management-caused and non-earnings-management-caused abnormal accruals is, however, beyond the scope of this paper.

earnings quality.

Earnings smoothing

Beidleman (1973) defined earnings smoothing as the managers' attempts to reduce abnormal earnings variations . The relationship between earnings smoothing and earnings quality is controversial. Low variability of earnings over time can indicate high-quality earnings because smoothed earnings can be forecasted with lower error than can high-variability earnings (Biddle & Hilary, 2006; Burgstahler, Hail, & Leuz, 2006; Schipper & Vincent, 2003). Yet managers can opportunistically smooth earnings through earnings-management practices. Thus, earnings smoothing would proceed from earnings-manipulation practices that introduce noise into accounting information, thereby reducing earnings quality (Schipper & Vincent, 2003). Managers would then be hiding or delaying changes in fundamental performance, which, if revealed, would increase the usefulness of earnings (Dechow et al., 2010). Furthermore, variation in the extent of smoothness is due not merely to variation in fundamental performance, but also to changes in the accounting choice or the ability of accounting systems to capture fundamental performance – even absent managers' decisions (Dechow et al., 2010).

Researchers have used two empirical proxies of earnings smoothing (Dechow et al., 2010). One compares variability in earnings relative to variability of sales or operating cash flow, the aim being to control for variability in a firm's economic performance (Leuz, Nanda, & Wysocki, 2003). A low ratio would indicate that earnings vary less than the proxy for the firm's economic performance variability, indicating smoothed earnings. The second measure correlates total or discretionary accrual changes with changes in cash flows. This correlation is expected to be negative, but can be expected to be closer to 1 if managers manipulate accruals to compensate for the firm's variation in economic performance, thereby smoothing earnings (Leuz et al., 2003; Tucker & Zarowin, 2006).

These measures present a significant problem for detecting accounting earnings management, however: They do not discriminate between earnings-smoothing consequences of earnings manipulation and earnings-smoothing consequences of such non-discretionary causes as the fundamental earnings process or the application of accounting rules (Dechow et al., 2010).

Time-series properties of earnings

Schipper and Vincent (2003) indicate that the analysis of time-series properties of the earnings innovation series are indicative of a greater perceived usefulness of earnings in decision making. In details, they indicate that this group of time-series properties include both persistence, predictive ability and variability of earnings The predictive ability of earnings, which is a function of how innovation series are distributed (Schipper & Vincent, 2003) enhances the decision usefulness of earnings because sustainable earnings are expected to be a better indicator of future cash flows, improving investors' valuation (Dechow et al., 2010). Sustainability is associated with earnings persistence – the extent to which earnings in one year predict future earnings (Freeman, Ohlson, & Penman, 1982), that is to say, how much of a given innovation remains in future realizations (Schipper & Vincent, 2003). Finally, variability of earnings is indicative, directly, of the time-series variance of innovations (Schipper & Vincent, 2003).

The most commonly used empirical proxy for time-series properties of earnings is the auto-regression coefficient of earnings on lagged earnings: The higher that coefficient, the more persistent earnings are, because current earning explain a greater proportion of future earnings. This model of auto-regression coefficients was later extended by disaggregating lagged earnings into cash flows and the main components of accruals, based on the idea that the cash-flow component of earnings has greater predictive ability than the accrual component does (Sloan, 1996). Thus a higher coefficient for current cash flows indicates that more future earnings are explained by a permanent component (cash flows) than by a transitory component (accruals). Rather than analyzing the earnings coefficient, then, only the cash-flow coefficient is considered a measure of the extent of earnings quality reflected by time-series properties of earnings (the greater the cash-flow coefficient, the greater earnings quality). Finally, variance of earnings has been used as a proxy to analyze the extent of earnings quality derived from time-series properties of earnings; higher earnings variance indicates lower predictive ability of time-series properties of earnings because earnings volatility affects the temporary component of earnings, lowering earnings predictability (Clubb & Wu, 2014).

Researchers have also criticized time-series properties of earnings models for misspecification and endogeneity. Regarding *misspecification*, observed predictability, persistence or variance of earnings can be due to earnings management, eventually leading to lower predictive ability of non-manipulated earnings. Consequently, the relationship to earnings management should be considered to distinguish artificial from real earnings sustainability (Dechow et al., 2010; Kothari et al., 2005; Schipper & Vincent, 2003). Regarding *endogeneity*, the predictive ability of time-series properties of earnings is a conjunctive variable of the quality of financial reporting and the accounting system that measures it (Barth, 2000; Dechow & Ge, 2006; Dechow et al., 2010). The predictive ability influences the quality of financial reporting, which determines the quality of the accounting system; but the quality of the accounting system also determines financial-reporting quality.

Conservatism

Conservatism is a prudent reaction to uncertainty, reflecting in accounting the risk and uncertainty of a firm's performance (FASB, 1980). Accounting research literature distinguishes between conditional and unconditional conservatism. *Conditional conservatism*[7] is the tendency to require a higher degree of verification to recognize good news than to recognize bad news (Basu, 1997) and is considered as positively associated with earnings quality because it helps to reduce overinvestment problems (Mora & Walker, 2015), constrain income-increasing accruals manipulation (García Lara, García Osma, & Penalva, 2018), and enhance debt-contracting efficiency (Beatty, Petacchi, & Zhang, 2012; Wittenberg-Moerman, 2008; Zhang, 2008). *Unconditional conservatism*[8] is the choice of a lower/higher-than-expected value in the estimation of assets or revenue valuation under uncertainty (Ball & Shivakumar, 2005) and is associated with

[7] Some authors refer to conditional conservatism as earnings conservatism, ex-post conservatism, or information-driven conservatism (Mora & Walker, 2015).

[8] Also known as balance-sheet conservatism or ex-antes conservatism (Mora & Walker, 2015).

a lower earnings-quality level. Various empirical studies have shown that it can lead to inefficient investments (Jackson, 2008; Jackson & Cechinni, 2009) and may provide more opportunities for earnings manipulation (Jackson & Liu, 2010).

Conditional-conservatism proxies.

The most frequently used measures of conditional conservatism are based on the loss-differential-timeliness concept developed by Basu (1997): Under conditional conservatism, the requirements for recognizing good news (gains) are stricter than those for recognizing bad news (losses). Consequently, it can be expected that losses will be recorded in a more timely fashion than good news is. Using market returns as the proxy for good and bad news, Basu (1997) showed that the correlation between negative market returns (a proxy for bad news) and earnings is higher than the correlation between positive market returns (good news) and earnings, using the differential timeliness coefficient between negative and positive market returns as the indicator of conditional conservatism. Despite its popularity, Basu's differential timeliness presents drawbacks. Several researchers have questioned its reliability in measuring conditional conservatism (Cano-Rodríguez & Nunez-Nickel, 2015; Dietrich, Muller, & Riedl, 2007; Givoly, Hayn, & Natarajan, 2007; Patatoukas & Thomas, 2011), and identified two limitations preventing its application in some settings. Basu's (1997) differential timeliness coefficient is not measured at the firm-year level; consequently, other authors have developed firm-year-specific measures of conditional conservatism: Khan and Watts's (2009) C-Score model, Callen, Segal and Hope's (2010) conservatism-ratio model, and, the Barth et al. (2014) model.

A second limitation is the information required by Basu's differential-timeliness coefficient on market returns for proxying good and bad news; it does not apply, therefore, when this information is not available, as in private companies. Researchers attempting to solve this limitation have developed various measures of conditional conservatism based exclusively on reported financial information. One such measure is the difference in reversals of the transitory components of earnings: If losses are recorded timelier than gains, negative variations in earnings will have a greater tendency than positive ones to reverse in the next period (Basu, 1997). Consequently, conditional conservatism can be captured by the differential mean reversion in earnings changes. This measure shares several problems, however: It is not measured at the firm-year level, it can be contaminated by transitory components in earnings produced by random errors or earnings manipulations, and it can identify only transitory components, and not whether they are recognized in a timely manner (Ball & Shivakumar, 2005).

Ball and Shivakumar (2005) developed an alternative measure of conditional conservatism based on the asymmetric contemporaneous correlation between accruals and cash flows. Thus, decreases in the current-period cash flows of an investment are likely to be associated with decreases in the expected future cash flows. Under conditional accounting, those decreases should be recognized through accruals, thereby producing a positive association between current cash flows and accruals, and making the correlation between cash flows and accruals closer to zero[9] for losses than for gains. The asymmetry of earnings compared to cash flows is another measure of conservatism based exclusively on accounting information. Thus, as conditional conservatism leads to an immediate and complete recognition of bad news and a lagged, gradual recognition of good news, earnings are expected to be left-skewed relative to operating cash flows (Gassen, Uwe Fülbier, & Sellhorn, 2006; Givoly & Hayn, 2000).

Unconditional conservatism proxies.

Unconditional conservatism is less prevalent in accounting research than conditional conservatism is (Ruch & Taylor, 2015). The most common empirical measures for unconditional conservatism are the market-to-book ratio, the accumulation of negative accruals, and the existence of hidden reserves.

Regarding the market-to-book (MTB) ratio, the stricter requirements for recording gains than recording losses would lead to the undervaluation of the book value of equity with respect to the market value, which is assumed to recognize gains and losses in a timely manner (Beaver & Ryan, 2000; Feltham & Ohlson, 1995; Givoly & Hayn, 2000; Watts, 2003). Consequently, it can be expected that conservatism contributes to an increase in the MTB ratio. The MTB ratio also presents problems, however. It is also affected by economic rents, which are not recognized in accounting because of accounting principles (Roychowdhury & Watts, 2007), so it would be necessary to adjust the ratio to control the effect of those rents. Additionally, the MTB ratio would be affected by unconditional conservatism and conditional conservatism, so it will likely measure unconditional conservatism with error (Gassen et al., 2006).

A second measure of unconditional conservatism is the accumulation of negative accruals. A consistent predominance of negative accruals over a long period would be, *ceteris paribus*, indicative of conservatism (Givoly & Hayn, 2000).

Finally, unconditional conservatism contributes to the creation of hidden reserves if some assets are not recorded. Penman and Zhang's (2002) conservatism measure is the estimation of those hidden reserves divided by net operating assets. The main drawback of this measure, however, is its dependence on the availability and quality of information on those hidden reserves.

A summary of the review on accounting properties of earnings

We have grouped the proxies that represent the different accounting properties of earnings into four categories: earnings management, earnings smoothing, time-series properties of earnings, and conservatism. Our review of the extant literature reveals that, for each one of these categories, there are various methods or variables that are intended to represent the same underlying concept and, moreover, almost all the reviewed empirical proxies present limitations that condition their validity. We conclude, hence, that there is no clear consensus in the literature about how to measure each of these earnings-quality dimensions empirically.

Additionally, as shown in Figure 1, studies on earnings quality are not uniformly distributed among the four groups. The majority of studies on earnings quality analyze the earnings-management property (350/472: 74%), followed by the conditional conservatism property (109/472: 23%). The number of articles analyzing the time-series properties of earnings, earnings smoothing, or unconditional conservatism is notably lower: 79/472 (17%), 67/472 (14%), 50/472 (11%), respectively)[10]. Thus, although none of the earnings-quality measures can be considered superior for all decisions (Dechow et al., 2010), previous research focused more on

[9] Dechow and Dichev (2002) have demonstrated that the theoretical relationship between accruals and cash flows is negative in the absence of conservatism.

[10] As some articles deal with more than one accounting property, percentages add to more than 100%.

earnings-management and conservatism measures than on the other two dimensions.

Discussion of results of the analysis of empirical research on the multidimensional nature of earnings

In this section we present the results of the analysis of empirical research about the multidimensional nature of earnings quality that can be highlighted from the bibliometric review undertaken in this study.

Single-dimension approach

Under this category, we classify papers that do not consider the multidimensional nature of earnings in their approach, but measure earnings quality using measures from just one of the four groups reviewed in this paper (earnings management, earnings smoothing, time-series properties of earnings, or conservatism). Two types of works are considered in this category: (1) Papers representing earnings quality using exclusively measures from just one of the four groups. (2) Papers that deal with measures from two or more groups, but those measures are used in *separate models*. Thus, the papers of this second group do consider the multidimensional nature of earnings quality, but they do not control for the inter-relationships among the different earnings properties. In other words, they provide various single-dimension analyses rather than a true multidimensional analysis.

One-dimension studies

We have classified as one-dimension studies those papers that use one or various earnings quality empirical proxies, belonging all those proxies to the same group (earnings management, earnings smoothing, time-series properties, or conservatism). Most of the reviewed papers (334/472: 70.8%) are included in this category, using just one empirical proxy (283/472: 60%), or different proxies for measuring the same dimension (51/472: 10.8%). Several of these papers, however, are focused on the causes or consequences of the specific property they are studying and, therefore, their aim is not to research the earnings quality construct, but just that specific property. Notwithstanding this, several one-dimension papers explicitly declare that they are dealing with earnings quality, even although they are considering just one of the dimensions. More specifically, 144 of the 334 single-dimension papers (43%) explicitly state that they are studying or measuring earnings quality[11].

A further analysis of the earnings-quality papers that rely on just one dimension reveals two key features about the research on earnings quality. (1) These 144 papers on earnings quality do not take into account its multidimensional nature, as they analyze just one of the earnings-quality dimensions. This number of papers is higher than the sum of the number of papers that consider several dimensions, that analyze the relationships among earnings properties, or that use a composite measure of earnings quality. Consequently, the unidimensional is the most common approach to earnings quality measuring used to date. (2) This unidimensional research is not uniformly distributed across the four dimensions, but it is highly concentrated on earnings management (100/144: 69.4% of the unidimensional earnings-quality papers) and, in a lower proportion, conservatism (22/144: 15.3%). Time-series properties of earnings (15/144: 10.4%) and earnings smoothing (7/144: 4.9%) are used much less frequently.

Studies that analyze various earnings-quality dimensions in separate models

This second group includes those studies (107/472: 22.7%) that analyzed two or more earnings-quality dimensions in separate models, but without analyzing the possible inter-relationships among those dimensions. Earnings management is again the most pervasive dimension (61/107: 57.0%), followed by conditional conservatism (46/107: 43.0%). Analyzing the combination of dimensions, the most common pairings were earnings management and earnings smoothing (29/107: 27.1%), earnings management and time-series properties of earnings (27/107: 25.2%), and earnings management and conditional conservatism (25/107: 23.4%). Unconditional conservatism was not often analyzed (29/107: 27.1%), and when it was, it tended to be paired with conditional conservatism (24/29: 82.8%). Finally, there is scant evidence of unconditional conservatism being analyzed in conjunction with any of the other properties.

Statistical problems associated with unidimensional studies of earnings quality

The two previous sections reviewed the vast literature on earnings quality representing that construct by a single proxy or various proxies in independent models –by far the most common approach in empirical earnings-quality research.

This section focuses on statistical problems that can arise when a multidimensional construct such as earnings quality is measured using only one of its dimensions. These problems are analyzed in two potential situations, following Dechow et al. (2010): (1) When earnings quality is an explanatory variable (i.e., analyses of the consequences of earnings quality), and (2) when earnings quality is the explained variable (i.e., studies on the determinants of earnings quality).

Earnings quality as the explanatory variable.

To demonstrate these statistical problems, consider a parsimonious model in which the construct earnings quality (*EQ*) is formed by two observable dimensions (EQ_1 and EQ_2):

$$\mathrm{EQ} = \alpha_0 + \alpha_1 \bullet \mathrm{EQ}_1 + \alpha_2 \bullet \mathrm{EQ}_2 + \varepsilon_1 \quad (1)$$

Assuming that a researcher wants to estimate the influence of earnings quality on some given dependent variable Y, the real relationship between them can be expressed in the following equation:

$$Y = \beta_0 + \beta_1 \bullet EQ + \varepsilon_2 \quad (2)$$

As *EQ* is not observable, the researcher estimates the relationship between dependent variable *Y* and one observable dimension (e.g., EQ_1). As demonstrated in Appendix

[11] We included in this group those one-property studies that meet one of the following two conditions:
The title or the keywords of the paper include the expression "earnings quality" or similar (such as "financial reporting quality" or "accounting quality").
The authors declare explicitly in the text that they are studying or measuring earnings quality (or similar) or that their results lead to conclusions for earnings quality (or similar).

Table 1
NUMBER OF PAPERS ACCORDING TO THE MULTIDIMENSIONAL APPROACH OF EACH CATEGORY (NOTE: A single paper may be classified in more than one category, as it may measure more than one earnings dimension).

	Single-dimensional studies								Multi-dimensional studies						
	One dimension		Various dimensions separate (107)						Inter-relationships among the properties (19)						Composite measures (indices) (12)
	Total (334)	EQ studies (144)	EM (61)	S (35)	T-S (36)	CC (46)	UC (29)	Total papers separate (107)	EM (16)	S (5)	T-S (10)	CC (6)	UC (7)	Total papers correlations (19)	
Earnings management (350)	235	100		29	27	25	6	61		4	9	4	4	16	12
Smoothing (67)	13	7	29		15	10	5	35	4		2	1	1	5	11
Time-series properties of earnings (79)	23	15	27	15		9	3	36	9	2		3	3	10	3
Conditional conservatism (109)	49	22	25	10	9		24	46	4	1	3		0	6	2
Unconditional conservatism (50)	14	0	6	5	3	24		29	4	1	3	0		7	0

Table 1 summarizes the number of papers in which each of the proxies of earnings quality has been analyzed. Information is divided into three columns: (1) *Accounting properties of earnings* Earnings management (EM), smoothing (S), time-series properties of earnings (T-S), conditional conservatism (CC), and unconditional conservatism (UC); (2) *Single-dimension studies* that consider the properties of accounting information/categories of earnings quality separately. This column is divided into two columns: (i) One dimension studies, in which only one dimension of earnings quality is analyzed, with a single proxy or several proxies for that dimension; for these studies, we indicate the total number of papers that study each dimension as well as the number of papers measuring that dimension and claiming that they are studying earnings quality; (ii) Various dimension studies that analyze various proxies representing different dimensions of earnings quality in separate regressions. (3) *Multi-dimension studies* that consider different properties/categories in the same analysis. This column is divided into two columns: (i) Inter-relationships among the dimensions studies in which one of the dimensions is considered an explanatory variable and another is considered an explained variable; (ii) Composite measures (indices) studies that form a composite measure (index) of earnings quality such as the aggregation of rankings of several properties of accounting information.
NOTE: For each column and for the different accounting properties of accounting information in Column 1, the total number of papers in the category is indicated between brackets.
Time-series properties of earnings includes the analysis of either persistence, predictive ability of earnings (predictability) or variance of earnings

A, by substituting the multidimensional construct *EQ* by one of its components, the researcher incurs an error-in-variables problem, resulting in a biased estimation of the relationship between *EQ* and *Y* (β_1). This bias (θ_1) would be:

$$\theta_1 = \beta_1 \bullet \left[\alpha_1 + \alpha_2 \bullet \frac{\text{Cov}(\text{EQ}_1,\text{EQ}_2)}{\text{Var}(\text{EQ}_1)} - 1\right] \tag{3}$$

The bias size will depend on the value of the relationship between *EQ* and Y (β_1), the relationship between *EQ* and EQ_1 (α_1), and the product of the relationship between *EQ* and EQ_2 (α_2), with the regression coefficient of EQ_2 on EQ_1. As shown in Appendix A, this bias will equal 0 only under highly restrictive conditions.

Alternatively, the researcher's interest may be in estimating the influence on *Y* of the specific component EQ_1, and not the influence of *EQ*. In this case, the estimated coefficient can also be biased because of the omission of the other components of *EQ*, which depends on the correlation between EQ_1 and the other components of *EQ*, as shown in Appendix A.

Earnings management as an explained variable.

In this case, assume that the researcher is interested in estimating the influence of a given variable X on earnings quality *EQ*:

$$\text{EQ} = \gamma_0 + \gamma_1 \bullet X + \varepsilon_4. \tag{4}$$

In Appendix A, it is demonstrated that, if the researcher tries to estimate the influence of *X* on *EQ* (γ_1) through the influence of X on the component EQ_1, the result would be a biased estimate, which can be represented as:

$$\theta_3 = \left(\frac{1}{\alpha_1} - 1\right) \bullet \gamma_1 - \frac{\alpha_2}{\alpha_1} \bullet \frac{\text{Cov}(\text{EQ}_2,X)}{\text{Var}(X)}. \tag{5}$$

As shown in Appendix A, this bias will equal 0 only under highly restrictive conditions.

In summary, the replacement of composite construct *EQ* by one of its components will likely produce biased estimates when earnings quality is an explanatory variable and when it is the explained variable.

Multidimensional approach

A paper can be classified as having a multidimensional approach if the researcher analyzed the relationship among various earnings-quality dimensions or synthetized a composite measure of earnings quality using empirical proxies from various dimensions.

Papers that study the empirical relationships among earnings-quality dimensions

Of the 472 papers that study accounting properties, only 19 (4%) examined the relationships among different measures of earnings quality. Within these papers, 17 (3.6%), listed in Table 2, examined the relationships among the different earnings dimensions and 2 (0.04%) analyzed the correlation between accounting properties measures and market reaction measures. Although the empirical research has found non-zero correlations among these earnings quality metrics, results are mixed.

Earnings-management–Time-series properties of earnings relationship.

Panel A, Table 2 presents the six papers from the sample in which researchers studied the relationship between earnings management and time-series properties of earnings. Most of them contend that, by managing earnings, managers decrease the predictive ability of earnings because they add noise to the reported earnings, thereby worsening the ability of current earnings to predict future earnings (Chang, Suh, Werner, & Zhou, 2012; Dechow & Dichev, 2002; Huang, Teoh, & Zhang, 2014) and other future events such as bankruptcy (Beaver, Correia, & McNichols, 2012). Their results corroborate this expectation, showing a negative relationship between earnings management and the predictive ability of earnings reflected by time-series properties of earnings.

In contrast, other authors consider that the correlation between these two dimensions could be positive, because managers can use their discretion to reveal relevant information that would make earnings more persistent. These authors argue that utilizing stricter accounting that limits earnings management would also reduce managers' capability to reveal their predictions about the firms' future economic performance in financial statements (Barth, Landsman, & Lang, 2008; Ewert & Wagenhofer, 2005; Perotti & Wagenhofer,

Table 2
PAPERS EMPIRICALLY ANALYZING THE CORRELATIONS BETWEEN EARNINGS-QUALITY MEASURES

Author	*Explained variable*	*Explanatory variable*	*Relationship*	*Theoretical justification*
PANEL A: EARNINGS MANAGEMENT AND TIME-SERIES PROPERTIES OF EARNINGS				
Dechow and Dichev (2002)	Time-series properties	Earnings management	Negative	A high level of accruals implies that earnings better reflect underlying cash flows. This benefit comes at the cost of incurring estimation errors, however.
Yeo et al. (2002)	Earnings management	Time-series properties	Positive	Managers in their choice of accepted accounting procedures reflect accounting numbers for personal benefit, influencing the informativeness of earnings with apparent, more persistent earnings.
Dechow et al. (2010)	Earnings management/ Time-series properties	Earnings management/ Time-series properties	Negative	Not provided.
Wang et al. (2011)	Time-series properties	Earnings management	Positive	Managers engaged in empire building avoid attracting attention to low-growth segments, making earnings artificially less volatile.
Chang et al. (2012)	Time-series properties	Earnings management	Negative	If managers decrease discretionary reporting of reliable information, information asymmetry between management and investors will increase, lowering predictability of earnings.
Huang et al. (2014)	Time-series properties	Earnings management	Negative	Firms with lower earnings have less readable annual reports, and readability increases with earnings persistence. Managers report tone strategically, trying to lower persistence of earnings.
PANEL B: EARNINGS MANAGEMENT AND SMOOTHING				
Dechow et al. (2010)	Earnings management/ Smoothing	Earnings management/ Smoothing	Positive	Not provided.
Guan and Pourjalali (2010)	Earnings management	Smoothing	Positive	The higher the earnings smoothing, which is strongly influenced by the culture of a country, the higher the expected extent of earnings management.
Boterenbrood (2014)	Smoothing	Earnings management	Positive	Managers manipulate earnings so as to smooth reported earnings because of contracting incentives.
PANEL C: EARNINGS MANAGEMENT AND CONSERVATISM				
García Lara et al. (2005)	Earnings management	Unconditional conservatism	Positive	When managers have incentives to reduce or delay the recognition of earnings, they take additional income-decreasing measures beyond investor protection objectives (unconditional conservatism). This increases reflected discretionary accruals.
Pae (2007)	Conditional conservatism	Earnings management	Positive	Managers have incentives to expedite the recognition of bad news (increasing earnings management) to lower litigation risk.
Ashbaugh et al. (2008)	Earnings management	Conditional conservatism	Negative	By requiring that only verifiable information is reported in accounting, conservatism improves accruals quality, reducing earnings management.
Dechow et al. (2010)	Earnings management/ Conditional conservatism	Earnings management/ Conditional conservatism	Negative	Not provided.
Houmes and Skantz (2010)	Earnings management	Conditional conservatism	Positive	Highly valued firms are more likely than others to report low future stock returns, to have incentives to recognize negative accruals, and to report bad news and reduce litigation risk.
Jackson and Liu (2010)	Earnings management	Unconditional conservatism	Positive	Income-increasing bad-debt expense (earnings management) is more readily recorded when the allowance is conservative because more previously recorded over-accruals of bad debt expense have accumulated on the balance sheet.
PANEL D: TIME-SERIES PROPERTIES OF EARNINGS AND SMOOTHING				
Tucker and Zarowin (2006)	Time-series properties	Smoothing	Positive	If earnings are more smoothed and maintained in time, earnings will be more predictable and useful for investors.
Dechow et al. (2010)	Time-series properties / Smoothing	Time-series properties/ Smoothing	Negative	Not provided.
PANEL E: TIME-SERIES PROPERTIES OF EARNINGS AND CONSERVATISM				
Bandyopadhyay et al. (2010)	Time-series properties	Unconditional conservatism	Mixed	Increasing conservatism over time has led to an increase in the ability of current earnings to predict future cash-flows, but to a decrease in its ability to predict future earnings
Dechow et al. (2010)	Time-series properties/ Conditional conservatism	Time-series properties / Conditional conservatism	Positive	Not provided.
Chen et al. (2014)	Time-series properties	Conditional and unconditional conservatism	Negative for conditional conservatism; positive for unconditional conservatism	Conditional conservatism decreases persistence during bad- news periods and increases persistence during good news periods. Unconditional conservatism is expected to increase earnings persistence because it is continually implemented.
PANEL F: SMOOTHING AND CONSERVATISM				
Gassen et al. (2006)	Conditional and unconditional conservatism	Smoothing	Negative	The correlation between income smoothing and conditional conservatism depends on the difference between the variance-increasing effect of timelier loss recognition and the variance-decreasing effect of less timely gains recognition.
Dechow et al. (2010)	Smoothing/ Conditional conservatism	Smoothing/ Conditional conservatism	Positive	Not provided.

Table 2 summarizes articles that empirically analyze the correlations between pairs of earnings-quality dimensions, analyzing the significance of the coefficient in a regression in which one of the properties is the explanatory variable and another property is the explained variable.
NOTE: Time-series properties of earnings includes the analysis of either persistence, predictive ability of earnings (predictability) or variance of earnings.

2014), thereby reducing the predictive ability of earnings (Ashbaugh-Skaife & Pincus, 2001; Schipper & Vincent, 2003). Consistent with this idea, some empirical evidence shows that managers improve earnings informativeness through accounting decisions, making them more predictable (Wang, Ettredge, Huang, & Sun, 2011; Yeo, Tan, Ho, & Chen, 2002).

Earnings management – Smoothing.

Panel B of Table 2 reports the three reviewed papers that empirically tested the correlation between earnings management and smoothing. It can be argued theoretically that lower-earnings variability can be due to a regular performance of the firm or artificially achieved through earnings manipulation (Schipper & Vincent, 2003; Wilson, 2011). In this regard, empirical evidence has primarily analyzed the influence of earnings management on earnings smoothing, showing that managers deliberately manipulate earnings to smooth earnings (Boterenbrood, 2014; Guan & Pourjalali, 2010; Yeo et al., 2002). Empirical evidence is consistent with this expectation, as the three reviewed papers found a positive relationship between earnings management and income smoothing. In summary, both theory and empirical evidence support the existence of a positive correlation between earnings management and smoothing, although this evidence is based on the idea that managers manipulate earnings with the aim of smoothing earnings.

Earnings management – Conservatism.

The expected relationship between earnings management and conservatism depends on the type of conservatism considered. Conditional conservatism is expected to reduce income, thereby increasing earnings management, because it delays the recognition of good news and encourages timely recognition of bad news (Ball, Kothari, & Ashok, 2000; Ball & Shivakumar, 2005; García Lara, García Osma, & Penalva, 2009; Mora & Walker, 2015) Although it could be argued that conditional conservatism could facilitate big-bath earnings management (Mora & Walker, 2015; Ruch & Taylor, 2015), no empirical studies support this possibility.

As expected, various empirical studies show a negative influence of conditional conservatism on earnings management (Ashbaugh-Skaife, Collins, Kinney, & LaFond, 2008; Dechow et al., 2010). Yet Pae (2007) and Houmes and Skantz (2010) found a positive relationship between conditional conservatism and discretionary accruals, indicating that managers may use their discretion to expedite the recognition of bad news, thereby producing a positive correlation between earnings management and conditional conservatism.

Unconditional conservatism, on the other hand, is expected to increase opportunities for earnings management (Ruch & Taylor, 2015) because it creates hidden reserves that can be used to increase earnings when conservatism is reversed (Penman & Zhang, 2002). This relationship between unconditional conservatism and earnings manipulation therefore depends on the firm's possibilities of reversing past unconditional conservatism (Mora & Walker, 2015). Empirical works employing related unconditional conservatism and earnings management proxies have typically found a positive correlation between them (García Lara, García Osma, & Mora, 2005; Jackson & Liu, 2010).

In summary, conditional conservatism is expected to be negatively related to earnings management, although some empirical papers suggest that discretionary accruals and conditional conservatism proxies can be positively related in some cases. Unconditional conservatism, on the other hand, is expected to be positively related to earnings management. Panel C of Table 1 reports the reviewed empirical papers that addressed the relationship between these two dimensions.

Time-series properties of earnings – Smoothing.

Theoretically, these dimensions are expected to be positively linked because a lower variance of earnings would make earnings more predictable (Schipper & Vincent, 2003), a relationship supported by empirical findings, providing evidence that smoothed earnings maintained for a long time are more predictable and useful for the users of financial information than non-smoothed earnings (Tucker & Zarowin, 2006). Dechow et al. (2010) reported a negative correlation between earnings smoothing and earnings persistence, however, but provided no theoretical explanation. Panel D, Table 2 reports the studies that have analyzed this relationship empirically.

Time-series properties of earnings – Conservatism.

The relationship between conservatism and predictability also depends on the type of conservatism. Regarding conditional conservatism, Basu (1997) argued that, as losses must be recognized earlier and more completely than gains, losses can be expected to be less persistent than gains. The relationship between conditional conservatism and predictability would then be asymmetric: Conservatism reduces persistence in the reporting of bad news and increases persistence in the reporting of good news (Chen, Folsom, Paek, & Sami, 2014). The main effect of conditional conservatism on persistence, therefore, would be an empirical issue. Unconditional conservatism, on the other hand, can increase earnings persistence because it is continually implemented, and can makes its recognition more predictable and correlated through time (Chen et al., 2014).

Panel E, Table 2 lists the papers reporting a relationship between conservatism and time-series properties of earnings. The empirical results are mixed: Whereas Chen et al. (2014) found that conditional conservatism reduces persistence, Dechow et al. (2010) observed a positive correlation between the measures of these two groups. Regarding unconditional conservatism, empirical results generally support its relationship to increased predictability, but with some caveats. Thus, Chen et al. (2014) evidenced that unconditional conservatism increases earnings persistence. Bandyopadhyay et al. (2010) reported results corroborating the greater ability of unconditional conservatism to forecast future cash flows, but they also showed that unconditional conservatism reduces the ability of current earnings to forecast future earnings.

Smoothing – Conservatism.

Similar to the relationship between smoothing and conditional conservatism, previous literature distinguishes between the effects of conservatism on smoothing in the presence of good versus bad news. Gassen et al. (2006) analyzed the relationships between earnings smoothing and conditional conservatism, and earnings smoothing and unconditional conservatism, and found weak negative correlations of earnings smoothing with the two types of conservatism. Panel F, Table 2 reports the works that have analyzed this relationship.

This review of the works that have analyzed the different inter-relationships among the earnings-quality dimensions reveals some relevant features. (1) Only a few papers have tried to analyze the inter-dependence between the different quality-related earnings measures. (2) Additional research is required for clarifying the contradictory empirical results showing both positive and negative empirical correlations (e.g., between earnings management and earnings quality reflected by time-series properties of earnings, between earnings management and conservatism, and between unconditional conservatism and predictability). (3) Overall, these pa-

pers show that the different earnings-quality measures are intercorrelated. As demonstrated in the previous section, these non-zero correlations cause the models that measure earnings quality using the single-dimension approach to produce biased estimates.

Composite-measure studies

The second group of multi-dimensional approaches has attempted to develop a composite measure of earnings quality that includes two or more earnings properties. Table 3 reports the 12 papers (2.5% of total) that use a composite measure of earnings quality by combining proxies of different properties.

Table 3
PAPERS USING A COMPOSITE MEASURE OF EARNINGS QUALITY

Author	*Group of earnings-quality properties for which a proxy is included in the composite measure*			
	Earnings management	Earnings smoothing	Time-series properties	Conservatism
Bhattacharya et al. (2003)	x	x		x
Biddle and Hilary (2006)	x	x		x
Burgstahler et al. (2006)	x	x		
Doupnik (2008)	x	x	x	
Francis et al. (2008)	x		x	
VanTendeloo and Vanstraelen (2008)	x	x		
Boulton et al. (2011)	x	x		x
Gaio and Raposo (2011)	x	x	x	x
Bhattacharya et al. (2012)	x		x	
Brown et al. (2014)	x	x		x
Healy et al. (2014)	x	x		
Jung et al. (2014)	x		x	

Table 3 summarizes the articles using composites measures of earnings quality: indices composed by rankings of different proxies of earnings properties. It is divided into two columns: (1) Author/s (year) of the article and (2) Earnings properties included in the measure. This column is divided into the four accounting properties of earnings: earnings management, smoothing, time-series properties of earnings, and conservatism.
NOTE: Time-series properties of earnings includes the analysis of either persistence, predictive ability of earnings (predictability) or variance of earnings.

Although they vary on the earnings dimensions included in the analysis or the proxies used to measure earnings properties, they follow the same methodology: The earnings-quality composite measures are multivariable indices of various proxies of earnings properties. These indices are built by aggregating the ranking (usually the decile to which the observation belongs) of each proxy or by applying principal components analysis to the different proxies. The result, then, is a composite variable that attempts to represent the construct of earnings quality.

The main difference among these papers is the composition of the multi-properties measure. Only one of the reviewed papers (Gaio & Raposo, 2011) included proxies from the four groups of earnings properties we define in this paper; five papers included proxies for three of the groups and the remaining six included measures of only two groups. Consistent with the predominance of earnings management in earnings-quality research, measures representing this dimension are included in all these papers. 9 of the 12 papers used earnings smoothing proxies, being the second-most-used dimension in these indices; conservatism and time-series properties of earnings were used in only 5 papers each.

Although these measures do take into account the multidimensional nature of earnings quality, Leuz and Wysocki (2016) argue that they are also under several limitations. (1) The selection of proxies for building the measures is subjective, and some of the earnings-quality dimensions may be not included in the measure. In this sense, as we have previously indicated, only one of the reviewed papers included proxies for the four groups of earnings properties. As the other papers do not include all these properties, they may be affected by the omitted-variables bias previously indicated for the single-dimension-approach studies.

(2) A second limitation is related to the weights assigned to each of the proxies used in building the composite variable. The most common method is to assign equal weights, implicitly assuming that all the variables have equal importance, or to apply principal component analysis. In any case, there is no guarantee that those weights faithfully represent the relative importance of each earnings property on the earnings-quality construct.

(3) These composite measures do not control for correlations among the proxies. Whether the included proxies are complements or substitutes has not been tested, so researchers may be using several proxies that are really representing the same property. Because the expected correlation between these proxies is high, they are likely redundant.

(4) The mere addition of the proxies does not necessarily solve the measurement problems and that there is no evidence for the superiority of these combined measures over single-dimension measures.

These limitations can be complemented with an analytical exploration of the estimation problems that can arise with the use of aggregate indices as composite measures. Using the parsimonious model of earnings quality presented in Appendix A, a composite index can be constructed using the observed values of the two earnings-quality components, and the potential errors that may arise when the construct earnings quality is replaced by that composite index can be analyzed. (See Appendix B.) In summary, as shown in the econometric analysis, the use of indices renders biased estimations of the parameters. Disaggregating the components of the bias in the equations, the problems that arise in the use of these indices are twofold.

(1) Given that the correlation between a variable and its categorized values is expected to be positive, the sign of the coefficient in the empirical model (index measure) will be the same as the sign of the coefficient in the theoretical model (multidimensional earnings-quality measure).

(2) The value of the estimated coefficient in the empirical model will differ from the theoretical model, and this difference is dependent on two factors: (a) the correlations

between the theoretical variable of earnings quality and the categorized index variables, and (b) the variances of the variables included in the index.

According to the equations, the correlations depend on such aspects of the internal structure of earnings quality as the coefficients of the different properties that form the index and the correlation among them. Then, even with standardized variables, the second factor could be mitigated, but not the first.

In Appendix B, to gain a better understanding of these problems, a simulation procedure was run, in which two variables were randomly generated. An explanatory variable was formed by the average of these random variables and an index with the rank by deciles of these random variables was generated. Finally, the explained variable was generated and the coefficients of the theoretical regression model between the explained variable and the explanatory variable was analyzed and compared with the coefficients when the explanatory variable was the index. The sign of the coefficient did not change. According to econometrics, however, the size of the coefficient of the ranking variable is always smaller. Moreover, as shown by econometric analysis, simulation shows that the difference between coefficients decreases as the correlation between the variables included in the index increases. Finally, the coefficients are more similar when variables are standardized, indicating that the scale factor is the main driver of the potential bias. In conclusion, standardized indices may be a reasonable method for measuring multidimensional earnings quality. Standardized coefficients cannot eliminate the persistent bias, however, due to the correlation factor.

Conclusions and suggestions for future research

The earnings literature broadly accepts the multidimensionality of earnings quality is a multidimensional concept, as there are various useful earnings properties for improving decision-making. This paper reviewed the empirical research on earnings quality. Following Dechow et al. (2010), a differentiation was made between proxies representing various accounting properties related to earnings quality (accounting properties of earnings) versus other proxies based on the evaluation of earnings quality by external parties (market reactions and other measures). Focusing on the first group, the different empirical proxies were categorized into four groups, representing different facets of earnings quality: earnings management, earnings smoothing, time-series properties of earnings and conservatism.

Despite the theoretical consensus on the multidimensionality of earnings quality, empirical research has widely adopted a unidimensional approach: More than 90% of the reviewed papers analyzed just one of the four facets of earnings quality, or analyzed various of those dimensions, but separately. It was demonstrated analytically that measuring a multidimensional construct using just one of its dimensions is likely to render biased estimates of the relationships between the underlying multidimensional construct and its determinants or consequences.

Additionally, this review showed that the research on earnings quality is heavily oriented toward earnings management and, to a lesser extent, to conservatism. Research on earnings smoothing and time-series properties of earnings is much less prevalent. This focus of accounting research on earnings management and conservatism as indicators of earnings quality contrasts with the opinions of financial analysts or Chief Financial Officers, who consider that other characteristics such as sustainability or the relationship with current cash-flows are more relevant for assessing earnings quality (Brown, Call, Clement, & Sharp, 2015; Dichev, Graham, Harvey, & Rajgopal, 2013).

Only 31 papers were found that adopted a multidimensional approach in earnings-quality empirical research; 17 papers analyzed inter-relationships among the different earnings dimensions, and 2 analyzed inter-relationships among the properties and market reactions. The few papers that investigated these relationships and the mixed results they reported strongly suggest the need for additional research. The remaining 12 papers developed a composite measure of earnings quality – largely composite indices formed by the aggregation of the ranks of different proxies of earnings properties. This solution has a number of limitations, however, including the absence of some earnings-quality dimensions in most of these papers, the subjective selection of the proxies and their weights, and lack of control over the correlations among the proxies.

In summary, there is a gap between the theoretical concept of earnings quality (a multidimensional construct) and the empirical literature aimed at measuring it. To close this gap, empirical researchers should adopt multidimensional earnings-quality measures, accounting for the correlations among its dimensions and assigning optimal weights for all the empirical proxies.

A possible limitation of our research is the selection criterion for the articles to be included in or sample. In order to limit the scope of our study we selected only those accounting journals included in the Journal of Citation Reports (JCR), due to the higher impact these journals have for the scientific community. However, we are aware that other journals that are not included in the JCR also publish accounting research papers and, specifically, on earnings quality. We do not expect, however, that the inclusion of these papers would change the overall conclusions of the paper. Similarly, also because of limitation of the scope, we have analyzed a period of 15 years, beginning from year 2000 (for most referent articles reviewing several aspects of earnings quality or developing models to proxy for the different desirable earnings characteristics were published in the late nineties). Future research could extend the period to analyze if the trend in earnings quality measurement remains for recent years.

Another potential research path is the application of more sophisticated statistical methods that allow the development of multidimensional measures of earnings quality, such as structural equation modelling (Leuz & Wysocki, 2016). In this sense, some recent papers (Ferrer, Callao, Jarne, & Lainez, 2016; Hinson & Utke, 2018) have started to apply this technique to the measurement of earnings quality. Structural Equation Modelling (SEM) works with a multivariate analysis, simultaneously examining several hypothesized relationships among one or more independent and dependent variables (Tabachnick & Fidell, 2007). Given that earnings quality is an unobservable concept, this technique is suitable for its measurement, because it analyzes the relationships between directly observable and/or non-directly observable variables, while incorporating potential measurement errors (Lee, Petter, Fayard, & Robinson, 2011). Moreover, earnings quality has been measured with multiple proxies, most of which correlated with each other. The omission of correlated variables leads to biases in the estimation but, if variables are correlated and measure the same concept, their inclusion causes multicollinearity problems. For that reason, SEM is more appropriate than OLS technique for earnings-quality

measurement, given that it allows for the inclusion of as many indicators as needed to explain unobservable concepts, even if these indicators are inter-correlated (Reinartz, Haenlein, & Henseler, 2009) – thereby solving the multicollinearity problem. Furthermore, the estimation of SEM models explicitly incorporates the correlation between variables for the mathematical calculation (Wold, 1980), thereby solving the problem of ignoring the correlation between the earnings-quality dimensions. Thus, researchers are to include all of the qualitative characteristics of earnings, and SEM allows for such incorporation also explicitly considering their correlations as opposed to traditional techniques, which were not suitable for modelling correlation between characteristics. Finally, regarding the optimal weights in composite measures of earnings quality, SEM may solve this problem because it offers optimal weights for all the indicators, assigning greater weights for proxies that better explain the variable (Ullman, 2006).

Additionally, another possible research line could be the analysis of whether the different dimensions of earnings quality are correctly measured by the different empirical proxies. Prior literature highlights estimation problems for each proxy individually considered (Leuz & Wysocki, 2016). Moreover, it is not clear whether earnings-quality proxies are measuring the same or different concepts (Ewert & Wagenhofer, 2011). In this regard, SEM enables a systematic analysis of the validity of measurement of each variable through its different proxies (Gefen, Straub, & Boudreau, 2000).

Appendix A: Statistical problems derived from analysis of unidimensional models of earnings quality

To analyze the problems that can arise when the multidimensional concept of earnings quality is measured using single-property measures, a parsimonious model in which earnings quality depends linearly on two characteristic can be defined, as indicated in expression (A.1):

$$\mathrm{EQ} = \alpha_0 + \alpha_1 \bullet \mathrm{EQ}_1 + \alpha_2 \bullet \mathrm{EQ}_2 + \varepsilon_1, \tag{A.1}$$

Where EQ is earnings quality, EQ_1 and EQ_2 are the two properties that define it, and ϵ_1 is the error term. It is assumed that EQ_1 and EQ_2 are directly observable, but not the composite measure EQ, are directly observable.

Following Dechow et al. (2010), the potential problems of using single-property proxies of earnings quality are analyzed when earnings quality is an explanatory variable (consequences of earnings quality) and when it is the explained variable (determinants of earnings quality).

Earnings quality as the explanatory variable

Assume a linear relationship between any given variable Y and earnings quality (EQ), as indicated in equation (A.2):

$$Y = \beta_0 + \beta_1 \bullet EQ + \varepsilon_2. \tag{A.2}$$

Substituting (A.1) in (A.2), provides the relationship between the dependent variable Y and the two earnings-quality characteristics:

$$\begin{gathered} Y = \beta_0 + \beta_1 \bullet (\alpha_0 + \alpha_1 \bullet \mathrm{EQ}_1 + \alpha_2 \bullet \mathrm{EQ}_2 + \varepsilon_1) \\ +\varepsilon_2 = (\beta_0 + \beta_1 \bullet \alpha_0) + (\beta_1 \bullet \alpha_1) \bullet \mathrm{EQ}_1 + (\beta_1 \bullet \alpha_2) \\ \bullet \mathrm{EQ}_2 + (\beta_1 \bullet \varepsilon_1 + \varepsilon_2). \end{gathered} \tag{A.3}$$

Consider that EQ is not observable, so an empirical researcher must try to capture the relationship between Y and EQ by analyzing the relationship between Y and one of the two components of EQ (for instance, EQ_1). The empirical model to be tested would then be:

$$Y = b_0 + b_1 \bullet \mathrm{EQ}_1 + \varepsilon_3. \tag{A.4}$$

The probability limit of coefficient b_1 would be

$$\operatorname{plim} b_1 = \frac{\mathrm{Cov}(Y, \mathrm{EQ}_1)}{\mathrm{Var}(\mathrm{EQ}_1)}, \tag{A.5}$$

where $Cov(.)$ and $Var(.)$ are the covariance and variance operators, respectively. Substituting Y by its value according to equation (A.3) and operating

$$\begin{gathered} \operatorname{plim} b_1 \\ = \frac{\mathrm{Cov}[(\beta_0+\beta_1\bullet\alpha_0)+(\beta_1\bullet\alpha_1)\bullet\mathrm{EQ}_1+(\beta_1\bullet\alpha_2)\bullet\mathrm{EQ}_2+(\beta_1\bullet\varepsilon_1+\varepsilon_2),\mathrm{EQ}_1]}{\mathrm{Var}(\mathrm{EQ}_1)} \\ = (\beta_1 \bullet \alpha_1) + (\beta_1 \bullet \alpha_2) \bullet \frac{\mathrm{Cov}(\mathrm{EQ}_1, \mathrm{EQ}_2)}{\mathrm{Var}(\mathrm{EQ}_1)}. \end{gathered} \tag{A.6}$$

By replacing EQ by EQ_1, therefore, the researcher incurs an error-in-variables problem, and the estimated coefficient b_1 measures the relationship between the dependent variable Y and EQ (β_1) with a bias. The value of this bias would be

$$\begin{gathered} \operatorname{plim} b_1 = (\beta_1 \bullet \alpha_1) + (\beta_1 \bullet \alpha_2) \bullet \frac{\mathrm{Cov}(\mathrm{EQ}_1, \mathrm{EQ}_2)}{\mathrm{Var}(\mathrm{EQ}_1)} \\ = \beta_1 \bullet \left[\alpha_1 + \alpha_2 \bullet \frac{\mathrm{Cov}(\mathrm{EQ}_1, \mathrm{EQ}_2)}{\mathrm{Var}(\mathrm{EQ}_1)}\right] = \\ \beta_1 + \beta_1 \bullet \left[\alpha_1 + \alpha_2 \bullet \frac{\mathrm{Cov}(\mathrm{EQ}_1, \mathrm{EQ}_2)}{\mathrm{Var}(\mathrm{EQ}_1)} - 1\right] = \\ \beta_1 + \theta_1. \end{gathered} \tag{A.7}$$

Bias θ_1 depends on the value of coefficients β_1, α_1, and α_2 and the value of the regression coefficient of EQ_2 on EQ_1. This bias would be equal to 0 (and the estimated coefficient b_1 would therefore capture the true relationship between EQ and Y) if one of two conditions is met.

(1) α_2=0 and α_1=1. In this case, EQ would be exactly equal to EQ_1, eliminating any error-in-variables problem, although earnings quality would not be multidimensional.

(2) $\frac{\mathrm{Cov}(\mathrm{EQ}_1, \mathrm{EQ}_2)}{\mathrm{Var}(\mathrm{EQ}_1)} = \frac{1-\alpha_1}{\alpha_2}$. As far as can be determined, there is no a priori reason for this equality to be fulfilled.

In summary, except under extremely restrictive conditions, the empirically estimated coefficient b_1 will measure the relationship between earnings quality and the dependent variable with error.

It is possible, however, that the aim of the researcher is not to measure the influence of earnings quality on the dependent variable Y (β_1), but the influence of that specific earnings-quality component on that variable. According to equation (A.3), that influence would be $\beta_1 \bullet \alpha_1$. In this case, the empirical coefficient b_1 also captures the relationship between Y and EQ_1 with a bias:

$$\begin{gathered}\text{plim } b_1 = \\ (\beta_1 \bullet \alpha_1) + (\beta_1 \bullet \alpha_2) \bullet \frac{\text{Cov}(\text{EQ}_1, \text{EQ}_2)}{\text{Var}(\text{EQ}_1)} = \\ (\beta_1 \bullet \alpha_1) + \theta_2.\end{gathered} \tag{A.8}$$

θ_2 is an omitted variables bias, and it depends on the influence of the second component EQ_2 on the dependent variable Y, and on the relationship between the two earnings-quality components. For θ_2 to be equal to 0, one of the two following conditions must be met:

(1) α_2=0: no relationship between EQ_2 and Y.

(2) $\text{Cov}(\text{EQ}_1, \text{EQ}_2) = 0$: EQ_1 and EQ_2 are independent. This condition, however, is not likely to be met because, as documented in the previous section, the extant literature has widely demonstrated the existence of non-zero correlations among the different components of earnings quality.

Earnings quality as the explained variable

8 Assume that earnings quality (EQ) is determined by a given variable X, as shown in equation (A.9):

$$\text{EQ} = \gamma_0 + \gamma_1 \bullet X + \varepsilon_4. \tag{A.9}$$

Also assume that EQ is replaced by the component EQ_1 in the empirical model, which would then be:

$$\text{EQ}_1 = c_0 + c_1 \bullet X + \varepsilon_5. \tag{A.10}$$

The empirically estimated coefficient c_1 would converge in probability to:

$$\text{plim } c_1 = \frac{\text{Cov}(\text{EQ}_1, X)}{\text{Var}(X)}. \tag{A.11}$$

From equation (A.1), EQ_1 can be expressed as a function of EQ and EQ_2 as

$$\text{EQ}_1 = \frac{EQ - \alpha_0 - \alpha_2 \bullet \text{EQ}_2 - \varepsilon_1}{\alpha_1}. \tag{A.12}$$

Substituting (A.12) in (A.11) and operating, obtains:

$$\begin{gathered}\text{plim } c_1 = \\ \frac{1}{\alpha_1} \bullet \frac{\text{Cov}(\text{EQ}, X)}{\text{Var}(X)} - \frac{\alpha_2}{\alpha_1} \bullet \frac{\text{Cov}(\text{EQ}_2, X)}{\text{Var}(X)} = \\ \frac{1}{\alpha_1} \bullet \gamma_1 - \frac{\alpha_2}{\alpha_1} \bullet \frac{\text{Cov}(\text{EQ}_2, X)}{\text{Var}(X)}.\end{gathered} \tag{A.13}$$

The estimated coefficient c_1 captures the relationship between earnings quality and the explanatory variable X with a bias, expressed as

$$\begin{gathered}\text{plim } c_1 = \\ \gamma_1 + \left(\frac{1}{\alpha_1} - 1\right) \bullet \gamma_1 - \frac{\alpha_2}{\alpha_1} \bullet \frac{\text{Cov}(\text{EQ}_2, X)}{\text{Var}(X)} \\ = \gamma_1 + \theta_3.\end{gathered} \tag{A.14}$$

For the bias θ_3 to be 0, the following condition must be met:

$$\frac{\text{Cov}(\text{EQ}_2, X)}{\text{Var}(X)} = \frac{1 - \alpha_1}{\alpha_2} \bullet \gamma_1$$

There appears to be no a priori reason for that condition to be met. In conclusion, the replacement of the composite concept EQ by one of its components implies that the estimated coefficient c_1 will likely capture the influence of X on earnings quality with a bias.

Appendix B: Statistical Problems Derived From Analysis of composite measures of earnings quality

Now, consider that the researcher measures EQ by a composite index composed by the addition of the percentile ranking of the observed values of EQ_1 and EQ_2. This model can be expressed as in equation (B.1):

$$\text{EQ\_IND} = \text{RankEQ}_1 + \text{RankEQ}_2, \tag{B.1}$$

where *EQ_IND is* the composite measure of earnings quality, and $RankEQ_1$ and $RankEQ_2$ are the percentile rankings of the two observable characteristics EQ_1 and EQ_2. *EQ_IND* would then measure EQ with an error:

$$\text{EQ}_{\text{IND}} = \text{EQ} + \varepsilon_6. \tag{B.2}$$

Assume that the researcher intends to study the relationship between a variable Y and earnings quality (EQ). The linear relationship between these two variables is indicated in equation (B.3):

$$\text{Y} = \delta_0 + \delta_1 \bullet \text{EQ} + \varepsilon_7. \tag{B.3}$$

The researcher measures EQ with aggregate index *EQ_IND*, so the empirical model that will be tested is

$$\text{Y} = \text{d}_0 + \text{d}_1 \bullet \text{EQ\_IND} + \varepsilon_8. \tag{B.4}$$

The probability limit of d_1 would then be

$$\begin{gathered}\text{plim } \text{d}_1 = \\ \frac{\text{Cov}(\text{Y}, \text{EQ\_IND})}{\text{Var}(\text{EQ\_IND})} = \\ \frac{\text{Cov}\left(\delta_0 + \delta_1 \bullet \text{EQ} + \varepsilon_7, \text{EQ\_IND}\right)}{\text{Var}(\text{EQ\_IND})} = \delta_1 \bullet \frac{\text{Cov}(\text{EQ}, \text{EQ}_{\text{IND}})}{\text{Var}(\text{EQ}_{\text{IND}})}.\end{gathered} \tag{B.5}$$

The estimated coefficient d_1 captures the relationship of the explained variable *Y* and the composite measure of earnings quality *EQ_IND* with a bias:

$$\text{plim } \mathrm{d}_1 = \delta_1 + \delta_1 \bullet \left(\frac{\text{Cov(EQ,EQ\_IND)}}{\text{Var(EQ\_IND)}} - 1 \right) = \delta_1 + \theta_4. \tag{B.6}$$

For bias θ_4 to be 0, one of the two following conditions must be met:

(1) $\delta_1 = 0$ (*EQ* does not explain *Y*), or

(2) the regression coefficient of earnings quality on the empirical index is exactly equal to 1.

Thus, except under extremely restrictive conditions, the replacement of *EQ* by a ranking index implies that the estimated coefficient d_1 will capture the influence of earnings quality on *Y* with a bias.

In order to analyze in greater depth, the formation of $_4$, an equation (B.5) can be expressed as

$$\text{plim } d_1 = \delta_1 \bullet r\,(\text{EQ}, \text{EQ\_IND}) \frac{\text{sd(EQ)}}{\text{sd(EQ\_IND)}}, \tag{B.6}$$

where *r (.)* is the correlation coefficient, and *sd(.)* is the standard deviation operator.

In summary, we can conclude:

(1) Given that the correlation between a variable and its categorized values is expected to be positive, the sign of d_1 will be the same as the sign of δ_1.

(2) The value of the estimated coefficient d_1 will differ from the theoretical coefficient δ_1, and this difference is dependent on two factors: (a) a correlation factor, which is determined by the correlation between the theoretical variable *EQ* and the categorized variable *EQ_IND*; and (b) a scale factor, determined by the ratio of the variances of the two variables.

The correlation factor depends on such aspects of the internal structure of *EQ* as the coefficients of the different properties (α_1 and α_2), the correlation among those properties, or the number of categories generated for *EQ_IND*. On the other hand, the scale factor is influenced not only by those aspects that also affect the correlation among the properties, but also by the standard deviations of earnings properties (EQ_1 and EQ_2).

Given that the scale factor depends on the various deviations of the theoretical variable *EQ* and the empirical variable *EQ_IND*, it could be mitigated by using standardized regression coefficients, a solution that would not affect the correlation factor.

A simulation procedure was used to analyze the effect of the correlation among the earnings properties on θ_4, following five steps:

(1) 100,000 random observations were generated for variables EQ_1 and EQ_2, following a normal distribution. The simulation process was repeated 19 times to check the influence of the correlation between these two variables. The correlation for the first simulation was set at 0.9, and increased in stages by +0.1 for the successive simulations; the correlation for the last simulation was thus +0.9.

(2) *EQ* was computed by the average of the simulated values of EQ_1 and EQ_2 ($\alpha_1 = \alpha_2 = 0{,}5$).

(3) By categorizing EQ_1 and EQ_2 by their deciles, the variables $Rank\_EQ_1$ and $Rank\_EQ_2$ were created. Composite earnings-quality measure *Rank_EQ* was then computed as the average of $Rank\_EQ_1$ and $Rank\_EQ_2$. To avoid the influence of the scale, *Rank_EQ* was standardized.

(4) The explained variable $Y = 0.5 \bullet \text{EQ} + \omega$, was generated, where is a white noise variable.

(5) Finally, the regression coefficient of *Y* on *Rank_EQ* was estimated. The difference between that regression coefficient and the real relationship between *Y* and *EQ* (that is, 0.5) is the bias introduced by the earnings-quality index. To isolate the effect of the correlation factor, the standardized regression coefficients were also computed.

The analysis of the simulation indicates that the empirical coefficient d_1 is always smaller than δ_1. This difference decreases as the correlation between the earnings properties increases. In addition, the relationship between the empirical and the theoretical coefficients is much larger when those coefficients are not standardized, showing that the scale factor is the main driver of the potential bias. Consequently, these indices may be a reasonable method for measuring multidimensional earnings quality, but only if standardized coefficients are considered. In any case, some bias will persist even if the standardized coefficients are used, given that the correlation factor would not be eliminated.

Of the 472 papers that study accounting properties, only 19 (4%) examined the relationships among different measures of earnings quality. Within these papers, 17 (3.6%), listed in Table 2, examined the relationships among the different earnings properties and 2 (.04%) analyzed the correlation between one of the properties and market reaction. Although the empirical research has found non-zero correlations among these properties, the results are mixed.

Conflict of interests

The authors declare no conflict of interests.

References

Ashbaugh-Skaife, H., Collins, D. W., Kinney, W. R. J., & LaFond, R. (2008). The effect of SOX internal control deficiencies and their remediation on accrual quality. The Accounting Review, 83(1), 217–250.

Ashbaugh-Skaife, H., & Pincus, M. (2001). Domestic accounting standards, international accounting standards, and predictability of earnings. Journal of Accounting Research, 39(3), 417–434.

Ball, R., Kothari, S. P., & Ashok, R. (2000). The effect of international institutional factors on properties of accounting earnings. Journal of Accounting & Economics, 29(1), 1–51.

Ball, R., & Shivakumar, L. (2005). Earnings quality in UK private firms: comparative loss recognition timeliness. Journal of Accounting & Economics, 39(1), 83–128.

Bandyopadhyay, S. P., Chen, C., Huang, A. G., & Jha, R. (2010). Accounting Conservatism and the Temporal Trends in Current Earnings' Ability to Predict Future Cash Flows versus Future Earnings: Evidence on the Trade-off between

Relevance and Reliability. Contemporary Accounting Research, 27(2), 413.

Barth, M. E. (2000). Valuation-based accounting research: Implications for financial reporting and opportunities for future research. Accounting and Finance, 40(1), 7–31.

Barth, M. E., Landsman, W. R., & Lang, M. H. (2008). International Accounting Standards and Accounting Quality. Journal of Accounting Research, 46(3), 467–498.

Barth, M. E., Landsman, W. R., Ravel, V., & Wang, S. (2014). Conservatism and the information content of earnings.

Basu, S. (1997). The conservatism principle and the asymmetric timeliness of earnings. Journal of Accounting & Economics, 24(1), 3–37.

Beatty, A., Petacchi, R., & Zhang, H. (2012). Hedge commitments and agency costs of debt: evidence from interest rate protection covenants and accounting conservatism. Review of Accounting Studies, 17, 700–738.

Beaver, W. H., Correia, M., & McNichols, M. F. (2012). Do differences in financial reporting attributes impair the predictive ability of financial ratios for bankruptcy? Review of Accounting Studies, 17(4), 969–1010.

Beaver, W. H., McNichols, M. F., & Nelson, K. K. (2007). An alternative interpretation of the discontinuity in earnings distributions. Review of Accounting Studies, 12(4), 525–556.

Beaver, W. H., & Ryan, S. G. (2000). Biases and lags in book value and their effects on the ability of the book-to-market ratio to predict book return on equity. Journal of Accounting Research, 38(1), 127–148.

Beidleman, C. R. (1973). Income smoothing: The role of management. The Accounting Review, 48(4), 653–667.

Bhattacharya, N., Ecker, F., Olsson, P. M., & Schipper, K. (2012). Direct and mediated associations among earnings quality, information asymmetry, and the cost of equity. The Accounting Review, 87(2), 449–482.

Bhattacharya, U., Daouk, H., & Welker, M. (2003). The world price of earnings opacity. The Accounting Review, 78(3), 641–678.

Biddle, G. C., & Hilary, G. (2006). Accounting Quality and Firm-Level Capital Investment. The Accounting Review, 81(5), 963–982.

Boterenbrood, R. (2014). Income smoothing by Dutch hospitals. Journal of Accounting and Public Policy, 33, 510–524.

Boulton, T. J., Smart, S. B., & Zutter, C. J. (2011). Earnings Quality and International IPO Underpricing. The Accounting Review, 86(2), 483–505.

Brown, L. D., Call, A. C., Clement, M. B., & Sharp, N. Y. (2015). Inside the 'Black Box' of sell-side financial analysts. Journal of Accounting Research, 53(1), 1–47.

Brown, N. C., Pott, C., & Wömpener, A. (2014). The effect of internal control and risk management regulation on earnings quality: Evidence from Germany. Journal of Accounting and Public Policy, 33(1), 1–31.

Burgstahler, D., & Dichev, I. (1997). Earnings management to avoid earnings decreases and losses. Journal of Accounting & Economics, 24(1), 99–126.

Burgstahler, D., Hail, L., & Leuz, C. (2006). The Importance of Reporting Incentives: Earnings Management in European Private and Public Firms. The Accounting Review, 81(5), 983–1016.

Callen, J. L., Segal, D., & Hope, O.-K. (2010). The pricing of conservative accounting and the measurement of conservatism at the firm-year level. Review of Accounting Studies, 15(1), 145–178.

Cano-Rodríguez, M., & Nunez-Nickel, M. (2015). Aggregation bias in estimates of conditional conservatism: Theory and evidence. Journal of Business Finance and Accounting, 42(1–2), 51–78.

Chang, H., Suh, S.-H., Werner, E., & Zhou, J. (2012). The effect of SOX on the predictability of future cash flows in litigious and non-litigious industries. Asia-Pacific Journal of Accounting & Economics, 19(2), 210–226.

Chen, L. H., Folsom, D. M., Paek, W., & Sami, H. (2014). Accounting conservatism, earnings persistence, and pricing multiples on earnings. Accounting Horizons, 28(2), 233–260.

Clubb, C., & Wu, G. (2014). Earnings volatility and earnings prediction: Analysis and UK evidence. Journal of Business Finance & Accounting, 41(1–2), 53–72.

Dechow, P., & Dichev, I. (2002). The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors. The Accounting Review, 77, 35–59.

Dechow, P., & Ge, W. (2006). The persistence of earnings and cash flows and the role of special items: Implications for the accrual anomaly. Review of Accounting Studies, 11(2–3), 253–296.

Dechow, P., Ge, W., & Schrand, C. (2010). Understanding earnings quality: A review of the proxies, their determinants and their consequences. Journal of Accounting & Economics, 50(2/3), 344–401.

Dechow, P., & Schrand, C. (2004). Earnings quality. Research Foundation Publications, 1–152.

Dechow, P., & Skinner, D. J. (2000). Earnings management: Reconciling the views of accounting academics, practitioners, and regulators. Accounting Horizons, 14(2), 235–250.

Dechow, P., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. The Accounting Review, 70(2), 193–225.

Degeorge, F., Patel, J., & Zeckhauser, R. (1999). Earnings management to exceed thresholds. The Journal of Business, 72(1), 1–33.

Demerjian, P., Lewis, M., Lev, B., & McVay, S. (2013). Managerial ability and earnings quality. The Accounting Review, 88(2), 463–498.

Dichev, I., Graham, R., Harvey, C. R., & Rajgopal, S. (2013). Earnings quality: Evidence from the field. Journal of Accounting & Economics, 56(1), 1–33.

Dietrich, J. R., Muller, K. A., & Riedl, E. J. (2007). Asymmetric timeliness tests of accounting conservatism. Review of Accounting Studies, 12(1), 95–124.

Doupnik, T. S. (2008). Influence of Culture on Earnings Management: A Note. Abacus, 44(3), 317–340.

Durtschi, C., & Easton, P. (2009). Earnings Management? Erroneous Inferences Based on Earnings Frequency Distributions. Journal of Accounting Research, 47(5), 1249–1281.

Ewert, R., & Wagenhofer, A. (2005). Economic Effects of Tightening Accounting Standards to Restrict Earnings Management. The Accounting Review, 80(4), 1101–1124.

Ewert, R., & Wagenhofer, A. (2011). Earnings quality metrics and what they measure. University of Graz.

FASB. (1980). Statement of Financial Accounting Concepts. No. 2. Qualitative Characteristics of Accounting Information.

Feltham, G. A., & Ohlson, J. A. (1995). Valuation and clean surplus accounting for operating and financial activities. Contemporary Accounting Research, 11(2), 689.

Ferrer, C., Callao, S., Jarne, I., & Lainez, J. (2016). A Structural Equation Model for Analyzing the Association between some Attributes of Earnings Quality and Value Relevance. Modeling and Simulation in Engineering, Economics and Management, 115, 31–39.

Fields, T. D., Lys, T. Z., & Vincent, L. (2001). Empirical research on accounting choice. Journal of Accounting & Economics, 31(1–3), 255–307.

Francis, J., LaFond, R., Olsson, P. M., & Schipper, K. (2004). Costs of Equity and Earnings Attributes. The Accounting Review, 79(4), 967–1010.

Francis, J., Nanda, D., & Olsson, P. M. (2008). Voluntary disclosure, earnings quality and cost of capital. Journal of Accounting Research, 46(1), 53–99.

Francis, J., Olsson, P. M., & Schipper, K. (2006). Earnings quality. Foundation and Trends in Accounting, 1, 259–340.

Freeman, R. N., Ohlson, J. A., & Penman, S. H. (1982). Book Rate-of-Return and Prediction of Earnings Changes: An Empirical Investigation. Journal of Accounting Research, 20, 639–653.

Gaio, C., & Raposo, C. (2011). Earnings quality and firm valuation: International evidence. Accounting and Finance, 51(2), 467–499.

García Lara, J. M., García Osma, B., & Mora, A. (2005). The Effect of Earnings Management on the Asymmetric Timeliness of Earnings. Journal of Business Finance & Accounting, 32(3/4), 691–726.

García Lara, J. M., García Osma, B., & Penalva, F. (2009). Accounting conservatism and corporate governance. Review of Accounting Studies, 14(1), 161–201.

García Lara, J. M., García Osma, B., & Penalva, F. (2018). Accounting conservatism and the limits to earnings management. Working Paper. https://doi.org/10.1108/20441391211197456

Gassen, J., Uwe Fülbier, R., & Sellhorn, T. (2006). International differences in conditional conservatism - The role of unconditional conservatism and income smoothing. European Accounting Review, 15(4), 527–564.

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural Equation Modeling and Regression : Guidelines for Research Practice. Communications of the Association for Information Systems, 4, 7.

Givoly, D., & Hayn, C. (2000). The changing time-series properties of earnings, cash flows and accruals: Has financial reporting become more conservative? Journal of Accounting & Economics, 29(3), 287–320.

Givoly, D., Hayn, C., & Natarajan, A. (2007). Measuring reporting conservatism. The Accounting Review, 82(1), 65–106.

Guan, L., & Pourjalali, H. (2010). Effect of Cultural Environmental and Accounting Regulation on Earnings Management: A Multiple Year-Country Analysis. Asia-Pacific Journal of Accounting & Economics, 17, 99–127.

Healy, P. M., Serafeim, G., Srinivasan, S., & Yu, G. (2014). Market competition, earnings management, and persistence in accounting profitability around the world. Review of Accounting Studies, 19, 1281–1308.

Healy, P. M., & Wahlen, J. M. (1999). A review of the earnings management literature and its implications for standard setting. Accounting Horizons, 13(4), 365–383.

Hinson, L. A., & Utke, S. (2018). Structural Equation Modeling in Archival Capital Markets Research.

Holthausen, R. W., & Watts, R. L. (2001). The relevance of the value-relevance literature for financial accounting standard setting. Journal of Accounting & Economics, 31(1–3), 3–75.

Houmes, R. E., & Skantz, T. R. (2010). Highly Valued Equity and Discretionary Accruals. Journal of Business Finance & Accounting, 37(1/2), 60–92.

Huang, X., Teoh, S. H., & Zhang, Y. (2014). Tone management. The Accounting Review, 89(3), 1083–1113.

Jackson, S. B. (2008). The effect of firms' depreciation method choice on managers' capital investment decisions. The Accounting Review, 83(2), 351–376.

Jackson, S. B., & Cechinni, M. (2009). Economic consequences of firms' depreciation method choice: evidence from capital investments. Journal of Accounting and Economics, 48(1), 54–68.

Jackson, S. B., & Liu, X. (2010). The Allowance for Uncollectible Accounts, Conservatism, and Earnings Management. Journal of Accounting Research, 48(3), 647–686.

Jones, J. (1991). Earnings Management During Import Relief Investigations. Journal of Accounting Research, 29(2), 193–228.

Jones, K., Krishnan, G., & Melendrez, K. (2008). Do Models of Discretionary Accruals Detect Actual Cases of Fraudulent and Restated Earnings? An Empirical Analysis. Contemporary Accounting Research, 25(2), 499–531.

Jung, B., Lee, W.-J., & Weber, D. P. (2014). Financial reporting quality and labor investment efficiency. Contemporary Accounting Research, 31(4), 1047–1076.

Khan, M., & Watts, R. L. (2009). Estimation and empirical properties of a firm-year-measure of accounting conservatism. Journal of Accounting & Economics, 48, 132–150.

Kothari, S. P., Leone, A. J., & Wasley, C. E. (2005). Performance matched discretionary accrual measures. Journal of Accounting & Economics, 39(1), 163–197.

Lee, L., Petter, S., Fayard, D., & Robinson, S. (2011). On the use of partial least squares path modeling in accounting research. International Journal of Accounting Information Systems, 12(4), 305–328.

Leuz, C., Nanda, D., & Wysocki, P. D. (2003). Earnings management and investor protection: an international comparison. Journal of Financial Economics, 69(3), 505–527.

Leuz, C., & Wysocki, P. D. (2016). The Economics of Disclosure and Financial Reporting Regulation: Evidence and Suggestions for Future Research. Journal of Accounting Research, 54(2), 525–622.

McNichols, M. F. (2002). Discussion of The Quality of Accruals and Earnings: The Role of Accruals Estimation Errors. The Accounting Review, 77(Supplement), 61–69.

Mora, A., & Walker, M. (2015). The Implications of Research on Accounting Conservatism for Accounting Standard Setting. Accounting & Business Research, 45(5), 620–650.

Pae, J. (2007). Unexpected accruals and conditional accounting conservatism. Journal of Business Finance & Accounting, 34(5–6), 681–704.

Patatoukas, P. N., & Thomas, J. (2011). More Evidence of Bias in the Differential Timeliness Measure of Conditional Conservatism. The Accounting Review, 86(5), 1765–1793.

Penman, S. H., & Zhang, X.-J. (2002). Accounting conservatism, the quality of earnings, and stock returns. The Accounting Review, 77(2), 237–264.

Perotti, P., & Wagenhofer, A. (2014). Earnings quality measures and excess returns. Journal of Business Finance & Accounting, 41(5–6), 545–571.

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and variance-based SEM. International Journal of Research in Marketing, 26(4), 332–344.

Roychowdhury, S., & Watts, R. L. (2007). Asymmetric timeliness of earnings, market-to-book and conservatism in financial reporting. Journal of Accounting & Economics, 44(1/2), 2–31.

Ruch, G. W., & Taylor, G. (2015). Accounting conservatism: a review of the literature. Journal of Accounting Literature, 34(1), 17–38.

Schipper, K., & Vincent, L. (2003). Earnings quality. Accounting Horizons, 17, 97–110.

Sloan, R. G. (1996). Do stock prices fully reflect information in accruals and cash flows about future earnings? The Accounting Review, 71, 289–315.

Tabachnick, B. G., & Fidell, L. S. (2007). Using Multivariate Statistics (5th ed.). Boston, United States: Allyn & Bacon / Pearson Education.

Thomas, J., & Zhang, X. (2000). Identifying unexpected accruals: A comparison of current approaches. Journal of Accounting and Public Policy, 19(4,5), 347–376.

Tucker, J. W., & Zarowin, P. (2006). Does Income Smoothing Improve Earnings Informativeness? The Accounting Review, 81(1), 251–270.

Ullman, J. (2006). Structural Equation Modeling : Reviewing the Basics and Moving Forward. Journal of Personality Assessment, 87(1), 35–50.

VanTendeloo, B., & Vanstraelen, A. (2008). Earnings Management and Audit Quality in Europe: Evidence from the Private Client Segment Market. European Accounting Review, 17(3), 447–469.

Wang, Q., Ettredge, M., Huang, Y., & Sun, L. (2011). Strategic revelation of differences in segment earnings growth. Journal of Accounting and Public Policy, 30(4), 383–392.

Watts, R. L. (2003). Conservatism in accounting part I: Explanations and implications. Accounting Horizons, 17(3), 207–221.

Wilson, M. (2011). Earnings management in Australian corporations. Australian Accounting Review, 21(3), 205–221.

Wittenberg-Moerman, R. (2008). The role of information asymmetry and financial reporting quality in debt trading. Journal of Accounting & Economics, 46, 240–260.

Wold, H. (1980). Model Construction and Evaluation When Theoretical Knowledge is scarce. Bureau of Economic Research, 47–74.

Yeo, G. H. H., Tan, P. M. S., Ho, K. W., & Chen, S.-S. (2002). Corporate ownership structure and the informativeness of earnings. Journal of Business Finance & Accounting, 29(7/8), 1023–1046.

Zhang, J. (2008). The contracting benefits of accounting conservatism to lenders and borrowers. Journal of Accounting and Economics, 45(1), 27–54.

Ashbaugh, H., Collins, D. W., Kinney, W. R. J., & LaFond, R. (2008). The effect of SOX internal control deficiencies and their remediation on accrual quality. The Accounting Review, 83(1), 217–250.

Ashbaugh, H., & Pincus, M. (2001). Domestic accounting standards, international accounting standards, and predictability of earnings. Journal of Accounting Research, 39(3), 417–434.

Ball, R., Kothari, S. P., & Ashok, R. (2000). The effect of international institutional factors on properties of accounting earnings. Journal of Accounting & Economics, 29(1), 1–51.

Ball, R., & Shivakumar, L. (2005). Earnings quality in UK private firms: comparative loss recognition timeliness. Journal of Accounting & Economics, 39(1), 83–128.

Bandyopadhyay, S. P., Chen, C., Huang, A. G., & Jha, R. (2010). Accounting Conservatism and the Temporal Trends in Current Earnings' Ability to Predict Future Cash Flows versus Future Earnings: Evidence on the Trade-off between Relevance and Reliability. Contemporary Accounting Research, 27(2), 413.

Barth, M. E. (2000). Valuation-based accounting research: Implications for financial reporting and opportunities for future research. Accounting and Finance, 40(1), 7–31.

Barth, M. E., Landsman, W. R., & Lang, M. H. (2008). International Accounting Standards and Accounting Quality. Journal of Accounting Research, 46(3), 467–498.

Barth, M. E., Landsman, W. R., Ravel, V., & Wang, S. (2014). Conservatism and the information content of earnings.

Basu, S. (1997). The conservatism principle and the asymmetric timeliness of earnings. Journal of Accounting & Economics, 24(1), 3–37.

Beatty, A., Petacchi, R., & Zhang, H. (2012). Hedge commitments and agency costs of debt: evidence from interest rate protection covenants and accounting conservatism. Review of Accounting Studies, 17, 700–738.

Beaver, W. H., Correia, M., & McNichols, M. F. (2012). Do differences in financial reporting attributes impair the predictive ability of financial ratios for bankruptcy? Review of Accounting Studies, 17(4), 969–1010.

Beaver, W. H., McNichols, M. F., & Nelson, K. K. (2007). An alternative interpretation of the discontinuity in earnings distributions. Review of Accounting Studies, 12(4), 525–556.

Beaver, W. H., & Ryan, S. G. (2000). Biases and lags in book value and their effects on the ability of the book-to-market ratio to predict book return on equity. Journal of Accounting Research, 38(1), 127–148.

Beidleman, C. R. (1973). Income smoothing: The role of management. The Accounting Review, 48(4), 653–667.

Bhattacharya, N., Ecker, F., Olsson, P. M., & Schipper, K. (2012). Direct and mediated associations among earnings quality, information asymmetry, and the cost of equity. The Accounting Review, 87(2), 449–482.

Bhattacharya, U., Daouk, H., & Welker, M. (2003). The world price of earnings opacity. The Accounting Review, 78(3), 641–678.

Biddle, G. C., & Hilary, G. (2006). Accounting Quality and Firm-Level Capital Investment. The Accounting Review, 81(5), 963–982.

Boterenbrood, R. (2014). Income smoothing by Dutch hospitals. Journal of Accounting and Public Policy, 33, 510–524.

Boulton, T. J., Smart, S. B., & Zutter, C. J. (2011). Earnings Quality and International IPO Underpricing. The Accounting Review, 86(2), 483–505.

Brown, N. C., Pott, C., & Wömpener, A. (2014). The effect of internal control and risk management regulation on earnings quality: Evidence from Germany. Journal of Accounting and Public Policy, 33(1), 1–31.

Burgstahler, D. C., Hail, L., & Leuz, C. (2006). The Importance of Reporting Incentives: Earnings Management in European Private and Public Firms. The Accounting Review, 81(5), 983–1016.

Burgstahler, D., & Dichev, I. (1997). Earnings management to avoid earnings decreases and losses. Journal of Accounting & Economics, 24(1), 99–126.

Callen, J. L., Segal, D., & Hope, O. K. (2010). The pricing of conservative accounting and the measurement of conservatism at the firm-year level. Review of Accounting Studies, 15(1), 145–178.

Cano-Rodríguez, M., & Nunez-Nickel, M. (2015). Aggregation bias in estimates of conditional conservatism: Theory and evidence. Journal of Business Finance and Accounting, 42(1–2), 51–78. https://doi.org/10.1111/jbfa.12099

Chang, H., Suh, S.-H., Werner, E., & Zhou, J. (2012). The effect of SOX on the predictability of future cash flows in litigious and non-litigious industries. Asia-Pacific Journal of Accounting & Economics, 19(2), 210–226.

Chen, L. H., Folsom, D. M., Paek, W., & Sami, H. (2014).

Accounting conservatism, earnings persistence, and pricing multiples on earnings. Accounting Horizons, 28(2), 233–260.

Clubb, C., & Wu, G. (2014). Earnings volatility and earnings prediction: Analysis and UK evidence. Journal of Business Finance & Accounting, 41(1–2), 53–72.

Dechow, P., & Dichev, I. D. (2002). The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors. The Accounting Review, 77, 35–59.

Dechow, P., & Ge, W. (2006). The persistence of earnings and cash flows and the role of special items: Implications for the accrual anomaly. Review of Accounting Studies, 11(2–3), 253–296.

Dechow, P., Ge, W., & Schrand, C. (2010). Understanding earnings quality: A review of the proxies, their determinants and their consequences. Journal of Accounting & Economics, 50(2/3), 344–401.

Dechow, P., & Skinner, D. J. (2000). Earnings management: Reconciling the views of accounting academics, practitioners, and regulators. Accounting Horizons, 14(2), 235–250.

Dechow, P., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. The Accounting Review, 70(2), 193–225.

Degeorge, F., Patel, J., & Zeckhauser, R. (1999). Earnings management to exceed thresholds. The Journal of Business, 72(1), 1–33.

Demerjian, P., Lewis, M., Lev, B., & McVay, S. (2013). Managerial ability and earnings quality. The Accounting Review, 88(2), 463–498.

Dietrich, J. R., Muller, K. A., & Riedl, E. J. (2007). Asymmetric timeliness tests of accounting conservatism. Review of Accounting Studies, 12(1), 95–124.

Doupnik, T. S. (2008). Influence of Culture on Earnings Management: A Note. Abacus, 44(3), 317–340.

Durtschi, C., & Easton, P. (2009). Earnings Management? Erroneous Inferences Based on Earnings Frequency Distributions. Journal of Accounting Research, 47(5), 1249–1281.

Ewert, R., & Wagenhofer, A. (2005). Economic Effects of Tightening Accounting Standards to Restrict Earnings Management. The Accounting Review, 80(4), 1101–1124.

FASB. (1980). Statement of Financial Accounting Concepts. No. 2. Qualitative Characteristics of Accounting Information.

Feltham, G. A., & Ohlson, J. A. (1995). Valuation and clean surplus accounting for operating and financial activities. Contemporary Accounting Research, 11(2), 689.

Fields, T. D., Lys, T. Z., & Vincent, L. (2001). Empirical research on accounting choice. Journal of Accounting & Economics, 31(1–3), 255–307.

Francis, J., LaFond, R., Olsson, P. M., & Schipper, K. (2004). Costs of Equity and Earnings Attributes. The Accounting Review, 79(4), 967–1010.

Francis, J., Nanda, D., & Olsson, P. (2008). Voluntary disclosure, earnings quality and cost of capital. Journal of Accounting Research, 46(1), 53–99.

Freeman, R. N., Ohlson, J. A., & Penman, S. H. (1982). Book Rate-of-Return and Prediction of Earnings Changes: An Empirical Investigation. Journal of Accounting Research, 20, 639–653.

Gaio, C., & Raposo, C. (2011). Earnings quality and firm valuation: International evidence. Accounting and Finance, 51(2), 467–499.

García Lara, J. M., García Osma, B., & Mora, A. (2005). The Effect of Earnings Management on the Asymmetric Timeliness of Earnings. Journal of Business Finance & Accounting, 32(3/4), 691–726.

García Lara, J. M., García Osma, B., & Penalva, F. (2009). Accounting conservatism and corporate governance. Review of Accounting Studies, 14(1), 161–201.

García Lara, J. M., García Osma, B., & Penalva, F. (2013). Accounting conservatism and the limits to earnings management.

Gassen, J., Uwe Fülbier, R., & Sellhorn, T. (2006). International differences in conditional conservatism - The role of unconditional conservatism and income smoothing. European Accounting Review, 15(4), 527–564.

Givoly, D., & Hayn, C. (2000). The changing time-series properties of earnings, cash flows and accruals: Has financial reporting become more conservative? Journal of Accounting & Economics, 29(3), 287–320.

Givoly, D., Hayn, C., & Natarajan, A. (2007). Measuring reporting conservatism. The Accounting Review, 82(1), 65–106.

Guan, L., & Pourjalali, H. (2010). Effect of Cultural Environmental and Accounting Regulation on Earnings Management: A Multiple Year-Country Analysis. Asia-Pacific Journal of Accounting & Economics, 17, 99–127.

Healy, P. M., Serafeim, G., Srinivasan, S., & Yu, G. (2014). Market competition, earnings management, and persistence in accounting profitability around the world. Review of Accounting Studies, 19, 1281–1308.

Healy, P. M., & Wahlen, J. M. (1999). A review of the earnings management literature and its implications for standard setting. Accounting Horizons, 13(4), 365–383.

Holthausen, R. W., & Watts, R. L. (2001). The relevance of the value-relevance literature for financial accounting standard setting. Journal of Accounting & Economics, 31(1–3), 3–75.

Houmes, R. E., & Skantz, T. R. (2010). Highly Valued Equity and Discretionary Accruals. Journal of Business Finance & Accounting, 37(1/2), 60–92.

Huang, X., Teoh, S. H., & Zhang, Y. (2014). Tone management. The Accounting Review, 89(3), 1083–1113.

Jackson, S. B. (2008). The effect of firms' depreciation method choice on managers' capital investment decisions. The Accounting Review, 83(2), 351–376.

Jackson, S. B., & Cechinni, M. (2009). Economic consequences of firms' depreciation method choice: evidence from capital investments. Journal of Accounting and Economics, 48(1), 54–68.

Jackson, S. B., & Liu, X. (2010). The Allowance for Uncollectible Accounts, Conservatism, and Earnings Management. Journal of Accounting Research, 48(3), 647–686.

Jones, K. L., Krishnan, G. V, & Melendrez, K. D. (2008). Do Models of Discretionary Accruals Detect Actual Cases of Fraudulent and Restated Earnings? An Empirical Analysis. Contemporary Accounting Research, 25(2), 499–531.

Jung, B., Lee, W.-J., & Weber, D. P. (2014). Financial reporting quality and labor investment efficiency. Contemporary Accounting Research, 31(4), 1047–1076.

Khan, M., & Watts, R. L. (2009). Estimation and empirical properties of a firm-year-measure of accounting conservatism. Journal of Accounting & Economics, 48, 132–150.

Kothari, S. P., Leone, A. J., & Wasley, C. E. (2005). Performance matched discretionary accrual measures. Journal of Accounting & Economics, 39(1), 163–197.

Lee, L., Petter, S., Fayard, D., & Robinson, S. (2011). On the use of partial least squares path modeling in accounting research. International Journal of Accounting Information

Systems, 12(4), 305–328.

Leuz, C., Nanda, D., & Wysocki, P. D. (2003). Earnings management and investor protection: an international comparison. Journal of Financial Economics, 69(3), 505–527.

Leuz, C., & Wysocki, P. D. (2016). The Economics of Disclosure and Financial Reporting Regulation: Evidence and Suggestions for Future Research. Journal of Accounting Research, 54(2), 525–622.

Li, Y., Niu, J., Zhang, R., & Largay, J. A. (2011). Earnings Management and the Accrual Anomaly: Evidence from China. Journal of International Financial Management & Accounting, 22(3), 205–245.

Mora, A., & Walker, M. (2015). The Implications of Research on Accounting Conservatism for Accounting Standard Setting. Accounting & Business Research, 45(5), 620–650.

Pae, J. (2007). Unexpected accruals and conditional accounting conservatism. Journal of Business Finance & Accounting, 34(5–6), 681–704.

Patatoukas, P. N., & Thomas, J. K. (2011). More Evidence of Bias in the Differential Timeliness Measure of Conditional Conservatism. The Accounting Review, 86(5), 1765–1793.

Penman, S. H., & Zhang, X.-J. (2002). Accounting conservatism, the quality of earnings, and stock returns. The Accounting Review, 77(2), 237–264.

Perotti, P., & Wagenhofer, A. (2014). Earnings quality measures and excess returns. Journal of Business Finance & Accounting, 41(5–6), 545–571.

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and variance-based SEM. International Journal of Research in Marketing, 26(4), 332–344.

Roychowdhury, S., & Watts, R. L. (2007). Asymmetric timeliness of earnings, market-to-book and conservatism in financial reporting. Journal of Accounting & Economics, 44(1/2), 2–31.

Ruch, G. W., & Taylor, G. (2015). Accounting conservatism: a review of the literature. Journal of Accounting Literature, 34(1), 17–38.

Schipper, K., & Vincent, L. (2003). Earnings quality. Accounting Horizons, 17, 97–110.

Sloan, R. G. (1996). Do stock prices fully reflect information in accruals and cash flows about future earnings? The Accounting Review, 71, 289–315.

Tabachnick, & Fidell. (1996). Using multivariate statistics.

Thomas, J., & Zhang, X. (2000). Identifying unexpected accruals: A comparison of current approaches. Journal of Accounting and Public Policy, 19(4,5), 347–376.

Tucker, J. W., & Zarowin, P. A. (2006). Does Income Smoothing Improve Earnings Informativeness? The Accounting Review, 81(1), 251–270.

Ullman, J. B. (2006). Structural Equation Modeling : Reviewing the Basics and Moving Forward. Journal of Personality Assessment, 87(1), 35–50.

VanTendeloo, B., & Vanstraelen, A. (2008). Earnings Management and Audit Quality in Europe: Evidence from the Private Client Segment Market. European Accounting Review, 17(3), 447–469.

Wang, Q., Ettredge, M., Huang, Y., & Sun, L. (2011). Strategic revelation of differences in segment earnings growth. Journal of Accounting and Public Policy, 30(4), 383–392.

Watts, R. L. (2003). Conservatism in accounting part I: Explanations and implications. Accounting Horizons, 17(3), 207–221.

Wilson, M. (2011). Earnings management in Australian corporations. Australian Accounting Review, 21(3), 205–221.

Wittenberg-Moerman, R. (2008). The role of information asymmetry and financial reporting quality in debt trading. Journal of Accounting & Economics, 46, 240–260.

Wold, H. (1980). Model Construction and Evaluation When Theoretical Knowledge is scarce. Bureau of Economic Research, 47–74.

Yeo, G. H. H., Tan, P. M. S., Ho, K. W., & Chen, S.-S. (2002). Corporate ownership structure and the informativeness of earnings. Journal of Business Finance & Accounting, 29(7/8), 1023–1046.

Zhang, J. (2008). The contracting benefits of accounting conservatism to lenders and borrowers. Journal of Accounting and Economics, 45(1), 27–54.