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HETEROGENEITY IN TIMING UNCERTAINTIES FOR THE QUALITY OF ACCRUALS

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Tese de Doutorado apresentada ao Programa de Pós-Graduação em Ciências Contábeis da Universidade Federal do Rio de Janeiro (PPGCC/UFRJ), como requisito parcial à obtenção do título de Doutora em Ciências Contábeis.

Orientador: Prof. Dr. Marcelo Alvaro da Silva Macedo

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ABSTRACT

KOLOZSVARI, Ana Carolina. **Heterogeneity in Timing Uncertainties for the Quality of Accruals.** 2021. Tese (Doutorado em Ciências Contábeis) – Programa de Pós-Graduação em Ciências Contábeis, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2021.

This study is about the quality of accruals, exploring the influence of timing uncertainties on the relation of accruals with cash flows and with balance sheets amounts. In a single framework, through theoretical reasoning and with simple algebra, I articulate accruals in two dimensions, in their role of anticipating or deferring economic impacts of cash flows, and in their effect of opening and closing balance sheets amounts. I demonstrate that both emerging deviations and errors are distinct in nature and affect the quality of accruals differently, as they relate to different kinds of accruals. Empirically, I used the reported financial information of non-financial companies actively listed in the New York Stock Exchange, provided by the Economatica Database, covering two distinct periods of analysis, of 22 years and 7 years, respectively. I approach the timing uncertainties in accruals by the Relative Standard Deviation (RSD) measurement. Tests of differences in uncertainties between the categories show anticipation accruals with higher uncertainty than deferral accruals, and opening accruals with higher uncertainty than closing accruals. The results are similar for both periods of analysis, and I highlight that the empirical measurement differences are also subject to the underlying activities of accounting procedures. Those results also apply to several additional analyses, like moderate levels of uncertainty, distinct levels of activity uncertainties, diverse economic activities, and an alternative uncertainty measurement based on the standard deviation of relative changes. Distinctions between the different accounts that compose each accruals category are more relevant as more granular is the analysis, which is a relevant trait under the analysis of the quality of short and long-term accruals separately. I expect to contribute by demonstrating how timing uncertainties in accruals articulate regarding their heterogeneity and how other factors may also be reflected in the reported accounting numbers. That may lead to new insights on discretion in accruals, also intending to reach potential interests of empirical research on the quality of accounting information and earnings management.

Keywords: accruals, accrual accounting, accruals quality, timing uncertainties, accruals errors and deviations

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RESUMO

KOLOZSVARI, Ana Carolina. **Heterogeneity in Timing Uncertainties for the Quality of Accruals.** 2021. Tese (Doutorado em Ciências Contábeis) – Programa de Pós-Graduação em Ciências Contábeis, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2021.

Este estudo versa sobre a qualidade dos accruals, explorando a influência das incertezas temporais na relação dos accruals com fluxos de caixa e com valores no balanço patrimonial. Em um único quadro, através de raciocínio teórico e com álgebra simples, eu articulo accruals em duas dimensões, em seu papel de antecipação ou diferimento de impactos econômicos de fluxos de caixa, e em seu efeito de abertura e fechamento de valores no balanço patrimonial. Demonstro que ambos os desvios e erros emergentes são distintos em natureza e afetam a qualidade dos accruals de maneira diferente, dado que se relacionam a diferentes tipos de accruals. Empiricamente, utilizo as demonstrações financeiras divulgadas por empresas não-financeiras ativamente listadas na Bolsa de Valores de Nova York, fornecidas pela Database Economática, cobrindo dois períodos de análise distintos, de 22 anos e 7 anos, respectivamente. Abordo as incertezas temporais nos accruals pela medida de Desvio-Padrão Relativo (RSD). Os testes de diferenças das incertezas entre as categorias mostram os accruals de antecipação com maior incerteza do que os accruals de diferimento, e os accruals de abertura com maior incerteza do que os de fechamento. Os resultados são semelhantes para ambos os períodos de análise e destaco que as diferenças empíricas mensuradas também estão sujeitas às atividades subjacentes aos procedimentos contábeis. Esses resultados também se aplicam a diversas análises adicionais, como níveis moderados de incerteza, diferentes níveis de incertezas das atividades, diversas atividades econômicas e uma medida alternativa de incerteza baseada no desvio-padrão das variações relativas. As distinções entre as diferentes contas que compõem cada categoria de accruals são mais relevantes conforme mais granular é a análise, o que é uma característica relevante para a análise da qualidade de accruals de curto e longo prazo separadamente. Espero contribuir demonstrando como incertezas temporais nos accruals se articulam relacionadas à sua heterogeneidade e como outros fatores também podem se refletir nos números contábeis divulgados. Isso pode levar a novas ideias sobre a discricionariedade nos accruals, também com intenção de alcançar interesses potenciais da pesquisa empírica sobre a qualidade da informação contábil e gerenciamento de resultados.

Palavras-chave: accruals, regime de competência, qualidade dos accruals, incertezas temporais, desvios e erros nos accruals

O presente trabalho foi realizado com apoio da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Código de Financiamento 001, e com apoio da Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro – FAPERJ.

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1 INTRODUCTION

1.1 Context and research problem

Some part of the literature on accruals focus on their contribution as information useful for valuation. For example, Feltham and Ohlson (1995) model relations between market value and accounting data, reasoning that accounting conventions for accruals lead to discrepancies between the firm's book and market values, Sloan (1996) compares accruals and cash flows as persistent components of earnings and examines how their information is reflected in stock prices returns, and Penman (2013) comprehensively articulates about the contribution of accruals to capture value in the firm's operations.

Another branch of accruals literature relates earnings quality to earnings management, notably dealing with models to estimate discretionary accruals. Usually, studies that make efforts to enhance measurement procedures for empirical testing would rely on incentives for managers to manipulate accounting numbers, such as importing regulation (Jones, 1991), actual indications of manipulation, as firms under the SEC enforcement actions (DECHOW; SLOAN; SWEENEY, 1995; DECHOW; HUTTON; KIM; SLOAN, 2012), or comparing models across different settings from simulated event conditions (KOTHARI; LEONE; WASLEY, 2005).

There is also the possibility to treat accruals as a research object, more specifically. Such studies may also investigate relations of accruals with valuation or other accounting features as auditing, but they do not directly use an equity valuation perspective or managerial opportunism as support. Instead, they state intentions to make efforts for the evolution of accounting discipline (ETHERIDGE, 1991, 2004), towards a better understanding about the costs and benefits of using accounting accruals (NIKOLAEV, 2018; DICHEV; OWENS, 2020), and with the reasoning that without conceptual or a construction analysis about accruals, it is hard to access measurement alternatives (OHLSON, 2014), for example. This thesis belongs to this stream of research.

Such studies propose new approaches or investigate relevant elements to discuss the impacts of the use of accruals to the quality of accounting earnings, in comparison to cash flow accounting. For example, Etheridge (1991, 2004) considers the accounting communicative process, Richardson, Soliman and Sloan (2005) approach the reliability in accruals by the nature of underlying business activities, and Larson, Sloan and Giedt (2018) expand this approach by considering also the nature of the events that lead to accruals. In those studies, researchers

usually identify how those new elements affect accruals and, from the respective categorization, they seek to establish the impacts on the quality of accounting information.

In those studies, researchers usually identify how those new elements affect accruals and, from the respective categorization, they seek to establish the impacts on the quality of accounting information. A characteristic of this stream of research is that several concepts are abstract and not directly observable, but are estimated and summarized by a number, e.g. net income as representative of firms' performance, or equity as representative of owners' wealth. Beyond that, those objects are also connected and influence each other, e.g. the net income number and changes in equity are closely related, or similarly, performance estimates influence owners' wealth representation. Considering such connections, I elaborate on how accruals articulate with cash flows and balance sheets amounts. In addition, considering that estimates carry uncertainties, I explore the influence of timing uncertainties on the relation of accruals with cash flows and with balance sheets amounts.

Some studies approach timing issues in accrual accounting, providing advances in the understanding about accruals, but generally focusing on one aspect or dealing with distinct sources of uncertainty as a single one. For example, Dechow and Dichev (2002) approach uncertainties regarding the estimation of future cash flows, Dichev and Owens (2020) extend the approach to include uncertainties from other sources beyond that, while Nikolaev (2018) defends that changes in future cash flows are not an accrual accounting issue and addresses only uncertainties related to estimates of economic impacts. Those three studies motivate the development of this research, because they approach distinct sources of timing uncertainties without articulating them.

Therefore, I propose that there is an unexplored heterogeneity in timing uncertainties in accrual accounting. Timing uncertainties emerge from two distinct sources, which are estimates of future cash flows and estimates of economic impacts in owners' wealth. I associate the first source of uncertainty to the order of events causing economic and cash impacts, and the second to the time extension between those events.

In this research, I also articulate two complementary perspectives of earnings, as flows that report performance and as changes in equity, which extends to its components, cash flows and accruals. From that, I propose a categorization for accruals that captures both sources of uncertainty, analytically. That composes the first part of my study and intends to provide theoretical grounds to approach uncertainty. The second part is dedicated to empirically measure the uncertainties of accruals regarding their categories and differences between them.

My study resembles the group of studies that identify relevant elements, because I propose a categorization for accruals regarding time. I also rely on those previous studies in efforts to incorporate their reasoning about uncertainty in accruals in a single framework and provide a general overview of those distinct sources of uncertainty.

I associate the uncertainty in Dechow and Dichev (2002) to the order of events since the focus on the short-term reduces the time extension influence. In comparison, Dichev and Owens (2020) motivate the investigation of time extension issues with the concept of accrual duration[1], without abandoning the Dechow and Dichev (2002) perspective. That leads to a combined approach of both sources of uncertainty, which I articulate separately. In turn, Nikolaev (2018), to associate part of the uncertainty to cash flows, argues for the available information at the moment of events recognition leading to estimated cash flows, instead of realized cash flows, disregarding the uncertainty from order and modeling only on time extension issues. Following those studies, I articulate both sources of uncertainty in accruals in a single theoretical framework, and perform empirical measurements and statistical tests of differences for complementary practical evidence.

Accordingly, I propose the following research question: *How timing uncertainties from distinct sources are reflected in accrual accounting?* In this study, I approach timing uncertainties considering that (i) some accruals have their associated cash flows in the future, and (ii) some accruals do not just compensate their associated cash flows, reflecting changes in owners' wealth. Both propositions require the assumption of realized cash flows as parameter for the true value of accruals.

1.2 Objectives

The main objective is to investigate how timing uncertainties affect the quality of accruals. I separate my study in two broad parts, one theoretical and another, empirical.

In the first part, I intend to build a coherent single framework, as simply as possible, about different kinds in accruals and how they compose earnings. In order to achieve that, the following steps apply:

1.a To present a definition of accruals to articulate flows and changes of states. I depart from Ohlson (2014).

[1] As I present in Section 2.3.2, Dichev and Owens (2020) define accrual duration as "the length of time between an accrual and its associated cash flow".

1.b To articulate some properties of accruals regarding their relation to cash flows and with balance sheet amounts. For that, I rely on a typology discussed by Dechow and Dichev (2002) and Dichev and Owens (2020).

1.c To approach uncertainty in accruals, relating to their different kinds. Besides those previous studies, I consider Nikolaev's (2018) reasoning on accounting errors.

These steps follow a construction process that provides an analytical framework that evoke the heterogeneity in timing uncertainties in accruals, with two distinct sources that emerge from the relation between accruals, cash flows and balance sheets amounts. From the developed framework, I elaborate general hypotheses about the different kinds of accruals and their uncertainties, which provide orientation to the empirical tests on the second part of the study.

In sequence, I aim to empirically investigate differences of uncertainty levels in accruals, accordingly to their categories. For that, the following steps apply:

2.a To measure uncertainty of accruals regarding each category. From the balance sheet approach, that intends to provide at account and category level, an empirical overview of uncertainties in accruals.

2.b To estimate differences of uncertainty between categories. The assessment of uncertainty in each category results from estimates at account-level, by their relative standard deviations (RSD), and differences estimates at firm-level.

For the empirical approach, I rely on reported financial information. As intrinsic to studies that investigate the quality of accounting information using financial data, the empirical proxies and estimates capture also effects that emerge from activities that generate the accounting procedures. Specifically for this research, it implies that while the hypotheses predictions rely on the articulation of uncertainties based on timing issues of accrual accounting, the results of the empirical tests are also subject to uncertainties from the underlying activities. Therefore, the empirical part of this study complements the theoretical development, instead of serving only as a verifying mechanism of research hypotheses.

1.3 Contributions

Research on accounting information relies on abstract concepts of non-directly observable constructs. An example is the representation of earnings as firms' performance, putting a number figure on the bottom line of income statements to represent how well a firm

performed in a determined year. Performance is an abstract concept and its quantification by a net income number requires estimates, such as how much of accounts receivable will or not be received, or how much of an asset is no longer capable of providing future benefits. In addition, at times, those constructs also carry more than one denomination related to diverse research interests, which make them even harder to articulate. For example, earnings are usually decomposed in cash flows and accruals, while Ohlson (2014) denominates the cash component as cash earnings, instead of cash flows.

From the theoretical development, I expect to contribute by disentangling and articulating some of those abstract concepts. For that, I converge in a single framework complementary perspectives about accruals, as earnings components and as representatives of changes in net assets, evidencing how they articulate. The intention is to contribute by deepening the discussion, which may lead to new insights for familiarized researchers, and for the less familiar with the theme, an introduction to the concept in both perspectives. The task uncovers distinct sources of timing uncertainties in the accounting numbers registered by accruals, depending on their role of anticipating or deferring economic impacts of cash flows and their effects of opening or closing balance sheets amounts.

Empirically, I provide evidence of how the theoretical findings reflect on reported accounting numbers. I keep the statistical approach as simple as possible, to show more clearly the required assumptions for estimating accruals uncertainties and their differences. The empirical approach reflects that accounting numbers, independently of discretion or estimates requirements, represent underlying activities and also embrace their uncertainty. This is, potentially, the most fundamental idea that one should keep in mind regarding accounting research. There are relevant aspects of a complex social reality in which accounting numbers reflect firms' activities and applied policies, that could be unintentionally neglected. To avoid it, I systematically highlight the presence of underlying activities in accounting numbers when I present the empirical results, interpreting them under this consideration.

In this research, I advance theoretically by mapping on the timing uncertainties in accruals to a single and articulated framework, and empirically by demonstrating how such uncertainties may or not be reflected in the reported accounting numbers. Both contributions may motivate refinements to the literature on the quality of accounting information and earnings management, approaching the heterogeneity of discretion in accruals, and further investigation about investor's decisions.

1.4 Delimitation and future research

In this research, I articulate only timing uncertainties in accruals, making efforts to remove effects of magnitude that could influence measurements of uncertainty. However, those could influence the perceived uncertainty in reported accounting numbers and further research may intend to estimate this effect, instead of removing it.

I also consider that accounting methods are homogeneous. I provide some additional analyses of uncertainties regarding economic activities, showing that there is some distinction among them, which could be related to the underlying activities. However, I do not approach specific regulations or changes in it, for example, that could influence distinctly the perceived uncertainty for the different categories of accruals. In the same sense, I do not estimate uncertainties for financial companies, for which the theoretical discussion could be similar, but the empirical measurement could require adjustments.

At last, this research is about uncertainties in accruals, both theoretically and empirically. It is about accruals quality, considering that accruals of higher quality are a closer estimate of actual changes in owners' wealth. Although I consider accruals as earnings components in the flows perspective, I do not extend the implications for the quality of earnings or other accounting information, empirically. I developed the empirical approach using more fundamental concepts on uncertainty measurements, under the consideration that more advanced or traditional techniques could difficult the assessment of the implications of the required assumptions, which is a clearer task with simpler measurements. Therefore, future research could investigate implications for the quality of earnings, like their persistence, as in Sloan (1996) and following literature, or predictive ability, as in Etheridge (1991, 2004). Other possibilities are to investigate the perceived uncertainty in the presence of earnings management practices or their assessment by investors in financial markets.

1.5 Organization of the study

After this first introductory section, I present the theoretical development of the timing uncertainties in accruals. I present a definition for accruals, how they relate with cash flows and balance sheets amounts, and how timing uncertainties associate with those relations. At the end of the theoretical section, I formulate two sets of hypotheses, providing the base for empirical assessments.

In section 3, I present the empirical approach, which includes information regarding

data availability, variables construction, and model developments. I analyze the results of the statistical tests in section 4, showing how they articulate with the research hypotheses. I also perform additional analyses, regarding some potentially relevant aspects to complement the empirical evidence.

Finally, in section 5, I summarize the study with concluding remarks.

2 THEORETICAL DEVELOPMENT

2.1 Earnings, cash flows and accruals as changes in net assets

The difference between stock variables and flow variables enlightens where accruals fit. In accounting, the difference is clear between the balance sheets, with recorded amounts as stocks, like assets and liabilities, and the income and cash flow statements, with flow information, like sales and depreciation[2]. In addition, the clean surplus relation helps to connect them, since it assumes that earnings link to changes in net assets. Consequently, under the clean surplus relation and simply put, earnings summarize changes in owner's wealth (HICKS, 1946), which are equivalent to assets net of liabilities. Therefore, the equivalence of earnings to changes in net assets is a starting point for understanding accruals as flows and their role for firm's accounting.

Other important matters are the accounting principles that guide accounting income measurements, as requested for financial statements. Accrual accounting seeks to alleviate timing and matching problems inherent to cash flows when measuring performance (DECHOW, 1994). Therefore, I highlight that accruals allow earnings to be a measurement of the firm's economic performance during a determined period, independently from the cash impacts of events.

Thus, the framing that earnings represent changes in net assets and measure the performance during a period encompasses the convergence of the perspectives of accruals as flows and as state changes, as I propose. That because, in a regular situation and under the clean surplus relation, the initial and final balance sheets sustain income measurement and that remains valid for both components of earnings, cash flows and accruals (OHLSON, 2014).

As a general definition, accruals are presented as earnings components, jointly with cash flows, similarly to the definition in Equation 1. Penman (2013) discerns cash flows as "hard" components of earnings, from a real character, and accruals as "soft" components, that involve estimates. Later, I explain that one can refine that distinction, since not all accruals come from estimates.

$$Earnings = Cash\ Flows + Accruals \quad (1)$$

[2] Robinson (1982) elabores about the confusion between stocks and flows in Economics. Accounting, on the other hand, benefits from Financial Statements as providers of very illustrative examples about stocks and flows.

To define accruals departing from changes in net assets, two assumptions are necessary: (i) the *clean surplus relation*, under which all changes of net assets come from trades with owners or from events that compound income; and (ii) trades with owners, such as dividends or capital contributions, are realized as cash, or equivalents of cash (FELTHAM; OHLSON, 1995; RICHARDSON ET AL., 2005; OHLSON, 2014).

With that, Ohlson (2014) proposes considering assets and liabilities in two mutually exclusive categories: cash and non-cash. From the difference between assets and liabilities, one gets net assets, which represent the owners' wealth. Cash net assets are cash and all net assets that may be considered as such, like short-term investments. All other net assets are non-cash, as properties, plant and equipment (PPE). Under the former assumptions, the distinction between cash assets (CA) and other assets (OA) is enough to define accruals as the difference in non-cash assets net of non-cash liabilities.

I highlight that Ohlson (2014) formalized the definition, by establishing the assumptions and from simple algebra, but as he states, this idea is not new – e.g. Feltham and Ohlson (1995) explicitly define accruals as changes in operating assets. Even more, the estimates of accruals from changes in accounts from balance sheets, mostly by excluding short-term cash elements, carries this perspective, as seen in Jones (1991), Dechow et al. (1995), Sloan (1996) etc.

Therefore, both perspectives of accruals, as earnings components and as changes in non-cash net assets, converge as I show on Table 1.

Table 1 Earnings, cash flows and accruals, as changes in net assets

Initially

1. $NA_{ending}(t\text{-}1) = NA_{beginning}(t) \rightarrow \Delta NA(t) = NA_{ending}(t) - NA_{beginning}(t) = NA_{ending}(t) - NA_{ending}(t\text{-}1)$.
Or, simply: $\Delta NA(t) = NA(t) - NA(t\text{-}1)$.

2. Assumptions formalized by Ohlson (2014):
(i) *Clean surplus relation* → ΔNA = Earnings – Dividends + Capital Contributions
(ii) Trades directly with owners (dividends and capital contributions) happen with cash assets.

Categorization of net assets

Since net assets NA are assets net from liabilities, there are the following mutually exclusive categories:
CA = Cash assets and equivalents of cash, net. Represent cash in net assets.
OA = Other assets, net. Represent the non-cash part of net assets.

Since NA = CA + OA, regarding 1, then ΔNA = ΔCA + ΔOA.

Categorization from the clean surplus relation

ΔNA = Earnings – Dividends + Capital contributions
ΔCA + ΔOA = Cash Flows + *Accruals* – Dividends + Capital Contributions
ΔCA = Cash Flows – Dividends + Capital Contributions
ΔOA = Accruals

Since dividends and capital contributions are flows of cash (assumption ii), accruals are equivalent to changes in net assets of non-cash category, by substitution on clean surplus relation (assumption i).

Note. Elaborated from Ohlson (2014).

Under the consideration that the initial state of an amount during a determined period equals its final state in an immediately previous period, changes of state between the beginning and ending of the period are given by the difference between the final states of two consecutive periods. Therefore, since balance sheets present the state of amounts recorded in a determined date, consecutive balance sheets provide the measurement of changes between the dates, for any recorded amount, including net assets (initial proposition 1 of Table 1). The assumptions of clean surplus relation and trades with owners through cash (initial proposition 2) imply that changes in net assets of non-cash cannot derive from trades with owners and should mandatorily flow through earnings. Furthermore, earnings represent changes in owners' wealth and their components, cash flows and accruals, fall under the proposed categories, changes in cash net assets and non-cash net assets, respectively[3]. Consequently, given those conditions, accruals are changes of non-cash net assets, that is, of non-cash assets net of non-cash liabilities.

When proposing the categorization of earnings components, Ohlson (2014) opted for naming the cash flows components as "cash earnings", instead of "cash flows". He observes that the literature does not offer a standard terminology, not whether there is a distinction of both, but researchers generally seem to understand, when using "cash flows", the current cash flows without adjustments for capital expenses. In this paper, I adopt the term "cash flow" for the cash component of earnings, in order to maintain equivalence with other studies. I also disregard dividends and capital contributions in the development of my comparisons. However, one must mind that for empirical research, there are different approaches to estimate the earnings components, with meanings and implicit assumptions to be carefully observed – e.g. Richardson et al. (2005), Larson et al. (2017).

Accruals settled from changes in non-cash net assets drive the concern for segregation of what is cash and what is non-cash. There are obvious situations, like the cash account being a cash asset, while property, plants and equipment, a non-cash asset. However, also, there are elements with a definition more sensible to judgment criteria, like accounts receivable.

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[3] To develop the comparison between flows and changes in net assets perspectives, I assumed no direct trades with owners, neither with cash assets. Ohlson (2014) assumes that owners receive all changes in cash net assets as dividends, in order to develop his reasoning about accruals as valuable information. From valuation formulas, he concludes that accruals are positive when the firm grows, while under a situation without growth, no accruals are necessary, and they behave noisily if there are errors. In turn, to keep simple relations, I completely disregard dividends and capital contributions, setting them zero, which equals earnings to total changes in net assets. Therefore, a positive ΔNA is a combination of $\Delta CA + \Delta OA$ that is positive, and the absence of dividends in the discussion implies that positive earnings increased owner's wealth, independently if they are from cash or non-cash, with no prejudice to established relations. All the developed reasoning works even for a no growth situation, since if $\Delta NA = 0$, then $\Delta OA = -\Delta CA$, which means that accruals just compensated changes in net cash assets in the period.

Ohlson (2014) defends to observe the nature of each group, which in cash category one must include, while in non-cash category one must exclude, all assets and liabilities related to cash without loss of information. This proposal seeks to redeem the economic essence of assets and liabilities, under the possibility to transform them directly in cash. From his given examples, that implies that accounts receivable or accounts payable of high quality, in which there is already a defined quantity of cash associated to the asset or liability to be extinct, would compose the cash net assets group, and their changes would not correspond to accruals. While that is perfectly valid and make sense in the conceptual framework, I note that this criterion is not absolute, neither the most used in empirical researches.

Dechow et al. (2010) tell that the definition for accruals has been changing. Historically, empirical researchers estimate accruals from balance sheets and earnings statements, by changes in working capital and depreciation accounts. More recently, since cash flows statements availability, there is the possibility to estimate accruals directly from the difference between accounting income and cash flows. Such approaches apply to empirical research for the American market and for countries that adopt IFRS.

Richardson et al. (2005) argue that, without accruals accounting, cash would be the only asset or liability in balance sheets. Therefore, accruals represent the changes in all assets, except cash, less changes in all liabilities, in a much more broad definition than by Ohlson (2014). Similarly, Larson et al. (2017) define as cash, the cash itself and short-term investments, but not long-term assets and liabilities, under the reasoning that they incorporate accrual accounting assumptions, making their changes as accruals. In a restricter definition, Dechow and Dichev (2002) work with only short-term accruals, departing from changes in working capital, according to their focus. In a slightly different approach, Etheridge (1991, 2004) combines both balance sheet amounts and their changes as accruals. Although I understand that it suited the researcher's pursposes of investigating the informational content of accounting items, in this paper, I treat separately balance sheet items as accrued amounts, and their changes as accruals.

It seems unlikely that there would be a convergence for a single definition of accruals in the literature, so, when empirical researchers delimit them, it is important to, at least, explicit the chosen definition (OHLSON, 2014). Beyond that, it is about a consistency issue, since the estimation of accruals itself leads researchers to assume inherent assumptions and depend on data availability, as they compound research variables.

For example, a common balance sheet approach, with changes in working capital assets and liabilities including depreciation for estimating accruals, implies an assumption of non-

exclusivity of short term, even if ignoring other long-term accruals. A possible reason to ignore such accruals can be a higher subjectivity and less reliability, like intangible capitalization or changes in pension plans, with even higher uncertainties than depreciation (RICHARDSON ET AL., 2005). Therefore, beyond model replication, researchers ought to mind the adherence of the extension and specificities of the estimated accruals with the research interests. Larson et al. (2017) relate, in an extensive list of papers, diverse empirical approaches to accruals estimation.

Summarily, accrual accounting generates accruals and an income measure that represents changes in owner's wealth from economic events. In addition, accruals may, or may not, coincide with their associated cash occurrences. Therefore, the characteristic timing of accruals comes from the recognition of events and their cash impacts and is a starting point to draw accruals properties in a broader framework from the basic definition.

2.2 Anticipation and deferrals of economic impacts from cash flows with opening and closing accruals

2.2.1 Cash flows composition according to their related events

Dechow and Dichev (2002) advance in formally developing the relation of accruals and cash flows from other periods, a former idea in the literature, such as in Dechow (1994), but unexplored in a single model. They propose that accruals open or close amounts in balance sheets, what fits well in a perspective of changes in net assets.

To develop their model, Dechow and Dichev (2002) work within short term, focusing on working capital accruals. In this study, I make efforts to keep as close as possible with the original terminology, but in order to converge the flows and changes perspectives, I also sought to generalize them when possible. Consequently, as an adjustment, I expanded the lags of economic and financial impacts, beyond the immediately previous and next periods.

The basic model departs from separating cash flows according to the timing of their associated events. Current cash flows, of a period t, have the following components: cash impacts of current events (occurred in t); events recognized past τ periods (anticipated in t-τ) with current impact of cash; and events still to cause economic impacts, in τ periods (deferred to t+τ) with current impact of cash. The assignment of a single symbol τ for lags is to simplify the presentation, since several events generally have distinct time horizons, however a more

rigorous representation would compromise the clarity of the modeling, without increasing contents. I initially present this mechanism in Equation 2.

$$CF_t = CF_t^{t-\tau} + CF_t^{t} + CF_t^{t+\tau} \quad (2)$$

where

$CF_t^{t-\tau}$ represent cash flows realizations of events previously accounted

CF_t^{t} represent cash flows realizations of current events

$CF_t^{t+\tau}$ represent cash flows realizations before recognition of events

Under this notation, the superior index means the period of the economic event recognition, such as revenues or expenses, and the inferior index shows the period of the cash realization, such as receipts or disbursements.

Accruals happen, in accrual accounting, from the lags between an event and its cash impact, in a broad role of recognizing an event in a distinct period of its cash realization. Then, in Equation 2, only the central term, CF^t_t, is not subject for accrual accounting adjustments, while the others, $CF^{t-\tau}_t$ and $CF^{t+\tau}_t$, relate with two different types of accruals, that anticipate and defer cash flows, respectively.

I highlight, such as Dechow (1994) observes, that the terms "accrual" and "accruals" are broadly applied in a general sense, independently of its role of anticipation or deferment. Even more, while the "deferral" term leaves no room for misunderstanding, the "accrual" term carries diverse meanings – e.g. accrual accounting, accruals as flows, the accrual of amounts in balance sheets, and so on. Dechow (1994) and Dechow and Dichev (2002) adopt the term "accrual" as opposed to "deferral", usually with supportive wording for clarification, and Dichev and Owens (2020) apply the terms "accruals proper" and "deferrals". I use these researchers' framework, but their work did not need specific naming for categorization, whilst it is not the case. I also chose not to reapply Dichev and Owens (2020) naming, due to my interest to contrast more evidently with the "deferral" term – which I judged it is neither "proper" nor "appropriation", but it would be "anticipation". Summarily, to avoid confusion, I opted to use the term "accruals" generally and for classification according to their roles, I named two categories: anticipation accruals and deferral accruals. That was an effort to disentangle the concept from its role, in order to provide a clearer presentation of the framework.

2.2.2 Anticipation accruals

Accruals that anticipate the economic impacts of cash flows work recognizing the economic impact of the event *before* its cash impact. In that situation, there are opening accruals, that reflect expectations of future cash flows, and closing accruals, that shut amounts previously accrued. For example, from a credit sale, the opening accrual increases accounts receivable, and the closing accrual decreases the accounts receivable, when there is the receipt from the sale. Such reasoning is initiated by Dechow and Dichev (2002), who explain that discretion and deviations between recognition and realization, from the moment of recognition, affect earnings. Dichev and Owens (2020) resume the idea, which I further develop adequately.

An opening anticipation accrual deals with the recognition of an economic event that has a future cash impact, therefore, it alters net assets amount through changes in non-cash net assets, without changes in cash net assets. On the other hand, the closing anticipation accrual refers to a current cash impact of a previously recognized event, thus, denotes a change of non-cash net assets in the opposite sense of cash net assets, making changes in total net assets null. I represent the equivalence in Table 2.

Table 2 Anticipation accruals: economic impact recognition before cash impacts

Accrual Effect	**Flows[1]**	**Changes in net assets[2]**		
		t – τ	***t***	**t + τ**
Open	$Accrual^{Open}_{Anticipation} = CF^{t}_{t+\tau}$	–	$\Delta CA = 0$ $\boldsymbol{\Delta OA} = \Delta NA$	ΔNA = 0 ΔOA = **- ΔCA**
Close	$Accrual^{Close}_{Anticipation} = - CF^{t-\tau}_{t}$	ΔCA = 0 ΔOA = ΔNA	$\Delta NA = 0$ $\boldsymbol{\Delta OA = - \Delta CA}$	–

Notes. [1] For flow notation, the superior index of CF denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similar to Dechow and Dichev (2002).
[2] For changes in net assets notation, in bold I marked the changes in non-cash assets related to represented flows and in italic I highlighted the changes in net assets in current period, *t*.

According to Dechow and Dichev (2002) notation, opening anticipation accruals bring the future cash impact to current earnings, as the superior index of $CF^{t}_{t+\tau}$ shows. That is equivalent to recognize a change in owners' wealth, $\Delta NA = \Delta OA$, with no cash impact, $\Delta CA = 0$. Complementarily, as the inferior index of $FC^{t}_{t+\tau}$ shows, in a future period $t+\tau$, there is the compensation of the changes in cash net assets with changes in non-cash net assets, $\Delta CA = \Delta OA$ with no changes in total net assets, $\Delta NA = 0$, representing the cash impact and the close of the previously accrued amount. Commonly, it is the case of credit sales, which influences

earnings currently with future cash impact, with the recognition of accounts receivable that is a change in non-cash net assets, $\Delta OA = \Delta NA$.

In comparison, closing anticipation accruals $-CF^{t-\tau}{}_t$ recognize the current cash impact, in t, from a previous economic impact of an event, in $t-\tau$, according to Dechow and Dichev (2002) notation. The flow relation comes with a negative sign, as I show with the corresponding changes in net assets, because the accrual ΔOA mitigates the economic impact provided by the change in cash net assets, ΔCA. Thus, the cash impact does not interfere in earnings, $\Delta NA = 0$. It is the case of a receipt of a previously recognized credit sale, in which the change in net assets from a cash receipt balances with another change in net assets, oppositely, with the closing of the account receivable previously accrued, $\Delta OA = -\Delta CA$, and so the total effect of changes in net assets equals zero.

Comparing jointly, in Dechow and Dichev (2002) flow notation, the same signal identifies the opening anticipation accruals and their corresponding cash flows; while for the closing anticipation accruals, it is the opposite signal. From the changes in net assets perspective, I show that changes in non-cash assets that go together with changes in cash net assets behave cancelling their effects over the total net assets, and therefore, have opposite signs. I illustrate those as $\Delta OA(t) = -\Delta OA(t+\tau) = -(-\Delta CA(t+\tau)) = \Delta CA(t+\tau)$, for opening anticipation accruals; and simply as $\Delta OA(t) = -\Delta CA(t)$, for closing anticipation accruals.

2.2.3 Deferral accruals

Accruals that defer the economic impacts of cash flows work with the recognition of the impact of an event on net assets after its previous cash impact – that is, when the economic impact happens *after* the cash impact. From the flows perspective, Dechow and Dichev (2002) explain opening deferral accruals with the role of keeping the cash amount to be realized in the future, while the closing deferral accruals recognize the economic impact of the event in current period, with past cash impact. That would be the case of acquisition of inventories, that increases through an opening accrual, and which will be held as an asset until a further period, when it will happen the appropriation of the cost of goods sold and the inventories amount decreases with a closing accrual.

Such as I did to anticipation accruals, I represent in Table 3 the changes in net assets perspective for deferral accruals.

Table 3 Deferral accruals: economic impact recognition after cash impacts

Accrual Effect	Flows[1]	Changes in net assets[2]		
		t – τ	***t***	**t + τ**
Open	$Accrual^{Open}_{Deferral} = - CF^{t+\tau}_{t}$	–	*ΔNA = 0* ***ΔOA = - ΔCA***	ΔCA = 0 ΔOA = ΔNA
Close	$Accrual^{Close}_{Deferral} = CF^{t}_{t-\tau}$	ΔNA = 0 ΔOA = - **ΔCA**	*ΔCA = 0* ***ΔOA*** *= ΔNA*	–

Notes. [1] For flow notation, the superior index of CF denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similar to Dechow and Dichev (2002).
[2] For changes in net assets notation, in bold I marked the changes in non-cash assets related to represented flows and in italic I highlighted the changes in net assets in current period, *t*.

According to Dechow and Dichev (2002) flow notation, opening deferral accruals remove the cash impact from current earnings to the future, as the superior index of $-CF^{t+\tau}_{t}$ shows. That implies no changes in current owners' wealth, as I represent in column *t*, with $\Delta NA = 0$. The inferior index shows the cash flow, related to a current accrual, implying a compensation of the current changes in cash net assets with changes in non-cash net assets, $\Delta OA = -\Delta CA$. The reasoning for the negative sign on flow notation for deferral accruals is the same of anticipation accruals. A simple example is an acquisition of inventory in cash, when their disbursement opens, or increases, an inventories account, without impact on earnings.

The closing deferral accruals, from the $FC^{t}_{t-\tau}$ term, correspond to current changes in earnings, like the superior index shows, with previous cash impacts, in $t–\tau$. From the changes in net assets perspective, I show that the impact on earnings, from the reversal of a previously accrued amount, causes changes on total owners' wealth, $\Delta OA = \Delta NA$. It is the case of sold inventories decreases, when closing the accrued amount affects the owners' wealth.

The reasoning for the attribution of signals, for opening deferral accruals, holds similarly for closing anticipation accruals. It also becomes clear that while for anticipation accruals, firstly there is an economic impact with no cash impact, for deferral accruals the cash impacts happen before the economic impact of the event. Altogether, the changes in net assets perspective shows consistency for the behavior of accruals in general and under the classification according to their roles (anticipation or deferrals) and effects over accrued amounts (opening and closing).

2.2.4 General overview of accruals mechanism

As I illustrate in Tables 2 and 3, the changes in net assets perspective associates accruals directly to changes of amounts in balance sheets, while the flows perspective associates accruals

to cash flows. That fundamental difference leads to the recognition of two related, but not equal, sets of characteristics of accruals.

The effects of opening and closing balance sheet amounts, represented by the ΔOA notations in the t columns, denote an opposition behavior, meaning that opening and closing accruals are opposite flows around a state, which is the recognized amount in balance sheets as an asset or liability. Complementarily, this amount recognized by the opening accrual remains in balance sheets, until another accrual closes it. That is what the pairs of ΔOA in columns t-τ or t+τ, of Tables 2 and 3, denote. I denominate that characteristic of accruals as permanence.

From the flows perspective, accruals are not focused around an amount, but in relation to a cash flow, which implies in their role of anticipating or deferring the economic impacts of cash flows. The underlying reasoning to segregate between anticipation or deferral accruals focus on the opening accruals, and is complementary for the closing accruals. For example, for a credit sale, the opening accrual anticipates the economic impact of the sale to be received; for acquiring inventories in cash, the opening accrual defers the economic impact for when they are sold. In both situations, the distinction between anticipating or deferring economic impacts situates the cash and non-cash flows when the event of the opening accrual happens, while the event that promotes the closing accrual, e.g. the collection of a credit sale and the selling of goods, just completes the framework. Therefore, from flows perspective, this role of anticipating or deferring economic impacts of cash flows relates to the opposition characteristic by its direct association with opening accruals, and complementary association with closing accruals. Dechow and Dichev (2002) explore this characteristic of opposition and the role of accruals, from flows perspective.

The permanence characteristic relates to the concept of accrual duration, by Dichev and Owens (2020). They define accrual duration as the time extension between the accrual and its associated cash flow, which have important implications to discretion, as I will approach further. In contrast, I define permanence as the time extension between the opening and the closing accruals, which relates accruals independently of cash flows, and reinforces the need of an accrual to close an amount previously opened by another accrual. As Dichev and Owens (2020) explain, the duration is zero for an accrual that compensates its cash flow, leaving no room for discretion, while for accruals far from their cash flows there is room for discretion, which affects earnings. Accordingly, permanence and duration are similar, although they relate to distinct constructs.

In Figure 1, I illustrate the mechanism of accruals in relation with cash flows and

accrued amounts. The timelines represent events related to a credit sale and the closing inventories of goods sold, with the moment of the sale and the closing inventories. The events related to the economic impacts are considered at the current moment *t*, and their respective cash flows are in other periods, at $t+\tau$ and $t-\tau$, in accordance to the lines of the opening anticipation accruals of Table 2 and the closing deferral accruals of Table 3. Distinct time placements do not affect the analysis.

The categorization between anticipation and deferral accruals emerges from de comparison between the economic and cash impacts, as we developed so far. I illustrate the economic impacts with the empty circle and the cash impact with the solid circle. The characteristic of permanence is represented by the long right arrows, while the opposition is illustrated by the up and down arrows, that represent the effects of opening and closing the balance sheet amounts.

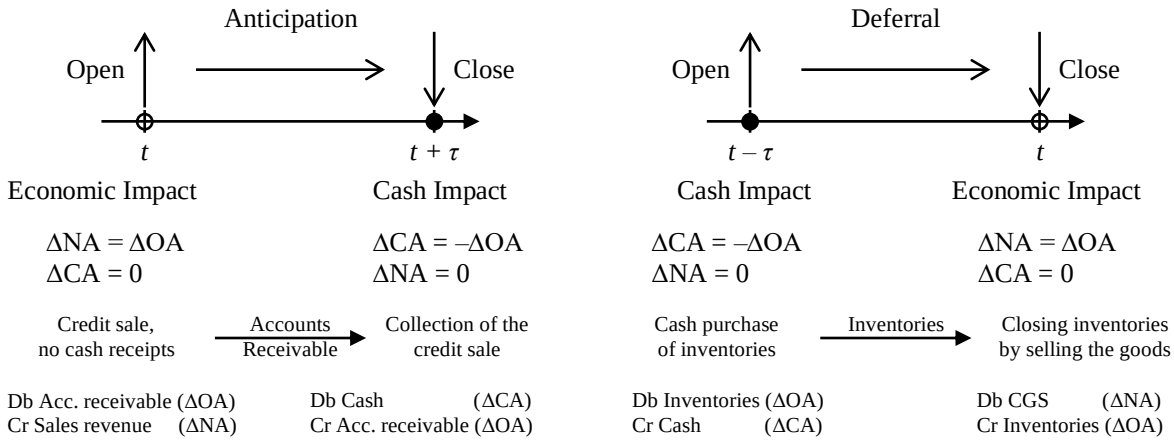


Figure 1 General overview of the accruals mechanism

Opposition and permanence are two fundamental characteristics of accruals that are usually approached separatedly – e.g. Dechow and Dichev (2002) disregard permanence by focusing on the short-term while Richardson et al. (2005) disregard opposition by focusing on short-term vs. long-term comparisons; or approached altogether – e. g. Ethetridge (1991, 2004) and Dichev and Owens (2020) consider the informative content of accruals broadly. In my efforts to disentangle concepts and ideas about accruals, I consider both opposition and permanence relating to their opening and closing effects on balance sheets amounts and their role to anticipate and defer cash flows. I extend such approach to the natural uncertainties in accruals to propose that errors and deviations in accrual accounting have distinct nature, relatable to dimension.

Resuming the comparison between flows and changes in net assets perspectives, I show the relation between accruals and their associated cash flows in Table 4. That allows refining the basic equation of flow perspective.

In Table 4, I depart from a basic decomposition of earnings, with categorized accruals, similarly to Dechow and Dichev (2002) approach, but I disregarded the errors (discussed in next section). I also sought to explicit the role of accruals, with their behavior from changes in net assets perspective, in *t*.

By flows perspective, I approach earnings composed by current cash flows from events with current economic impacts, CF^{t}_{t}, current cash flows from events with economic impacts in other periods, $CF^{t-\tau}_{t}$ and $CF^{t+\tau}_{t}$, and the four categories of accruals accordingly to their role of anticipating or deferring cash flows and their effects of opening and closing balance sheets amounts.

Among the distinct accruals, there are the accruals that recognize the economic impacts of cash flows from other periods (opening anticipation and closing deferral accruals), e.g. the recognition of a credit sale, inventories sold or depreciation. From the change in net assets perspective, those accruals of current events contribute directly to earnings, $\Delta OA = \Delta NA$, since the cash impacts are allocated in the past or in the future, $\Delta CA = 0$.

There are also the accruals that accompany current cash flows, with the function of removing their economic impacts, which belong to other periods (closing anticipation and opening deferral accruals), e.g. credit sales receipts or cash acquisition of an asset. That shows that accruals of lagged or leaded economic events just compensate current cash impacts, $\Delta OA = -\Delta CA$, mitigating their influence over earnings, $\Delta NA = 0$.

This is a remarkable distinction, which Dichev and Owens (2020) discuss focusing on discretion, as the first group is discretionary and the second group is of non-discretionary accruals, as they just compensate cash flows[4]. Thus, being the economic impact of an event in a period before or after to its cash impact, accruals anticipate or defer the amount to/from current earnings, respectively. The delay between the recognition of events and their cash realizations make estimates necessary, which may be associated to deviations and errors, as Dechow and Dichev (2002) approach and Nikolaev (2018) and Dichev and Owens (2020) reinforce.

[4] As presented so far, closing anticipation accruals are associated with non-discretionarity, as they compensate economic impacts of cash flows, previously anticipated. However, considering that opening anticipation accruals are subject to differences between estimated and actual values, closing anticipation accruals also carry those effects as reversals. Therefore, they have also this discretionary component. I discuss the presence of estimates in accruals in the next section.

Table 4 Changes in net assets from flow relations of earnings, cash flows and accruals

Flow relation: $Earnings_t = CF_t + Accruals_t$

$$Earnings_t = CF_t^{t-\tau} + CF_t^{t} + CF_t^{t+\tau} + Accruals^{Open}_{Anticipation} + Accruals^{Close}_{Anticipation} + Accruals^{Open}_{Deferral} + Accruals^{Close}_{Deferral}$$

Rearranging:

$$Earnings_t = \underbrace{CF_t^{t-\tau} + Accruals^{Close}_{Anticipation}}_{\text{Past}} + \underbrace{CF_t^{t} + Accruals^{Open}_{Anticipation} + Accruals^{Close}_{Deferral}}_{\text{Current}} + \underbrace{CF_t^{t+\tau} + Accruals^{Open}_{Deferral}}_{\text{Future}}$$

Timing of event	Past	Current		Future
Earnings are…	Cash realizations of previously recognized events + Compensation of current cash impacts from past events	Cash realizations in the same period of events + Adjustments of events which cash impacts will happen in future periods or happened previously		Cash realizations of not yet recognized events + Compensation of current cash impacts from future events
Accruals (t)	$\Delta NA = 0$ $\Delta OA = -\Delta CA$	$\Delta CA = 0$ $\Delta OA = \Delta NA$	$\Delta CA = 0$ $\Delta OA = \Delta NA$	$\Delta NA = 0$ $\Delta OA = -\Delta CA$

Replacing accruals with their respective cash flows:

$$Earnings_t = CF_t^{t-\tau} - CF_t^{t-\tau} + CF_t^{t} + CF_{t+\tau}^{t} + CF_{t-\tau}^{t} + CF_t^{t+\tau} - CF_t^{t+\tau}$$

Then $$Earnings_t = CF^{\,t}_{\,t} + CF^{\,t}_{\,t+\tau} + CF^{\,t}_{\,t-\tau}$$

Or $$Earnings = CF_t^{t} + Accruals^{Open}_{Anticipation} + Accruals^{Close}_{Deferral}$$

Therefore, in t $$\Delta NA = \Delta CA + \Delta OA(opening, anticipation) + \Delta OA(closing, deferral)$$

Notes. ¹ For flow notation, the superior index of CF denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similar to Dechow and Dichev (2002).

2.3 Uncertainty over events recognition: errors and deviations

2.3.1 Deviations of expected from realized cash flows in anticipation accruals

Balance sheets show several classes of assets and liabilities, which count with greater or lesser precision of accrued amounts. Much of the reliability of measured amounts may arise from operational and environmental factors, such as extension and volatility of a firm's operations, its size, earnings, cash flows and accruals volatilities, and even the size of accruals (DECHOW; DICHEV, 2002). Additionally, the very amounts in balance sheets require higher or lower levels of estimation and have characteristic timing issues (DECHOW; DICHEV, 2002; RICHARDSON ET AL., 2005; DICHEV; OWENS, 2020).

According to Ohlson (2014), changes in net assets that already have a defined cash amount may compound directly the changes in cash net assets group. Under that delimitation,

changes in non-cash assets are susceptible to deviations from their cash realization amounts; consequently, accruals are susceptible to estimate errors. In complement, the broader definition of Richardson et al. (2005) assumes that all assets, except cash, and liabilities are amounts recognized in balance sheets due to accrual accounting, which increases the flexibility of accruals precision. The reasoning is that there are amounts with high proximity with their cash realization values, such as short-term investments, but other amounts, as properties, plant and equipment and pension plans, require high estimate levels, resulting in less reliability that the realization value equals the registered amount in balance sheets. Other concerns about discretion on accruals depart from Dechow and Dichev (2002), Nikolaev (2018) and Dichev and Owens (2020). In these papers, arguments drive the focus towards the timing of accruals estimates and their associated cash flows.

When the economic impacts of events happen before their cash realization, accruals anticipate cash flows, raising the need for estimates about how much cash will be received or disbursed in future (DECHOW; DICHEV, 2002). Such estimates about the future cash flow may differ from the realization amount that is due to the lack of perfect foresight.

However, the difference between accruals estimates and future cash flow realizations embrace two distinct effects, being one the difference between accruals estimates and the expectation of cash flows, and another being the difference between cash flows expectations and their actual realization. Nikolaev (2018) proposes that the latter is associated to performance instead of accounting errors, because such differences relate to events that impact expected cash flows, after the economic impact expectation is registered.

When the firm recognizes an economic impact with accruals ($\Delta OA = \Delta NA$), adequately using all available information at that moment, there could be no differences between the economic impact and the expected cash flow ($\Delta NA(t)$ = expected $\Delta CA(t+\tau)$), however, afterwards the expected cash flow may change due to new events, e.g. a customer may fall into a financial distress after the credit sale (expected $\Delta CA(t+\tau) \neq$ realized $\Delta CA(t+\tau)$). That would promote changes in the expected cash flows in a moment after the initial recognition of the economic impact by the opening accrual. Consequently, the registered accrual in t would correctly correspond to the cash flows expectations, while new events, happening between t and $t+\tau$, promote differences between the initial cash flow expectation and its actual realization.

Nikolaev (2018) denominates differences from such new events as cash flow shocks, which should not be associated to errors related to accrual accounting, but to changes in underlying performance, and argues that Dechow and Dichev's model embraces both

accounting errors and cash flow shocks. Dichev and Owens (2020) approach, that I discuss further, also embraces this difference.

Nikolaev (2018) associates the changes in expected cash flows to the firms' performance instead of accounting, leaving them out of the modeling of accounting errors. I argue that, although differences between expected and realized cash flows are not under the control of accounting procedures, they are part of the accounting numbers. I address such differences as deviations, because they represent the expectations that deviate from realizations. They are consequence of the order of the impacts, as economic changes in owners' wealth are recognized in advance of cash flow realizations, i.e. before cash impacts. Therefore, order deviations are related to anticipation accruals, because of their role of anticipating economic impacts of future cash flows, like when opening accounts receivable. In contrast, deferral accruals do not estimate cash flows expectations, already departing from actual cash flows, like when purchasing inventories. In addition, I leave remaining differences, between accruals and what would represent the correct value of the expected cash flows, for the next section, because it is conceptually closely related to differences between accruals and actual estimates of changes in owners' wealth or firms' performance.

From changes in net assets perspectives, initially, one may think of accruals compound by a term that represents a perfect forecast, ΔOA^*, plus natural deviations of expected from realized cash flows, δ. Therefore, segregating earnings in cash flows and accruals components, and under clean surplus relation and absence of errors in realized cash flows assumptions, in case of a perfect forecast, changes in owners' wealth would be perfectly accounted for, ΔNA^*, with accrual accounting carrying deviations δ from future realized cash flows to earnings, ΔNA. I represent those ideas in relations 3.1 and 3.2.

$$\Delta OA = \Delta OA^* + \delta \tag{3.1}$$

$$\Delta NA = \Delta CA + \Delta OA^* + \delta$$

$$\Delta NA = \Delta NA^* + \delta \tag{3.2}$$

Thus, as I show the opening and closing anticipation accruals in Table 2 without errors and deviations, in Table 5, I introduce the recognition of estimate deviations. For anticipation accruals, I present the flow relations of Dechow and Dichev (2002) also with the deviation term.

Table 5 Deviations in anticipation accruals

Accrual Effect	Flows[1]	Changes in net assets[2]		
		t - τ	***t***	**t + τ**
Open	$Accrual^{Open}_{Anticipation} = CF^{t}_{t+\tau} + \delta^{t}_{t+\tau}$	–	$\Delta CA = 0$ $\boldsymbol{\Delta OA} = \Delta NA^{*} + \delta$	ΔNA = - δ ΔOA = **- ΔCA - δ**
Close	$Accrual^{Close}_{Anticipation} = - CF^{t-\tau}_{t} - \delta^{t-\tau}_{t}$	ΔCA = 0 ΔOA = ΔNA* + δ	$\Delta NA = - \delta$ $\boldsymbol{\Delta OA = - \Delta CA - \delta}$	–

Notes. [1] For flow notation, the superior index of CF denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similarly to Dechow and Dichev (2002).
[2] For changes in net assets notation, in bold I marked the changes in non-cash assets related to represented flows and in italic I highlighted the changes in net assets in current period, *t*.

From changes in net assets perspective, I show that opening anticipation accruals influence current earnings in the same sense of its deviation, i.e. if changes in non-cash net assets are over or undervalued, earnings will carry the same effect. Afterwards, in $t+\tau$, the deviation reverses and the associated cash flow reveals what would be accrued under a perfect forecast of realized cash flows, with the deviation affecting earnings again.

Similarly to anticipation accruals, I suppose a credit sale of 100 monetary units, and in a next period, only 70 monetary units are effectively received. Dechow and Dichev (2002) present the same example in Appendix A. I illustrate it in Table 6, to represent also the changes in net assets perspective.

Table 6 Example of deviations in anticipation accruals – credit sale

Flows				Changes in net assets	
A firm sells $100 in credit and, in a future period, receives only $70. The difference, $30, is a loss.					
[A] ***In t:*** *Recognition of $ 100, from the credit sale*					
Db	Accounts receivable	100	$(Accrual^{Open}_{Anticipation})$	ΔOA = 100	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	100		ΔNA = 100	100 = 0 + 100
[B] ***In t+1:*** *No deviation situation (realization of $100)*					
Db	Cash	100	(CF^{t}_{t-1})	ΔCA = 100	ΔNA = ΔCA + ΔOA
Cr	Accounts receivable	100	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 100	0 = 100 – 100
[C] ***In t+1:*** *Deviation situation (recognition of $100 with a realization of $70)*					
Db	Cash	70	(CF^{t}_{t+1})	ΔCA = 70	ΔNA = ΔCA + ΔOA
Db	Sales loss	30	(δ^{t}_{t+1})	ΔNA = - 30	- 30 = 70 – 100
Cr	Accounts receivable	100	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 100	

Notes. [1] For flow notation, the superior index of CF denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similar to Dechow and Dichev (2002).

At first, at situation [A], in current period t, an opening anticipation accrual registers the credit sale, $\Delta OA = 100$, meaning an increase of owners' wealth, in the same amount, $\Delta NA =$

100. Note that, in the case of a full receipt, there would be perfect estimates and changes in net assets, with no deviations in earnings.

In the next period, *t+1*, there are two distinct situations. Under a situation of no deviation, at [B], the total estimated sale is received, *ΔCA = 100*, and the closing anticipation accrual, *ΔOA = -100*, compensates the changes in owners' wealth with a consistent negative sign. Under the proposed deviation situation, at [C], there is the receipt with changes in cash net assets of *ΔCA = 70*, and the accrual reversal *ΔOA = -100*, reflecting the previously overvalued amount, resulting in a negative impact on earnings of *ΔNA = -30*.

I present the changes in net assets for a more complete framework. There are regular deviations from the need of estimation for anticipation accruals that affect earnings, both for opening and closing amounts in balance sheets. It is appropriate to view such intuition as a natural process of accrual accounting, something that empirical researchers should mind, especially when dealing with discretion on economic events.

In addition, by the changes in net assets perspective, the association between discretion and economic impacts are evidenced under the column *t* of Table 5 and at situation [C] in Table 6. For opening anticipation accruals, there is no cash impact (ΔCA = 0), with the accrual impacting the change in owners' wealth (ΔOA = ΔNA). In this situation, the opening accrual carries the value for the expected cash flow in *t*, plus the difference between the cash flow expectation and its realization (ΔOA = ΔOA* + δ). In the example of Table 6, the difference between situations [B] and [C] are whether this difference is zero or not, which is not assessed by the firm in *t*, when the firm registers the sale with the opening anticipation accrual. Therefore, for opening anticipation accruals, both their components of perfect forecast (ΔOA*) and any deviations based on the difference between expected and realized cash flows (δ), are discretionary.

On the other hand, by the cash flow realization, in *t+1*, the closing accrual compensates its economic impact and reversing the deviation (ΔOA = - ΔCA - δ), as represented in Table 5. As Dichev and Owens (2020) observe, the compensation of economic impacts by cash realizations is non-discretionary. However, the deviation reversal component of the closing anticipation accrual is related to adjustments in cash flows expectations, which are discretionary. For example, although in situation [C] of Table 6 the recognition of the sale loss is illustrated in the same moment of the cash flow realization, the adjustment in the cash flow expectation could be in a different moment. There is the possibility that new information about

the loss arrived before the cash realization, or the firm keeps the difference for longer[5]. Therefore, different from opening anticipation accruals, which are entirely discretionary, closing anticipation accruals carry the non-discretionary compensation of cash flows and the discretionary deviations reversals.

Dechow and Dichev (2002) explain that these same ideas are not valid for deferral accruals, since cash already defines the initial recognition of changes in non-cash net assets. I illustrate that in Table 3, and further develop some reasoning about it, after Table 8. In this case, there are no such deviations from changes in expected cash flows, and so, no deviations due to recognition order of economic and cash impacts affecting earnings.

2.3.2 Discretion on estimating changes in wealth in anticipation and deferral accruals

Dichev and Owens (2020) extend the estimates needs idea, arguing that accrual accounting requires estimates of expected future cash flows, and also other forward-looking estimates, like depreciable lives, residual values, and stages of contract completion, for example. They define the concept of accrual duration, as the time extension between the accrual and its associated cash flow, which contributes to the discussion about estimation needs for the recognition of non-cash amounts and its variations. Their reasoning is as follows. Accruals that happen jointly with cash flows have zero duration with their amounts already defined, since they compensate the effect of the cash impact on total net assets. Their role is to take *away* the cash flow from current earnings, and are non-discretionary by nature. On the other hand, accruals that take cash flows from another period *into* current earnings have duration different from zero, and since they involve estimates about this duration, are discretionary. Even more, longer horizons carry higher discretion.

Within the framework I developed so far, accruals with zero duration, i.e. that happen jointly with cash flows, $\Delta OA = -\Delta CA$, are the non-discretionary component of closing anticipation accruals and opening deferral accruals. Their pairs, opening anticipation accruals and closing deferral accruals, respectively, as well as the discretionary component of closing

[5] In a situation of a firm adjusting the expected cash flow after its realization, the deviation reverts after the collection, or equivalently, there is an economic impact after the cash impact. This reversal is not a deferral because its underlying reasoning is to adjust the cash flow expectation and not defer an economic impact. Although one could argue that the consequence of carrying the reversal beyond the collection could be perceived as a deferral of an economic impact, I highlight that the categorization between anticipation or deferral regards the main balance sheet account and its changes, independent of differences between estimates and actual values, as elaborated in the previous section. Therefore, in terms of the framework developed in this study, deviations and their reversals relate to anticipation accruals, regarding differences between expected and realized cash flows.

anticipation accruals, have non-zero duration and estimate changes owners' wealth with reference of cash flows that are in another period, $\Delta OA = \Delta NA$. These latter accruals are the ones one may think as shorter or longer, while the former ones have equally zero duration. Generally, I already presented that mechanism from changes in net assets perspective, in Tables 2, 3 and 5, under the current period *t* column.

I also highlight that the idea of timing in accruals is not new, e.g. it derives from accrual accounting, it is fundamental in financial statements, Dechow (1994) and Penman (2013) approach the idea. I reinforce that, what is new in Dichev and Owens (2020) is that the idea of a *time horizon* deepens previous work of Dechow and Dichev (2002), and I propose that time extension can be approached separately, in alignment to Nikolaev (2018).

Such refinement allows one to consider degrees beyond the distinction between "hard" for cash flows and "soft" for accruals, as earnings components (Penman, 2013). It appeals to segregate more subtly between concretely based information from speculation. Though, it is consistent to associate accruals to a higher abstraction than cash flows, simply because of the presence of estimates, and on a further degree, there are estimated and non-estimated accruals, which one may think about "soft accruals" and "hard accruals", respectively.

In Table 7, I present current changes in net assets and indicate the moments of changes in net cash assets, with the subscript of ΔCA. That illustrates discretion in accruals regarding time extension, for when the accrual relates to changes in net cash assets in the same period, it is non-discretionary, and when the accrual relates to changes in net cash assets from different periods, it is discretionary.

Table 7 Discretion, effects and accounting functions of accruals (simplified presentation)

Accounting function	**Accrual effect**	
	Open	**Close**
Anticipation	**Discretionary**: $\Delta CA_{t+\tau}$ In *t*: $\Delta CA = 0 \rightarrow \Delta OA = \Delta NA$ e.g. Credit sales, accounts payable recognition	**Non-discretionary**: ΔCA_t (Deviation reversals are discretionary) In *t*: $\Delta NA = 0 \rightarrow \Delta OA = -\Delta CA$ e.g. Credit sales receipts, disburse from incurred expenses
Deferral	**Non-discretionary**: ΔCA_t In *t*: $\Delta NA = 0 \rightarrow \Delta OA = \Delta CA$ e.g. Inventory and PPE aquisition, prepaid expenses and deferred revenues recognition	**Discretionary**: $\Delta CA_{t-\tau}$ In *t*: $\Delta CA = 0 \rightarrow \Delta OA = \Delta NA$ e.g. Inventories sold, depreciation, prepaid expenses/deferred revenues realization

Note. In italic, I highlight current changes in net assets.

In addition, while Dichev and Owens (2020) propose a timing error approach to accruals as a more general version of Dechow and Dichev (2002) model, I argue that part of the

differences between accruals and cash flows realization can be approached separatedly from order deviations, which I name time extension errors. Those align with the proposal of cash flow shocks and accounting errors discussed by Nikolaev (2018), being the differences between the accruals and the expected cash flows that actually represent the change in owners' wealth, or equivalently, firms' performance, for anticipation accruals. In addition, for deferral accruals, when they represent these same changes in wealth or performance, there are also needs of estimation. Therefore, as I previously associated the cash flow shocks to deviations in accruals that affect only anticipation accruals, both opening and closing, I also associate such accounting errors to time extension errors, that affect both anticipation and deferral accruals.

2.3.3 Errors and deviations in accruals and impacts on earnings

The advance of Dichev and Owens (2020) is the perception that not only anticipation accruals are subject to estimates, an idea that a simplifyed reading of Dechow and Dichev (2002) may induce. On that previous work, the estimation of accruals errors reasons on the order of the impacts on earnings, of that comes first, if cash or economic impact of the event. On that case, only anticipation accruals would carry discretion, since deferral accruals would have their amount already set by the cash flow.

Then, Dichev and Owens (2020) enhance the discretion approach with the concept of accrual duration, valid for both anticipation and deferral accruals. Under the simplest situation, with single registers for opening and closing accruals, even if there is an already defined magnitude for the closing accrual, the period of registration remains under discretion or, at best, depends on other factors, such as policies or accounting principles. Consequently, with more periods for accruals distribution, like the choice of a depreciation extension, accruals magnitudes at each period also receive impacts and become subject of uncertainties that affect earnings, with subsequent reflections.

In turn, Nikolaev (2018) proposes to segregate accounting errors from changes in estimated performance, that includes cash flow shocks. As I previously associated cash flow shocks to deviations in accruals that affect only anticipation accruals, I also associate accounting errors to time extension errors, that affect both anticipation and deferral accruals.

I add that order deviations and time extension errors affect earnings differently, since they relate to different kinds of accruals. For example, errors and deviations alter earnings, however, only deviations in anticipation accruals affect earnings similarly to the example of Table 6, at situation [C]. For deferral accruals, no such reflexes on earnings happen.

In Table 8, I jointly present the effects on earnings caused by deviations from the order of impacts, δ, and time extension errors, ϵ, in accruals.

Table 8 Discretion, effects and accounting functions of accruals: estimate errors and deviations effects on earnings (complete presentation)

Accounting function	**Accrual effect**	
	Open	**Close**
Anticipation	**Discretionary**: $Accrual^{Open}_{Anticipation} = CF^{t}_{t+\tau} + Error^{t}_{t+\tau}$ In t-τ: – *In t:* $\Delta CA = 0 \rightarrow \Delta OA = \Delta NA^{*} \pm \epsilon + \delta$ In t+τ: $\Delta NA = -\delta \pm \epsilon \rightarrow \Delta OA = -\Delta CA - \delta \pm \epsilon$ e.g. Credit sales, accounts payable recognition	**Partially non-discretionary (ΔCA), partially discretionary (– δ ± ϵ)**: $Accrual^{Close}_{Anticipation} = -CF^{t-\tau}_{t} - Error^{t-\tau}_{t}$ In t-τ: $\Delta CA = 0 \rightarrow \Delta OA = \Delta NA^{*} \pm \epsilon + \delta$ *In t:* $\Delta NA = -\delta \pm \epsilon \rightarrow \Delta OA = -\Delta CA - \delta \pm \epsilon$ In t+τ: – e.g. Credit sales receipts, disburses from incurred expenses
Deferral	**Non-discretionary**: $Accrual^{Open}_{Deferral} = -CF^{t+\tau}_{t}$ In t-τ: – *In t:* $\Delta NA = 0 \rightarrow \Delta OA = -\Delta CA$ In t+τ: $\Delta CA = 0 \rightarrow \Delta OA = \Delta NA^{*} \pm \epsilon$ e.g. Inventory and PPE acquisition, prepaid expenses and deferred revenues recognition	**Discretionary**: $Accrual^{Close}_{Deferral} = CF^{t}_{t-\tau}$ In t-τ: $\Delta NA = 0 \rightarrow \Delta OA = \Delta CA$ *In t:* $\Delta CA = 0 \rightarrow \Delta OA = \Delta NA^{*} \pm \epsilon$ In t+τ: – e.g. Inventories sold, depreciation, realization of prepaid expenses and deferred revenues

Notes. [1] For flow notation, the superior index of CF denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similar to Dechow and Dichev (2002).
[2] In italic, I highlight current changes in net assets.

From Table 8, I analyse that:

(i) opening anticipation accruals are estimates of future cash flows, so both sources of uncertainty potentially influence earnings, one of recognition order and the other related to time extension, $\Delta OA = \Delta NA = \Delta NA^{*} + \delta \pm \epsilon$. Further, I discuss this case in more detail.

(ii) closing anticipation accruals, presenting both non-discretionary and discretionary parts, equal cash flows plus deviations and errors reversals, $\Delta OA = -\Delta CA - \delta \pm \epsilon$. Their non-discretionary component mitigates cash impacts, $\Delta OA^{*} = -\Delta CA$, and, under a perfect foresight situation, earnings would equal zero, $\Delta NA^{*} = 0$. As deviations and previous errors are reversed, earnings carry the effects of those uncertainties, $\Delta NA = -\delta \pm \epsilon$. The moment of the registry of those reversals are discretionary and may happen separately from cash flow realizations.

(iii) opening deferral accruals are non-discretionary, and do not have order deviations or time extension errors issues. Since there are no estimates, accruals just fully compensate cash flows and earnings are not susceptible to uncertainties, $\Delta NA = 0$.

(iv) closing deferral accruals also do not have order deviations, but they require estimates because they happen in a different period of their associated cash flow. That means that these accruals influence earnings in the magnitude of their error at each period, $\Delta OA = \Delta NA = \Delta NA^* \pm \epsilon$. They behave similarly to time extension errors of opening anticipation accruals.

Non-discretionary accruals relate to cash flows compensation, in alignment with Dichev and Owens (2020), and discretion is related to estimates uncertainties and their reversals. Compensation of cash flows happens in closing anticipation accruals and opening deferral accruals, in comparison to the presence of uncertainties in opening anticipation accruals, in closing anticipation accruals, and in closing deferral accruals.

In addition, only errors affect deferral accruals, since there are no deviations on the opening accrual that the closing accrual may reverse. The difference between anticipation and deferral accruals is what comes first, if the economic impact or the cash impact. Consequently, that unveils that economic impacts and cash impacts are not commutative, implying that accruals have different content under this distinction.

To represent deviations at changes in net assets perspective, I used the same reasoning of sign attribution than Dechow and Dichev (2002). For time extension errors, I used a plus and minus sign to represent errors that happen or reverse along periods. That demands a more extensive explanation.

Since Equation 2, I have simplified the presentation used through the paper, for generality and clarity purposes – comparing only t, t-τ and t+τ, with the term τ meaning some lag from the current period. Also all examples and reasoning fitted in a single opening and single closing accruals, for the sake of simplicity.

However, to access the behavior of time extension errors separately, it is necessary to add more than one entry for non-discretionary accruals. A complete presentation for past or future, would embrace from t-τ until t, and from t until t+τ, passing through t-1, t-2, t-3 … and t+1, t+2, t+3…, respectively. The main reason for that higher detailing is that errors in accruals estimates also reverse during the time when there are no cash flows impacts.

I illustrate how errors and deviations articulate with the accruals mechanism, in Figure 2. I maintain the current time t in the moment of the economic impact and represent the deviations in anticipation accruals with the long curved arrow and the errors with the shorter arrows. They behave similarly, to the right, the same sense as the timeline. As the time extension increases, the need for estimates increases, which is represented by the several periods between the opening and the closing accrual.

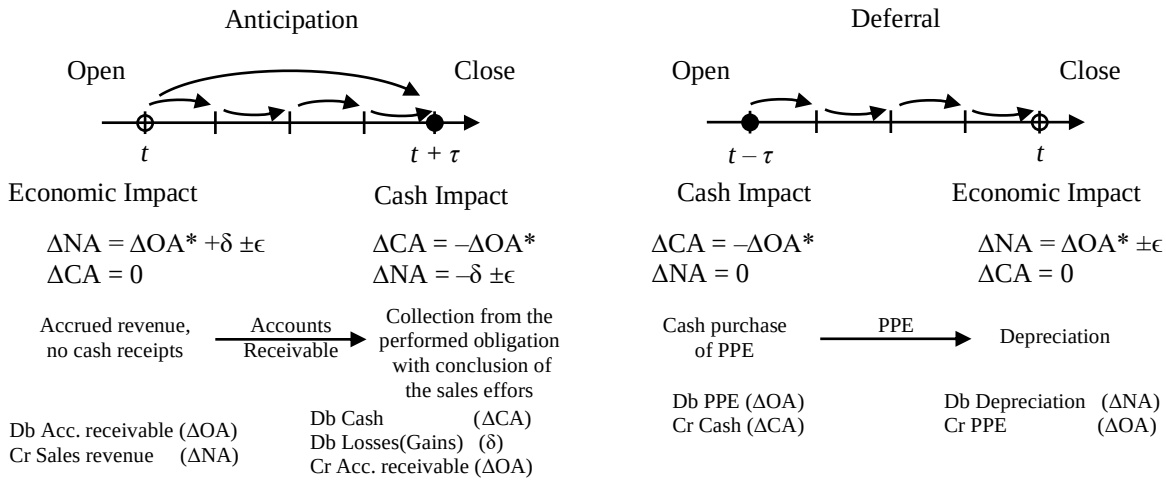


Figure 2 General overview of the accruals mechanism with errors and deviations

An immediate example for deferral accruals is the acquisition of an equipment, with an amount opened with a single entry accrual and closed through depreciation, during the equipment lifetime, τ. As the lifetime increases, discretion over accruals increases, and more the earnings become subject to errors. The main point is that errors regarding such discretion, related to time extension, cancel out each other during the lifetime of the equipment, i.e. if at some moment earnings were undervalued, they will be overvalued at some other moment, and vice-versa, until the equipment ceases to exist at the firm. The recorded amount also began free of error, since it was through a non-discretionary accrual.

Some very similar reasoning works for anticipation accruals. In the example of Table 6, at situation [A], I considered a single entry for the Sales revenue. Suppose that, instead of a single entry, the firm used two periods to appropriate the revenue, with any errors related to estimates of the efforts for the sales completion, and a perfect forecast of the amount of cash to be received. If the firm passed two periods developing efforts to complete the sale and appropriated revenues linearly, but actually had worked less than the half at the first period and more than the half for the second period; at the first period, earnings would be overvalued and at the second period, undervalued. I illustrate this situation in Panel A of Table 9.

Table 9 Example of time extension errors in anticipation accruals – credit sale

	Flows			Changes in net assets	
A firm sells \$100 in credit and, in a future period, receives the full amount. Two periods were necessary to complete the efforts for the sale.					
			Panel A: *Linear recognition, with non-linear efforts for development.*		
[A] ***In t:*** *Recognition of \$ 50, being the first part of the sale carrying 30% of total efforts.*					
Db	Accounts receivable	50	$(Accrual^{Open}_{Anticipation})$	ΔOA = 50	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	50		ΔNA = 50	50 = 0 + 50
				Note:	ΔNA = ΔNA* + ϵ
					50 = 30 + 20
[B] ***In t+1:*** *Recognition of \$ 50 for the remaining (70%) of the total efforts with the collection of \$ 100.*					
Db	Cash	100	(CF^{t}_{t+1})	ΔCA = 100	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	50		ΔNA = 50	50 = 100 – 50
Cr	Accounts receivable	50	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 50	
				Note:	ΔNA = ΔNA* – ϵ
					50 = 70 – 20
[C.1] ***In t+1:*** *Recognition of \$ 50 for the remaining (70%) of total efforts.*					
Db	Accounts receivable	50	$(Accrual^{Open}_{Anticipation})$	ΔOA = 50	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	50		ΔNA = 50	50 = 0 + 50
				Note:	ΔNA = ΔNA* – ϵ
					50 = 70 – 20
[C.2] ***In t+τ:*** *Collection of \$ 100 (perfect forecast, no deviations).*					
Db	Cash	100	(CF^{t}_{t+1})	ΔCA = 100	ΔNA = ΔCA + ΔOA
Cr	Accounts receivable	100	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 100	0 = 100 – 100
			Panel B: *Non-linear recognition, with linear efforts for development.*		
[A] ***In t:*** *Recognition of \$ 30, being the first part of the sale carrying 50% of total efforts.*					
Db	Accounts receivable	30	$(Accrual^{Open}_{Anticipation})$	ΔOA = 30	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	30		ΔNA = 30	30 = 0 + 30
				Note:	ΔNA = ΔNA* + ϵ
					30 = 50 – 20
[B] ***In t+1:*** *Recognition of \$ 70 for the remaining (50%) of the total efforts with the collection of \$ 100.*					
Db	Cash	100	(CF^{t}_{t+1})	ΔCA = 100	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	70		ΔNA = 70	70 = 100 – 30
Cr	Accounts receivable	30	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 30	
				Note:	ΔNA = ΔNA* – ϵ
					70 = 50 + 20
[C.1] ***In t+1:*** *Recognition of \$ 70 for the remaining (50%) of total efforts.*					
Db	Accounts receivable	70	$(Accrual^{Open}_{Anticipation})$	ΔOA = 70	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	70		ΔNA = 70	70 = 0 + 70
				Note:	ΔNA = ΔNA* – ϵ
					70 = 50 + 20
[C.2] ***In t+τ:*** *Collection of \$ 100 (perfect forecast, no deviations).*					
Db	Cash	100	(CF^{t}_{t+1})	ΔCA = 100	ΔNA = ΔCA + ΔOA
Cr	Accounts receivable	100	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 100	0 = 100 – 100

Notes. [1] For flow notation, the superior index of *CF* denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similarly to Dechow and Dichev (2002).

[2] Errors reflect the difference between actual and registered efforts, at each moment. For example, in Panel A, situation [A], the actual change in owners' wealth of \$ 30 reflects the part of 30% of total efforts of \$100, in comparison to the \$ 50, registered by the firm, which includes the error. The error reversal, illustrated in situation [B] of Panel A is related to the difference between the actual change of \$ 70, of the remaining 70% of efforts, and the registered change of \$ 50. This reversal is associated with the completion of efforts, not the cash flow realization, as reflected separately in [C.1] and [C.2] of Panel A. Similar considerations apply to Panel B.

As illustrated in Panel A of Table 9, any errors cancel out until the last period, when the closing accrual shuts the amount – under the assumption that only time extension errors happened, and not any deviations related to the order of impacts. Errors reversals do not depend on the collection but on the completion of sale efforts – i.e. in the situation [B] collection and effort completion happen together, while for situations [C.1] and [C.2] I separate the efforts and collection recognition procedures. The distinction provides a better understanding of the allocation of the time extension error, that is illustrated in [C.1] when the firm completes the efforts for the sale and the previous error of [A] compensates, and not in [C.2] when the firm collects the full predicted amount. I provide further a similar example with both errors and deviations to enhance such difference.

In contrast, in Panel B of Table 9, I consider a similar sale situation, with a non-linear recognition pattern, but efforts equally distributed along the development periods. While one may argue that Panel A would be a more recurrent situation, I understand that Panel B is equally valid for discussion purposes.

The comparison between Panels A and B of Table 9 is relevant because it shows similar situations with distinct implications for accounting earnings. In the first case, in Panel A, earnings present a characteristic of stability while the underlying operations were not as smooth, i.e. $\Delta NA(t)$ and $\Delta NA(t+1) = 50$, under a proportion of 30%-70% in developing efforts. On the other hand, in Panel B, operations were more stable than the accounting procedures captured, i. e. $\Delta NA(t) = 30$ and $\Delta NA(t+1) = 70$, under a 50-50% proportion in developing efforts.

This distinction is relevant because it highlights that accounting earnings may indicate more, or less, stability than their underlying operations, but still, in both cases, to account for the efforts reduced the errors of not considering any efforts at all during development, independently of the collection or not. Consequently, accounting earnings, in comparison to cash flows, did enhance the representation of changes in owners' wealth, and further interpretation on the firm's underlying operations requires additional information, such as normative rules or politics of recognition.

Time extension errors occur also in closing deferral accruals, like depreciation. A methodical recognition of an asset depreciation allows the firm to register its consumption, in a better estimate than under a total lack of recognition. Yet, it does not guarantee that the asset loses its value as registered – e.g., a politics of using the linear depreciation method, similarly to Panel A of Table 9.[6]

[6] Regarding opening and closing accruals of fixed assets, one may observe closing accruals behaving better than

Another relevant aspect regarding the timing uncertainties in accruals is that time extension errors do not seem directly observable, as well as the actual changes in the economic situation of the firm and they compensate between accruals independently of cash flows. In Table 10, I develop an example with both deviations and errors – a credit sale under a not perfect forecast, with two periods to complete the efforts.

Similarly to Panel A of Table 9, in Table 10, I also represent three distinct situations. In situation [A], I illustrate the recognition of the first part of the sale, admitting a linear pattern recognition, but distinct amounts of efforts between the periods, in addition to the lack of perfect forecast that causes an order deviation. In this case, changes in net assets reflect only the changes in non-cash net assets ($\Delta NA = \Delta OA$), and includes both errors and deviations by the recognition of the opening anticipation accrual. In situation [B], the firm completes the remaining of the total efforts and collects the sale, and both the deviations and errors revert. In situation [C], I segregate between the completion of the efforts in [C.1], showing the error reversal; the deviation reversal due to adjustments in expected cash flows in [C.2]; and the collection in [C.3].

The simultaneous presence of errors and deviations in anticipation accruals, as analysed in items (i) and (ii) in Table 8 and illustrated in Table 10, is a matter of timing coincidence, since the distinct causes are established by definition. Note that situation [C.1] of Table 10 carries the error reversal in the second opening anticipation accrual, while in situation [C.2] the closing anticipation accrual carries only the deviation reversal since the errors were previously fully reverted among the opening accruals.

opening ones – i.e., more steady, more predictable, less erratic, smoother, etc. That may seem contradictory, considering that opening deferral accruals are not susceptible to uncertainties like closing deferral accruals, as discussed in points (iii) and (iv) of Table 8. However, the potential confusion arises because to compare asset acquisitions with depreciation is a comparison between opening and closing accruals, while my analysis relates to timing uncertainties in accruals in comparison to cash flows and actual changes in owners' wealth. Assets acquisitons impact non-cash net assets more strongly than the individual recognition of depreciation during several periods. It is a matter of impact amounts and not uncertainty. Similarly to the comparison between Panels A and B of Table 9, the behavior of closing deferral accruals, without additional information or assumptions, does not say much about the underlying operations because of time extension errors. Besides, depreciation recognition represents better assets realization than a single closing accrual by their ending, case which the lack of recognition would carry greater errors during their lifetime.

Table 10 Example of order deviations and time extension errors in anticipation accruals – credit sale

Flows				Changes in net assets	
A firm sells \$100 in credit and, in a future period, receives the only 90% of this amount, \$ 90. Two periods were necessary to complete the efforts for the sale. The collection did not happened before the completion of efforts. New information regarding the amount to be received arrived at the moment of the collection.					
[A] ***In t:*** *Recognition of \$ 50, being the first part of the sale carrying 30% of total efforts and the deviations for the lack of perfect forecast.*					
Db	Accounts receivable	50	$(Accrual^{Open}_{Anticipation})$	ΔOA = 50 ΔNA = 50	ΔNA = ΔCA + ΔOA 50 = 0 + 50
Cr	Sales revenue	50			
				Note:	ΔNA = ΔNA* + δ + ϵ 50 = 27 + 3 + 20
[B] ***In t+1:*** *Recognition of \$ 50 for the remaining (70%) of the total efforts with the collection of \$ 90 and adjustment of cash flow expectation.*					
Db	Cash	90	(CF^{t}_{t+1})	ΔCA = 90	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	40		ΔNA = 40	40 = 90 – 50
Cr	Accounts receivable	50	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 50	
				Note:	ΔNA = ΔNA* – δ – ϵ 40 = 63 – 3 – 20
[C.1] ***In t+1:*** *Recognition of \$ 50 for the remaining (70%) of total efforts. Since no information*					
Db	Accounts receivable	50	$(Accrual^{Open}_{Anticipation})$	ΔOA = 50 ΔNA = 50	ΔNA = ΔCA + ΔOA 50 = 0 + 50
Cr	Sales revenue	50			
				Note:	ΔNA = ΔNA* + δ – ϵ 50 = 63 + 7 – 20
[C.2] ***In t+τ:*** *Adjustment of cash flow expectation.*					
Db	Sales loss	10	(δ^{t}_{t+1})	ΔNA = - 10 ΔOA = - 10	ΔNA = ΔCA + ΔOA -10 = 0 – 10
Cr	Accounts receivable	10	$(Accrual^{Close}_{Anticipation})$		
				Note:	ΔNA = ΔNA* – δ -10 = 0 – 10
[C.3] ***In t+τ:*** *Collection of \$ 90.*					
Db	Cash	90	(CF^{t}_{t+1})	ΔCA = 90	ΔNA = ΔCA + ΔOA
Cr	Accounts receivable	90	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 90	0 = 90 – 90
				Note:	ΔNA = 0

Notes. **[1]** For flow notation, the superior index of *CF* denotes the economic impact of the event (revenue/expense) and the inferior index denotes the cash impact of the event (receipt/disburse), similarly to Dechow and Dichev (2002).

[2] In [A], the deviation of \$ 3 is proportional to the completion of the efforts, reflecting 30% of the full deviation of \$ 10. The remaining deviation of \$ 7 occurs by the completion of the remaining 70% of the efforts, considering no adjustments in the expectations of cash flows. The error of \$ 20 reflects the difference between actual and registered efforts, also considering no adjustments in expectations of cash flows in *t*. The actual change in owners' wealth of \$ 27 reflects the part of 30% of the cash flow realization of \$ 90.

[3] In [B], the deviation reversal of \$ -3 is compound by the remaining deviation of \$ -7, illustrated in C.1, and the full deviation reversal of \$ 10, illustrated in C.2. In a similar way, the Sales revenue of \$ 40 is compound by the remaining deviation of \$ 50, illustrated in C.1, minus the adjustment for the loss of \$ -10, illustrated in C.2. The actual change in owners' wealth of \$ 63 reflects the remaining 70% of the cash flow realization of \$ 90.

The comparison between closing situations [B] and [C], under both order deviations and time extensions errors, reinforces that order deviations relate to differences between estimated future cash flows and their realization, which affects only anticipation accruals. On the other hand, time extension errors occur and revert among accruals themselves, for both anticipation

and deferral accruals, and relate to differences between the actual changes in owners' wealth and their estimates by accounting recognition. From that, I conclude that differently from deviations caused by the order of recognition and cash impacts, time extension errors are present in both anticipation and deferral accruals[7].

2.4 About uncertainty and hypotheses development

According to the Joint Committee for Guides in Metrology (JCGM, 2008), conceptually, uncertainty means doubt. As a parameter, uncertainty is associated with the result of a measurement characterizing the dispersion the values that can be attributed to the measurand. Independently of the approach, whether conceptually or applied, uncertainty reflects the lack of exact knowledge about the object, and that is the sense it is to be taken when also applied to accruals, earnings and wealth.

To make a measurement, it is necessary to define what is being measured. Definition itself is a source of uncertainty. In principle, describing a measurand completely requires an infinite amount of information, and an incomplete definition of the measurand leaves room for interpretation, introducing a component that may or may not matter to the accuracy required (JCGM, 2008). The definition of accruals as non-cash changes in owners' wealth, presented in Table 1, raises the opportunity to extend the discussion on uncertainty about the definition of wealth. In an admittedly rough concept, wealth represents how well one economically is, at some moment (HICKS, 1946). Such definition brings in some ideas, as a person and its economic situation, which corresponds to owners and non-cash net assets. On the other hand, it leaves out other ideas, as how much one may effectively purchase or how much one could be remunerated by saving, which would be inflation and interest. Consequently, the definition of accruals leaves out such aspects of economics and finance, in order to keep things as simple as possible, and by so, I assume that these do not carry significant amounts of uncertainty to the

[7] An important point is about the final composition of earnings, at the ending of Table 4. As illustrated, earnings are composed of current cash transactions, ΔCA, and the discretionary accruals, ΔOA(opening, anticipation) and ΔOA(closing, deferral). Non-discretionary accruals ΔOA(closing, anticipation) and ΔOA(opening, deferral) were previously canceled by their cash flows compensations, however, their uncertainties compose earnings, as closing anticipation accruals carry the reversals of errors and deviations of previously registered opening anticipation accruals, as in Table 8. By inserting uncertainties in Table 4, the substitution of accruals terms with their respective cash flows and uncertainties gives:

$$Earnings_t = CF_t^{t-\tau} - CF_t^{t-\tau} - \delta_t^{t-\tau} \pm \epsilon_t^{t-\tau} + CF_t^t + CF_{t+\tau}^t + \epsilon_{t+\tau}^t + \delta_{t+\tau}^t + CF_{t-\tau}^t + \epsilon_{t-\tau}^t + CF_t^{t+\tau} - CF_t^{t+\tau}$$

which yields the final expression:

$$\Delta NA = \Delta CA + \text{deviations reversals} + \Delta OA^*(\text{opening, anticipation}) + \text{errors and deviations} + \Delta OA^*(\text{closing, deferral}) + \text{errors reversals.}$$

Therefore, although some cash flows and accruals cancel out, their respective uncertainties remain in earnings.

results.

Another source of uncertainty that I do not approach, but it is extensively investigated in accounting literature research is conservatism. It is also a source of uncertainty that introduces bias in the measurement of accruals. To correct for known biases in measurement provides a best estimate of value, to satisfy fully the definition of the measurand (JCGM, 2008). In his proposed model, Nikolaev (2018) shows some possibilities to approach conservatism regarding errors in accruals, although the model disregards deviations. I do not empirically address conservatism; therefore, I assume that it affects the different categories of accruals similarly, i. e. conservatism biases accruals equally and independently of their opening or closing accrued amounts and anticipating or deferring cash flows.

At last, the very attribution of uncertainty to accruals ought to be discussed. Nikolaev (2018) proposes his model to approach accruals errors and he argues that Dechow and Dichev (2002) approach both errors and deviations indistinctly. The same applies to Dichev and Owens (2020). The main difference between these approaches is how they allocate the deviations.

Nikolaev (2018) names deviations as cash flows shocks, associating them to cash flows. The reasoning is that there is an expectation about future cash flows, which is based on a certain amount of information at the moment, and assuming that expectations are correct, changes in such expectation relate to changes in cash flows themselves. In terms of accounting procedures, when new information arrives, adjustment accruals will be performed, and in terms of this research, deviations in previously recorded accruals will be acknowledged. This proposition aligns with the idea of performing measurements relying on all available information (JCGM, 2008), and, of course, changes in available information may lead to changes in the corrected measurement.

The point is, before new information arrives, it appears not to be possible to distinguish between errors and deviations, for the accruals in which they happen jointly – opening anticipation accruals, as illustrated in Table 8. To assume that expected cash flows, in the absence of accounting errors, are the true value for accruals and deviations relate to cash flows themselves, carries the problem that such true value is unobservable. That is consistent with the conceptual idea that the true value of a measurand is unknown and that it is only possible to provide best estimations about it (JCGM, 2008). That is also a problem which Nikolaev (2018) empirically intends to circumvent, as the model does not address such changes in expectations in cash flows.

Another way is to use realized cash flows as a parameter of true value for accruals,

similarly to Dechow and Dichev (2002), Dichev and Owens (2020), and other models that use reported cash flows. Those are observable values. Those also conceptually attribute deviations to accruals instead of to cash flows. That is the main reason that, in the theoretical development, I nominate separately deviations from errors. I agree with the reasoning that changes in expectations because of new information are not accounting errors, but I also understand they deviate the value of the accrued amount from its realization value, and therefore, it is a source of uncertainty in accrual accounting when compared to cash flow accounting.

In sum, I associate errors and deviations to uncertainty in accruals, that occurs because of two distinct reasons: (i) the fact that, for anticipation accruals, the associated cash flow will occur in the future and expected and realized cash flows may be different, and (ii) the fact that, for opening anticipation accruals and for closing deferral accruals, the cash flow and the accrual do not just compensate each other, i.e. do not happen at the same time, and consequently, such accruals reflect changes in owners' wealth that may be different than the actual changes. That is illustrated in Table 8. The distinction between deviations and errors, in my study, relies on the distinct nature of the source of uncertainty, which leads to the general hypotheses to guide the models development and tests.

Two general hypotheses can be formulated that relate accruals themselves and to cash flows, for opening and closing accruals, as well as for anticipation and deferral accruals. Also, considering both dimensions simultaneously, those general hypotheses generate specific versions, considering only uncertainties within each category of the other dimension, e.g. for comparisons between anticipation and deferral accruals, the general hypothesis disregards the opening-closing dimension, while the specific hypotheses consider only opening accruals and only closing accruals. The same applies to comparisons between opening and closing accruals.

Regarding the relation between accruals and their associated cash flows, anticipating accruals would have higher degrees of uncertainty than deferral accruals, because of the presence of deviations. That applies generally, as well as isolatedly for opening and closing accruals. Accordingly, that compounds the first set of hypotheses.

H1: Anticipation accruals have a higher degree of uncertainty than deferral accruals.

H1a: For opening accruals, anticipation accruals have a higher degree of uncertainty than deferral accruals.

H1b: For closing accruals, anticipation accruals have a higher degree of uncertainty than deferral accruals.

In terms of Table 8, *H1* compares anticipation and deferral accruals independently of the opening and closing effects, implying in the inequality $|\pm \epsilon + \delta| + |-\delta \pm \epsilon| > 0 + |\pm \epsilon|$; while *H1a* can be represented as $|\pm \epsilon + \delta| > 0$; and *H1b* as $|-\delta \pm \epsilon| > |\pm \epsilon|$. Modules represent that it is the amounts that are under consideration, disregarding the direction of deviations and errors impacts on owners' wealth. For the hypotheses, I assume that deviations and errors contribute to accruals uncertainties equally and independently if errors are related to anticipating or deferring economic impacts of cash flows.

Hypothesis *H1a* relates to the idea that there is a higher uncertainty when firms register credit sales than when firms register assets acquisitions. That is because, in the first case estimates of future cash flows are necessary, being subject to deviations to the realization value, and estimates of partial the efforts to complete the sale may also be necessary, opening room for time extension errors. On the latter case, cash flows are already defined by the value of acquisition, therefore, no estimates are necessary for cash flows realizations or changes in owners' wealth. Version *H1b* states that there would be also a higher degree of uncertainty from errors and deviations when firms collect credit sales than when firms recognize depreciation. For those cases, there is the assumption that deviations and errors occur at a same level, i.e. differences in the estimated future cash flow and actual cash flows carry the same degree of uncertainty than differences between estimated and actual changes in owners' wealth. Therefore, the presence of reversals of previous deviations and errors in the sales collection yields a higher uncertainty than the presence of only errors in depreciation, since there is no source of uncertainty regarding cash flow realizations.

Regarding the relation between accruals and balance sheets amounts, generally comparing opening and closing accruals, the expectation is of lower uncertainty in opening accruals than in closing accruals, because of the presence of errors and their reversals in closing deferral accruals. Specifically for anticipation accruals, it is expected that opening accruals have the same degree of uncertainty than closing accruals, due to the presence of deviations and errors in opening accruals and their reversals in closing accruals, while for deferral accruals, it is expected that the opening accruals have a lower degree of uncertainty than closing accruals, due to the presence of errors in closing accruals but not in opening accruals. Such reasoning compounds the second set of hypotheses.

H2: Opening accruals have a lower degree of uncertainty than closing accruals.

H2a: For anticipation accruals, opening and closing accruals have similar degrees of uncertainty.

H2b: For deferral accruals, opening accruals have a lower degree of uncertainty than closing accruals.

In terms of Table 8, *H2* compares the opening and closing groups, considering the distiction in total uncertainties, $| \delta \pm \epsilon | + 0 < |- \delta \pm \epsilon | + |\pm \epsilon|$; while *H2a* can be represented as $| \delta \pm \epsilon | = |- \delta \pm \epsilon |$; and *H2b* as $0 < |\pm \epsilon|$. Modules represent that it is the amounts that are under consideration, disregarding the direction of deviations and errors impacts on owners' wealth. Similarly to the first set of hypotheses, I assume that deviations and errors affect the quality of accruals equivalently.

An example of what generates anticipation accruals are credit sales. Hypothesis *H2a* illustrates the idea that there are similar degrees of uncertainty associated with the moment when firms register credit sales and when firms collect the sale, because of the presence of deviations and errors in the opening accrual in comparison with their reversals in the closing accrual. For deferral accruals, as *H2b* states, there would be lower uncertainty in registering asset acquisitions than for depreciation recognition. That is because when the asset is registered there is no estimation regarding cash flows or changes in owners' wealth, but for depreciation there are estimates of how much changed in owners' wealth. Similar to previous comparisons, assumptions remain the same.

The sets of hypotheses H1 and H2 articulate the expected uncertainties for anticipation and deferral, and opening and closing categories of accruals. Each set is associated to the relation of accruals with cash flows and with balance sheets amounts, respectively. Such expectations rely on the accounting uncertainties as evidenced in Table 8, which, in turn, are based on the theoretical reasoning developed so far. This theoretical approach disregards other potential influences that could affect the results of an empirical approach, such as the magnitude of the reference balance sheets amounts, or how much they change, i.e. the magnitude of the flows, as discussed in note 5 regarding the opening and closing of fixed assets.

I use an empirical approach in order to compare the uncertainties in the categories considering the JCGM (2008) definition. In this approach, the estimates capture both the accouting uncertainties as well as variations in their underlying operating activities. This is a relevant difference between the theoretical and empirical approaches, being intrinsic to this research as it is in studies that investigate the quality of accounting information using reported

financial data. Therefore, theoretical and empirical approaches may be considered as more of complementary to each other than a verifying mechanism of hypotheses. In this study, to associate differences in uncertainty between the categories only to accounting uncertainties, as formulated in H1 and H2, requires the assumption of a same level of uncertainties in the underlying activities.

Summarily, the sets of hypotheses relate to uncertainties in accruals comparing their role of anticipating and deferring economic impacts of cash flows and with the effect of opening and closing balance sheets amounts. This framework provides a classification between anticipation or deferral and opening or closing in two levels, one with general categories, with independent dimensions, and other with specific categories. Those articulating dimensions are presented in Figure 3.

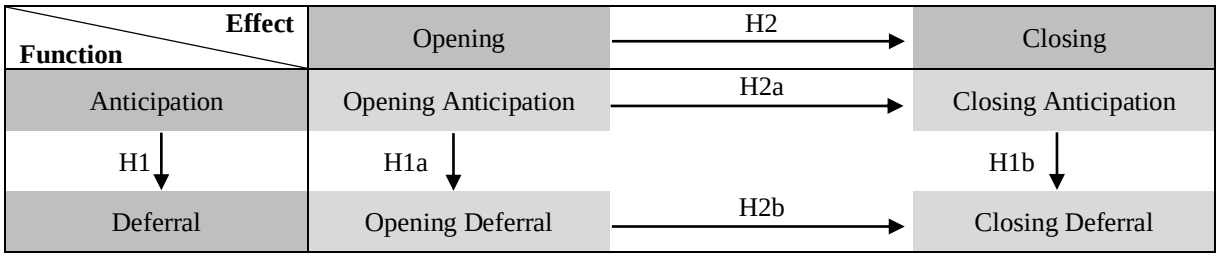


Figure 3 Categorization Scheme for Empirical Tests
Source: Research data.

In this study, I compare uncertainties between the accruals. For that, I performed comparisons between categories by estimating uncertainties within each category, at firm-level, and applying statistical tests. That follows the association between uncertainty and dispersion, as proposed by the JCGM (2008).

3 EMPIRICAL APPROACH

3.1 Overview

This section aims to empirically investigate timing uncertainties in accruals, according to their role in anticipating and deferring cash flows and their effect of opening and closing balance sheets amounts, by comparing uncertainties between the different categories of accruals. To elaborate on the research method, I considered several aspects for measurement construction and sample composition to use the most of available information, under organized comparisons between the categories of accruals.

Regarding the use of available information, I approached the data comprehensively. For example, I did not exclude observations that presented missing data for a variable, as the models adapt to that. Another aspect is that I did not exclude extreme values neither winsorized them in advance of performing the statistical tests, but I interpret the findings deepening the analysis in the extent of their required assumptions. In addition, I also perform additional analyses, considering only cases with moderate uncertainty levels, uncertainties in underlying activities, for different economic activities, how uncertainties behave for short and long term accruals and under a similar metric based on relative changes.

Based on data availability, I used two distinct research periods in this study to compare uncertainties between the accruals categories. A short period includes more firms, while a longer period includes fewer firms, but with longer time series. That allows for comparisons between results under the consideration of the periods of analysis.

Regarding the organization to perform the comparisons, I approach the categories of anticipation and deferral accruals, and opening and closing accruals, firstly in each dimension separately, and then simultaneously, integrating the dimensions under the four categories. The general analysis relates to the propositions of hypotheses H1 and H2. The integrated analysis provides evidence of the simultaneous consideration of the accruals' role in anticipating and deferring economic impacts of cash flows and their effect of opening and closing balance sheets amounts. They are based on the specificities (a) and (b) of each of the general hypotheses.

All of those aspects are discussed in more detail as I present the sample composition, variables, data availability, as well as the models' development. Next, I present firms' selection and discuss the periods of analysis, data availability, and the approach for accruals in this study. Then I show how the variables fit in the uncertainties measurements, elaborate the analyses models and discuss how each model articulates with the hypotheses propositions.

3.1.1 Data collection and availability

3.1.2 Variables and sample composition

The research data is from Economatica® database, collected in February and March of 2019, for firms actively listed in the New York Stock Exchange (NYSE). The data frequency is annual, regarding the 4th financial statement following the previous fiscal year-end (4th FSFPFYE). Data availability begins in 1994 and extends up to the last report for each firm. As there is no unique format for financial statements reporting in the United States, an adequate standardization for statements of non-financial firms is the Industrial template provided by the database.

The Industrial template provides Balance Sheets, Income Statements and Statements of Cash Flows with the variables presented in Table 11. The variables used in this research are marked with (*).

Table 11 Variables from Industrial Template by Economatica Database

Balance Sheets

Assets	*Liabilities and Equity*
Total assets*	Total liabilities
Current assets*	Current liabilities
Cash & ST Investments*	Accounts Payable current*
Accounts receivable net*	Debt ST*
Inventories*	Other ST Liabilities
Other Assets ST	
Investments in Subsidiaries and others*	Debt LT*
Property Plant and Equipment*	Deferred Taxes LT*
Intangibles & Goodwill*	Other Liabilities LT
Other assets	
	Stockholder equity (total)
	Noncontrolling interests
	Stockholders equity (parent)
	Preferred stock
	Common stock & surplus
	Retained earnings
	Other equity

Income Statement	**Cash Flows Statement**
+ Net operating revenues*	+ Cash flows from used in operating activities
- Cost of goods sold*	Net income
= Gross profit	Adjustments for depreciation and amort…*
- SGA Expenses and R&D*	Decrease (increase) assets & liabilities*
- Other operating expenses (income)	Other Oper Cash Flows Items
= Profit (loss) from operating activities*	+ Total Cash from Investiment Activities
- Net financial expenses (income)	Properties, plants & equipments net
+ Net equity income*	Addition to property, plant and…*
+ Other income (expense)	Proceeds from sales of prope…*
= Profit loss before tax	Investments net
- Income tax expense continuing operations*	Acquisition of investments*
- Other	Sale of investments*

= Profit loss from continuing operations	Other acq(sale) of investments*
+ Profit loss from discontinued operations	Other inv cash flow items*
+ Extraordinary items	+ Cash flows from used in financing activities
+ Changes account princ	Proceeds (repayment) of debt
= Consolidated net income	Proceeds from debt
- Profit loss attributable to noncontro…	Repayment of debt
= Net income*	Other proceeds (rep) of debt
	Proceeds from (repurchase) equity
	Proc from issu of equity
	Paym for repur of equity
	Dividends paid classified as fina…
	Other Financ. Cash Flow Items
	+ Discontinued operations
	+ Effect of exchange rate changes
	+ Other changes
	= Increase (decrease) in cash

Other Relevant Variables	
ID*	NAICS Level 1*
Year*	

Note: * Denotes variables used in the research.
Source: Extracted from Economatica® database.

Balance Sheets variables determine the composition of anticipation and deferral accruals, while the Income Statement and the Statement of Cash Flows support the opening and closing categories composition. The North American Industry Classification System (NAICS) variable allowed for the control for industry when applicable, as well as the identification of 330 firms in the finance industry, that are not considered in this study. With that, from the 1,365 firms, the initial sample composition is of 1,035 non-financial firms active in the NYSE, as described in Table 12.

Table 12 Initial sample composition

	Firms	**Observations**
Active firms listed in the NYSE	1,365	17,930
(-) "Finance and Insurance" (NAICS)	(330)	(4,261)
Non-financial active firms listed in the NYSE	1,035	13,369

Source: Research data.

3.1.3 Periods of analisys

Accordingly to the annual data availability, I opted for using two periods of analysis, being a shorter one, of 7 years, and a longer one, of 22 years. In Table 13, I present the number of firms with their data availability. The columns referring to the number of available firms and observations are presented in Panels (a) and (b) of Figure 4.

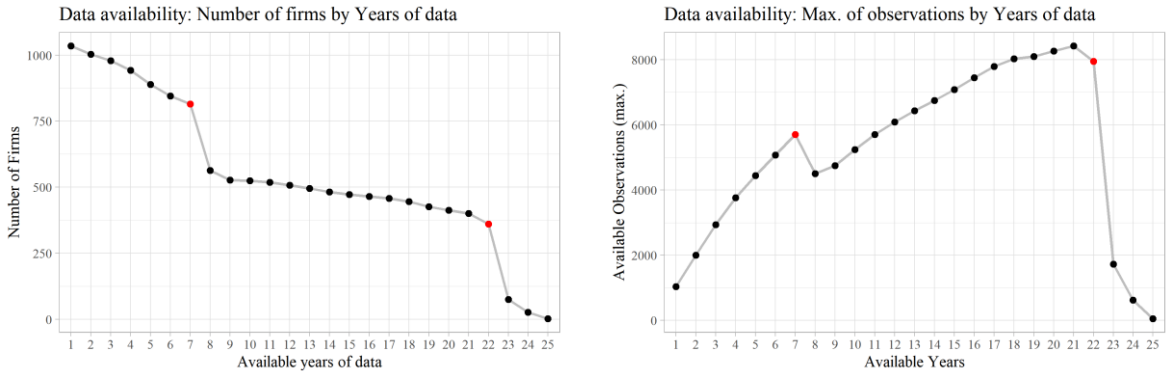


Figure 4 Data availability: Number of firms (a) and observations (b), by years of data
Source: Research data.

Table 13 Data availability according to each level of available periods

Available periods	Total firms by period	Total firms cumulative	Available observations	Available periods	Total firms by period	Total firms cumulative	Available observations
1	32	1035	1035	14	10	482	6748
2	24	1003	2006	15	7	472	7080
3	37	979	2937	16	7	465	7440
4	53	942	3768	17	12	458	7786
5	44	889	4445	18	20	446	8028
6	30	845	5070	19	13	426	8094
7	**252**	**815**	**5705**	20	12	413	8260
8	36	563	4504	21	40	401	8421
9	3	527	4743	**22**	**286**	**361**	**7942**
10	6	524	5240	23	49	75	1725
11	11	518	5698	24	24	26	624
12	12	507	6084	25	2	2	50
13	13	495	6435	*Total*	*1035*		

Source: Research data.

The first year with available data is 1994, and the last year, 2018. Only two firms presented data available within this range of 25 years. The red dots of Figure 4, as well as the bold lines of Table 13, mark the two analysis periods. They provide the two longest time-series before the loss of several observations, i.e. from 1 to 7 periods of available data there is a steady decrease of firms with available data, and for 8 periods there is a strong decrease. The same applies to the long period of analysis of 22 years.

From the 1,035 non-financial firms active in the NYSE, 815 firms provide data regarding the last 7 available years (5,705 observations) and 361 firms provide data with 22 years (7,942 observations). These values are summarized in Table 14.

Table 14 Number of firms and observations for each period of analysis

Period of Analysis	Number of Firms	Observations
Short: 7 years	815	5,705
Long: 22 years	361	7,942

Source: Research data.

In this study, the approaches to summarize uncertainties within the firms during those analysis periods, of several years, require the assumption that such uncertainties are constant during the whole period. In addition, the longer the period of analysis the stronger is the survival selection bias. Therefore, it is more reasonable to assume constant uncertainty and a weaker survival bias in a shorter period than in a longer one. On the other hand, findings in a longer period are more stable to extreme values in the time series or extreme impacts. Those aspects compose the main motivation to use the two distinct analysis periods for the estimation in the differences in uncertainty between categories.

3.1.4 Data availability by account

Observations represent the potential data availability, but that does not necessarily mean that all the variables present available data for all the firms. The variables used in the research are marked with (*) in Table 11. I present the occurrences of missing data, by variable, in Table 15.

In general, there are not many occurrences of missing data, except for costs of goods sold and SGA expenses, which present a higher incidence of missing data, of more than 15%. Since there is no standardization for financial reporting, it is reasonable to admit that those companies did not provide that information in income statements. The same is valid for the statement of cash flows, in which the aggregate information of net cash flows about PPE and Investments presents less missing data than their specificities of additions, acquisitions, and sales, for example.

Zero values also happen although they do not mean exactly missing data. For example, among Balance Sheets accounts, Investments in Subsidiaries presents only 7 cases of missing data, but more than 3,800 reports of zero values, and its related Income Statement account, Net Equity Income, shows more than 4,000 observations of zero values. Although zero values do not mean missing data, they mean that whatever the amount represents in the firm, as well as its changes, are absent.

Table 15 Occurrences of missing data, zero values and non-zero values by account

	Period of Analysis			
	Short (7 years)		Long (22 years)	
Variable	**Number of Obs.**	**Proportion (%)**	**Number of Obs.**	**Proportion (%)**
Balance Sheet Statement				
Cash & ST Investments	63	1.10	0	0.00
Accounts Receivable, Net	63	1.10	0	0.00
Inventories	63	1.10	0	0.00
Investments in Subsidiaries	7	0.12	0	0.00
Property, Plant and Equip.	63	1.10	0	0.00
Intangibles and Goodwill	63	1.10	0	0.00
Accounts Payable ST	63	1.10	2	0.03
Debt ST	63	1.10	2	0.03
Debt LT	56	0.98	0	0.00
Deferred Taxes LT	63	1.10	0	0.00
Income Statement		0.00		0.00
Net operating revenues	7	0.12	0	0.00
Cost of goods sold	960	16.83	1,204	15.16
SGA expenses and R&D	960	16.83	1,204	15.16
Net equity income	7	0.12	0	0.00
Income tax expense	0	0.00	0	0.00
Statement of Cash Flows		0.00		0.00
Adj. for depreciation…	38	0.67	57	0.72
Decr. (incr.) assets & liab.	38	0.67	57	0.72
Other oper. cash flows	94	1.65	57	0.72
Total cash from invest.	7	0.12	0	0.00
Prop. Plant and Equip., Net	71	1.24	9	0.11
Add. to PPE	109	1.91	61	0.77
Investments, Net	71	1.24	9	0.11
Acquisition of investments	364	6.38	1,109	13.96
Sale of investments	364	6.38	1,109	13.96
Total Observations	*5,705*	*100.0*	*7,942*	*100.0*

Source: Research data.
Note: Proportions are calculated as the occurrences of missing data relative to Total Observations.

In practical terms, occurrences of missing data and full time-series of zero values imply no meaningful information for uncertainty estimates. In this study, the empirical models generally address accruals regarding their categories and do not focus on the isolated balance sheets amounts or their related accounts. Uncertainties at the category-level are estimated by the average uncertainties of their component accounts. Therefore, missing data in one account imply that only uncertainties of the remaining accounts contribute to the categories uncertainty estimates.

3.1.5 Data usability in this study versus a traditional approach

Another aspect of the use of available data regards the “others” categories. Traditionally, accruals are estimated from the difference between changes in net assets and changes in cash net assets, like cash and debt. In this research, because of the interest in segregating anticipation

and deferral accruals, values allocated in "other" categories do not apply, since they comprehend transactions from events of both categories.

Considering the monetary unit as a measure of available information, the proportion of the use of information by the main accounts in balance sheets in this study in comparison to the total available information may be estimated by the proportion in Equation 3.

$$\frac{\sum X_i}{\sum X_i + \text{Other Assets ST} + \text{Other Assets (LT)} + \text{Other ST Liabilities} + \text{Other Liabilities LT}} \quad (3)$$

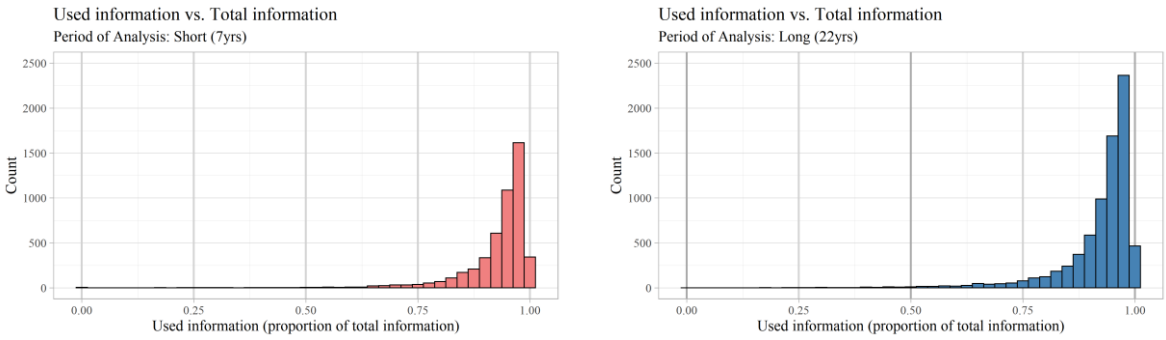
where X_i is the sum of used balance sheets accounts amounts, i.e.

$$\sum X_i = \text{Accounts Receivable} + \text{Inventories} + \text{Investments in Subsidiaries} + \text{PPE} + \\ + \text{Intangibles and Goodwill} + \text{Accounts Payable ST} + \text{Deferred Taxes LT}$$

Such proportion assumes that all the accounts have the same importance, since the information of resources allocated in Inventories is as important as Deferred Taxes or Other Assets, for example. Another assumption is that all resources in "others" categories are non-cash, under the comparison between the information that is used and the information that would be used if those categories applied.

An additional aspect is the sum of Assets and Liabilities and not the use of their net value, therefore this proportion is not about resource allocation within the firm neither represents owners' wealth, but intends to estimate the usage of non-cash information in this study in comparison to a total of available non-cash information.

Figure 5 illustrates the distribution of the proportion of allocated resources informed in the main balance sheets non-cash accounts in comparison to the total non-cash resources in assets and liabilities among firms, for both periods of analysis short (Panel A) and long (Panel B). Table 16 describes the distributions.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 5 Used information in comparison to total information in a traditional approach

Source: Research data.

Table 16 Deciles for the proportion between main and total non-cash assets and liabilities

Period of Analysis	Quantiles										
	Min.	10%	20%	30%	40%	50%	60%	70%	80%	90%	Max.
Short	0.0000	0.8399	0.8966	0.9254	0.9423	0.9538	0.9629	0.9710	0.9781	0.9854	0.9988
Long	0.0000	0.8233	0.8895	0.9188	0.9368	0.9503	0.9605	0.9683	0.9760	0.9840	1.0000

Source: Research data.

From the distributions, it is possible to observe that cases accumulate near one, with very rare cases of a low proportion of data usage. The proportions of 0.8399 (0.8233) in the first decile means that in less than 10% of the firm-year cases values reported in the "others" categories are almost 20% of non-cash values reported in Balance Sheets, corresponding to 5 (8) firms in the short (long) period of analysis. Therefore, for 90% of the cases, the use of non-cash information is above 80%, for both short and long periods of analysis.

These proportions, as well as the presence of missing and zero values in data, do not limit the models' development but provide comparisons to other estimate alternatives. Also, they provide a better perspective of how much one should conclude from the empirical findings from the analysis models.

3.2 Models development

3.2.1 Category composition

To attribute accruals to each category, I measure them at account-level, similar to some previous studies that investigated their specific characteristics. I present the corresponding categorization of those previous studies, in Table 17.

Etheridge (1991, 2004) segregates between accruals that reflect economic events not reported under cash flow accounting, i.e. syntactic data, and accruals that restate cash flow data, i.e. semantic data. Some variables in that study, I consider as accrued amounts, such as total receivables and total inventories, while accruals as I define in my study, would be the changes in these amounts. The income statement also provides useful variables, like depreciation and amortization and sales of PPE and Investments.

In turn, Richardson et al. (2005) use only changes in balance sheet amounts to extract accruals, considering differences between current and non-current operating and financial accruals. That categorization provides a basis for their reasoning about reliability in accruals, and it can be useful to explore short-term and long-term accruals in this study.

Table 17 Categorization of accruals in previous studies

Panel A: Etheridge (1991, 2004) – Semiotics in accruals	
Syntactic data, or "new information"	
Receivables, total	Accounts payable and accrued liabilities, incr (decr)
Accounts payable and accrual liabilities	Income taxes payable, increase (decrease)
Income taxes payable	Equity in net loss (earnings)
Deferred taxes	Accounts receivable, decrease (increase)
Semantic data, or "meaningful information"	
Inventories, total	Inventories, decrease (increase)
Debt in current liabilities	Depreciation and amortization
Sales of property, plant and equipment and sale of investments, loss (gain)	
Panel B: Richardson et al. (2005) – Operating, investment and financing activities	
Working capital accruals = ΔCurrent operating assets – ΔCurrent operating liabilities	
ΔReceivables	ΔAccounts payable
ΔInventories	ΔIncome taxes payable
ΔOther current assets	ΔOther current liabilities
Non-current operating accruals = ΔNon-current operating assets - ΔNon-current operating liabilities	
ΔProperty, plant and equipment, net	ΔOther liabilities
ΔInvestments, equity method	ΔDeferred taxes
ΔIntangibles, net	ΔMinority interest
ΔOther assets	
Change in net financial assets = ΔShort-term investment - ΔLong-term investment - ΔFinancial liability	
ΔShort term investments	ΔDebt in current liabilities
ΔInvestments – other	ΔLong-term debt
	ΔPreferred stock
Panel C: Larson et al. (2018) – Decomposition of comprehensive accruals	
Comprehensive Accruals	
ΔCommon stockholders' equity	ΔCash and equivalents
Working capital and long term accruals	
ΔTotal Assets	ΔTotal liabilities
ΔCash and short term investments	ΔDebt in current liabilities
ΔLong-term investments and advances	ΔDebt in long-term liabilities
Financial accruals = comprehensive accruals – working capital and long term accruals	

Source: Based on previous studies (Etheridge, 1991, 2004; Richardson et al., 2005; Larson et al., 2018).

At last, Larson et al. (2018) approach accruals comprehensively and regarding non-articulating events, such as extraordinary events or in the presence of conditional conservatism. Their first decomposition, presented in Panel C of Table 17, relies on Richardson et al. (2005) reasoning, but they approach the variables differently – from changes in total net assets minus cash changes, remaining only non-cash changes in net assets. That approach seems not directly useful for this study since I would need more detailing to segregate between categories.

Considering those previous studies, I apply a detailed approach to accruals departing from changes in balance sheets amounts, similarly to Richardson et al. (2005). The income and cash flows statements also provide useful data, such as revenues and depreciation, similar to Etheridge (1991, 2004). A pure flows approach, similarly to Larson et al. (2018), would embrace accruals more comprehensively, but would not provide the required deep detailing.

In Table 18, I present the categorization for the accounts used in this study, regarding their accounting function of anticipating or deferring economic impacts of cash flows and their

effect of open and close balance sheets amounts. I also present the distinction regarding the term of the account, which matters to total and current accruals composition, relating to the set of hypotheses.

Table 18 Variables for accruals categorization

Accruals (ΔOA)	Accounting Function	Accrual effect on BS amounts	
		Increase	Decrease
Balance Sheet Statement			
ΔAccounts Receivable, Net	Anticipation	Opening	Closing
ΔInventories	Deferral	Opening	Closing
ΔInvestments in Subsidiaries	Anticipation	Opening	Closing
ΔProperty, Plant and Equipment, Net	Deferral	Opening	Closing
ΔIntangibles and Goodwill	Deferral	Opening	Closing
ΔAccounts Payable ST	Anticipation	Opening	Closing
ΔDeferred Taxes LT (liability)	Anticipation	Opening	Closing
Income Statement			
Net operating revenues	Anticipation	Opening for Receivables	
Cost of goods sold	Deferral	Closing for Inventories	
SGA expenses and R&D	Anticipation	Opening for Accounts Payable ST	
Net equity income	Anticipation	Opening for Investments Subsid	
Income tax expense	Anticipation	Opening for Deferred Taxes LT	
Statement of Cash Flows			
Adjust. for depreciation and amort.	Deferral	Closing for PPE and Intangibles	
Addition (proceeds from sales) of PPE	Deferral	Closing (opening) for PPE	
Acquisition (sale) of investments	Anticipation	Closing (opening) for Investments	
Other investments cash flow items	Deferral	Closing (opening) for Intangibles	

Source: Research data.
Notes: 1. Accounting function relates to the function of anticipating or deferring economic impacts of cash flows, directly by the opening accrual, and complementarily by the closing accruals, as discussed in Section 2.2.4, about the general overview of accruals mechanism.
2. The signs of the variables are considered for categorization purposes and cash flows items of acquisition and sales of Investments and of PPE are represented in a single line each, but embrace two variables. The intent is to simplify the representation, and opening and closing composition for each account is discussed in greater detail further.

The distinction between anticipation and deferral accruals relates to cash flows timing, which carries no unique association to balance sheets amounts. Therefore, the classification of changes in these accounts depends on the specific nature of the accrued amount. For example, Accounts Receivable holds amounts that the firm considers as earned but has not yet received its cash, so openings in this account denote anticipation of cash flows. In addition, "other" assets and liabilities do not have a simple association with anticipation or deferral accounting function, therefore, their changes are not considered as accruals in this study.

That is different for opening and closing accruals. As discussed in Section 2.2.4, this is a dimension that relates accruals to their accrued amounts directly, as opposite flows around a state, i.e. an opening accrual increases the accrued amount, while a closing accrual decreases it. There is a conceptual distinction between increase a balance sheet amount and increase the

owners' wealth. The classification associated to balance sheets amounts is straightforward as presented in Table 18, although the impacts on non-cash net assets, representative of non-cash owners' wealth (OA), depend if the account is an asset or liability. Opening accruals associated with assets contribute positively to an aggregate measure of ΔOA, while opening accruals related to liabilities carry an opposite sign, contributing negatively to ΔOA, although they open amounts in balance sheets. This study articulates accruals to cash flows and balance sheets amounts, as the classification presented in Table 18. However, to investigate changes in owners' wealth, regarding inflows or outflows of value, for example, further considerations whether the account represents an asset or liability are appropriate.

For anticipation and deferral categories, the nature of the amount in Balance Sheets provides bases for classification, as presented in the Balance Sheet Statement Panel of Table 18. For the general classification between anticipation and deferral accruals, total variation of the amounts in balance sheets applies.

For opening and closing categories, accounts from Income Statements and Statements of Cash Flows complement the variations in Balance Sheet amounts, as they represent counterparts of changes in net assets that convey information by themselves. Therefore, accounts from those statements provide information on one side of the accruals pairs regarding the main account, e.g. Cost of Goods Sold typically closes Inventories.

Changes in Balance Sheets amounts result from their openings minus closings, as illustrated by the relations in Equations 4.1 and 4.2. Therefore, they are sufficient to generally determine between anticipation and deferral accruals, depending only on the nature of the account.

$$OA_{Beginning}(t) + OA^{Open} + (-OA^{Close}) = OA_{Ending}(t) \tag{4.1}$$

$$\Delta OA = OA^{Open} - OA^{Close} \tag{4.2}$$

On the other hand, to generally classify between opening and closing accruals, income and cash flows variables complement the composition, as presented in Table 18. In addition, as those accounts increase or decrease their related balance sheets amounts, their categorization between anticipation or deferral derives from the nature of the reference account.

For some accounts, data from the Income Statement is sufficient to establish opening and closing flows. That is the case for Accounts Receivable, Inventories, Accounts Payable and Deferred Taxes LT, which the Income Statement values represent the opening or closing pair of accruals of the reference account in the year, and the other pair is estimated by the difference in

relation to the variation in the Balance Sheet amount, based on the Equation 4.2.

In Table 19, I use this relation to estimate the opening and closing flows related to each of those accounts.

Table 19 Estimation of Opening and Closing accruals, using a single-step estimation

Ref. Account	Opening	Closing
Accounts Receivable	Net Operating Revenues^{IS}	ΔAccounts Receivable^{BS} – Opening
Inventories	ΔInventories^{BS} + Closing	Cost of Goods Sold^{IS}
Accounts Payable ST	SGA expenses and R&D^{IS}	ΔAccounts Payable^{BS} – Opening
Deferred Taxes LT	Income tax expense continuing operations^{IS}	ΔDeferred Taxes LT^{BS} – Opening

Source: Research data.
Notes: 1. Reference relation: $\Delta OA = OA^{Open} - OA^{Close}$
2. BS and IS stand for Balance Sheets and Income Statements, respectively, indicating the source of each variable.

This procedure assumes that all the variation reported in the Income Statement flows through the Balance Sheet amount, being entirely a non-cash flow, as well as the variation in the Balance Sheet amount is fully reflected in the Income Statement. For example, it admits that all of the Cost of Goods Sold in Income Statements closes Inventories, as well as all the closes in Inventories derive only from Costs of Goods Sold. The same occurs for Accounts Receivable, admitting that all Net Operating Revenues is from credit sales, which is the only source for opening the amount. This is a common approach in the literature that articulates financial statements flows and positions, like estimations of operating cycles to empirical tests, e.g. Dechow and Dichev (2002).

Besides the Income Statement, there are also accounts with useful information in the Statement of Cash Flows, e.g. PPE acquisitions increasing its related balance sheet amount of PPE. Therefore, I used specific values about acquisitions and sales of Investments in Subsidiaries, PPE and Intangibles and Goodwill reported in the Statements of Cash Flows, to estimate the opening and closing flows of these accounts and compose their respective accruals categories. In addition, I proportionally distributed values of Adjustments for Depreciation and Amortization, since they jointly relate to PPE and Intangibles, using the beginning of period amount for reference. As a general reasoning, negative flows represent cash consumptions, meaning opening Balance Sheets amounts, with the opposite for positive values. At last, the Income Statement also provided useful information with the Net Equity Income variable, with positive values reflecting increases in Investiments in subsidiaries, an opening accruals, and negative values reflecting decreases, closing the amount.

The association of Income Statements and Statements of Cash Flows values to opening and closing Balance Sheet amounts implies the assumption, similarly to the previous cases, that all the amount variation derives from their associated flows. However, differently from the previous cases, there is a detachment between the reference Balance Sheet amount and the difference between opening and closing flows, originating residues. This residual term captures the increases or decreases in the Balance Sheet amounts that were not considered or were considered in excess, and are estimated by the difference between the change in the amount and the difference of opening and closing amounts. The relations are presented in Equations 5.1 to 5.3.

$$OA_{Beginning}(t) + OA^{Open} - OA^{Close} + OA_{Residual} = OA_{Ending}(t) \quad (5.1)$$

$$OA_{Residual} = \Delta OA - (OA^{Open} - OA^{Close}) \quad (5.2)$$

$$\Delta OA = OA^{Open} - OA^{Close} + OA_{Residual} \quad (5.3)$$

The residue assumes a positive or negative value, being associated respectively to the opening or closing amount. The choice to sum the residual accordingly to their signal admits that those are values that were not yet considered. On the other hand, to admit that they represent values in excess would require to subtract the residual, accordingly to their signal. I argue that it is more reasonable to admit that the cash events do not fully represent changes in the reference Balance Sheet account, neither in excess, due to the possibility of flows between the reference account and other accounts that are not cash, like debt accounts. Therefore, to sum the residues is a way to, at least in part, correct for that.

I also highlight that this correction may not be absolute, in the sense that other opening and closing flows may occur and cancel out within the period, not being recognized under this procedure. Besides those aspects, I understand the sum of residual terms as enhancing the opening and closing estimates for each reference balance sheet account.

Summarily, to use the statement of cash flows variables to estimate opening and closing accruals, I applied a two-step procedure. Initially, I associate positive or negative values of the pertinent variables to the opening or closing category, and I compare those values with the changes in the reference balance sheet amount, applying Equation 5.2 to estimate the residual term. On the second step, I associate this residue to the opening or closing category depending on its sign. After this final residual adjustment, the opening and closing accruals to the group of accounts that uses information from the Statement of Cash Flows are equivalent to its changes in Balance Sheets, similar to the first group of accounts.

I present the variables associated to the opening and closing accruals for the balance sheets amounts that use this two-step procedure in Table 20.

Table 20 Estimation of Opening and Closing accruals, using the two-step estimation

Ref. Account	Variable	Statement	Opening	Closing
Investments in Subsidiaries	ΔInvestments in Subsidiaries	Balance		
	Acquisition of Investments	Cash Flows	–	+
	Sale of Investments	Cash Flows	–	+
	Other acq(sale) of Investments	Cash Flows	–	+
	Net equity income	Income	+	–
	Residuals		+	–
Property, Plant and Equipment	ΔProperty, Plant and Equipment, Net	Balance		
	Addition to PPE	Cash Flows	–	+
	Proceeds from sales of PPE	Cash Flows	–	+
	Adjustments for depreciation and amort$^{\%}$	Cash Flows	–	+
	Residuals		+	–
Intangibles and Goodwill	ΔIntangibles and Goodwill	Balance		
	Other investments cash flow items	Cash Flows	–	+
	Adjustments for depreciation and amort$^{\%}$	Cash Flows	–	+
	Residuals		+	–

Source: Research data.
Notes: 1. Reference relation: $\Delta OA = OA^{Open} - OA^{Close}$ + Residuals. The residual term is calculated using the changes in the balance sheet amounts and the variables from income and cash flows statements. Depending on their positive or negative sign, they are then associated to the opening or closing category. This extra step is necessary because the flows variables do not add exactly to the changes in their reference balance sheets amounts, originating the residual term.
2. The composition for opening and closing estimates for each account depends on the sign of the variable in the income statement and the cash flows statements. Positive and negative values indicate impacts on the balance sheet reference account that are used as opening and closing estimates, depending on their source. For example, negative values for Addition to PPE reflect consumption of cash, being associated to increases in PPE, an opening accrual, while positive values indicate cash received, which I associate to closing accruals for balance purposes.
3. % indicates proportionality. The variable Adjustments for depreciation and amortization was proportionally distributed between PPE and Intangibles, accordingly to the beginning of period values.

The composition of the categories themselves regarded each model under analysis, which measured uncertainties between the categories and their impacts on earnings. Since there are specific aspects in the development of each model, I elaborated on the categories composition with the intent of treating those specificities accordingly. The association of the estimates to the predictions elaborated in the hypothesis is also approached individually, but I present a general overview at the end of the section. The same applies to the analyses of the results.

3.2.2 Uncertainty between categories: the Relative Standard Deviation (RSD)

According to JCGM (2008), uncertainty is a parameter associated with the dispersion values attributed to the measurand. From that, it is reasonable to expect higher dispersion for accruals associated with higher uncertainty, i.e. accruals expected to carry more errors and

deviations would show greater variance than accruals with less errors and deviations. It is also reasonable that accounts that keep higher amounts may vary more than accounts with lesser amounts, e.g. inventories would show lower changes than PPE from one period to another.

Single dispersion measures, like variance, capture both variation and size effects, and therefore, a dispersion measure relative to the mean would be more suitable. As described by Heckert and Filliben (2003), the coefficient of variation can be a useful alternative when comparing data with very different mean values. It requires data measured on a ratio scale, i.e. continuous and with a meaningful zero; if the mean value is near zero, it is sensitive to small changes in the mean; and it may also be negative if the mean is negative.

Increases or decreases of accrued amounts, i.e. positive or negative accruals, carry the meaning of value inflow, or outflow. This study does not focus on that but discusses if such flows are more or less reliable, similarly to Richardson et al. (2005). The signal of the accrual is not under consideration since the main interest of the measurement is on uncertainty in accruals.

Heckert and Filliben (2003) compare the use of the mean value itself and the use of its absolute value in the ratio measure, naming the first as coefficient of variation and the last as relative standard deviation. The JCGM (2008) uses some similar squared ratio under the naming of relative variance.

Under such considerations, in this study, the metrics to capture uncertainties within the distinct accruals categories rely on the uncertainties of each reference balance sheet account. For each account, it was calculated the firm's Relative Standard Deviation as the proportion of the account populational standard deviation of the absolute values of the flows scaled by its mean, for both short and long periods of analysis. Then, the composition of the categories considers their role of anticipation and deferral economic impacts of cash flows and their effect of opening and closing amounts in Balance Sheets.

For anticipation and deferral accruals, generally, the changes in balance sheet account (ΔOA) is equivalent to the difference between opening and closing amounts ($OA^{Open} - OA^{Close} + OA_{Residual}$), as presented in Equations 4.2 e 5.3. For the specific groups, i.e. considering anticipation and deferral specifically for opening and closing accruals, only the opening or closing accruals were used, respectively. The estimated relative uncertainties for each balance sheet reference account, RSDs, generally and specifically for opening and closing, are presented in Equations 6.1 to 6.3.

$$RSD_{\Delta OA} = \frac{SD(|\Delta OA_t|)}{Mean(OA)} \quad (6.1)$$

$$RSD_{OA^{Open}} = \frac{SD\left(OA_t^{Open}\right)}{Mean(OA)} \quad (6.2)$$

$$RSD_{OA^{Close}} = \frac{SD\left(OA_t^{Close}\right)}{Mean(OA)} \quad (6.3)$$

The relative uncertainty for the groups of anticipation and deferral was established by the mean of the relative uncertainties of their accounts, as the categorization presented in Table 18. Therefore, in account-level, the uncertainties for the general categories are represented in the Equations 7.1 and 7.2.

$$RSD_{Anticipation} = Mean\ (RSD_{\Delta Acc.Receiv.}, RSD_{\Delta Invest.Subsid.}, RSD_{\Delta Acc.Payable\ ST}, RSD_{\Delta Def.Taxes\ LT}) \quad (7.1)$$

$$RSD_{Deferral} = Mean\ (RSD_{\Delta Inventories}, RSD_{\Delta PPE}, RSD_{\Delta Intangibles\ and\ Goodwill}) \quad (7.2)$$

For the uncertainties in the opening and closing accruals, in general groups, I calculated the mean of RSD of each account and for all the accounts, considering the opening and closing flows separately, but disregarding their accounting function of anticipation or deferral. Those estimates are presented in Equations 8.1 and 8.2.

$$RSD^{Open} = Mean\ (RSD^{Open}_{Acc.Receiv.}, RSD^{Open}_{Inventories}, RSD^{Open}_{Invest.Subsid.}, RSD^{Open}_{PPE}, RSD^{Open}_{Intangibles\ and\ Goodwill}, RSD^{Open}_{Acc.Payable\ ST}, RSD^{Open}_{Def.Taxes\ LT}) \quad (8.1)$$

$$RSD^{Close} = Mean\ (RSD^{Close}_{Acc.Receiv.}, RSD^{Close}_{Inventories}, RSD^{Close}_{Invest.Subsid.}, RSD^{Close}_{PPE}, RSD^{Close}_{Intangibles\ and\ Goodwill}, RSD^{Close}_{Acc.Payable\ ST}, RSD^{Close}_{Def.Taxes\ LT}) \quad (8.2)$$

At last, to estimate uncertainties within each specific group, i.e. considering simultaneously the classification in anticipation or deferral and opening or closing accruals, I combined both procedures, as presented in Equations 9.1 to 9.4.

$$RSD^{Open}_{Anticipation} = Mean\ (RSD^{Open}_{Acc.Receiv.}, RSD^{Open}_{Invest.Subsid.}, RSD^{Open}_{Acc.Payable\ ST}, RSD^{Open}_{Def.Taxes\ LT}) \quad (9.1)$$

$$RSD^{Close}_{Anticipation} = Mean\ (RSD^{Close}_{Acc.Receiv.}, RSD^{Close}_{Invest.Subsid.}, RSD^{Close}_{Acc.Payable\ ST}, RSD^{Close}_{Def.Taxes\ LT}) \quad (9.2)$$

$$RSD^{Open}_{Deferral} = Mean\ (RSD^{Open}_{Inventories}, RSD^{Open}_{PPE}, RSD^{Open}_{Intangibles\ and\ Goodwill}) \quad (9.3)$$

$$RSD^{Close}_{Deferral} = Mean\ (RSD^{Close}_{Inventories}, RSD^{Close}_{PPE}, RSD^{Close}_{Intangibles\ and\ Goodwill}) \quad (9.4)$$

As presented in Table 15, missing data and zero-values occur at different levels in the

accounts. In general, both the standard deviation and mean components of the RSD metric disregard missing information, removing them from the estimate. Zero values have a distinct behavior whether the whole time-series for the firm is zero or there are just some occurrences. For a whole zero time-series, both the standard deviation of the flows and the mean of the reference balance sheet amount are zero, therefore the RSD is undetermined. On the other hand, for cases when the firm presents some zero values and some non-zero values within its time-series, they both compose the RSD metric, regarding the dispersion of the flows and the average of the reference amount.

For category composition, cases that present non-available RSD for some variable, the mean of RSDs for the category is adjusted to disregard the missing data. That is, in case of non-available data, the RSD for the accounts within the category is the mean of the RSD of the remaining accounts with available data, as presented in Equations 7 to 9.

To investigate the differences between the categories, I performed tests of differences of means for paired observations at firm-level, comparing the distinct categories for the same firms. The differences were tested in three restriction levels, by the parametric t-test and non-parametric Wilcoxon and sign tests. I perform the tests on those three levels to discuss their assumptions regarding the distributions of differences between categories. That allowed for a more elaborated discussion of the findings. Generally, I discuss the test results considering the extent of attendance of their assumptions.

I present the predictions for the tests results, according to the research hypotheses, in Table 21.

Table 21 Predictions for differences in RSD according to the research hypotheses

	Hypothesis	RSD Prediction
H1	*Anticipation accruals have a higher degree of uncertainty than deferral accruals.*	$RSD_{Antic.} > RSD_{Defer.}$
H1a	For opening accruals, anticipation accruals have a higher degree of uncertainty than deferral accruals.	$RSD^{Open}_{Antic.} > RSD^{Open}_{Defer.}$
H1b	For closing accruals, anticipation accruals have a higher degree of uncertainty than deferral accruals.	$RSD^{Close}_{Antic.} > RSD^{Close}_{Defer.}$
H2	*Opening accruals have a lower degree of uncertainty than closing accruals.*	$RSD^{Open} < RSD^{Close}$
H2a	For anticipation accruals, opening and closing accruals have similar degrees of uncertainty.	$RSD^{Open}_{Antic.} = RSD^{Close}_{Antic.}$
H2b	For deferral accruals, opening accruals have a lower degree of uncertainty than closing accruals.	$RSD^{Open}_{Defer.} < RSD^{Close}_{Defer.}$

Source: Research data.

Regarding the use of available information, I approached the data comprehensively. For example, I did not exclude observations that presented missing data for a variable, as the models

adapt to that. Another aspect is that I did not exclude extreme values neither winsorized them in advance of performing the statistical tests, but I interpret the findings deepening the analysis in the extent of their required assumptions.

To perform the statistical tests, I make comparisons with all companies in the sample composition, including cases of low and high uncertainty levels in anticipation, deferral, opening and closing accruals. As an additional analysis, in order to investigate whether the evidence is sustained for the more typical cases, I trimmed the RSDs of each category under comparison in 10% and performed the tests again. That allows to analyse how the differences behave for companies with more moderate uncertainty levels, and identify potential sensitivity of the results of the tests regarding uncertainties within the categories.

In addition, I highlight that the tests rely on the hypotheses based on the accounting uncertainties presented in Table 8 and their theoretical discussion. Regarding the RSD metric, it is relevant to consider that it captures accounting uncertainties jointly with uncertainties from the underlying operating activities that influence the flows of the amounts. Therefore, the results of the tests are subject to the influence of those broad uncertainties, and not only from timing uncertainties in accounting.

Considering that the tests measure differences between the categories, i.e. anticipation minus deferral and opening minus closing, it is not necessary to admit lack of operating uncertainties, but it requires the assumptions of equivalent levels of operating uncertainties between the categories under comparison and operating and accounting uncertainties as mutually exclusive or with equivalent interaction effects. This proposition is presented in Equations 10.1 to 10.3.

$$RSD_I - RSD_{II} = (RSD_I^{Op} + RSD_I^{Acc} + a \cdot RSD_I^{Op} \cdot RSD_I^{Acc}) - (RSD_{II}^{Op} + RSD_{II}^{Acc} + b \cdot RSD_{II}^{Op} \cdot RSD_{II}^{Acc}) \quad (10.1)$$

$$RSD_I - RSD_{II} = RSD_I^{Acc} - RSD_{II}^{Acc} \underbrace{+ RSD_I^{Op} - RSD_{II}^{Op}} + \underbrace{a \cdot RSD_I^{Op} \cdot RSD_I^{Acc} - b \cdot RSD_{II}^{Op} \cdot RSD_{II}^{Acc}} \quad (10.2)$$

$$RSD_I - RSD_{II} = RSD_I^{Acc} - RSD_{II}^{Acc} + \text{Zero} + \text{Zero} \quad (10.3)$$

where a and b are general interaction parameters to illustrate the possibility that a potential interaction between operating and accounting uncertainties for each category under comparison are different but cancel out as in Eq. 10.2

As indicated in Equation 10.2, the reasoning to associate the difference of uncertainties measured by the RSDs to accounting uncertainties only requires the assumption that operating

uncertainty terms cancel out by being equivalent between the categories, including any assumed interactions between accounting and operating uncertainties. Notably, the assumption of no operating uncertainty is also sufficient to hold the Equation true, however, it is a more naïve version to approach the problem.

I performed an additional analysis under the consideration of operating uncertainties, measured by the RSD of cash accounts. I estimated the operating uncertainty similarly to the accruals uncertainty, considering the cash accounts as indicated in Equations 11 and 12.

$$RSD_{\Delta CA} = \frac{SD(|\Delta CA_t|)}{Mean(CA)} \tag{11}$$

$$RSD_{\text{Cash Flows}} = Mean(RSD_{\Delta \text{Cash and ST Invest.}}, RSD_{\Delta \text{Debt ST}}, RSD_{\Delta \text{Debt LT}}) \tag{12}$$

The main intent of this analysis was to investigate possible relations between the RSD estimates and operating uncertainties. For that, I divided the operating uncertainty measurements ($RSD_{\text{Cash Flows}}$) in quintiles, to compare the behavior of the accruals RSDs in distinct levels of operating uncertainties. I note that, in order to extract the operating uncertainties from each accrual account, the level of information required is to know how much of each change in the account is from cash and from non-cash, which is not available in reported financial statements. This analysis provides further evidence of the operating uncertainties in the RSD metric, for the categories isolatedly and for the differences between them, supporting the possibility of some generalization of the tests results, regarding operating uncertainties.

I also compared uncertainties within each category by industry and performed paired tests comparisons grouping the firms by their industries, to illustrate and identify potential sources for higher or lower uncertainty levels related to economic activity. One could propose using the industry uncertainties estimates as a benchmark for operating uncertainties and firm differences from it as accounting uncertainties. However, as industry estimates depart from accounting numbers, they would not be free from errors and deviations. Besides that, I consider that, as accounting and operating uncertainties are intertwined, deviations and errors could be carried as operating uncertainties more strongly as higher the instabilities of activities within the industry. Therefore, I present the RSD estimates and results of the tests for firms grouped by industry, to provide evidence about RSD estimates among the economic activities, which have distinct levels of operating uncertainties.

In addition, the assumption of equivalence of uncertainties for the categories under comparison may fit differently regarding the short or long-term impacts of underlying activities.

In that sense, it would be more reasonable to admit that short-term operating activities carry similar uncertainties for anticipation and deferral accruals, or opening and closing accruals, than it would be reasonable to admit the same for activities that generate long-term accruals, with events from operating activities and activities from investments. For example, it is more reasonable to assume that the activities of purchase and selling inventories carry similar amounts of uncertainty than the purchase and selling of investments. Considering that, I also perform an additional analysis to compare the uncertainties between the categories composed by short and long-term accruals separatedly.

At last, I also perform comparisons considering a more traditional tool in the analysis of the behavior of accounting numbers, based on the relative change, or percentage change, applied in budget variance analysis and horizontal analysis of financial statements, for example. Even further, Penman (2013) builds on the idea to demonstrate a trend analysis to illustrate changes in financial statements over time. In this work, it can estimate, for each balance sheet account, how much it changed from one year to the next, proportionally to the size of the account each year. Similar to the RSD, the relative change approach takes into consideration that distinct accounts have typically distinct sizes.

However, it also captures the effect of the magnitude of the flows, since more positive or negative changes yield higher values for relative changes. Therefore, to apply the relative changes approach to capture categories uncertainties and their differences, I considered the standard deviation of the relative changes at the account-level, instead of their values directly or their average, which is closer to the definition for uncertainty as a parameter, according to the JCGM (2008). In addition, similar to the RSD estimates, I also consider the absolute values of the relative changes, under a general approach. I represent the standard deviation of relative changes (SDRC) metric, in the account-level in Equations 13.1 to 13.3. The composition for the SDRC at category-level follows the same procedure for the estimates of the RSD, as represented in Equations 7 to 9, as well as the predictions are in the same as Table 21.

$$SDRC_{\Delta OA} = SD\left(\frac{|\Delta OA_t|}{OA_{t-1}}\right) \tag{13.1}$$

$$SDRC_{OA^{Open}} = SD\left(\frac{OA_t^{Open}}{OA_{t-1}}\right) \tag{13.2}$$

$$SDRC_{OA^{Close}} = SD\left(\frac{OA_t^{Close}}{OA_{t-1}}\right) \tag{13.3}$$

The RSD and SDRC are closely related, in the sense that they are built on the same constructs and with adjustments for similar considerations. I highlight that, by construction, the SDRC is subject to measuring higher uncertainty when the reference amount decreases and lower uncertainty when the reference increases, because the changes are carried yearly. Although that may be suitable for a situation where decreasing amounts should be related to higher metric values, that is not the case for this research. Therefore, I perform the tests with the SDRC to provide further evidence using a distinct metric that is based on a more familiar approach but I still consider the RSD more adequate for the research purposes, as it is more stable when using the balance sheet amount as reference for size.

Regarding the proposed hypotheses consider only accounting uncertainties, I argue that the operating uncertainties in the RSD estimates do not impair the theoretical discussion, but complement it. I interpret the findings from the tests of difference of means according to their assumptions, regarding their statistical requirements as well as the model reasoning, and present a discussion of the results at the end of the next section.

4 RESULTS AND ANALYSIS

4.1 Overview

The hypotheses stated from the reasoning in Table 8 provide a useful direction for analysis, by comparing uncertainties between accruals categories. Deviations and errors, as exposed in the theoretical part, based on Dechow and Dichev (2002), Nikolaev (2018), and Dichev and Owens (2020), come from differences between accounting recognition of events and their associated cash flows, and they sustain the expectations for differences between the categories.

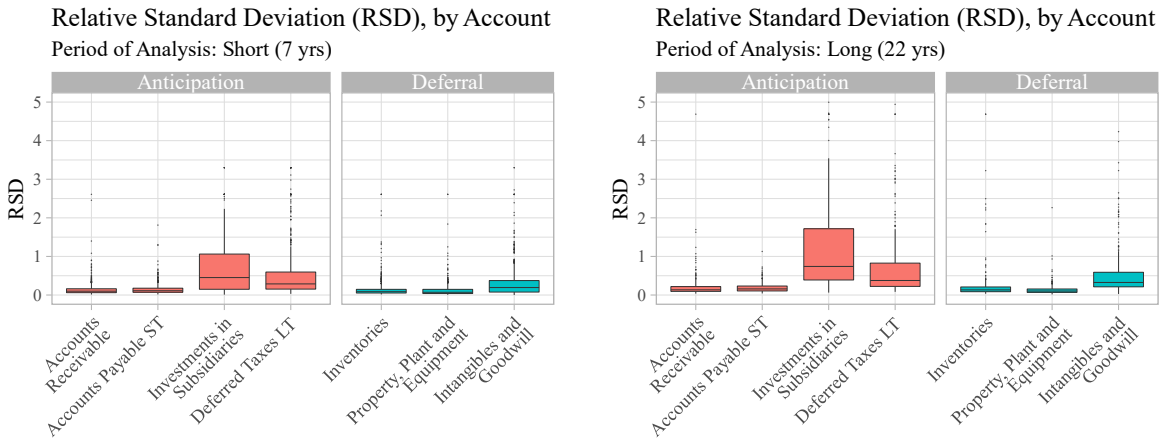
The Relative Standard Deviation (RSD) measurement captures both accounting uncertainties and instabilities from their underlying activities. Empirical evidence of differences between accruals categories capture higher or lower levels of uncertainty between pairs of accounting recognition, like anticipation vs. deferral, or opening vs. closing, and not the direct comparison between recognition and actual economic impacts of events, which are virtually inaccessible. Therefore, results obtained under the directions provided by the hypotheses require a sense that categories under comparison carry also operating uncertainties, and to associate differences between them to accounting uncertainties requires the assumption that, at least, both categories carry the same amount of uncertainties in their underlying activities.

Other aspects also require attention. The different sizes among the firms and the accounts themselves are controlled by definition, and potential influences regarding the extension of the periods under analysis are evidenced by comparisons between the short and long periods. I perform additional analyses to investigate differences (i) considering only firms with more moderate levels of uncertainty, (ii) under distinct levels of underlying activity uncertainties, (iii) regarding different economic activities, (iv) for short and long-term accounts, and (v) considering an alternative measure for uncertainty.

Next, I present the uncertainty measurements, by the RSD estimates, at account-level. Following that, I describe and compare uncertainties between anticipation and deferral, to address hypotheses H1 and its set, and between opening and closing categories, for the set of hypothesis H2. Besides that, all the results are paired regarding the short and long periods of analysis, to expose potential differences from distinct periods extensions. Then, I provide some additional analysis, to address other possible sources of influence on the results, and at last, I present a discussion of the findings.

4.2 Uncertainties at account-level

Uncertainties for the categories depart from uncertainties estimated for the individual reference balance sheets accounts, by their Relative Standard Deviation (RSD). The grouping in anticipation and deferral relies on the nature of each reference account. The distributions for the RSD estimates are illustrated in Figure 6 and the descriptive statistics are presented in Table 22.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 6 Relative Standard Deviation (RSD), by Account
Source: Research Data.

Table 22 Descriptive statistics for RSD, by Account

Panel A – Period of Analysis: Short (7 yrs)							
	Accounts Receivable	**Accounts Payable ST**	**Investments in Subsidiaries**	**Deferred Taxes LT (liability)**	**Inventories**	**PPE**	**Intangibles & Goodwill**
Min.	0.0129	0.0159	0.0095	-1.066	0.0149	0.0063	0.0000
1st Q.	0.0607	0.0712	0.1488	0.1528	0.0516	0.0387	0.0765
Median	*0.0991*	*0.1108*	*0.4524*	*0.2875*	*0.0863*	*0.0708*	*0.1939*
Mean	0.1412	0.1485	0.6728	0.5447	0.1503	0.1215	0.3229
3rd Q.	0.1629	0.1769	1.0616	0.5951	0.1473	0.1470	0.3748
Max.	2.6088	1.8114	3.2998	3.2998	2.6088	2.6087	3.2998
Std. Dev.	0.1767	0.1375	0.6928	0.6814	0.2507	0.1872	0.4311
N	789	804	350	636	686	803	730
Panel B – Period of Analysis: Long (22 yrs)							
	Accounts Receivable	**Accounts Payable ST**	**Investments in Subsidiaries**	**Deferred Taxes LT (liability)**	**Inventories**	**PPE**	**Intangibles & Goodwill**
Min.	0.0363	0.0414	0.0626	0.0820	0.0324	0.0169	0.0274
1st Q.	0.0940	0.1055	0.3999	0.2256	0.0864	0.0683	0.2121
Median	*0.1343*	*0.1585*	*0.7593*	*0.3832*	*0.1338*	*0.1024*	*0.3259*
Mean	0.2047	0.1868	1.3156	0.7931	0.2764	0.1382	0.5336
3rd Q.	0.2186	0.2332	1.8248	0.8460	0.2118	0.1568	0.5895
Max.	4.6851	1.1285	6.4580	6.4580	6.4578	2.2644	4.2339
Std. Dev.	0.3050	0.1218	1.3845	1.0774	0.6776	0.1560	0.5982
N	356	361	204	311	342	359	340

Source: Research Data.

For all the reference accounts, the distributions of firms' RSDs are right-skewed, with lower values more concentrated than higher values. This skewness is notable in the graphs and in the mean values that are higher than the medians, for all the accounts. Generally, the mean values are closer to the third quartile than to the medians, and for Inventories, the mean is above the third quartile.

By definition, the RSD is positive, estimated by the proportion of absolute values of the changes in the account and their mean value for the period of analysis. The negative minimum value for Deferred Taxes LT (liability) is an exception, a result of the fiscal planning performed by General Electric, that in the years of 2011 and 2012 reported deferred taxes as negative liabilities and in the following years started to report them as positive assets. Since the database specifies Deferred Taxes LT as liabilities but not as assets, this inversion reflects in a temporary negative value for two years and after that as zero, leading to a negative value for the mean of this account for the firm. For the long period of analysis, this firm reports the majority of values of Deferred Taxes LT (liability) as actual liabilities.

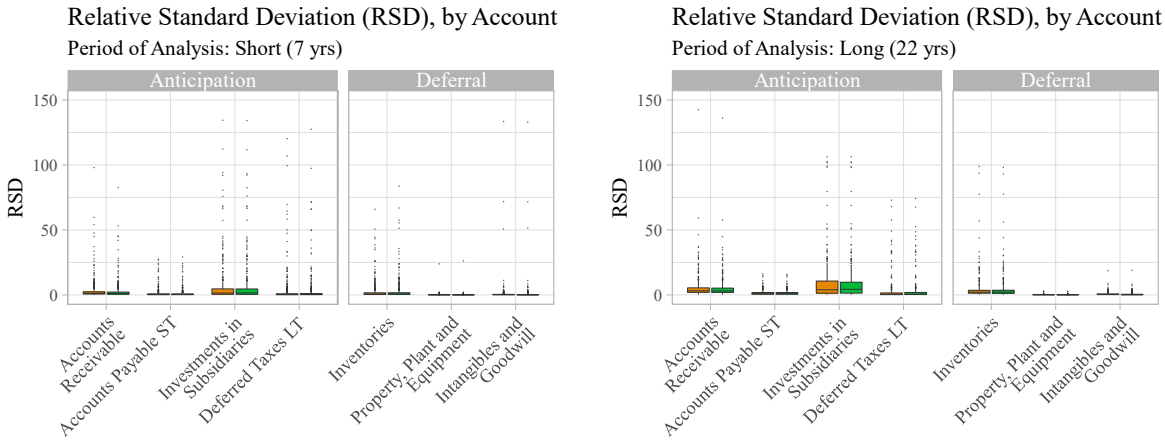
Also regarding the skewness in the distributions, although the maximums exceed the value of 6, the values for the 3rd quartile are below the unit, except for the Investments in Subsidiaries. By definition, it reflects that typically the variation of absolute changes in the accounts is of lower proportion than their size, of an average of 0.30 (0.50) for means, and 0.20 (0.30) for medians, for the short (long) period of analysis. In addition, the short-term accounts and PPE show the lower RSDs, while the Investments in Subsidiaries, Deferred Taxes, and Intangibles show the higher RSDs. In terms of uncertainty, therefore, PPE is a long term account, with uncertainty levels of short term accounts. The same applies to the dispersion of the RSD values, as presented in Table 22. A possible explanation for that is the higher stability in the short-term in comparison to the long-term inside the firms, reflecting in lower relative standard deviations associated with higher reliability, in alignment to Richardson et al. (2005).

In accordance with the proposed categorization in anticipation and deferral, there is an indication of higher uncertainty levels in anticipation accounts than in deferral, by the median values, including the short-term accounts only, and for both short and long periods of analysis. However, that is not conclusive since it disregards the fact that they are accounts within the same firms, therefore the observations are paired, which is considered for the statistical tests.

Besides the comparisons between anticipation and deferral categories, following the set of hypotheses, I also propose comparisons between opening and closing categories. For that, I estimated the opening and closing relative uncertainties for each reference account, as described

in Table 23. Also, the opening and closing RSD estimates also apply to the specific comparisons between anticipation and deferral categories.

In Figure 7 and Table 23, I present the RSDs for opening and closing uncertainties for each balance sheet reference account, similar to the general approach. I opted for a presentation and analysis for the differences between anticipation and deferral followed by the analysis with the grouping in opening and closing for clearer comparisons, following the research hypotheses development.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 7 Relative Standard Deviation (RSD), by Account, with distinction between Opening and Closing
Source: Research Data.

Table 23 Descriptive statistics for RSD, by Account, with distinction between Opening and Closing

Panel A – Period of Analysis: Short (7 yrs)								
	Accounts Receivable		**Accounts Payable ST**		**Investments in Subsidiaries**		**Deferred Taxes LT (liability)**	
	Open	Close	Open	Close	Open	Close	Open	Close
Min.	0.0796	0.0696	0.0000	0.0285	0.0023	0.0000	-73.9834	-68.6001
1st Q.	0.6411	0.5732	0.1606	0.1995	0.5044	0.5194	0.1322	0.1900
Median	*1.1947*	*1.0609*	*0.3554*	*0.3491*	*1.4942*	*1.5172*	*0.3148*	*0.3713*
Mean	2.6414	2.3440	1.0450	0.9937	18.5813	18.5304	3.4733	3.3335
3rd Q.	2.3183	2.1652	0.8402	0.7765	5.0426	5.2807	0.8978	1.0840
Max.	97.9880	82.6366	27.5229	29.2999	1131.7979	1131.5700	299.3420	290.1920
Std.Dev.	6.0990	5.3292	2.7859	2.6080	92.4748	92.4919	19.5010	18.2528
N	789	789	677	677	350	350	636	636

	Inventories		**PPE**		**Intangibles & Goodwill**	
	Open	Close	Open	Close	Open	Close
Min.	0.0353	0.0350	0.0050	0.0016	0.0000	0.0007
1st Q.	0.3590	0.3538	0.0359	0.0280	0.0817	0.0161
Median	*0.7283*	*0.7535*	*0.0666*	*0.0532*	*0.2036*	*0.0485*
Mean	2.2583	2.5413	0.1510	0.1275	0.7636	0.6139
3rd Q.	1.6218	1.6991	0.1391	0.1028	0.4102	0.1732
Max.	65.9220	83.7016	23.8866	26.2025	133.4814	132.9540
Std.Dev.	5.7536	7.0073	0.8587	0.9345	5.9441	5.9420
N	593	593	802	802	729	729

Panel B – Period of Analysis: Long (22 yrs)								
	Accounts Receivable		**Accounts Payable ST**		**Investments in Subsidiaries**		**Deferred Taxes LT (liability)**	
	Open	Close	Open	Close	Open	Close	Open	Close
Min.	0.2873	0.3383	0.0428	0.1017	0.1094	0.1291	0.0285	0.0515
1st Q.	1.9781	1.9143	0.4572	0.4995	1.5805	1.4246	0.2278	0.2907
Median	*3.1681*	*3.0558*	*0.9483*	*0.9283*	*4.5922*	*4.5443*	*0.4814*	*0.5899*
Mean	11.9387	10.9156	1.6646	1.6498	41.3932	41.2739	4.8073	4.9414
3rd Q.	5.4655	5.3433	1.8515	1.8583	16.9164	16.1392	1.5480	1.9806
Max.	1682.6545	1408.8190	16.3372	15.8501	2518.8473	2518.7836	226.2564	230.1025
Std.Dev.	91.5363	77.3093	2.1473	2.0926	194.2477	194.2574	20.0683	20.2348
N	356	356	307	307	204	204	311	311
	Inventories		**PPE**		**Intangibles & Goodwill**			
	Open	Close	Open	Close	Open	Close		
Min.	0.1870	0.1420	0.0223	0.0093	0.0492	0.0071		
1st Q.	1.2970	1.3220	0.0794	0.0561	0.2334	0.0596		
Median	*2.1600*	*2.1900*	*0.1238*	*0.0944*	*0.3605*	*0.1566*		
Mean	124.3870	126.7110	0.1796	0.1450	0.7687	0.5593		
3rd Q.	3.9890	4.0170	0.1883	0.1503	0.7791	0.4871		
Max.	29288.9680	29616.7620	3.0703	2.8909	18.5927	18.8865		
Std.Dev.	1722.0790	1742.5280	0.2669	0.2366	1.3956	1.3934		
N	293	293	359	359	340	340		

Source: Research Data.

By the comparisons for opening and closing for each account, the central measures for the uncertainties in Table 23 are similar to the general approach, as presented in Table 22, especially the medians. However, although they are on similar levels, they vary distinctly.

For anticipation accounts, by segregating between opening and closing, the medians increase in the short and long periods. That occurs specially for Accounts Receivable, that increases from 0.10, in the general grouping, to 1 in the short period and 3 for the long period, for the opening and closing groups respectively, and for Accounts Payable, that goes from 0.15 to 0.3 for the short period and to 0.9 in the long period, for both opening and closing groups, respectively. The other anticipation accounts also show increases in the uncertainty estimates, but with less intensity.

For deferral accounts, the median of Inventories, which represents current accruals, shows increases in uncertainty levels estimates, from 0.08 in the general approach, to 0.74 for the short period, for both opening and closing groups, and from 0.13 to 2.18, for the long period. The long-term account of PPE shows a little decrease, from 0.07 in the general approach to 0.06 for opening and closing groups, in the short period of analysis, and in the long period, from 0.10, increases to 0.12 for opening and decreases to 0.09 to the closing group. The Intangibles account, in turn, shows general uncertainties of 0.19 and 0.32 for the short and long periods of analysis, that increase for opening, 0.20 and 0.36, respectively, and decrease for closing, to 0.05 and 0.16. Therefore, even the stronger variations in the deferral accounts are less intense than

the anticipation accounts.

In terms of the differences between anticipation and deferral, such variations in the uncertainty estimates may influence diversely, which requires specific analyses, especially considering that not only the central measures vary, but also dispersion and skewness.

There is a great increase in the dispersion and skewness of the distributions, which is stronger as greater they are in the general approach. For accounts with low dispersion and skewness, like Accounts Receivable, Accounts Payable and Inventories, that show general standard-deviations around 0.20, as indicated in Table 22, their segregation between opening and closing groups they show standard-deviations around 5, accordingly to Table 23. In comparison, uncertainties estimates for Investments in Subsidiaries, Deferred Taxes LT and Intangibles & Goodwill, with a general standard-deviation of 0.6, show an increase to around 60, when segregated between opening and closing.

By construction, the RSD estimates are higher for opening and closing categories than for anticipation and deferral, because the values from Income Statement and Statement of Cash Flows are higher than the absolute changes in Balance Sheets amounts. While for anticipation and deferral categories, the RSD values are below the unit, it is not the same case for the opening and closing categories. Flows in those statements represent all the inflow and outflow for each account, and it is reasonable to consider that part of them cancel out during the year, therefore the total of openings and total of closings are individually higher than their difference. This increase in magnitudes relates to increases in dispersion. Since the RSD is estimated by absolute changes in proportion to the size of the amount, and the size remains the same, the uncertainties measured by the RSD are of higher magnitude for opening and closing categories separately, than when they collapse in the general absolute change of the amount. That does not mean that the uncertainties in opening and closing are higher, that only means that it is a consequence of the construction.

However, the intention is to maintain the comparability between the distinct accounts within the same firm and not between categories with distinct analysis dimensions, i.e. I compare between anticipation and deferral, and between opening and closing, I do not compare between anticipation and opening or deferral and closing. Therefore, different levels for uncertainty estimates do not influence the statistical tests applied within each framework but do not allow for direct comparisons between distinct frameworks. That has implications for comparing conclusions between the general and specific approaches, for anticipation and deferral categories.

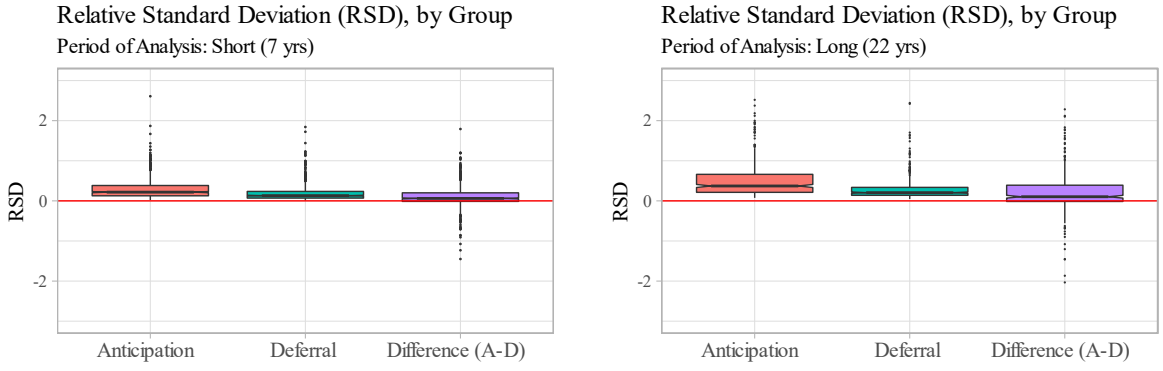
In sum, the specification between opening and closing shows increases in the RSD of the accounts, in comparison to a general approach, and that may result not from a reflection of actual increases in uncertainties but be a matter of variable construction. As there are distinct dimensions of the problem under analysis, within the appropriate frameworks, comparisons remain valid.

4.3 Differences of uncertainty between Anticipation and Deferral

4.3.1 General approach

The uncertainty estimates for the anticipation and deferral groups were obtained by the mean of the RSDs at account-level, for each firm, as previously indicated in Equations 6 and 7. The data availability varies among the firms, as indicated by the lines N in Tables 22 and 23. For cases lacking data for a specific account, the RSD for the category in the firm was remeasured considering only the accounts with available data.

The distributions for uncertainties for anticipation and deferral groups and their difference, disregarding the opening and closing dimension, are illustrated in Figure 8 and their descriptive statistics are presented in Table 24, for both the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 8 Relative Standard Deviation (RSD), by Group (Anticipation and Deferral) and their difference

Source: Research Data.

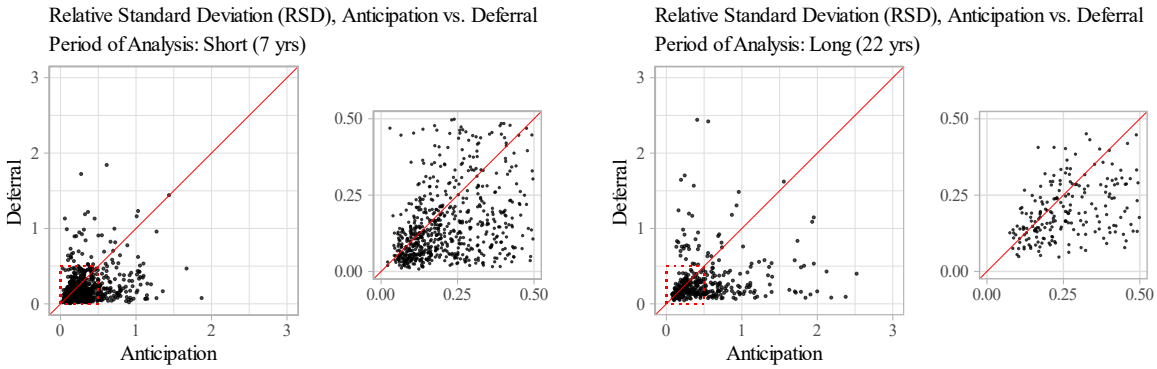
Table 24 Descriptive statistics for RSD, by Group (Anticipation and Deferral) and their difference

	(A) Period of Analysis: Short (7 yrs)			(B) Period of Analysis: Long (22 yrs)		
	Anticipation	**Deferral**	**Difference [A – D]**	**Anticipation**	**Deferral**	**Difference [A – D]**
Min.	0.0212	0.0080	-1.4498	0.0749	0.0472	-2.0336
1st Q.	0.1267	0.0693	-0.0131	0.2127	0.1389	-0.0147
Median	*0.2184*	*0.1310*	*0.0613*	*0.3715*	*0.2054*	*0.1035*
Mean	0.3069	0.1963	0.1041	0.5157	0.3106	0.2051
3rd Q.	0.3855	0.2362	0.2007	0.6615	0.3365	0.3906
Max.	3.2999	1.8430	1.7920	2.5203	2.4419	2.2821
Std. Dev.	0.2878	0.2091	0.2759	0.4451	0.3157	0.5103
N	811	805	805	361	361	361

Source: Research Data.

The central values of mean and median are comparable to the central values of their composition accounts, as well as their dispersion. The skewness observed in the isolated accounts also is similar to the anticipation and deferral groups, being the mean closer to the third quartile than the median, for both groups in the short period of analysis and for the anticipation group for the long period.

The difference between anticipation and deferral considers paired observations, that is illustrated in Figure 9, considering both uncertainties simultaneously, for each firm.



(a) Short Period of Analysis (b) Long Period of Analysis

Figure 9 Relative Standard Deviation (RSD), by Group (Anticipation vs. Deferral)
Source: Research Data.

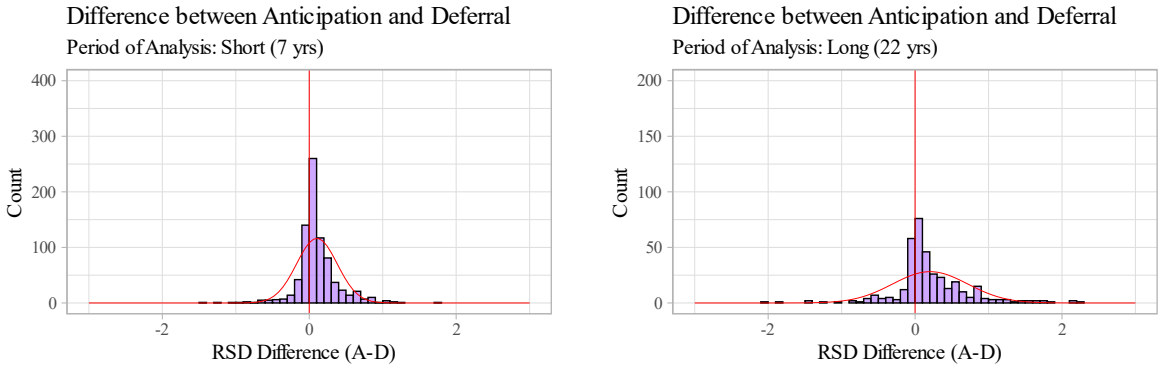
Note: The red line represents equivalent uncertainty for Anticipation and Deferral categories. Dots below (above) the line are cases which the uncertainty of Anticipation is higher (lower) than the uncertainty of Deferral. The dashed square represents the limits for the zoom on the right of each main figure.

In Figure 9, the diagonal line represents the position where the uncertainty levels of anticipation and deferral are equivalent. Cases which uncertainty for anticipation is higher than for deferral are located below the line, and the opposite for cases above the line. There is a high concentration of cases near the origin, indicating RSDs below 0.5 for both anticipation and deferral categories.

In addition, there are more cases below the diagonal line, indicating more firms with higher levels of estimated uncertainty for anticipation than for deferral. This behavior is aligned with Hypothesis H1, that states that uncertainty levels of anticipation are higher than of deferral, leading to an expectation of positive difference between them.

Statistical approaches relied on the Shapiro-Wilk test, for identification of the normality in the distributions, and mean differences tests, in three levels of information, with paired t-test, Wilcoxon and sign tests. The tests were applied over the distribution of the difference between anticipation and deferral estimates of uncertainty at firm-level, by considering the observations paired.

The choice to present the results for the three means difference tests, even under rejection of normality, that is an assumption for the t-test, is to provide more detailment for the analyses. For conclusion purposes, the results of the tests are considered as their assumptions are reasonable. The tests results for the difference between anticipation and deferral, for total accruals, are presented in Table 25, and its distribution is illustrated in Figure 10, for both the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 10 Histogram: Difference between Anticipation and Deferral

Source: Research Data.

Note: The vertical line marks zero and the distribution line represents the normal distribution with the data parameters.

For both periods of analysis, normality is rejected for the distribution of the difference between anticipation and deferral, in accordance to the results of the Shapiro-Wilk test. There is also some degree of positive skewness in the distribution, that is stronger for the long period of analysis. Therefore, the results of the statistical tests require attention to those aspects.

Table 25 Tests for the difference between Anticipation and Deferral

Period of Analysis	Panel A: Short, 7 yrs	Panel B: Long, 22 yrs
Shapiro-Wilk normality test	W = 0.8790 p-value < 0.0001	W = 0.8889 p-value < 0.0001
Parametric test (*t*)	Mean (dif) = 0.1041 t = 10.697 p-value < 0.0001	Mean (dif.) = 0.2051 t = 7.6249 p-value < 0.0001
Rank-sum test (Wilcoxon)	Pseudo-median: 0.0804 Σ Pos. Ranks = 246940 Σ Neg. Ranks = 77475 p-value < 0.0001	Pseudo-median: 0.1584 Σ Pos. Ranks = 50674 Σ Neg. Ranks = 14667 p-value < 0.0001
Sign test	Prop. Pos. Signs = 0.7193 Prop. Neg. Signs = 0.2807 p-value < 0.0001	Prop. Pos. Signs = 0.7175 Prop. Neg. Signs = 0.2825 p-value < 0.0001

Source: Research Data.

The differences are indicated as positive stronger by the t-test than by its non-parametric version of the Wilcoxon test. Also, the pseudo-median estimates, of 0.0804 and 0.1584, are a little higher than the actual medians of 0.0613 and 0.1035, for the short and long periods of analysis, respectively. Both tests reject the hypothesis of non-difference, showing positive estimates for the difference, although the t-test do not have their normality assumption attended. At last, the sign tests show a proportion of more than 70% of positive differences, statistically significant. This proportion is in accordance to Figure 9, that shows more cases with a higher RSD for anticipation than for deferral, i.e. below the diagonal line, and with Figure 10, with the distribution values falling heavier in the positive differences, i.e. to the right side of the vertical line. Therefore, the evidence is that there is a positive difference between anticipation and deferral, for both short and long periods of analysis.

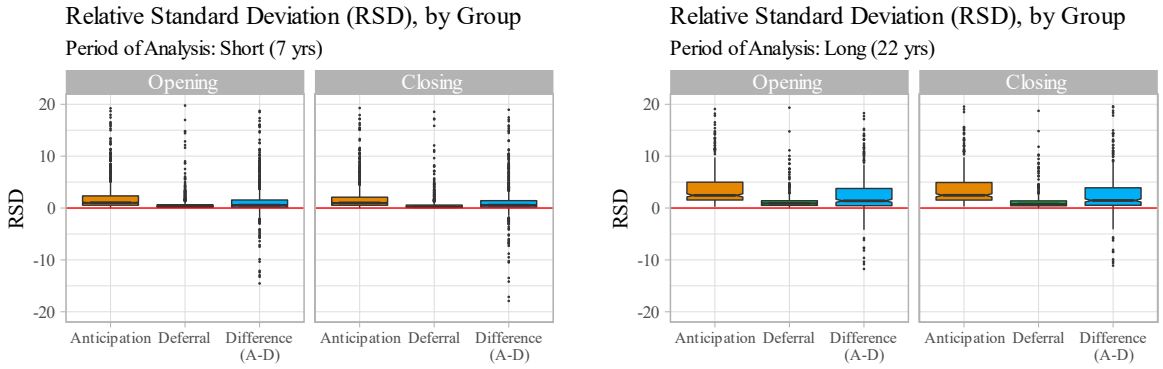
This first set of tests address the first research hypothesis H1, that states for a higher level of uncertainty in anticipation than in deferral accruals. The expectation of higher uncertainties relied on the presence of deviations in anticipation accruals, that do not occur for deferral accruals. The results of the tests align with this prediction, showing significant positive differences between uncertainties in the anticipation and deferral categories.

As discussed before, the RSD measurement capture both accounting and activities uncertainties, and to associate the differences to accounting uncertainties requires the assumption of at least the same levels of activities uncertainties between the groups under comparison. Therefore, the evidence is that there is a higher uncertainty in anticipation than in deferral, and the association for this higher uncertainties to accounting uncertainties relies on the extension of one may admit as activities uncertainties in anticipation and in deferral at a same level.

In addition, I highlight that I did not perform any previous control for extreme values. Besides the approach with the statistical tests that use different levels of information within the data, I also performed some additional analyses considering only firms with moderate levels of uncertainty. I also present some evidence addressing the uncertainties from activities and how they relate to the categories and their differences. Although those approaches do not isolate accounting uncertainties, these additional analyses help to support the evidences and provide better understading of uncertainties in the distinct accruals categories.

4.3.2 Specific approach: under segregation between Opening and Closing

Estimates for anticipation and deferral under consideration of opening and closing regard the specific hypotheses H1a and H1b. The distributions of uncertainty for those groups are illustrated in Figure 11 and their descriptive statistics are presented in Table 26, for both the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 11 Relative Standard Deviation (RSD), by Group (Anticipation and Deferral) and their difference, with distinction between Opening and Closing
Source: Research Data.

Table 26 Descriptive statistics for RSD, by Group (Anticipation and Deferral) and their difference, with distinction between Opening and Closing

(A) Period of Analysis: Short (7 yrs)						
	Opening			**Closing**		
	Anticipation	**Deferral**	**Difference [A – D]**	**Anticipation**	**Deferral**	**Difference [A – D]**
Min.	-23.4146	0.0074	-42.3191	-22.0868	0.0024	-43.1781
1st Q.	0.5553	0.1632	0.1712	0.5527	0.1145	0.1925
Median	*1.0704*	*0.3099*	*0.5825*	*1.0193*	*0.2452*	*0.5909*
Mean	4.2761	0.8905	3.4134	4.1125	0.9026	3.2322
3rd Q.	2.6094	0.6442	1.8348	2.4148	0.5905	1.7011
Max.	283.6225	44.7498	283.2287	283.7271	44.6098	283.2932
Std. Dev.	17.1748	2.7476	17.4932	17.0077	2.9928	17.3924
N	811	805	805	811	805	805

(B) Period of Analysis: Long (22 yrs)						
	Opening			Closing		
	Anticipation	Deferral	Difference [A – D]	Anticipation	Deferral	Difference [A – D]
Min.	0.2544	0.0520	-9761.0162	0.2894	0.0114	-9870.3201
1st Q.	1.5749	0.5182	0.4553	1.6056	0.4449	0.5229
Median	*3.7377*	*0.9243*	*1.5001*	*2.7344*	*0.8143*	*1.5921*
Mean	12.0970	34.1220	-22.0250	11.7738	34.6680	-22.8942
3rd Q.	6.9104	1.5119	5.6270	6.9572	1.4622	5.6064
Max.	634.8267	9763.1310	634.1728	634.3930	9872.3621	633.6188
Std. Dev.	49.0264	517.3982	520.3250	46.2980	523.5486	526.1847
N	361	361	361	361	361	361

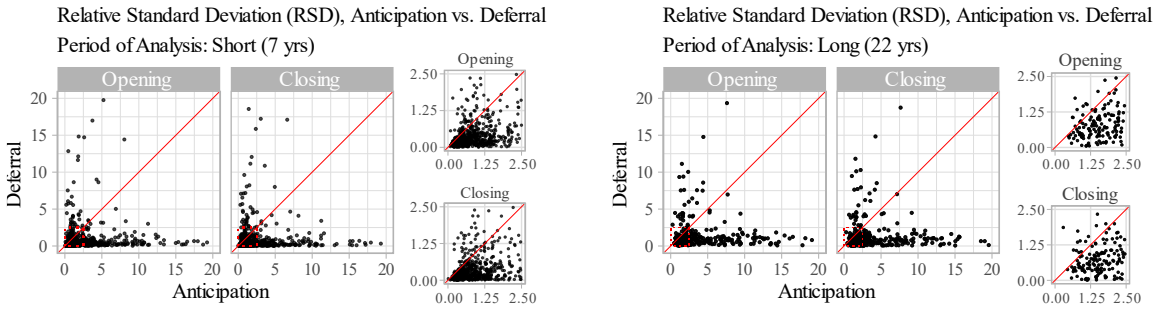
Source: Research Data.

The uncertainty distributions for anticipation, deferral and their difference are very similar between the opening and closing categories, for both periods of analysis. Comparing the general median uncertainty estimates in Table 24 with the segregation between opening and closing in Table 26, the median for the general estimate for anticipation increases from 0.1 to 1 and 3, for the opening group in the short and long periods of analysis, respectively, and for the closing group, to 1 and 11. For the deferral category, the median increases from 0.08 and 0.13, under the general approach to 0.28 and 0.87, for the short and long periods of analysis, respectively. That is similar to what is observed for the reference accounts. Also, that is similar to the increase for the anticipation group than for the deferral group, which is reflected in their difference. Under the general grouping, the median of the distribution of their difference is 0.01, increasing to around 0.06 and 1.55, for both the opening and closing groups, for the short and long periods of analysis, respectively.

Regarding dispersion, the segregation between opening and closing shows higher values than for the general approach. For example, as presented in Tables 24 and 26, the standard deviation increases from 0.29, under the general grouping, to 17 for both opening and closing groups for anticipation in the short period of analysis, and from 0.45 to 47, for the long period. Regarding the deferral category, the standard deviation increases from 0.21, under the general approach, to 3 for both opening and closing groups, in the short period of analysis, and from 0.31 to around 520, for the long period. This is similar to the distribution of the differences, with the observation that it follows the group with the higher dispersion, increasing from 0.28 in the general approach to 17, like the anticipation group in the short period, and for the long period, the standard deviation is similar to the deferral, from 0.51 to around 520. That has consequences for the results of the statistical tests.

Similarly to the general approach, the composition of the differences, showing the pairing composition is illustrated in Figure 12, with the segregation between opening and

closing groups. In Figure 13, I present the distributions of the difference, and in Table 27, the tests results, for the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis (b) Long Period of Analisys

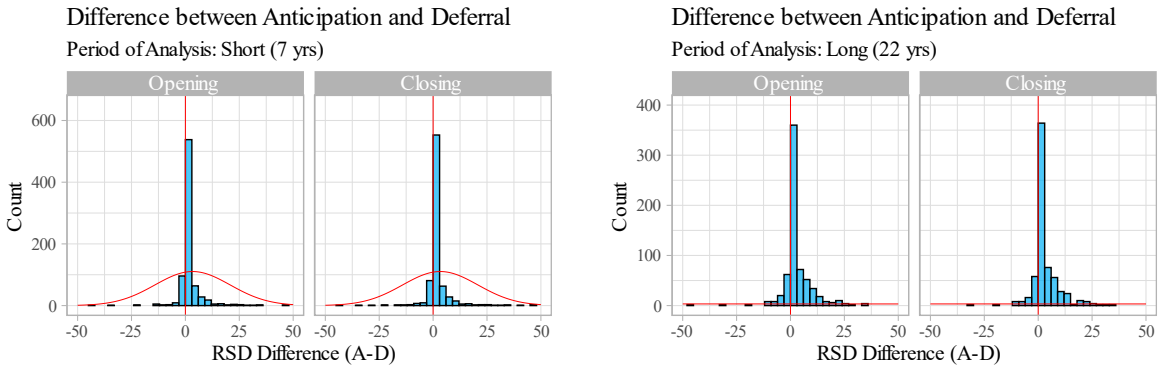
Figure 12 Relative Standard Deviation (RSD), by Group (Anticipation vs. Deferral), with distinction between Opening and Closing

Source: Research Data.

Note: The diagonal line represents equivalent uncertainty for Anticipation and Deferral categories. Dots below (above) the line are cases which the uncertainty (RSD) of Anticipation is higher (lower) than the uncertainty of Deferral. The dashed square represents the limits for the zooms on the right, according to the opening and closing categories.

Just like the descriptive statistics are similar between the opening and closing groups, the illustration for the pairing observations is also very similar, for both the short and long periods of analysis. The higher dispersions in the distribution of the difference are a consequence of situations when one of the uncertainty levels, between anticipation and deferral, is high and the other one is low, and there are more cases with higher uncertainty in anticipation than in deferral, i.e. below the diagonal line and closer to the horizontal axis. There are few cases with both high uncertainty levels, i.e. along the diagonal, as well as many cases with both low uncertainty levels, i.e. near the origin. In addition, the opening and closing categories, for both the short and long periods of analysis, show very similar patterns, reflecting the proximity of the same cases.

In Figure 13, there is a higher concentration of cases than a theoretical normal distribution with the same parameters, as well as the occurrence of more cases with a positive difference. That is consistent with the cases below the diagonal line in Figure 12, for both the short and long periods of analysis. That is also similar to the general approach for the difference between opening and closing, with higher distance from normality, e.g. the Shapiro-Wilk tests show a statistics W of around 0.89 for the general approach, that decreases to around 0.24 for the short period and 0.05 for the long period. The results of the tests and estimates are presented in Table 27, for both the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 13 Histogram: Difference between Anticipation and Deferral, with distinction between Opening and Closing

Source: Research Data.

Note: The vertical line marks zero and the distribution line represents the normal distribution with the data parameters.

Table 27 Tests for the difference between Anticipation and Deferral, with distinction between Opening and Closing

Period of Analysis	**Panel A: Short, 7 yrs**	
	Opening	**Closing**
Shapiro-Wilk normality test	W = 0.2369 p-value < 0.0001	W = 0.2362 p-value < 0.0001
Parametric test (*t*)	Mean (dif) = 3.4134 t = 5.5328 p-value < 0.0001	Mean (dif.) = 3.2322 t = 5.2695 p-value < 0.0001
Rank-sum test (Wilcoxon)	Pseudo-median: 0.8453 Σ Pos. Ranks = 281699 Σ Neg. Ranks = 42716 p-value < 0.0001	Pseudo-median: 0.8010 Σ Pos. Ranks = 281058 Σ Neg. Ranks = 43357 p-value < 0.0001
Sign test	Prop. Pos. Signs = 0.8522 Prop. Neg. Signs = 0.1478 p-value < 0.0001	Prop. Pos. Signs = 0.8646 Prop. Neg. Signs = 0.1354 p-value < 0.0001
Period of Analysis	**Panel B: Long, 22 yrs**	
	Opening	**Closing**
Shapiro-Wilk normality test	W = 0.0539 p-value < 0.0001	W = 0.0536 p-value < 0.0001
Parametric test (*t*)	Mean (dif) = -22.0250 t = -0.8031 p-value = 0.4224	Mean (dif.) = -22.8942 t = -0.8255 p-value = 0.4096
Rank-sum test (Wilcoxon)	Pseudo-median: 2.2226 Σ Pos. Ranks = 54609 Σ Neg. Ranks = 10732 p-value < 0.0001	Pseudo-median: 2.2563 Σ Pos. Ranks = 54665 Σ Neg. Ranks = 10676 p-value < 0.0001
Sign test	Prop. Pos. Signs = 0.8366 Prop. Neg. Signs = 0.1634 p-value < 0.0001	Prop. Pos. Signs = 0.8476 Prop. Neg. Signs = 0.1524 p-value < 0.0001

Source: Research Data.

The statistical tests regarding the differences of uncertainty levels between anticipation

and deferral, considering the opening and closing categories, show results that ought to be considered in the measure their assumptions hold. Also, as the descriptive statistics of the difference in Table 26 shows, the means are higher than the third quartile for the short period and lower than the first quartile for the long period, for both the opening and closing groups. The standard deviations are also high, indicating a strong influence of extreme values, especially for the long period of analysis. In this sense, the results for the parametric *t*-tests are subject to those characteristics and not the actual information provided by the position of the mean, in the case of the short period, with a significant positive difference.

The non-parametric tests results also point to a positive difference, but are robust to the influence of extreme values and show stable estimates. The Wilcoxon test provides estimates for the pseudo-median of around 0.8 and 2.2 for the opening and closing groups, respectively, for both the short and long periods of analysis, comparable to the actual medians of around 0.6 and 1.5. The sign test shows similar proportions for the opening and closing groups for the periods of analysis, of around 85% of positive differences, in comparison to 15% of negative differences.

The results of the tests point to a positive significant difference between anticipation and deferral, for both opening and closing groups and for both the short and long periods of analysis. That is in accordance with the predictions of both research hypotheses H1a and H1b, that state for higher uncertainty in anticipation than in deferral accruals due to the presence of deviations. I highlight, however, that the RSD metric captures both operating and accounting uncertainties and the association of the differences to accounting uncertainties require to at least assume that the operating uncertainties are at the same level for both categories under comparison.

4.3.3 Overview of the results for differences between Anticipation and Deferral

The results of the tests show higher uncertainties for anticipation than for the deferral category, for the general approach and for both the opening and closing categories. The conclusions and proportions of positive differences are presented in Figure 14, for the short (long) period of analysis.

Function \ Effect	Opening		Closing
Anticipation	**Opening Anticipation**		**Closing Anticipation**
Positive ↓ 72% (72%)	Positive ↓ 85% (84%)		Positive ↓ 86% (85%)
Deferral	**Opening Deferral**		**Closing Deferral**

Figure 14 General overview of the conclusions for the difference between anticipation and deferral

Source: Research Data.

Notes: The percentual values indicate the proportion of positive differences for the short (long) period of analysis. The conclusions are based on joint evidence from the Wilcoxon and sign results for both periods of analysis.

The predictions of the first research hypothesis *H1*, comparing between anticipation and deferral, and its specific versions *H1a* and *H1b*, regarding the opening and closing categories respectively, are for positive differences. That reflects the higher expectation of uncertainties due the presence of deviations in anticipation accruals that do not apply to deferral accruals, as developed in the theoretical approach.

Although the research hypotheses provided basis for the tests comparisons, I reinforce that empirical evidence is also subject to the influence of activities that generate the accounting process. Therefore, it provides additional information about the uncertainties regarding the accounting function of accruals, instead of serving as confirmation or rejection mechanism of the research hypotheses. In this sense, the empirical evidence of positive differences between the uncertainties in anticipation than in deferral reflects that, in practice, anticipating carries more uncertainty than deferring, in general and considering only the opening or closing categories. That is in alignment with the presence of deviations argument and is also subject to the activities that are represented by the accounting numbers.

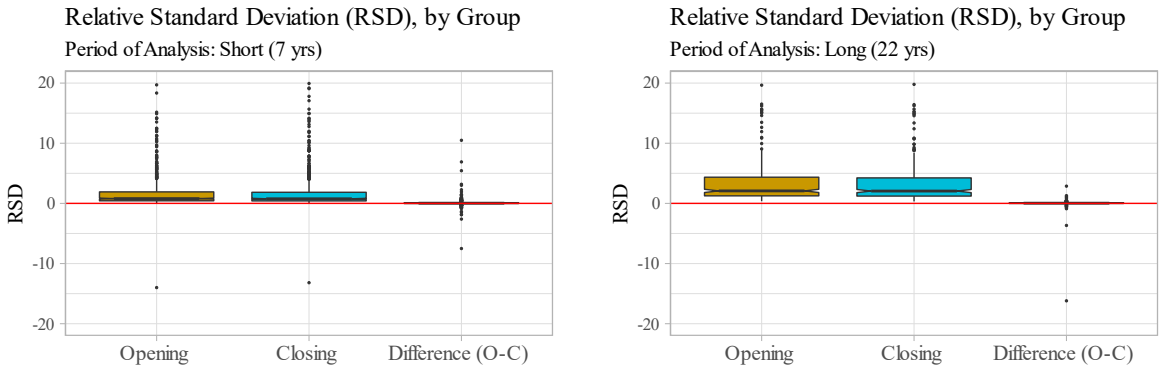
4.4 Differences of uncertainty between Opening and Closing

4.4.1 General approach

For a general comparison between uncertainties in opening and closing, the uncertainty levels were estimated by the average of opening and closing uncertainties using balance sheet accounts as reference. Analogous to the previous comparisons, the average for each category is supported by the data availability, which varies among the firms.

The distributions for opening and closing categories, disregarding anticipation and

deferral, are illustrated in Figure 15 and the descriptive statistics are presented in Table 28, for both the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 15 Relative Standard Deviation (RSD), by Group (Opening and Closing) and their difference

Source: Research Data.

Table 28 Descriptive statistics for RSD, by Group (Opening and Closing) and their difference

	(A) Period of Analysis: Short (7 yrs)			**(B) Period of Analysis: Long (22 yrs)**		
	Opening	**Closing**	**Difference [O – C]**	**Opening**	**Closing**	**Difference [O – C]**
Min.	-13.9938	-13.1846	-7.5048	0.3641	0.3301	-54.6012
1st Q.	0.4472	0.4141	-0.0251	1.3138	1.2958	-0.0146
Median	*0.8380*	*0.7901*	*0.0349*	*2.2763*	*2.2033*	*0.0352*
Mean	2.7824	2.7031	0.0793	23.1238	23.2160	-0.0923
3rd Q.	2.0043	1.9512	0.1177	5.0061	4.9634	0.1045
Max.	162.2388	162.3157	10.4912	4882.6009	4937.2021	45.7554
Std. Dev.	9.7426	9.6434	0.6351	259.1383	262.0279	4.0957
N	811	811	811	361	361	361

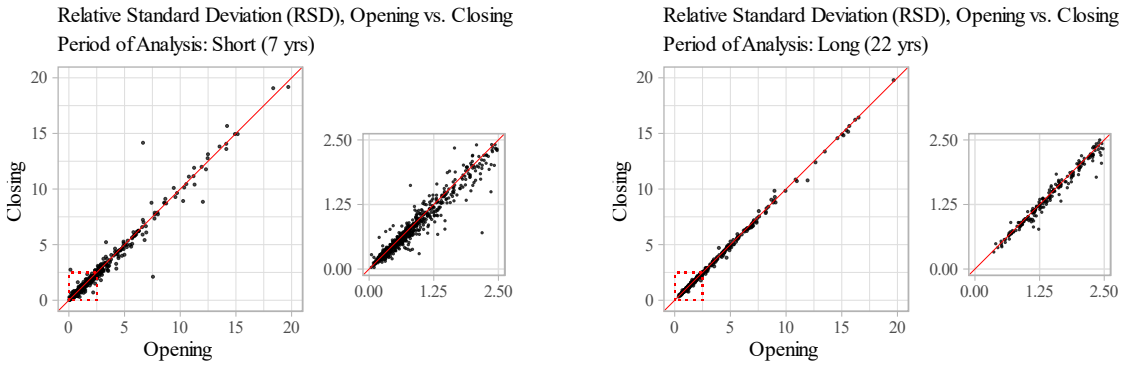
Source: Research Data.

The extreme values, i.e. the maximum and minimum, for the uncertainty of the opening and closing categories, are high, but lower than the extreme values for the isolated accounts presented in Table 23. Those values are more comparable to the composition of anticipation and deferral categories under segregation between opening and closing groups, as presented in Table 26. Also similarly to that, the central values of mean and median are comparable to their composition accounts, which is also valid for the dispersion estimates.

Besides that, by the comparison between Tables 24 and 28, it is notable that the opening and closing estimated uncertainties are greater than uncertainties for anticipation and deferral. That reflects the accounts uncertainties under a general approach and segregated between opening and closing, as presented in Tables 22 and 23, respectively. In addition, the values for the difference are not as high as the groups under comparison. Regarding skewness, there are also similarities with the isolated accounts, with the means higher than the third quartile, for

both the short and long periods of analysis.

For the difference between the opening and closing categori,es, according to Table 28 and Figure 15, the distribution presents lower dispersion than the categories, as well as admits positive and negative values, consistently to the definition. In Figure 16, I illustrate the composition for the difference, considering simultaneously the opening and closing estimated uncertainties, for each firm, for both the short (Panel A) and long (Panel B) periods of analysis.

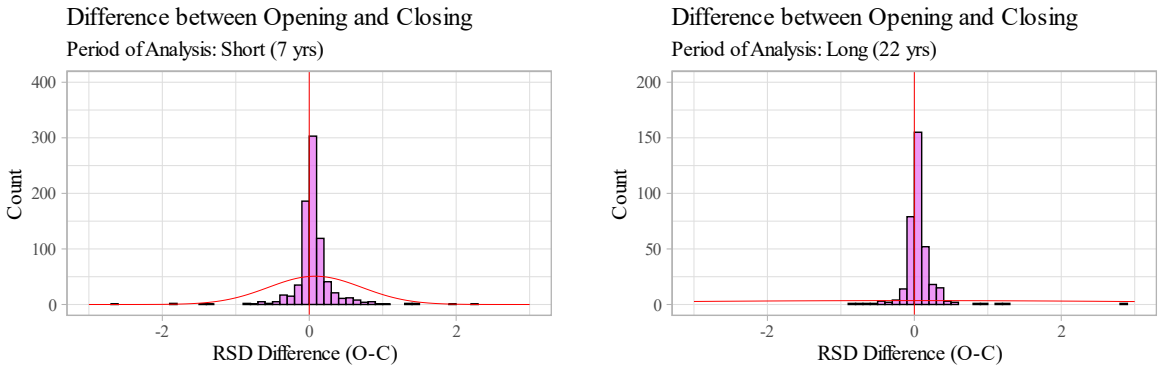


(a) Short Period of Analysis (b) Long Period of Analisys

Figure 16 Relative Standard Deviation (RSD), by Group (Opening vs. Closing)
Source: Research Data.
Note: The red line represents equivalent uncertainty for Opening and Closing categories. Dots below (above) the line are cases which the uncertainty (RSD) of Opening is higher (lower) than the uncertainty of Closing. The dashed square represents the limits for the zoom on the right of each main figure.

In Figure 16, the diagonal line represents the position where the uncertainty of opening is equivalent to the uncertainty of closing. Below the line are the cases in which the uncertainty of opening is higher than closing, and above the line, the opposite. Typically, both uncertainties of opening and closing are simultaneously high or low, lacking cases where uncertainties of opening would be high and the uncertainties of closing would be low, and vice-versa. That is distinct from the composition with anticipation and deferral, like in Figure 9. That can be explained by a higher value of the flow accounts, from the income statements and statements of cash flows, in comparison to the balance sheets amounts, for the paired estimation of opening and closing uncertainties, which does not occur for the variations of amounts, for anticipation and deferral uncertainties estimates.

The strong concentration of cases near the diagonal is consistent with the high values of estimated uncertainties for opening and closing and lower values for the difference distribution around zero. That also is illustrated in Figure 17, and the results of the tests for paired comparisons between opening and closing are presented in Table 29.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 17 Histogram: Difference between Opening and Closing

Source: Research Data.

Note: The vertical line marks zero and the distribution line represents the normal distribution with the data parameters.

Table 29 Tests for the difference between Opening and Closing

Period of Analysis	**Panel A: Short, 7 yrs**	**Panel B: Long, 22 yrs**
Shapiro-Wilk normality test	W = 0.3297 p-value < 0.0001	W = 0.1123 p-value < 0.0001
Parametric test (*t*)	Mean (dif) = 0.0793 t = 3.5541 p-value = 0.0004	Mean (dif.) = -0.0923 t = -0.4274 p-value = 0.6693
Rank-sum test (Wilcoxon)	Pseudo-median: 0.0421 Σ Pos. Ranks = 227501 Σ Neg. Ranks = 100954 p-value < 0.0001	Pseudo-median: 0.0413 Σ Pos. Ranks = 47044 Σ Neg. Ranks = 18297 p-value < 0.0001
Sign test	Prop. Pos. Signs = 0.6621 Prop. Neg. Signs = 0.3379 p-value < 0.0001	Prop. Pos. Signs = 0.6953 Prop. Neg. Signs = 0.3047 p-value < 0.0001

Source: Research Data.

The difference presents similar distributions for both periods of analysis, around zero, while the theoretical underlying normal distribution presents a very high dispersion, due to extreme values. The Shapiro-Wilk normality test rejects the conclusion for a normal distribution, for both periods of analysis. The statistic W for the long period is 0.1123, which indicates a big distance between the distribution of the data and the theoretical normal distribution with the same parameters. Therefore, the parametric t-test results, including the non-difference from zero in the long period, requires further investigation with non-parametric tests.

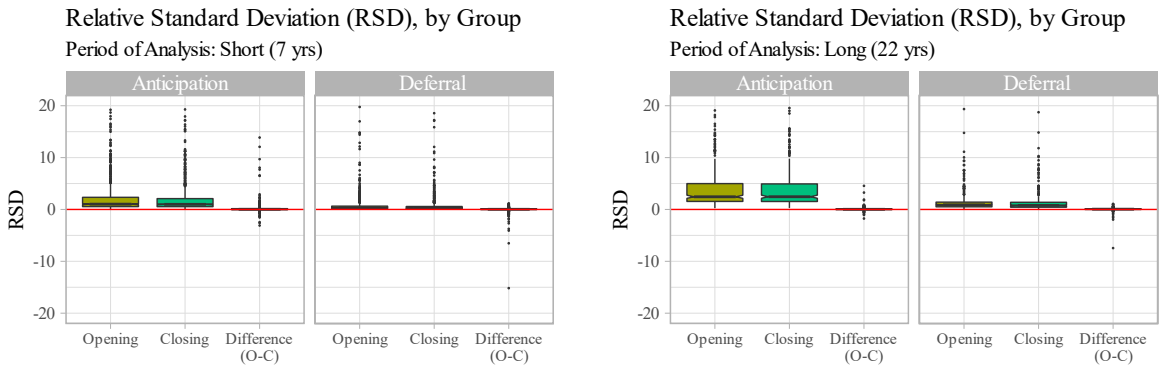
The non-parametric tests results show a higher uncertainty for opening than closing, in both short and long periods of analysis. By Table 29, the estimated medians from the Wilcoxon test of 0.0421 and 0.0413 are comparable to the actual medians of 0.0349 and 0.0342, being a little higher, reflecting the skewness in the distributions, for both short and long periods of

analysis. By the sign test, the proportion of positive values in the difference is significantly higher than negatives, of 66% vs. 33%, for the short period and 70% vs. 30% for the long period of analysis.

Those results are contrary to the expectation of hypothesis H2, of lower degree of uncertainty in opening than in closing accruals. From the results of the tests, the difference is positive, meaning that there is a higher uncertainty in opening than in closing for accruals, independently of the periods of analysis. I highlight that, similarly to anticipation and deferral tests, the higher uncertainties may be due to operating uncertainties since the RSD metric captures both accounting and operating uncertainties, and the association of differences only to accounting uncertainties requires the assumption that both categories under comparison carry similar levels of operating uncertainties.

4.4.2 Specific approach: under segregation between Anticipation and Deferral

In terms of specific groups, comparisons between the uncertainties of opening and closing also extend to the anticipation and deferral accruals. That leads to the extension of hypothesis H2 in its versions H2a and H2b, regarding anticipation and deferral accruals, respectively. In Figure 18 and Table 30, I present the distributions of opening and closing and their difference, considering separately anticipation and deferral accruals, for the short (Panel A) and long (Panel B) periods of analyses.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 18 Relative Standard Deviation (RSD), by Group (Opening and Closing) and their difference, with distinction between Anticipation and Deferral

Source: Research Data.

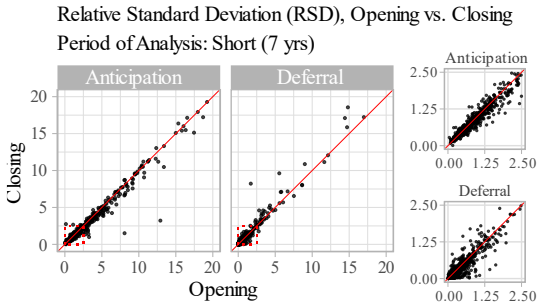
Table 30 Descriptive statistics for RSD, by Group (Opening and Closing) and their difference, with distinction between Anticipation and Deferral

	Anticipation			Deferral		
(A) Period of Analysis: Short (7 yrs)						
	Opening	**Closing**	**Difference [O – C]**	**Opening**	**Closing**	**Difference [O – C]**
Min.	-23.4146	-22.0868	-3.0948	0.0074	0.0024	-15.1729
1st Q.	0.5553	0.5527	-0.0546	0.1632	0.1145	-0.0286
Median	*1.0704*	*1.0193*	*0.0286*	*0.3099*	*0.2452*	*0.0287*
Mean	4.2761	4.1125	0.1636	0.8905	0.9026	-0.0121
3rd Q.	2.6094	2.4148	0.1546	0.6442	0.5905	0.1097
Max.	283.6225	283.7271	13.8666	44.7498	44.6098	1.1587
Std. Dev.	17.1748	17.0077	0.9695	2.7476	2.9928	0.6758
N	811	811	811	805	805	805
(B) Period of Analysis: Long (22 yrs)						
	Anticipation			**Deferral**		
	Opening	**Closing**	**Difference [O – C]**	**Opening**	**Closing**	**Difference [O – C]**
Min.	0.2544	0.2894	-1.7464	0.0520	0.0114	-109.2306
1st Q.	1.5749	1.6056	-0.0393	0.5182	0.4449	-0.0121
Median	*3.7377*	*2.7344*	*0.0283*	*0.9243*	*0.8143*	*0.0532*
Mean	12.0970	11.7738	0.3233	34.1220	34.6680	-0.5460
3rd Q.	6.9104	6.9572	0.1122	1.5119	1.4622	0.1170
Max.	634.8267	634.3930	91.3329	9763.1310	9872.3621	1.0678
Std. Dev.	49.0264	46.2980	4.8130	517.3982	523.5486	6.8818
N	361	361	361	361	361	361

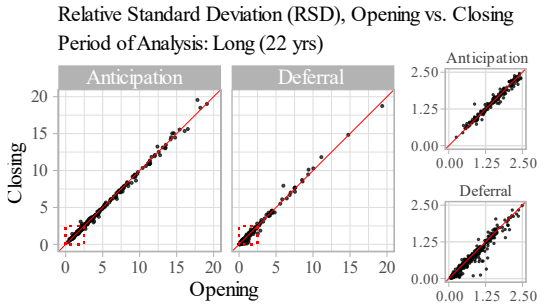
Source: Research Data.

For both opening and closing categories, the anticipation group presents higher values with more dispersion than the deferral group. The long period of analysis shows this more strongly than the short period, as illustrated in Figure 18, as well as by comparisons between the position values in Table 30. That is similar to the general approach for opening and closing accruals. Also, the specific groups of opening and closing for anticipation and deferral accruals, in Table 30, show the same descriptive statistics of the specific groups in Table 26, because they are the same. The distinction is in the differences, that at first regarded uncertainties between anticipation and deferral and now regard opening and closing uncertainties.

Also, similarly to the previous cases, the difference between opening and closing shows distribution close to zero, consistently with its definition. The composition of the difference between the opening and closing categories is illustrated in Figure 19, considering the anticipation and deferral specific groups.



(a) Short Period of Analysis



(b) Long Period of Analisys

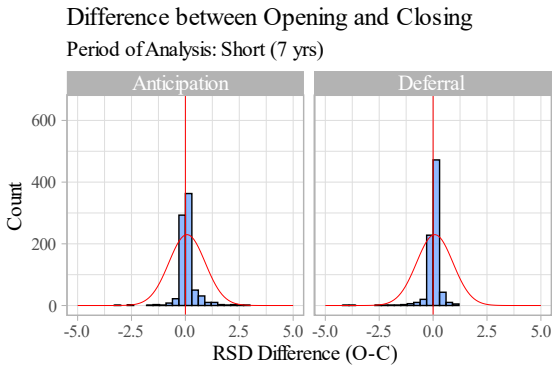
Figure 19 Relative Standard Deviation (RSD), by Group (Opening vs. Closing), with distinction between Anticipation and Deferral

Source: Research Data.

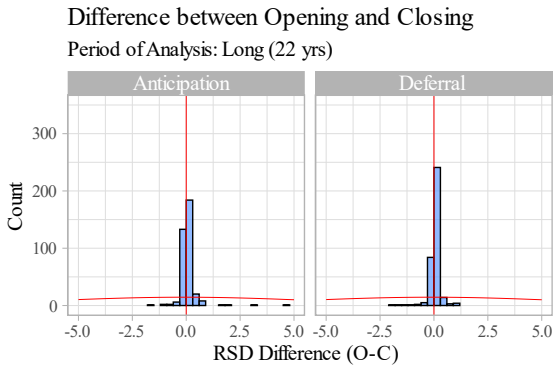
Note: The red line represents equivalent uncertainty for Opening and Closing categories. Dots below (above) the line are cases which the uncertainty (RSD) of Opening is higher (lower) than the uncertainty of Closing. The dashed square represents the limits for the zooms on the right, according to the anticipation and deferral categories.

Similarly to the general composition, for the specific groups of anticipation and deferral accruals, uncertainties of opening and closing accruals show concentration around the diagonal line in Figure 19. That is consistent with the distribution of the difference being around zero and with lower dispersion than uncertainties estimated separately for opening and closing categories.

The distributions of the difference between opening and closing, considering the groups of anticipation and deferral accruals, are illustrated in Figure 20. The results of the tests are presented in Table 31, for the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis



(b) Long Period of Analisys

Figure 20 Histogram: Difference between Opening and Closing, with distinction between Anticipation and Deferral

Source: Research Data.

Note: The vertical line marks zero and the distribution line represents the normal distribution with the data parameters.

Table 31 Tests for the difference between Opening and Closing, with distinction between Anticipation and Deferral

Period of Analysis	**Panel A: Short, 7 yrs**	
	Anticipation	**Deferral**
Shapiro-Wilk normality test	W = 0.3205 p-value < 0.0001	W = 0.2532 p-value < 0.0001
Parametric test (*t*)	Mean (dif) = 0.1636 t = 4.8029 p-value < 0.0001	Mean (dif.) = -0.0121 t = -0.5076 p-value = 0.6119
Rank-sum test (Wilcoxon)	Pseudo-median: 0.0442 Σ Pos. Ranks = 211010 Σ Neg. Ranks = 117445 p-value < 0.0001	Pseudo-median: 0.0354 Σ Pos. Ranks = 214646 Σ Neg. Ranks = 109769 p-value < 0.0001
Sign test	Prop. Pos. Signs = 0.5919 Prop. Neg. Signs = 0.4081 p-value < 0.0001	Prop. Pos. Signs = 0.6584 Prop. Neg. Signs = 0.3416 p-value < 0.0001
Period of Analysis	**Panel B: Long, 22 yrs**	
	Anticipation	**Deferral**
Shapiro-Wilk normality test	W = 0.0496 p-value < 0.0001	W = 0.0760 p-value < 0.0001
Parametric test (*t*)	Mean (dif) = 0.3232 t = 1.2743 p-value = 0.2034	Mean (dif.) = -0.5460 t = -1.5053 p-value = 0.1331
Rank-sum test (Wilcoxon)	Pseudo-median: 0.0340 Σ Pos. Ranks = 42233 Σ Neg. Ranks = 23108 p-value < 0.0001	Pseudo-median: 0.0539 Σ Pos. Ranks = 48362 Σ Neg. Ranks = 16979 p-value < 0.0001
Sign test	Prop. Pos. Signs = 0.6011 Prop. Neg. Signs = 0.3989 p-value < 0.0001	Prop. Pos. Signs = 0.7258 Prop. Neg. Signs = 0.2742 p-value < 0.0001

Source: Research Data.

Under the segregation in anticipation and deferral accruals, the evidence is that uncertainties in opening accruals are higher than uncertainties in closing accruals. That is similar to the general comparison. Also similarly, the distribution of the differences is more distant from normality in the long period of analysis than in the short one, according to the statistics W of the Shapiro-Wilk tests, which is consistent with the presence of extreme values. Therefore, distribution means are influenced by them, and the results of t-tests are of no-difference of uncertainties between opening and closing.

The results of the non-parametric tests indicate more positive differences than negative. From the Wilcoxon test, estimated pseudo-medians are slightly higher, indicating a very little skewness in the distribution. According to the results of the sign tests, differences of uncertainty between opening and closing accruals are positive for more than half of the cases, in a proportion of 60-40% for anticipation accruals in both short and long periods of analysis, and around 70-30% for deferral accruals. That is consistent with the general approach and refines

the evidence of higher uncertainties in opening than in closing, and this effect is stronger for deferral accruals than for anticipation accruals.

The specific hypotheses *H2a* and *H2b*, that reflect expectations of same and lower uncertainties in opening than in closing accruals, considering the anticipation and deferral groups, respectively. The results differ from both predictions, showing higher uncertainties in opening than in closing accruals, for both the anticipation and deferral groups and similar to the general approach.

As in the previous cases, I reinforce that the hypotheses are based on the theoretical discussion on accounting uncertainties, while the results of the tests capture accounting and operating uncertainties by the RSD metric, and the association of the results with only accounting uncertainties requires the assumption that operating uncertainties are similar on the categories under comparison.

4.4.3 Overview of the results for differences between Opening and Closing

As the results of the tests show, there are higher uncertainties for opening than for the closing, generally and for both the anticipation and deferral categories. The conclusions and proportions of positive differences between opening and closing are presented in Figure 21, for the short (long) period of analysis.

Effect / Function	Opening		Closing
Anticipation	**Opening Anticipation**	Positive → 59% (60%)	**Closing Anticipation**
Deferral	**Opening Deferral**	Positive → 66% (73%)	**Closing Deferral**

		Positive → 66% (70%)	

Figure 21 General overview of the conclusions for the difference between opening and closing

Source: Research Data.

Notes: The percentual values indicate the proportion of positive differences for the short (long) period of analysis. The conclusions are based on joint evidence from the Wilcoxon and sign results for both periods of analysis.

The predictions of the second research hypothesis *H2* and its specific versions, *H2a* and *H2b*, regards comparisons between opening and closing, generally and for the anticipation and deferral categories. The general expectation of lower uncertainty in opening than in closing is due to the presence of errors in closing deferral accruals that do not occur in opening deferral accruals, since for anticipation accruals there is the presence of both deviations and errors in

opening that reverse for closing.

The results of the tests provide evidence contrary to the predicted. Similarly to the first set of hypotheses, the predictions had focus only on accounting uncertainties, while the empirical evidence is also subject to uncertainties in the underlying activities of the accounting procedures. As argued before, to associate the differences only to accounting uncertainties, it is equal uncertainties in such activities are assumed, which may not hold.

A higher uncertainty in opening than in closing, could also relate to the magnitude of the flows, since the control for magnitudes by the average of the balance sheets amounts capture differences in uncertainties related to the size of the amounts equally for opening and closing. Therefore, flows of higher magnitudes for opening than in closing, e.g. fixed assets acquisitions in comparison to its depreciation, could reflect in empirical evidence contrary to the theoretical expectation.

Similar to the conclusions for the anticipation and deferral comparisons, also for opening and closing categories, the empirical evidence is complementary to the theoretical development, reflecting differences in uncertainty as reported in financial statements.

4.5 Additional Analyses

4.5.1 Moderate uncertainty levels

As a general strategy, I performed the analyses using the most of data available, interpreting the results of the tests as their assumptions fit. That included companies with several distinct levels of uncertainty in each category of accruals. High or low levels of uncertainty may indicate a distinct situation in comparison to companies with more moderate levels of uncertainty for the categories under comparison, which could influence the results of the tests.

As illustration, in Figure 9, there are several cases with high uncertainty for the anticipation category and low uncertainty for deferral, represented by the cases that spread near the horizontal axis. By considering only cases which are closer to the center of both the anticipation and the deferral levels of uncertainty, the evidence would reflect more the typical situations where companies have some moderate uncertainty in the categories, removing the influence of the lowest or highest levels of uncertainty. A similar reasoning applies to the opening and closing comparisons.

For example, companies with a very steady growing pattern would show lower RSDs

than ones that face some instabilities during their lifetime, as well as companies that have their accounts heavily impacted by an acquisition process would show higher RSDs than more steady ones. Therefore, by removing the firms with the highest and lowest RSDs in the categories under comparison, the intention is to focus on more moderate situations, assuming that those reflect the more typical cases.

In order to investigate whether the evidence remains the same considering only companies with moderate levels of uncertainty, I trimmed the RSD for each category under comparison at 10%, by excluding their lower and upper deciles, and performed the tests again. I present the descriptive statistics for the distribution of the differences between anticipation and deferral, and opening and closing accruals, with both original data and trimmed data, in Table 32, for the short (Panel A) and long (Panel B) periods of analysis.

Table 32 Descriptive statistics for the differences between Anticipation and Deferral and between Opening and Closing, for original and trimmed data

	(A) Period of Analysis: Short (7 yrs)				**(B) Period of Analysis: Long (22 yrs)**			
Difference	**Anticip. – Deferral**		**Opening – Closing**		**Anticip. – Deferral**		**Opening – Closing**	
Data	**Original**	**Trimmed**	**Original**	**Trimmed**	**Original**	**Trimmed**	**Original**	**Trimmed**
Min.	-1.4498	-0.2599	-7.5048	-0.8208	-2.0336	-0.4523	-54.6012	-0.8845
1st Q.	-0.0131	0.0013	-0.0251	-0.0230	-0.0147	0.0165	-0.0146	-0.0103
Median	*0.0613*	*0.0646*	*0.0349*	*0.0402*	*0.1035*	*0.1177*	*0.0352*	*0.0371*
Mean	0.1041	0.0924	0.0793	0.0626	0.2051	0.1868	-0.0923	-0.0550
3rd Q.	0.2007	0.1791	0.1177	0.1205	0.3906	0.3474	0.1045	0.1060
Max.	1.7920	0.5443	10.4912	1.4822	2.2821	0.8905	45.7554	1.1509
Std.Dev.	0.2759	0.1432	0.6351	0.0230	0.5103	0.2470	4.0957	0.1660
N	805	527 (65%)	811	631 (78%)	361	234 (65%)	361	284 (79%)

Source: Research Data.

To compose the trimmed difference, the uncertainty in both categories under comparison are required to be between the lower and upper deciles. The opening and closing comparison proportion are close to 80%, meaning that there almost the same firms are considered as moderate uncertainty in each category. For the difference between anticipation and deferral, the proportion of cases is 65% because of several cases are considered with high or low uncertainty in a category but not for the other, as reflected by the spread of the cases in Figure 9.

In comparison to the original data, the distributions of differences in the trimmed data, show lower standard deviations and mean values closer to the medians. Also, the medians for the differences are more similar between the original and the trimmed data, than the mean values.

I present the Tests estimates for the distribution of the differences between anticipation and deferral, and opening and closing accruals, with both original data and trimmed data, in Table 33, for the short (Panel A) and long (Panel B) periods of analysis.

Table 33 Tests estimates for the differences between Anticipation and Deferral and between Opening and Closing, for original and trimmed data

	(A) Period of Analysis: Short (7 yrs)				(B) Period of Analysis: Long (22 yrs)			
Difference	**Anticip. – Deferral**		**Opening – Closing**		**Anticip. – Deferral**		**Opening – Closing**	
Statistical tests distributions and estimates – General Categories								
	Original	**Trimmed**	**Original**	**Trimmed**	**Original**	**Trimmed**	**Original**	**Trimmed**
W	0.8790	0.9690	0.3297	0.8330	0.8889	0.9352	0.1123	0.8145
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.0804	0.0816	0.0421	0.0464	0.1584	0.1625	0.0413	0.0463
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pos. Signs	0.7193	0.7533	0.6621	0.6704	0.7175	0.7906	0.6953	0.7113
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004

Source: Research Data.

The distributions of the differences are closer to the normal distribution, as the statistics W of the Shapiro-Wilk tests are higher for the trimmed data in comparison to the original data, with a great increase for the opening and closing comparison that increase from 0.33 and 0.11 to above 0.80 for both periods of analysis. Yet, all the groups reject the hypotheses of normality, even for the trimmed cases.

The pseudo-median estimates of the Wilcoxon tests are quite similar between the original and the trimmed data, of around 0.08 and 0.15 for the differences between anticipation and deferral comparisons, for the short and the long periods of analysis, respectively. For the difference between opening and closing, the pseudo-medians are close to 0.04 for the original and trimmed data.

Regarding the proportion of positive signs, the difference between anticipation and deferral uncertainties present increases in trimmed data, in comparison to the original data, which does not happen as much for the opening and closing comparisons. For the difference between anticipation and deferral, the original data present a proportion of positive signs of 72% that increases to 75% and 79% for the short and long periods of analysis, respectively. Comparatively, the estimates for the opening and closing differences increase from 66% to 67%, for the short period of analysis, and from 70% to 71% for the long period, showing very little increases of around 1%. This distinction reflects that anticipation and deferral comparisons are more sensitive to extreme uncertainties regarding the opening and closing effects of accruals, than the opening and closing comparisons are sensitive when also considered the role of anticipation and deferral of accruals. Generally, the results for positive and significant differences remain inaltered, with a little increase in the Tests estimates.

In Appendix A, I provide comparisons for differences between categories under specific groupings, i.e. between anticipation and deferral considering the opening and closing groups,

and between opening and closing, considering the anticipation and deferral groups. The results for trimmed data remain unchanged in comparison to the results for original data, presented in Tables 27 and 31, showing a positive difference between anticipation and deferral, and between opening and closing, for both the short and long periods of analysis.

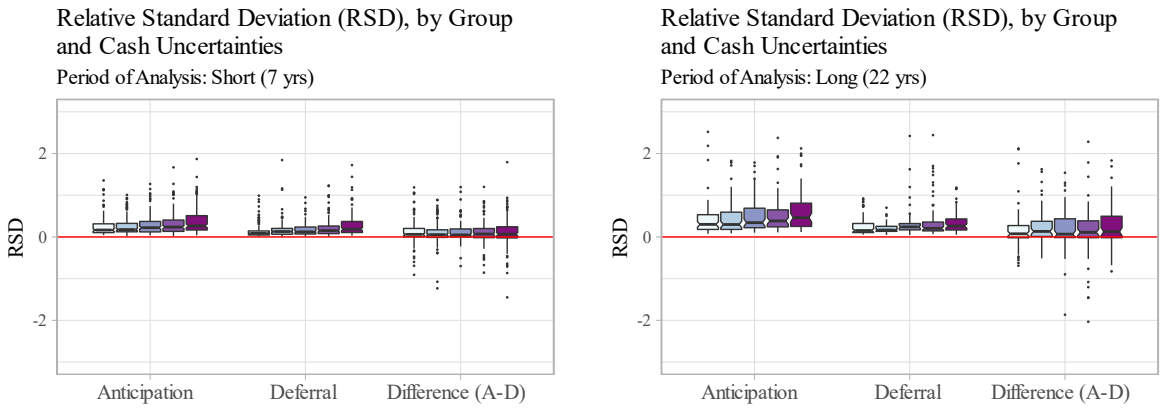
In terms of evidence, in both periods of analysis and for both cases of general and specific categorization, the results of the tests present evidence of positive differences of uncertainties between anticipation and deferral and between opening and closing categories. The conclusions of higher uncertainty in anticipation than deferral, confirming the hypothesis H1, and higher uncertainty in opening than in closing, rejecting H2, remain the same for companies with moderate levels of uncertainty, and therefore, are not subject to the uncertainties within the categories under comparison.

4.5.2 Underlying activities

The statistical tests performed capture differences in uncertainties between categories that carry both accounting and operating uncertainties in their composition. Therefore, as argued, although the research hypotheses relied on accounting uncertainties, the results of the tests may also be subject to the influence of their underlying activities.

In order to investigate the influence of activities, I estimated their uncertainty by the Relative Standard Deviation from cash assets and liabilities, using the accounts of Cash and ST Investments, Debt ST, and Debt LT, similarly to the accrual accounts. Next, I associated those measurements to five levels of activity uncertainties, represented by the quintiles of the Cash RSD.

In Figure 22, I present the distributions of the uncertainties measured by the RSD for the categories, similarly to Figures 8 and 11, segregated by the levels of activity uncertainties, for the short (Panel A) and long (Panel B) periods of analysis. In Table 34, I present the correlations between the categories and the activity uncertainties, captured by the Cash RSD, for the short (Panel A) and long (Panel B) periods of analysis.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 22 Relative Standard Deviation (RSD), by Group (Anticipation and Deferral) and their difference, by levels of activities uncertainties

Source: Research Data.

Table 34 Correlations between categories uncertainties (Anticipation and Deferral) and underlying activities uncertainties

	(A) Period of Analysis: Short (7 yrs)			(B) Period of Analysis: Long (22 yrs)		
	Anticipation	**Deferral**	**Difference [A – D]**	**Anticipation**	**Deferral**	**Difference [A – D]**
Pearson Correlations						
Corr.	0.1819	0.2149	0.0059	0.1471	0.1668	0.0248
p-value	<0.0001	<0.0001	0.8673	0.0051	0.0015	0.6382
Spearman Correlations						
ρ	0.1944	0.2758	-0.0004	0.1815	0.2195	0.0573
p-value	<0.0001	<0.0001	0.9915	0.0005	<0.0001	0.2778

Source: Research Data.

For both anticipation and deferral categories, isolatedly, there is a pattern of increasing uncertainties as higher are the activity uncertainties that does not occur for their difference. That effect is reinforced by the correlation tests, that show a significant positive association of the isolated categories with activity uncertainties, but show no correlation between their difference and activities uncertainties. The evidence is consistent with the argument that the RSD metric captures underlying operating and investment uncertainties, for both anticipation and deferral accruals.

As the difference between anticipation and deferral do not relate to levels of activity uncertainties, it means that the effects of the uncertainties of activities within the categories are mitigated in their difference. Therefore, although it does not guarantee that the results of the tests are free from activity uncertainties, it is reasonable to admit that the positive differences between anticipation and deferral do not depend on their level. For further clarification, in Table 35, I present the statistics and test estimates, by levels of activities uncertainty, for the short (Panel A) and long (Panel B) periods of analysis.

Table 35 Descriptive statistics and Tests estimates for the differences between Anticipation and Deferral, by levels of underlying activities uncertainties

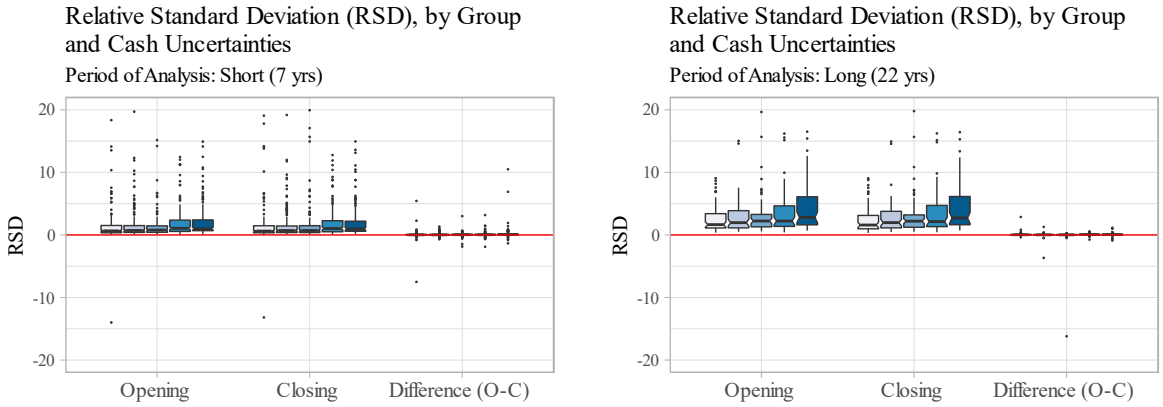
	(A) Period of Analysis: Short (7 yrs)					(B) Period of Analysis: Long (22 yrs)				
Cash RSD	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Min.	-0.9075	-1.2320	-0.6992	-0.8559	-1.4498	-0.6904	-0.5132	-1.8660	-2.0336	-0.8256
1st Q.	0.0033	-0.0110	-0.0015	-0.0174	-0.0236	-0.0198	0.0106	-0.0147	-0.0184	-0.0186
Median	*0.0613*	*0.0553*	*0.0487*	*0.0697*	*0.0661*	*0.0754*	*0.1323*	*0.0670*	*0.1109*	*0.1256*
Mean	0.1123	0.0907	0.1053	0.0974	0.1147	0.1702	0.2514	0.1956	0.1366	0.2721
3rd Q.	0.2038	0.1716	0.1922	0.2021	0.2441	0.2731	0.3757	0.4355	0.3864	0.4964
Max.	1.1876	0.8864	1.1952	1.2009	1.7920	2.1204	1.6232	1.5385	2.2821	1.8330
Std.Dev.	0.2779	0.2542	0.2320	0.2580	0.3434	0.4861	0.3911	0.4807	0.6509	0.4958
N	161	161	161	161	161	73	72	72	72	72
Statistical tests distributions and estimates										
W	0.8638	0.8340	0.8780	0.9092	0.8947	0.7869	0.8415	0.8801	0.9056	0.9301
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0006
P.-median	0.0825	0.0714	0.0795	0.0826	0.0885	0.1010	0.1809	0.1637	0.1454	0.2164
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0007	<0.0001	0.0001	0.0021	<0.0001
Pos. Signs	0.7578	0.7391	0.7391	0.6957	0.6646	0.7123	0.7500	0.6667	0.7222	0.7361
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0063	0.0002	0.0001

Source: Research Data.

As expected, there is no systematic increase or decrease in the difference distribution, neither for position or dispersion values. According to Table 24, the medians for the difference distribution in general are 0.0613 and 0.1035, for the short and long periods of analysis, respectively, that are comparable to these values for the distinct levels of Cash RSD in Table 35.

The same applies for the results of the tests. In the general grouping, the difference between anticipation and deferral categories shows pseudo-medians of 0.0804 and 0.1584, and proportions of positive signs of 0.7193 and 0.7175, for the short and the long periods of analysis, respectively, as presented in Table 25. Those values are comparable to the tests estimated considering the levels of Cash RSDs, in Table 35. Also, there is no clear indication of tendencies for the results, there seems to happen increase in normality for the long period and a decrease in the proportion of positive signs in the short period. In general, the higher uncertainty for anticipation than for deferral do not carry association to the underlying activities uncertainties, despite both categories isolatedly do.

I repeat the same process to the comparison between opening and closing accruals. In Figure 23, I present the distributions for the categories and their difference, accordingly to the different levels of activity uncertainties. In Table 36, I present the correlations and in Table 37, the descriptive statistics and tests.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 23 Relative Standard Deviation (RSD), by Group (Opening and Closing) and their difference, by levels of activities uncertainties

Source: Research Data.

Table 36 Correlations between categories uncertainties (Opening and Closing) and underlying activities uncertainties

	(A) Period of Analysis: Short (7 yrs)			(B) Period of Analysis: Long (22 yrs)		
	Opening	**Closing**	**Difference [O – C]**	**Opening**	**Closing**	**Difference [O – C]**
Pearson Correlations						
Corr.	0.0600	0.0556	0.0779	0.0500	0.0493	0.0056
p-value	0.0888	0.1151	0.0272	0.3439	0.3501	0.9153
Spearman Correlations						
ρ	0.1765	0.1662	0.0923	0.2172	0.2142	0.0924
p-value	<0.0001	<0.0001	0.0087	<0.0001	<0.0001	0.0797

Source: Research Data.

For the opening and closing categories, correlation measurements differ, depending on the method applied, which does not happen for the anticipation and deferral. That indicates a higher similarity of the Cash RSD with anticipation and deferral estimates of uncertainty than for the opening and closing groups. It is consistent with the form of estimation, by using changes in cash and non-cash assets and liabilities, in comparison to the use of additional information from income statements and statements of cash flows.

On the other hand, ρ values behave quite similarly for all the groups and their differences. The distinction between the methods is that Spearman correlations disregard the distances, treating data accordingly to their position. In the case of comparisons with the opening and closing groups, it is reasonable that this method is more suitable for analysis purposes.

Regarding opening and closing uncertainties estimates, they show a significant positive correlation with activity uncertainties, while their differences, although significant at 1% and 10% levels for the short and long period, respectively, are lower than the isolated groups. Also,

the correlation of their difference is not as low as the difference between anticipation and deferral, meaning that, although the difference mitigates the activity uncertainties, they could still vary accordingly to their levels.

In Table 37, I present the statistics and test estimates, by levels of activities uncertainty, for the short (Panel A) and long (Panel B) periods of analysis.

Table 37 Descriptive statistics and Tests estimates for the differences between Opening and Closing, by levels of underlying activities uncertainties

	(A) Period of Analysis: Short (7 yrs)					(B) Period of Analysis: Long (22 yrs)				
Cash RSD	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Min.	-7.5048	-0.6926	-1.8532	-1.8858	-1.3451	-0.3635	-3.6662	-16.1985	-54.6012	-0.8845
1st Q.	-0.0202	-0.0269	-0.0257	-0.0320	-0.0102	-0.0127	-0.0142	-0.0329	-0.0124	-0.0083
Median	*0.0206*	*0.0226*	*0.0438*	*0.0354*	*0.0545*	*0.0355*	*0.0224*	*0.0208*	*0.0586*	*0.0629*
Mean	0.0458	0.0511	0.0426	0.0731	0.2082	0.0981	-0.0068	-0.2042	-1.0603	0.7092
3rd Q.	0.1021	0.0872	0.1141	0.1187	0.1531	0.0914	0.0755	0.0732	0.1134	0.1288
Max.	5.4352	1.3365	3.0085	3.1801	10.4912	2.8678	1.2873	0.2801	0.5666	45.7554
Std.Dev.	0.7747	0.2333	0.3421	0.3861	1.0217	0.3606	0.4760	1.9020	7.0603	5.3523
N	161	161	161	161	161	73	72	72	72	72
Statistical tests distributions and estimates										
W	0.2948	0.7677	0.5321	0.6020	0.2830	0.4050	0.3498	0.1338	0.1654	0.1225
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.0330	0.0285	0.0434	0.0450	0.0717	0.0423	0.0261	0.0213	0.0544	0.0691
p-values	0.0001	0.0010	<0.0001	<0.0001	<0.0001	0.0003	0.0040	0.0386	0.0007	0.0001
Pos. Signs	0.6460	0.6149	0.6708	0.6646	0.7391	0.6986	0.6806	0.6806	0.7083	0.7083
p-values	0.0003	0.0044	<0.0001	<0.0001	<0.0001	0.0009	0.0029	0.0029	0.0005	0.0005

Source: Research Data.

The values of position and dispersion for the difference between opening and closing under the distinct levels for uncertainties of activities are close to the general level. As presented in Table 28, the median values for difference in the general grouping are 0.0349 and 0.0352, for the short and long periods of analysis, and the means are 0.0793 and -0.0923.

Considering the activities uncertainty levels, these metrics do not show clear trends in relation to uncertainties in activities, in comparison to the increases in the categories isolatedly, as illustrated in Figure 23. However, the means and medians for levels 1 and 2 of Cash RSD are lower than these metrics for the levels 4 and 5, which does not happen for the anticipation and deferral comparison. That is consistent with the weak evidence of positive correlation between the difference between opening and closing and uncertainties in the underlying activities.

Similarly, the estimates of the tests are comparable to the general grouping. From Table 29, the pseudo-median estimates for the general grouping are 0.0421 and 0.0413, and the proportion of positive differences are 0.6621 and 0.6953, for the short and long periods of analysis, respectively. In Table 37, the tests by activities uncertainty levels present similar

estimates, for the pseudo-median and the proportion of positive signs, for both periods of analysis.

In addition, while there is not a clear linear pattern for those estimates, the lower levels of actitivies uncertainties, in groups 1 and 2 of Cash RSD, present generally lower estimates for the difference than the higher levels of uncertainty, in groups 4 and 5. I highlight that, although in the lower levels the estimates are lower, there is still evidence of significant positive difference between opening and closing uncertainties, for both periods of analysis.

In Appendix B, I present the Tests estimates for specific groups comparisons, with similar evidence of positive differences between anticipation and deferral, and between opening and closing. The proportion of positive signs between anticipation and deferral are close to 80%, while the proportion of positive differences between opening and closing are around 60%, for both the anticipation and deferral groups. Regarding trends, the difference between opening and closing for the anticipation group seem to follow an increasing pattern as the cash uncertainties increase, while the remaining comparisons do not show any clear trends.

Generally, for the accruals categories of anticipation, deferral, opening and closing, there is a significant association of the isolated categories with operating uncertainties, which reinforces the argument that the RSD metric contains both accounting and operating uncertainties.

For the difference between anticipation and deferral, there is no association to the levels of uncertainty in cash flows, implying that the evidence of positive differences, confirming hypothesis H1, are not influenced by the levels of operating uncertainties at the firm-level. Regarding the comparison between opening and closing categories, there is a weaker evidence of higher differences for higher cash flows uncertainties and even for the lowest activities uncertainties, their differences are still significant and positive, also rejecting H2.

I highlight that those comparisons considered activities uncertainties at firm-level, and not category-level, due to the restriction of the nature of the available data. It means that, the perceived uncertainty differences are still subject of the activities uncertainties within each category under comparison, which may differ.

4.5.3 By industry

Besides the levels of uncertainties in activities estimated by the cash RSD, firms also perform in distinct sectors of the economy. The North American Industry Classification System (NAICS) aggregates establishments with similar production processes in the same industry,

dividing the economy into 20 sectors. I present all the sectors with the number of companies within each industry in Appendix C.1, and in Table 38, I present the adapted categorization, considering only industries with more than 10 firms.

Table 38 Number of firms within each industry

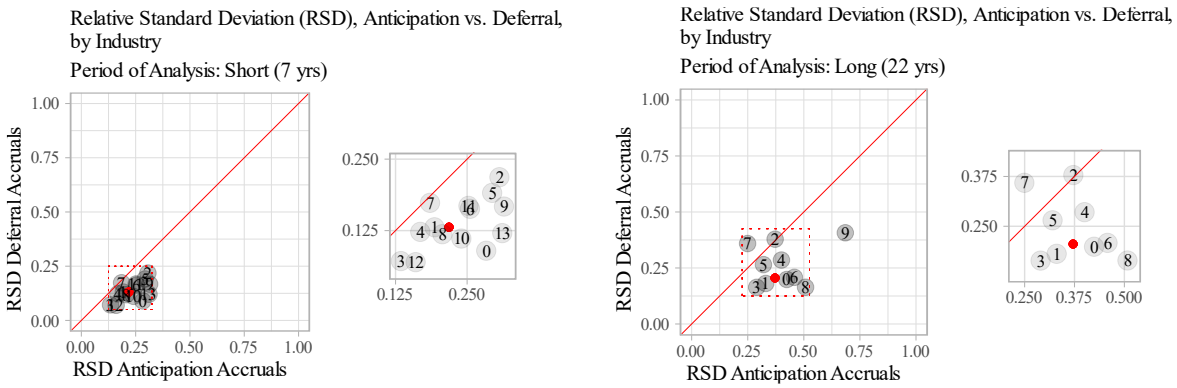
	Industry	Period of Analyis	
		[A] Short	[B] Long
1	Manufacturing	369	171
2	Mining, Quarrying, and Oil and Gas Extraction	62	29
3	Retail Trade	60	34
4	Utilities	56	27
5	Information	43	19
6	Administrative and Support and Waste Management and Remediation Services	41	14
7	Transportation and Warehousing	32	16
8	Wholesale Trade	29	13
9	Construction	25	12
10	Real Estate and Rental and Leasing	24	-
11	Professional, Scientific, and Technical Services	17	-
12	Accommodation and Food Services	17	-
13	Health Care and Social Assistance	16	-
0	Others	24	26
	Total	*815*	*361*

Source: Research data.
Note: Industries with less than 10 companies were combined in a single category named “others”, coded 0.

In the short period of analysis, there is a total of 14 categories of industries, while in the long period, there is a total of 10. The number of firms within each category is relevant to the significance of the statistical tests performed.

In Figure 24, I show the medians of anticipation and deferral by industry, for both the short (Panel A) and long (Panel B) periods of analysis. The codes are the same as indicated in Table 38, and the red dot marks the position of the medians considering the total of firms for each period.

In Appendix C.1, I present the median values for each industry and in C.2 and C.3, I also present the results of the Tests for the difference between the categories, by industry, for both the short (Panel A) and long (Panel B) periods of analysis. The analysis of the medians for each industry and the results of paired comparisons provide the same evidence, with the results indicating positive differences between the anticipation and deferral, and between opening and closing, very similar to the previous comparisons and analyses.



(a) Short Period of Analysis (b) Long Period of Analysis

Figure 24 Relative Standard Deviation (RSD), by Group (Anticipation vs. Deferral) and by industry

Source: Research Data.

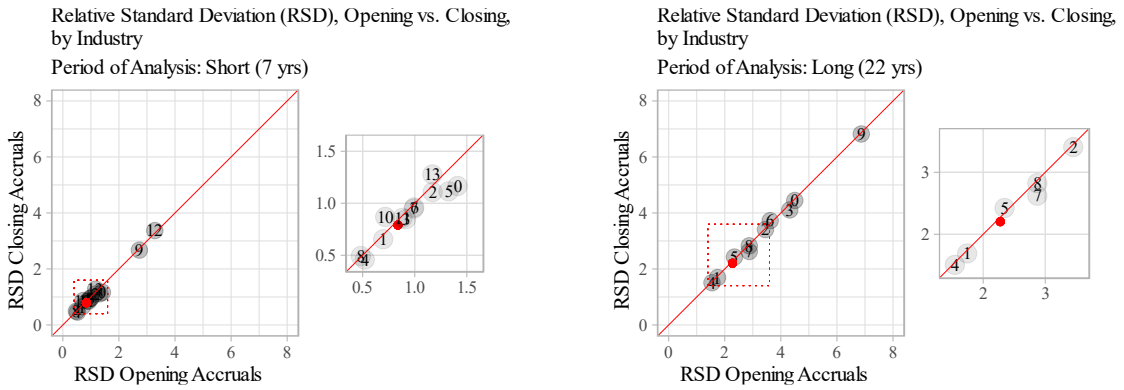
Note: The red line represents equivalent uncertainty for Anticipation and Deferral categories. Dots below (above) the line are cases which the uncertainty of Anticipation is higher (lower) than the uncertainty of Deferral. The red dot represents the medians for the complete set of firms. The dashed square represents the limits for the zoom on the right of each main figure.

The medians for each industry are scattered around the median for the full set of firms, for both the anticipation and the deferral categories. In addition, the pattern of the scattering is similar to the general comparisons between the firms, as presented in Figure 9, with more cases below the diagonal than above. Therefore, aggregation from the individual firms to industries indicates a convergence in the relative uncertainties, leading to the general conclusion of a higher uncertainty in anticipation than in deferral. That is similar for both the short and long periods of analysis.

In the short period, all industries present medians that are higher in the anticipation group than in deferral, with Transportation and Warehousing (code 7) being the industry with these values that are the closest, with 0.19 for the anticipation and 0.17 for the deferral category. Analysis for paired comparisons within the industries shows that they all present proportions of positive differences above 50%, and Transportation is the one with the lowest proportion, of 65% of the 32 companies presenting higher uncertainty in anticipation than in deferral. In comparison, for the long period, Transportation shows higher uncertainty in deferral than in anticipation, either by comparing the RSD medians, which are 0.25 for anticipation and 0.36 for deferral, and by the proportion of positive differences between anticipation and deferral, of 37%. By the NAICS definition, firms in Transportation and Warehousing provide transportation of passengers and cargo and warehouse and storage for goods. Another industry that shows a distinct behavior is Construction (code 9), in which firms engage in the construction of building and engineering projects like highways and utility systems. This industry shows the highest uncertainties for anticipation, of 0.31 and 0.68 for the short and long periods of analysis, and

the highest uncertainty for deferral in the long period, with a median of 0.40.

For opening and closing comparisons, I illustrate in Figure 25 the medians for each industry, for both the short (Panel A) and long (Panel B) periods of analysis. Similar to the anticipation and deferral categories, the opening and closing composition reflect the same patterns of distribution around the median of all companies, as well as for the companies individually. Uncertainties measured by the RSD for the categories of opening and closing are higher than the values for anticipation and deferral, but they are closely related, with cases near the diagonal line.



(a) Short Period of Analysis (b) Long Period of Analysis

Figure 25 Relative Standard Deviation (RSD), by Group (Opening vs. Closing) and by industry

Source: Research Data.

Note: The red line represents equivalent uncertainty for Anticipation and Deferral categories. Dots below (above) the line are cases which the uncertainty of Anticipation is higher (lower) than the uncertainty of Deferral. The red dot represents the medians for the complete set of firms. The dashed square represents the limits for the zoom on the right of each main figure.

For the short period of analysis, the uncertainty in opening and closing are similar among the industries, with Construction (code 9) and Accommodation (code 12) showing the highest values of medians RSDs, respectively of 2.73 and 1.71 for the opening category, and 2.67 and 1.11 for the closing category. In the long period of analysis, the Construction industry still shows the highest opening and closing uncertainties, if RSD medians of 6.87 and 6.82, respectively. The composition illustrated in Figure 25 illustrates the medians of RSD estimates for the sectors, showing some sectors with a higher median for closing than for opening, like Real State (code 10) and Health Care (code 13). However, both those industries present evidence of paired comparisons of higher uncertainty in opening than in closing, with proportions of positive differences between opening and closing above 50%, of 57% and 63%, respectively, although statistically non-significant.

Industry-level comparisons reflect the general evidence of higher uncertainties for

anticipation than for deferral, and higher in opening than closing. They also show pattens for the compositions of the differences that are similar to the approach for the firms individually. One industry that shows uncertainties above the others is Construction, although the differences between the uncertainties are not distinct from the general conclusions. Therefore, although firms perform distinct economic activities and the accounting uncertainties reflect instabilities in those activities, the evidence of differences of uncertainty between the accruals categories under comparison are similar among the industries.

4.5.4 Short-term and long-term accruals: general comparisons

The research hypotheses regard accruals and their uncertainties generally. However, accruals reflect the economic and cash impacts of events with distinct time horizons, relating to short and long-term accounts that may hold distinct uncertainties in their categories and their differences.

Considering the reference accounts in balance sheets, I estimated the differences in uncertainty between anticipation and deferral, and opening and closing, for short-term and long-term accruals separately. For short-term accruals, Accounts Receivable and Accounts Payable compose the anticipation group, and Inventories composes the deferral group. For long-term accruals, Investments in Subsidiaries and Deferred Taxes LT compose the anticipation group, and Property, Plant and Equipment (PPE), and Intangibles and Goodwill compose the deferral group.

In Table 39, I present the Descriptive statistics for the distributions of the differences between anticipation and deferral, and between opening and closing, for short-term and long-term accruals, and for both the short (Panel A) and long (Panel B) periods of analysis.

Table 39 Descriptive statistics for the differences between Anticipation and Deferral and between Opening and Closing, for short and long-term accruals

	(A) Period of Analysis: Short (7 yrs)				**(B) Period of Analysis: Long (22 yrs)**			
Difference	**Anticip. – Deferral**		**Opening – Closing**		**Anticip. – Deferral**		**Opening – Closing**	
Term	**Short**	**Long**	**Short**	**Long**	**Short**	**Long**	**Short**	**Long**
Min.	-2.5445	-1.5226	-14.8896	-3.4704	-6.2422	-1.8195	-109.2445	-1.1834
1st Q.	-0.027	0.0395	-0.0252	-0.0455	-0.0339	0.0751	-0.0068	-0.0217
Median	*0.0128*	*0.1852*	*0.0342*	*0.0293*	*0.0155*	*0.3091*	*0.0354*	*0.0407*
Mean	-0.0118	0.3745	0.0785	0.0850	-0.0838	0.6669	-0.2763	0.0545
3rd Q.	0.0519	0.5175	0.1254	0.1141	0.0556	0.9278	0.0932	0.1150
Max.	1.3011	3.2452	6.4812	13.9127	2.3188	6.3604	91.351	2.1704
Std.Dev.	0.2568	0.6193	0.7465	0.8104	0.6810	1.0628	8.4127	0.2264
N	686	707	804	811	342	333	361	361
(% total)	(85%)	(88%)	(99%)	(100%)	(95%)	(92%)	(100%)	(100%)

Source: Research Data.

Data availability for short-term accruals is a little lower than for long-term accruals because of the composition of the deferral group, that uses only Inventories, while the other categories have at least two distinct accounts in the composition. Besides that, for all differences, the data availability is above 85% for all categories, in comparison to the number of observations for the tests applied to total accruals.

The medians are similar for the difference between opening and closing, for both the short and long-term accruals, in both the short and long periods of analysis. That indicates uncertainties for opening similarly higher than for closing, independently of the accruals terms. However, the distributions of the difference between anticipation and deferral are distinct. For short-term accruals, the medians are close to 0.01 in both periods of analysis, while for long term-accruals, the medians increase to 0.19 and 0.31, for the short and long periods of analysis, respectively. These increases indicate that uncertainties in anticipation are higher than for the deferral category more strongly for long-term accruals than for short-term accruals.

In Table 40, I present the results of the statistical tests for the differences between anticipation and deferral and between opening and closing, for the short and long-term accruals, for both the short (Panel A) and long (Panel B) periods of analysis.

Table 40 Tests estimates for the differences between Anticipation and Deferral and between Opening and Closing, for short and long-term accruals

	(A) Period of Analysis: Short (7 yrs)				(B) Period of Analysis: Long (22 yrs)			
Difference	**Anticip. – Deferral**		**Opening – Closing**		**Anticip. – Deferral**		**Opening – Closing**	
	Short	**Long**	**Short**	**Long**	**Short**	**Long**	**Short**	**Long**
W	0.4617	0.8118	0.3217	0.2419	0.3264	0.8169	0.1046	0.7306
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.0118	0.2598	0.0447	0.0325	0.0123	0.4666	0.0388	0.0441
p-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0054	<0.0001	<0.0001	<0.0001
Pos. Signs	0.6050	0.8161	0.6567	0.6005	0.5906	0.8288	0.7175	0.6870
p-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0009	<0.0001	<0.0001	<0.0001

Source: Research Data.

No distribution of differences shows normality, which is consistent with the results for total accruals distributions of differences. The results of Wilcoxon and the sign tests show that, for all comparisons, the differences are statistically positive, which implies that uncertainties in the anticipation are higher than in the deferral category, and uncertainties in the opening are higher than in the closing category, independently if the accruals terms and periods of analysis.

According to the Wilcoxon tests, the pseudo-median for the difference between anticipation and deferral for long term accruals is higher than for short-term accruals, increasing from 0.01 for both periods of analysis to 0.26 and 0.47 for the short and long periods of analysis,

respectively. The proportion of cases in which the uncertainty for anticipation is higher than for deferral also increases from 60% for short-term accruals to over 80% for long-term accruals, for both the short and long periods of analysis. Comparably, the proportion of positive signs for total accruals is around 70%. Those results corroborate the observation that uncertainties in anticipation are higher than in deferral, and this effect is stronger for long-term accruals than for short-term accruals.

The differences between opening and closing are positive, but similar for short-term and long-term accruals, with pseudo-medians of 0.04 and proportion of positive differences of around 60 and 70%, similar to the proportion for total accruals. The proportion of positive differences for short-term accruals are higher than for long-term accruals, being 66% in comparison to 60% for the short period of analysis (Panel A), and 72% in comparison to 69% for the long period (Panel B).

The comparisons between anticipation and deferral, and between opening and closing reinforce that the distinction between short-term and long-term accruals are relevant for the differences of uncertainty between the uncertainties for the opening and closing categories. I highlight that all those comparisons comprehend both activities and accounting uncertainties, due to the nature of the RSD approach.

Similar to the other additional analyses, I also performed the same comparisons considering the specific groups, i.e. between anticipation and deferral considering the opening and closing categories and between opening and closing considering the anticipation and deferral categories. Because there is more detailed evidence in those comparisons, next, I present the results of the tests and their analysis.

4.5.5 Short-term and long-term accruals: specific comparisons

In Table 41, I provide the results of the tests comparing differences of uncertainties regarding the specific categories for each short and long term accruals, i.e., between anticipation and deferral considering the opening and closing groups, and between opening and closing considering the anticipation and deferral groups, for the short term accruals and long term accruals.

The tests provide similar results for both the short and long periods of analysis but distinct for short and long-term accruals depending on the comparisons. To provide a better general overview, in Figures 26 and 27, I replicate the conclusions of the results for the general and specific comparisons for each kind of accruals, and the proportion of positive differences

for the short (long) periods of analysis.

Table 41 Tests estimates for the differences between Anticipation and Deferral, with distinction between Opening and Closing, and between Opening and Closing, with distinction between Anticipation and Deferral, for short and long-term accruals

	(A) Period of Analysis: Short (7 yrs)				(B) Period of Analysis: Long (22 yrs)			
Difference	**Anticip. – Deferral**		**Opening – Closing**		**Anticip. – Deferral**		**Opening – Closing**	
	Opening	**Closing**	**Anticipation**	**Deferral**	**Opening**	**Closing**	**Anticipation**	**Deferral**
Short-term Accruals								
W	0.4936	0.4335	0.3839	0.1685	0.0471	0.0472	0.0403	0.0803
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	-0.0187	-0.0823	0.0772	-0.0170	-0.1714	-0.2578	0.0676	-0.0270
p-value	0.6102	0.0199	<0.0001	0.0211	0.1887	0.0567	<0.0001	0.0001
Pos. Signs	0.4874	0.4722	0.6978	0.4840	0.4608	0.4505	0.7812	0.4300
p-value	0.5654	0.1888	<0.0001	0.4598	0.1986	0.1017	<0.0001	0.0193
Conclusion:	*Zero*	*Zero*	*Positive*	*Zero*	*Zero*	*Zero*	*Positive*	*Neg. (5%)*
Long-term Accruals								
W	0.1774	0.1751	0.2621	0.8152	0.1930	0.1930	0.6106	0.7713
p-value	<0.0001	<0.0001	<0.0001	<0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
P.-median	0.9322	1.0284	-0.0324	0.0614	2.8742	3.0336	-0.0350	0.0941
p-value	< 0.0001	< 0.0001	0.0005	< 0.0001	< 0.0001	< 0.0001	0.0020	< 0.0001
Pos. Signs	0.8272	0.9065	0.4370	0.7347	0.8529	0.9099	0.3904	0.8393
p-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Conclusion:	*Positive*	*Positive*	*Negative*	*Positive*	*Positive*	*Positive*	*Negative*	*Positive*

Source: Research Data.

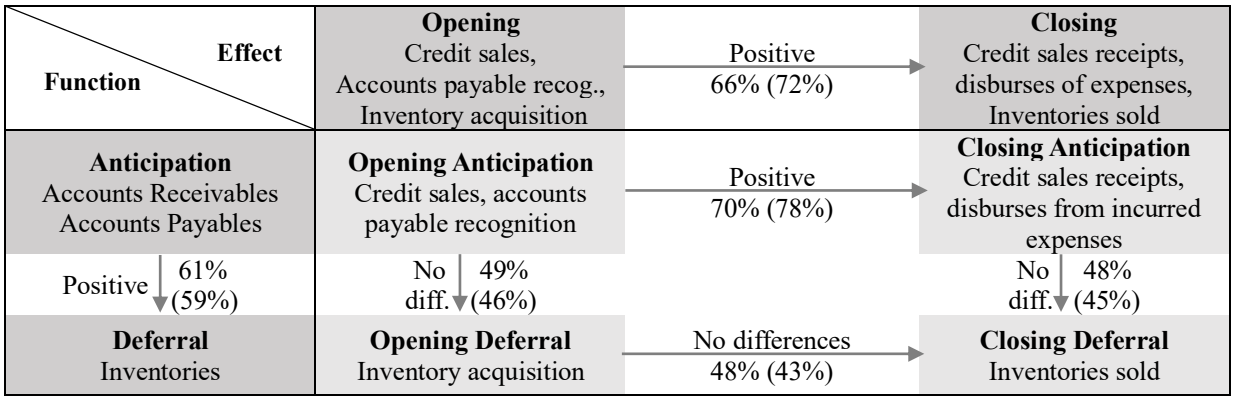


Figure 26 General overview of the conclusions for short-term accruals

Source: Research Data.

Notes: The percentual values indicate the proportion of positive differences for the short (long) period of analysis. The conclusions are based on joint evidence from the Wilcoxon and sign results for both periods of analysis.

For short-term accruals, the general comparison shows a positive difference between anticipation and deferral, with a proportion of positive differences close to 60%, while for the specific comparisons, the proportions are below 50%, although non-significant for both periods of analysis.

A trait of the short-term accruals is that there is a high level of opening and closing flows

that cancel out during the year. Besides that, the estimates for those flows consider income statements accounts as a whole, which implies that the full value changed the respective balance sheet amount, e.g. all the sales opened accounts receivable. Therefore, the results are subject to this condition, which is more impacting for short-term accruals.

Regarding the general changes in the accounts, i.e. for general comparisons between anticipation and deferral, there is a higher uncertainty measured by the RSD for Accounts Receivable and Accounts Payable than for Inventories. However, that is not the same for the opening and closing categories isolatedly. Comparing only the opening category, or the closing category, for short-term accounts, there is the same level of uncertainty between anticipation and deferral, due to the non-significance of the results of the tests, as presented in Table 41 and illustrated in Figure 26. That is, accounting for the activities of inventories purchases have comparable uncertainties than activities of sales or consuming short-term operating resources, as well as the accounting for activities of writing-down inventories are comparable in uncertainty than collecting the sales and paying for the resources used.

Account-level analyses suggest an effect of compensation since the RSD for the category is estimated by the average of the RSD of each composing account. The medians presented in Table 23 show that, while the relative uncertainties for Accounts Receivable are high, close to 1 for the short period of analysis and close to 3, for the long period, in comparison to the uncertainties for Accounts Payable, which are low, close to 0.3 and 0.9, for the short and long periods of analysis, respectively. These accounts compose the anticipation category. In turn, Inventories compose the deferral category, presenting intermediate medians, of 0.7 and 2.2, respectively. Therefore, the non-significant difference between anticipation and deferral for short-term accruals is potentially related to the heterogeneity within the anticipation group. When the changes in the accounts are taken generally, Accounts Receivable and Accounts Payable present RSD medians of 0.10 and 0.12, for the short and long periods of analysis respectively, both higher than the RSD for Inventories of 0.07 and 0.10.

In sum, anticipation and deferral comparisons for short-term accruals, regarding only the opening or closing categories, show uncertainties at the same level, which is possibly associated with a compensation behavior among the individual accounts involved. However, under the consideration of a longer time period, like yearly, the perceived uncertainties in anticipation are higher than in deferral.

For opening and closing comparisons, short-term accruals show a higher uncertainty in opening than in closing, under a general approach, with proportions of positive differences of

66% and 72%, for the short and long periods of analysis, as presented in Table 40 and illustrated in Figure 26. Specific comparisons show that, for the anticipation category, there is higher uncertainty in opening Accounts Receivable and Accounts Payable than in closing, with proportions of positive differences of 70% and 78%, for the short and long periods of analysis. In turn, for the deferral category, opening and closing Inventories show similar uncertainties[8], with proportions of positive differences of 48% for the short period of analysis and 43% for the long period, this last one statistically significant at 5%.

For comparing the accounts individually, as presented in Table 23, the medians for opening are higher than for the closing category of both Accounts Receivable and Accounts Payable, with differences close to 0.1 and 0.01, respectively, and lower for Inventories, with differences close to -0.03, for both the short and the long periods of analysis. Similar to the anticipation and deferral comparisons, the magnitudes of the differences suggest that the positive differences between opening and closing in the anticipation group for short-term accruals are more influenced by the Accounts Receivable than by Accounts Payable.

The comparisons between the general approach and the specific approaches for the differences between anticipation and deferral, as well as between opening and closing categories, provide important distinctions for the conclusions regarding short-term accruals. Possibly, such distinctions are because those are accounts that carry opening and closing flows that cancel out during the year, implying in time series with different levels of uncertainty when under comparison. In addition, the use of the whole value of the income statements accounts to represent such values may influence these comparisons, since the underlying streams can be not as estimated.

Regarding long-term accruals, such considerations are also valid, with the distinction that some accounts also use the statements of cash flows information and they do not carry the same expectation of the opening and closing flows canceling out during the year. In Figure 27, I represent the proportions of positive differences for both the short and long periods of analysis and the conclusions for the comparisons between the categories of accruals, for long-term accruals.

[8] I note that the evidence for similar uncertainties in Inventories is admitting a conservative posture, as one could perceive for lower uncertainties in opening than in closing, due to the significant results of the Wilcoxon tests, as presented in Table TT26, with negative pseudo-medians, and lower medians for opening than in closing. However, I opted for admitting a no-difference conclusion because the tests are intended to identify whether there are differences or not, both positive or negative, and it is more conservative to admit that any differences are due to statistical variance. Therefore the conclusion for no-differences reflected in Table TT26 and Figure FF28.

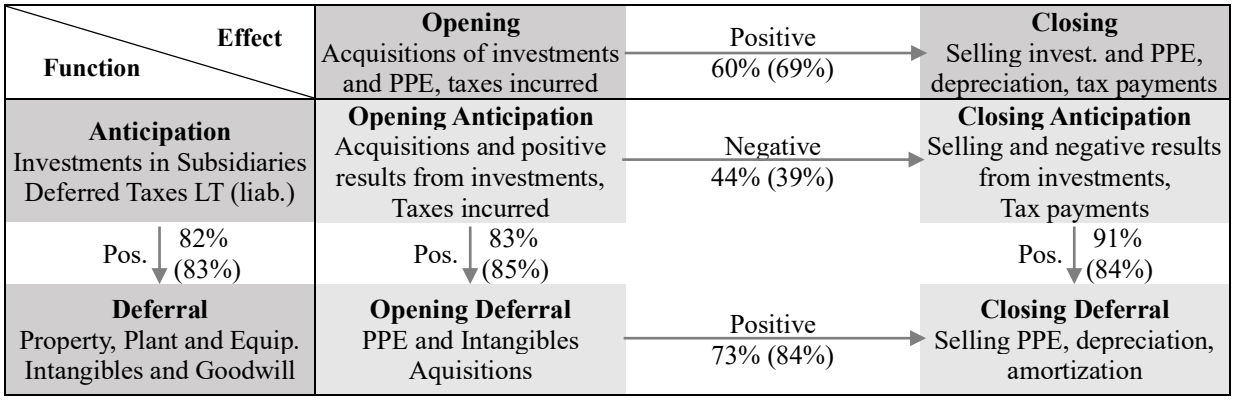


Figure 27 General overview of the conclusions for long-term accruals

Source: Research Data.

Notes: The percentual values indicate the proportion of positive differences for the short (long) period of analysis. The conclusions are based on joint evidence from the Wilcoxon and sign results for both periods of analysis.

For long-term accruals, the positive differences between anticipation and deferral are maintained when only the opening and the closing groups are considered isolatedly, with a proportion of positive differences above 80%. From Table 23, the opening and closing medians for Investments in Subsidiaries and Deferred Taxes LT are close to 1.5 and 0.3 (4.5 and 0.5), respectively, for the short (long) period of analysis. Both values are higher than the medians of PPE and Intangibles and Goodwill, with medians of 0.05 and 0.1 (0.1 and 0.2), respectively, for the short (long) period of analysis. That is consistent with the proportions of positive differences between anticipation and deferral for long-term accruals of 83% (85%) and 91% (84%), for the opening and closing categories, respectively, for the short (long) period of analysis. Those results reflect a higher uncertainty for events related to Investments in Subsidiaries and Tax recognition as a liability than to events related to PPE and Intangibles, in general and for both increases and decreases of the accounts.

In turn, the comparisons between opening and closing present differences in opposite senses for the anticipation and deferral categories. The proportion of positive differences between opening and closing, for the anticipation group, is 44% for the short period of analysis and 39% for the long period. That is consistent with the lower medians for opening than closing for Investments in Subsidiaries and Deferred Taxes, as presented in Table 23. The differences of the medians between opening and closing of Deferred Taxes, of -0.06 (-0.11), are more negative than for Investments in Subsidiaries, of -0.02 (-0.05), for the short (long) period of analysis. Considering that, it is reasonable that the negative differences in the anticipation category reflect more strongly the higher uncertainty in closing the Deferred Taxes that were being held in balance sheets than in the generation of such taxes. Similar to the short-term

accruals, for Deferred Taxes, this comparison assumes that all taxes were recognized in balance sheets and even further, as a long-term activity. That implies that the underlying stream for opening and closing Deferred Taxes LT can be different from the estimated, and the approach to the individual accounts enhances the effects of this assumption.

In comparison, the medians for PPE and Intangibles and Goodwill show higher values for opening than for closing, with positive differences close to 0.02 and 0.2, respectively. That is in alignment with the positive proportions of positive differences between opening and closing for the deferral category, of 73% (84%) for the short (long) period of analysis. This positive difference indicates that the acquiring PPE and intangibles impact more the stream of increases of these amounts than their closing by depreciation, amortization, and selling, which would be sustained by a smoother stream, although subject to errors from the actual changes in owners' wealth, according to Table 8. In terms of individual comparisons, the higher magnitude of the differences in the medians for Intangibles and Goodwill, as well as high medians for their opening, of 0.20 (0.36), in comparison to other medians in the same category close to 0.10, indicating that events that promote increases in this accounts are quite impacting in comparison to the remaining events for long-term deferral accruals.

Therefore, similar to the previous analysis, for long-term accruals, specific comparisons reflect distinctions between anticipation and deferral, as well as between opening and closing, that behave distinctly than under a general approach.

The other additional analyses sustain the general and specific evidence of higher uncertainties for anticipation than for deferral, and higher uncertainty in opening than in closing, under the consideration that there are uncertainties from accounting and activities. However, for comparisons that consider the segregation between short and long-term accruals, distinct results emerge related to when the comparisons are general or specific. Since all the comparisons are associated with underlying activities that sustain accounting procedures, their influence is more evidenced in consequence of the granularity of the analysis, as the short-term deferral category comprised only by Inventories and the long-term only by PPE and Intangibles.

4.5.6 Standard Deviation of Relative Changes (SDRC)

I applied the Relative Standard Deviation (RSD) metric to capture uncertainties in the accounts, departing from their association with the dispersion of values. I departed from the definition provided by the JCGM (2008), considering other relevant features like the different sizes of the accounts within each category and the absolute values of their changes, to estimate

the RSD at account-level, for each firm.

Another measurement widely applied to the analysis of trends in accounting numbers is the percentage change, or relative change. Besides it already estimates changes considering the sizes of the amounts under analysis, the relative change is still subject to the magnitude effects of the flows, therefore, I use the standard deviation for estimating the uncertainties, which is closer to the JCGM (2008) definition. That composes the standard deviation of relative changes (SDRC) metric, for which I present a descriptive statistics regarding in Table 42, for the short (Panel A) and long (Panel B) periods of analysis. In appendix D, I also present the descriptive statistics for the specific categorization.

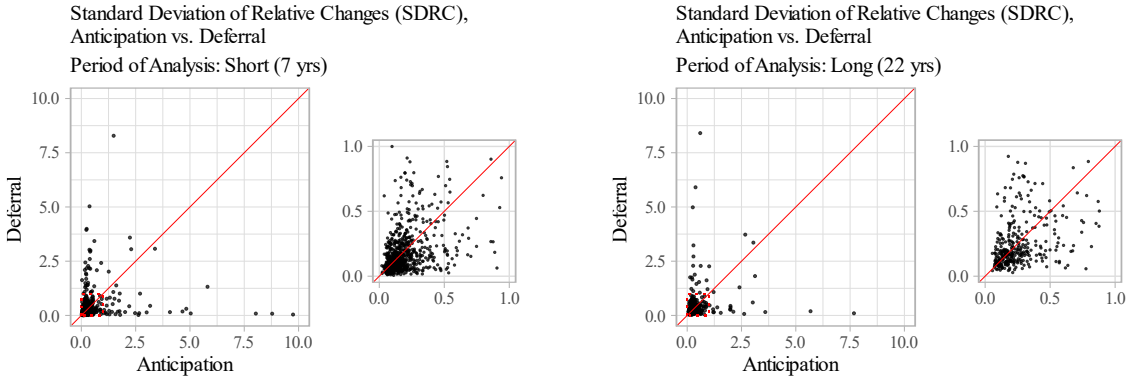
Table 42 Descriptive statistics for SDRC, for Anticipation, Deferral, Opening and Closing

	(A) Period of Analysis: Short (7 yrs)				**(B) Period of Analysis: Long (22 yrs)**			
	Anticipation	**Deferral**	**Opening**	**Closing**	**Anticipation**	**Deferral**	**Opening**	**Closing**
Min.	0.0196	0.0069	0.0520	0.0204	0.0554	0.0281	0.0587	0.0579
1st Q.	0.1014	0.0668	0.4455	0.3538	0.1540	0.1246	0.8532	0.7207
Median	*0.1631*	*0.1354*	*0.8256*	*0.6745*	*0.2299*	*0.2006*	*1.3496*	*1.1269*
Mean	0.4954	0.3549	2.8758	2.6066	2.2691	0.4384	4.2226	2.9427
3rd Q.	0.2688	0.2597	1.9048	1.4823	0.3889	0.3989	2.4418	2.2039
Max.	46.6267	47.6297	247.5094	241.9915	668.6790	12.1374	277.5480	65.0515
Std.Dev.	2.4164	1.769	12.4373	12.0282	35.2272	0.9625	17.9318	7.3695
N	808	805	808	808	359	358	361	361

Source: Research Data.

The uncertainty estimates by the SDRC for the categories present similar characteristics than the estimates by the RSD, with right-skewed distributions and mean values above the third quartile for all the categories. Both metrics present similar values for the medians, regarding each categorization, with lower values for anticipation and deferral, close to 0.1, than for opening and closing, that are closer to the unit. Similar to the RSD, that is a characteristic due to the construction of the variable, it does not imply in evidencing higher uncertainty in opening or closing than in anticipation or deferral, because those are distinct dimensions for which there is no meaning in direct crossed comparisons.

In Figures 28 and 29, I illustrate the composition for the paired differences comparisons, and in Table 43, I present the results of the tests, for the general categorization, for both the short (Panel A) and long (Panel B) periods of analysis.

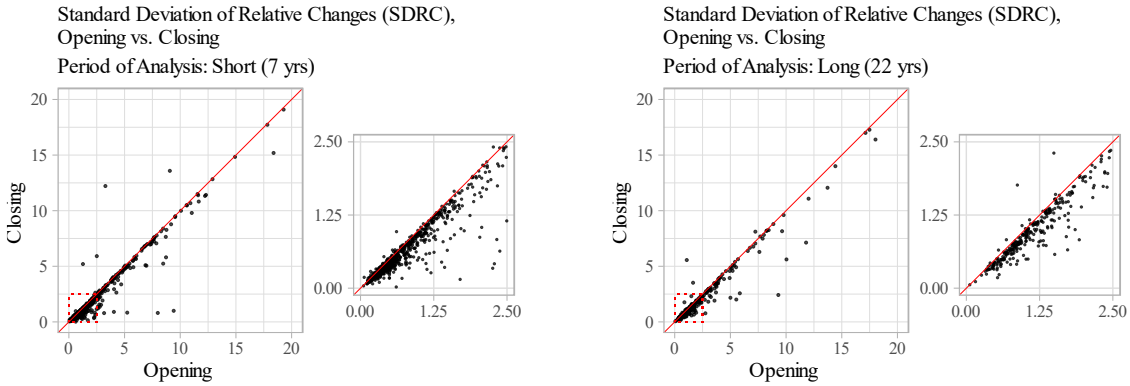


(a) Short Period of Analysis (b) Long Period of Analysis

Figure 28 Standard Deviation of Relative Changes (SDRC), by Group (Anticipation vs. Deferral)

Source: Research Data.

Note: The red line represents equivalent uncertainty for Anticipation and Deferral categories. Dots below (above) the line are cases which the uncertainty of Anticipation is higher (lower) than the uncertainty of Deferral. The dashed square represents the limits for the zoom on the right of each main figure.



(a) Short Period of Analysis (b) Long Period of Analisys

Figure 29 Standard Deviation of Relative Changes (SDRC), by Group (Opening vs. Closing)

Source: Research Data.

Note: The red line represents equivalent uncertainty for Opening and Closing categories. Dots below (above) the line are cases which the uncertainty (RSD) of Opening is higher (lower) than the uncertainty of Closing. The dashed square represents the limits for the zoom on the right of each main figure.

The patterns for the comparisons compositions for the SDRC are quite similar to the RSD. For the anticipation and deferral comparison, there is a concentration of cases near the origin and several occurrences of a higher value in a category and lower value in another. In turn, for the opening and closing comparison, cases are concentrated along the diagonal line, which indicates that the difference between the categories are distributed closer to zero than for the individual categories.

Table 43 Tests estimates for the Differences between Anticipation, Deferral, Opening and Closing, for the SDRC metric

	(A) Period of Analysis: Short (7 yrs)		(B) Period of Analysis: Long (22 yrs)	
Difference	**Anticip. – Deferral**	**Opening – Closing**	**Anticip. – Deferral**	**Opening – Closing**
W	0.1709	0.1499	0.0350	0.0605
p-value	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.0212	0.1078	0.0154	0.1597
p-value	0.0001	<0.0001	0.1483	<0.0001
Pos. Signs	0.5888	0.9022	0.5518	0.9557
p-value	<0.0001	<0.0001	0.0566	<0.0001

Source: Research Data.

The distributions of the differences present more distance from normality by the SDRC metric than by the RSD. While the differences between anticipation and deferral presented statistics W above 0.88 for the RSD, as presented in Table 25, for the SDRC they present values of 0.17 and 0.04 for the short and long periods of analysis. For the opening and closing difference, those values are also lower, with statistics W of 0.33 and 0.11 for the RSD, as in Table 29, and values 0.15 and 0.06 for the SDRC, respectively for the short and long periods of analysis. Those differences are mostly due to the presence of more extreme values for the categories under the SDRC than for the RSD.

The results of the Wilcoxon tests show evidence of higher uncertainty in anticipation than in deferral for the short period of analysis, while for the long period, the evidence is for a no-difference, with a p-value of 0.15, besides the close positive pseudo-median estimates of 0.02. Under the RSD metric, the pseudo-medians were higher, close to 0.10 with statistical significance at 1%. The proportion of positive differences also is higher for the short period, with 58% of the cases, while for the long period of 55%, which is not significant at a 5% level. Comparatively, the proportions of positive differences for the RSD are above 70%, as presented in Table 25. Therefore, for the anticipation and deferral comparison, the SDRC metric also shows evidence of higher uncertainty for anticipation than for deferral, although it is weaker than the RSD metric.

For the opening and closing comparisons, the evidence of higher uncertainty for opening than for closing is higher under the SDRC metric than under the RSD metric, with estimated pseudo-medians of 0.11 and 0.16, higher than the 0.04 estimates, for the short and long periods of analysis, respectively. Also, the proportion of positive differences between opening and closing SDRC are higher, above 90% for the short period and 95% for the long period, in comparison to 66% and 70% proportions of the RSD, respectively. All those estimates are statistically significant at 1%. Therefore, under the SDRC metric, there is also evidence of a higher uncertainty in opening than in closing, and the evidence is stronger than under the RSD

metric.

In Appendix D, I also presents the results for the tests under specific categorization, i.e. for differences between anticipation and deferral considering the opening and closing groups and for differences between opening and closing, considering the anticipation and deferral groups. The conclusions are of positive differences for all comparisons, with similar results than for the RSD comparisons.

Both the RSD and the SDRC approaches are very similar, in the sense that they are built on the same variables and use similar reasoning. However, they also are distinct in how they approach the accounts changes in relation to their size, by the average of the period under analysis or yearly. While the SDRC metric is more closely related to the analysis of accounting numbers based on percentage changes, I consider the RSD metric more adequate for this research due to its equal approach to impacts that increase or decrease the reference amount.

4.6 Discussion

Following the comparisons between RSD categories sustained by the research hypotheses, in Table 44, I present a general overview of the comparisons between the expectations and the conclusions from the tests results.

Table 44 Predictions and conclusions for differences in RSD according to the research hypotheses

	Hypothesis	RSD		Confirm ?
		Prediction	Results	
H1	*Anticipation accruals have a higher degree of uncertainty than deferral accruals.*	$RSD_{Antic.} > RSD_{Defer.}$	$RSD_{Antic.} > RSD_{Defer.}$	✓
H1a	For opening accruals, anticipation accruals have a higher degree of uncertainty than deferral accruals.	$RSD_{Antic.}^{Open} > RSD_{Defer.}^{Open}$	$RSD_{Antic.}^{Open} > RSD_{Defer.}^{Open}$	✓
H1b	For closing accruals, anticipation accruals have a higher degree of uncertainty than deferral accruals.	$RSD_{Antic.}^{Close} > RSD_{Defer.}^{Close}$	$RSD_{Antic.}^{Close} > RSD_{Defer.}^{Close}$	✓
H2	*Opening accruals have a lower degree of uncertainty than closing accruals.*	$RSD^{Open} < RSD^{Close}$	$RSD^{Open} > RSD^{Close}$	✗
H2a	For anticipation accruals, opening and closing accruals have similar degrees of uncertainty.	$RSD_{Antic.}^{Open} = RSD_{Antic.}^{Close}$	$RSD_{Antic.}^{Open} > RSD_{Antic.}^{Close}$	✗
H2b	For deferral accruals, opening accruals have a lower degree of uncertainty than closing accruals.	$RSD_{Defer.}^{Open} < RSD_{Defer.}^{Close}$	$RSD_{Defer.}^{Open} > RSD_{Defer.}^{Close}$	✗

Source: Research data.

The results of the tests align with the predictions for anticipation and deferral comparisons and differ for opening and closing comparisons. To compare between categories,

the research hypotheses provide expectations regarding accounting uncertainties, while the RSD metric also captures the underlying activity uncertainties. As the hypotheses follow the theoretical reasoning from accounting deviations and errors while the tests reflect empirical evidence of accounting and activity uncertainties, the results of the tests can provide a more complete overview, regarding perceived uncertainties in accounting numbers.

The uncertainty estimates by the RSD are very similar between the short and long periods of analysis regarding their descriptive statistics, categories compositions, and results of the tests. The paired comparisons show higher uncertainty in anticipation than in deferral and higher uncertainty in opening than in closing. The evidence is the same considering only firms with moderate uncertainty levels, distinct levels of activity uncertainties, different industries, and general comparisons regarding only short and long-term accruals. For specific comparisons, the evidence starts to become closer to the uncertainties perceived for the individual accounts, reflecting more strongly the behavior of the underlying components within the categories.

The comparisons between anticipation and deferral categories investigate timing uncertainties associated with the relation between accruals and cash flows. Anticipating economic impacts of cash flows carry deviations that are not present in deferring such impacts. Activities associated with anticipation involve events related to accounts receivable and payable, as well as investments in subsidiaries. Empirically, the results show that events in those accounts carry higher uncertainty than events related to deferral accounts, involving Inventories, PPE, and Intangibles, for example. Therefore, information on changes in the first group of accounts is more uncertain than information related to changes in the second group.

Evidence of timing uncertainties associated with the relation between accruals and balance sheets amounts reflects the quality of information that increases or decreases balance sheets amounts. As both assets and liabilities are grouped together, that does not inform about increases or decreases of owners' wealth directly, but relates to the size of the amounts reflected in balance sheets, i.e. the size of the firms. The empirical evidence of higher uncertainty in opening than in closing indicates that information about increases in balance sheets amounts are more uncertain than about decreases. Such increases reflect acquisitions of inventories and PPE, new contracts with customers and suppliers, and so on, while decreases reflect the fulfillment of those. Therefore, the opening and closing comparisons do not segregate between different activities directly, like anticipation and deferral do, but investigate the quality of the information of events that increase and decrease balance sheets amounts.

The results of the statistical tests only confirm partially the expectations, and yet the evidence is based on the presence of both accounting and operating uncertainties, being complementary to the theoretical discussion. The consistency of the empirical results reveals an important characteristic of the quality of accruals in reported financial statements. Although the theoretical predictions for the specific comparisons depend on both the anticipation-deferral and opening-closing dimensions, the tests results are the same, independently of the general or specific comparisons. That indicates the presence of additional factors that are also relevant to the perceived uncertainties in accruals, such as underlying activities, accounting policies, financial standards and so on, and they show independent effects for the quality of accruals in each dimension of analysis, which is distinct of timing uncertainties in accruals from their relation with cash flows and balance sheets amounts.

In addition, unless one knows the cash flows associated with each accruals category, some assumptions are required to estimate how much of the variation is cash or non-cash, which may have implications for the perceived differences and limit conclusions. That is the case for the empirical comparisons between uncertainties of the categories, that would require knowledge about category-level cash flows to provide evidence regarding specifically for accounting uncertainties. As I pointed out, by the use of Cash RSDs or industry to control of activities uncertainties, even under the general control of firm-level cash flows, there are still distinct levels of operating uncertainties intertwined with accounting uncertainties that would require category-levels operating information.

Besides that, there is also the possibility that the estimated values represent uncertainties that are not directly comparable, as it is the case for the higher values for opening and closing than for the general changes for anticipation and deferral comparisons. Those higher values do not reflect higher uncertainty levels, they reflect that the inflows and outflows are higher in magnitude than the absolute values of the changes. The comparisons performed in this research regard each dimension as I did not perform crossed comparisons, e.g. anticipation with opening uncertainties or general anticipation with opening anticipation. If that was the case, empirical evidence could reflect a size effect related to the construction of the metric, which requires attention in interpreting results.

In this research, I intended to explicit the assumptions and distinctions of the empirical estimates from the theoretical expectations, like the presence of activities uncertainties and size effects. Discussing those aspects is easier as the applied procedures are simpler and the underlying reasoning is clearer.

5 SUMMARY AND CONCLUDING REMARKS

This research is about the quality of accruals, in alignment with studies that intend to make efforts to provide a better understanding of accounting, such as Etheridge (1991, 2004), Dechow and Dichev (2002), Richardson et al. (2005), Ohlson (2014), Larson et al. (2018), Nikolaev (2018), and Dichev and Owens (2020). In this stream of research, several concepts are abstract and not directly observable, but are estimated and summarized by a number, e.g. net income as representative of firms' performance, or equity as representative of owners' wealth. Beyond that, those objects are also connected and may influence each other, e.g. the net income number and changes in equity are closely related, or similarly, performance estimates influence owners' wealth representation. Considering such connections and that estimates carry uncertainties, I elaborate on how accruals articulate with cash flows and balance sheets amounts to build a framework to approach their associated timing uncertainties. I propose that there is an heterogeneity in timing uncertainties in accruals, related to two distinct sources: estimates of future cash flows and estimates of changes in owners' wealth.

In the theoretical development section, I depart from a definition of accruals as non-cash changes in net assets, being equivalent to their association with the non-cash components of earnings, which reflect the perspectives of changes in net assets and of flows, respectively. Subsequently, I relate the role of anticipating and deferring economic impacts of cash flows to the anticipation and deferral categories, and the effect of opening and closing balance sheets amounts to the opening and closing categories. Using this framework, I provide a distinction of the timing uncertainties in accruals, based on discussions of Dechow and Dichev (2002), Nikolaev (2018), and Dichev and Owens (2020). Some accruals estimate future cash flows, carrying uncertainties that relate to the order of economic and cash impacts, and embracing differences between cash flows estimates and realization values, which I denominate as order deviations. Other timing uncertainties relate to differences between estimates and actual values of changes in owners' wealth, and as the time extension between the opening and closing accruals increases, those differences are expected to also increase, which I denominate as time extension errors. Both deviations and errors affect the categories of accruals distinctly, which I use as base for the research hypotheses.

Departing from uncertainty definitions by the JCGM (2008) and using appropriate reasoning to attend the research interests, I elaborated the Relative Standard Deviation (RSD) metric, to estimate uncertainty levels regarding accruals categories. Using the research hypotheses as guidance, I applied statistical tests to compare uncertainties between the

categories. Empirical evidence shows that anticipating carries more uncertainty than deferring, which is in accordance with the first research hypothesis, and that opening carries more uncertainty than closing, which opposes the second hypothesis. The research hypotheses provide predictions based on timing accounting uncertainties articulated in the theoretical development, while the empirical approach that also embraces the underlying activities uncertainties, which may influence the results of the tests. Those results are the same for other situations, such as under the consideration of only moderate levels of uncertainty, distinct levels of activity uncertainties, different economic activities, for only short or long-term accruals, and considering a similar metric based on relative changes.

Therefore, the theoretical development and empirical approach show complementary assessments of the timing uncertainties in accruals, considering their role of anticipating or deferring economic impacts of cash flows and their effect of opening and closing balance sheets amounts. The evidence relate to both earnings management literature and the quality of accounting information.

Research that follows models for estimating discretionary accruals, like Jones (1991), Modified Jones by Dechow et al. (1995), and subsequent developments, typically assume homogeneity on the uncertainty regarding accruals. Papers like Dechow and Dichev (2002) and Francis et al. (2005) enlight how innate characteristics of the firms may influence the expectations regarding discretion in accruals, by considering that accruals have heterogeneous uncertainties. In this same sense, Dichev and Owens (2020) associate discretion to accruals that are timely distant of their associated cash flows, which I complement by segregating between deviations and errors, in accordance with Nikolaev (2018). This research relates to those studies, both by the theoretical discussion about deviations and errors in accruals and by providing empirical evidence of distinct uncertainty levels regarding the categories under analysis. These results lead to questions like how the uncertainties of each category relate to the innate characteristics of the firms and to what extent those uncertainties are associated with abnormal exercises of managerial discretion over the accounting numbers, for example.

Another approach for the heterogeneity in accruals regards their influence on the quality of earnings. Etheridge (1991, 2004) investigates the information content in accruals on their ability to predict future earnings, while Richardson et al. (2005) and Larson et al. (2017) relate what types of activities accruals represent with their reliability in provide information of earnings. In those cases, the studies use financial statements as a base for categorization, similar to this research. Considering the role of accruals in anticipating or deferring economic impacts

of cash flows, or their effect of opening and closing balance sheets amounts, it is possible to investigate how those characteristics influence the quality of accounting information, like the persistence of earnings or the predictive ability of those categories.

There is also the possibility to investigate how those uncertainties behave in distinct accounting settings, like under new regulations or standards, or how financial markets assess them. It is relevant to consider that accounting research that is based on the application of empirical models would carry implications that are not straightforward. At first, it is pertinent to expect higher uncertainties reflecting in measurements of higher discretion and lower quality of earnings, based on the theoretical discussion about deviations and errors. However, empirical models require assumptions and present caveats that can be relevant for the results, similar to the specific models in this research. For example, controlling for size by total assets is at the level of the firm, which is distinct from controlling by the amounts of balance sheets accounts. A firm-level control for size can be inadequate to reduce effects of uncertainty estimates that are also related to the size of the amounts, as I considered for the metrics in this research, the Relative Standard Deviation (RSD) and the Standard Deviation of Relative Changes (SDRC).

The implications of the heterogeneity in timing uncertainties in accruals go beyond academic research. Users that aware of such uncertainties may benefit of better informed decisions. Not only owners but also banks have interest in how accounting numbers and their changes effectively represent reality, the quality of accruals. Users receive accounting information for their decision making, and how they perceive uncertainty is a combined product of accounting procedures, activities, policies, regulation. Therefore, understanding timing uncertainties in accruals relates closely to the accounting procedures as input.

Regulation is also an important influencer for accounting numbers, often taken as controlling mechanism for the exercise of discretion in financial statements. Uncertainty in accruals derives from estimates of unobservable constructs, and higher levels of regulation, with more rigid norms, for example, do not necessarily remove uncertainty. It is more a matter of holding responsability for the uncertainties in accounting numbers, than reducing them.

At last, pratictioners act as the providers of accounting numbers. Their exercise of discretion, combined with application of policies and regulation, generates useful information about economic change. Understanding uncertainties in accruals, for accountants, is a matter of being aware of the implications of accounting choices.

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APPENDIX

Appendix A Tests Estimates for the Differences between Anticipation and Deferral, and Opening and Closing, under specific categorization

	(A) Period of Analysis: Short (7 yrs)				(B) Period of Analysis: Long (22 yrs)			
Difference	**Anticip. – Deferral**		**Opening – Closing**		**Anticip. – Deferral**		**Opening – Closing**	
	Opening	**Closing**	**Anticipation**	**Deferral**	**Opening**	**Closing**	**Anticipation**	**Deferral**
W	0.8034	0.8039	0.7846	0.8837	0.8572	0.8574	0.8439	0.7856
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.8316	0.7915	0.0539	0.0421	2.3322	2.2987	0.0356	0.0563
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pos. Signs	0.9179	0.9280	0.6086	0.6683	0.9200	0.9289	0.6140	0.7554
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001
Conclusion: Positive differences for all comparisons.								

Source: Research Data.

Appendix B Tests Estimates for the Differences between Anticipation and Deferral, and Opening and Closing, under specific categorization, by levels of underlying activities uncertainties

	(A) Period of Analysis: Short (7 yrs)					(B) Period of Analysis: Long (22 yrs)				
Cash RSD	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Difference Between Anticipation and Deferral: Opening Category										
W	0.4765	0.1962	0.2827	0.6561	0.3050	0.3455	0.4652	0.2886	0.1267	0.2943
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.7209	0.6460	0.7278	1.0352	1.2704	2.2026	1.7756	1.4502	3.0594	3.5689
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Pos. Signs	0.8758	0.8447	0.8634	0.8447	0.8323	0.9041	0.8333	0.7778	0.8056	0.8611
p-values	0.0003	0.0044	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Conclusion: Positive differences for all comparisons.										
Difference Between Anticipation and Deferral: Closing Category										
W	0.4807	0.1945	0.2840	0.6855	0.3022	0.3461	0.4502	0.2983	0.1272	0.3310
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.6665	0.6235	0.6926	0.9393	1.2600	2.1971	1.7907	1.4591	3.048	3.5929
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Pos. Signs	0.8758	0.8571	0.8385	0.8758	0.8758	0.9178	0.8472	0.7917	0.8194	0.8611
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Conclusion: Positive differences for all comparisons.										
Difference Between Opening and Closing: Anticipation Category										
W	0.3119	0.6586	0.3897	0.3722	0.2879	0.3605	0.4743	0.9471	0.9045	0.1177
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0044	<0.0001	<0.0001
P.-median	0.0492	0.0450	0.0428	0.0288	0.0697	0.0334	0.0215	0.0181	0.0313	0.0690
p-values	0.0005	0.0005	0.0017	0.0291	0.0001	0.0142	0.0776	0.1808	0.0613	0.0008
Pos. Signs	0.5901	0.6335	0.6025	0.5652	0.5901	0.6575	0.5556	0.5694	0.5694	0.6528
p-values	0.027	0.0009	0.0114	0.1147	0.027	0.0095	0.4096	0.2888	0.2888	0.0128
Conclusion:	*Pos. (5%)*	*Positive*	*Pos. (5%)*	*Zero*	*Pos. (5%)*	*Positive*	*Zero*	*Zero*	*Zero*	*Pos. (5%)*
Difference Between Opening and Closing: Deferral Category										
W	0.1176	0.6621	0.6921	0.3947	0.5604	0.6786	0.1699	0.1248	0.1657	0.7171
p-values	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.0153	0.0169	0.0379	0.0484	0.0742	0.0451	0.0381	0.0423	0.0719	0.0739
p-values	0.0162	0.0523	0.0001	<0.0001	<0.0001	<0.0001	0.0019	0.0075	0.0003	0.0001
Pos. Signs	0.6087	0.6211	0.6522	0.7019	0.7081	0.7534	0.6806	0.6944	0.7083	0.7917
p-values	0.0072	0.0026	0.0001	<0.0001	<0.0001	<0.0001	0.0029	0.0013	0.0005	<0.0001
Conclusion: Positive differences for all comparisons.										

Source: Research Data.

Appendix C.1 Number of firms within each NAICS economy sector

	Sector	Period of Analyis	
		[A] Short	[B] Long
1	Manufacturing	369	171
2	Mining, Quarrying, and Oil and Gas Extraction	62	29
3	Retail Trade	60	34
4	Utilities	56	27
5	Information	43	19
6	Administrative and Support and Waste Management and Remediation Services	41	14
7	Transportation and Warehousing	32	16
8	Wholesale Trade	29	13
9	Construction	25	12
10	Real Estate and Rental and Leasing	24	2
11	Professional, Scientific, and Technical Services	17	6
12	Accommodation and Food Services	17	4
13	Health Care and Social Assistance	16	5
14	Arts, Entertainment, and Recreation	7	2
15	Other Services (except Public Administration)	6	3
16	Educational Services	6	2
17	Agriculture, Forestry, Fishing and Hunting	5	2
18	Finance and Insurance	-	-
19	Management of Companies and Enterprises	-	-
20	Public Administration	-	-
	Total	*815*	*361*

Source: Research data.
Note: Sectors with less than 10 companies were combined in a single category named "others", coded by 0.

Appendix C.2 Medians for each category, by industry

	(A) Period of Analysis: Short (7 yrs)				(B) Period of Analysis: Long (22 yrs)			
Ind.	**Anticip**	**Deferral**	**Opening**	**Closing**	**Anticip.**	**Deferral**	**Opening**	**Closing**
1	0.1930	0.1308	0.6972	0.6544	0.3303	0.1809	1.7421	1.6909
2	0.3064	0.2184	1.1717	1.1078	0.3721	0.3785	3.4511	3.4061
3	0.1343	0.0717	0.9160	0.8469	0.2900	0.1638	4.3185	4.1071
4	0.1682	0.1228	0.5204	0.4587	0.4002	0.2854	1.5441	1.5067
5	0.2937	0.1910	1.3246	1.1147	0.3200	0.2650	2.3447	2.4245
6	0.2550	0.1631	0.9954	0.9611	0.4578	0.2083	3.6193	3.7246
7	0.1852	0.1736	0.9901	0.9482	0.2493	0.3591	2.8720	2.6220
8	0.2068	0.1187	0.4820	0.4927	0.5077	0.1641	2.8731	2.8250
9	0.3144	0.1671	2.7290	2.6726	0.6849	0.4071	6.8668	6.8199
10	0.2400	0.1111	0.7165	0.8690				
11	0.2523	0.1682	0.8825	0.8598				
12	0.1601	0.0698	3.2803	3.3701				
13	0.3114	0.1206	1.1696	1.2772				
0	0.2834	0.0898	1.4111	1.1664	0.4240	0.1987	4.4968	4.4443
Total	*0.2184*	*0.1310*	*0.8380*	*0.7901*	*0.3715*	*0.2054*	*2.2763*	*2.2033*

Source: Research data.

Appendix C.3 Difference between Anticipation and Deferral, by industry

Ind.	N	Stat. W & p-value		Pseudo-Median & p-value		Prop. Pos. Signs & p-value	
(A) Period of Analysis: Short (7 yrs)							
1	368	0.8261	<0.0001	0.0712	<0.0001	0.7011	<0.0001
2	62	0.8526	<0.0001	0.0687	0.0319	0.6613	0.0151
3	60	0.8088	<0.0001	0.0831	<0.0001	0.8000	<0.0001
4	56	0.9820	0.5663	0.0666	0.0065	0.6786	0.0105
5	43	0.9371	0.0204	0.1124	0.0002	0.7674	0.0006
6	41	0.9263	0.0109	0.0594	0.0634	0.6585	0.0596
7	32	0.9428	0.0897	0.0465	0.1966	0.6562	0.1102
8	29	0.9501	0.1844	0.0985	0.0002	0.7931	0.0023
9	25	0.9047	0.0232	0.0758	0.1336	0.6800	0.1078
10	15	0.9275	0.2499	0.1191	0.0181	0.7333	0.1185
11	17	0.9468	0.4085	0.1202	0.0174	0.8235	0.0127
12	17	0.7474	0.0004	0.0746	0.0797	0.8235	0.0127
13	16	0.9473	0.4483	0.2180	0.0052	0.8125	0.0213
0	24	0.8635	0.0039	0.1543	<0.0001	0.8750	0.0003
(B) Period of Analysis: Long (22 yrs)							
1	171	0.8353	<0.0001	0.2054	<0.0001	0.7895	<0.0001
2	29	0.9681	0.5105	0.0008	1.0000	0.5517	0.7111
3	34	0.8134	<0.0001	0.2232	0.0001	0.7941	0.0008
4	27	0.8155	0.0003	-0.0245	0.7676	0.5185	1.0000
5	19	0.7348	0.0001	0.0576	0.2413	0.7368	0.0636
6	14	0.9511	0.5784	0.3425	0.0785	0.7143	0.1796
7	16	0.9616	0.6910	-0.1196	0.2114	0.3750	0.4545
8	13	0.8295	0.0156	0.3908	0.0034	0.7692	0.0923
9	12	0.7736	0.0048	0.2979	0.0210	0.6667	0.3877
0	26	0.8532	0.0016	0.2219	0.0061	0.7308	0.0290

Source: Research Data.

Appendix C.4 Difference between Opening and Closing, by industry

Ind.	N	Stat. W & p-value		Pseudo-Median & p-value		Prop. Pos. Signs & p-value	
(A) Period of Analysis: Short (7 yrs)							
1	368	0.2669	<0.0001	0.0371	<0.0001	0.6739	<0.0001
2	62	0.2158	<0.0001	0.0234	0.2531	0.5323	0.7035
3	60	0.6303	<0.0001	0.1047	<0.0001	0.8000	<0.0001
4	56	0.9315	0.0034	0.0312	0.0695	0.5536	0.5044
5	43	0.7517	<0.0001	0.0119	0.6976	0.5349	0.7608
6	41	0.8701	0.0002	0.0768	0.0009	0.8049	0.0001
7	32	0.8804	0.0020	0.0701	0.0057	0.8125	0.0005
8	29	0.7372	<0.0001	0.0361	0.0044	0.7241	0.0241
9	25	0.6875	<0.0001	0.0949	0.1645	0.6800	0.1078
10	15	0.7912	0.0005	0.0398	0.6677	0.5714	0.6636
11	17	0.9241	0.1734	0.0377	0.1202	0.7059	0.1435
12	17	0.4545	<0.0001	-0.0901	0.2633	0.4706	1.0000
13	16	0.9535	0.5470	0.0331	0.4954	0.6250	0.4545
0	24	0.5407	<0.0001	0.0400	0.0526	0.6250	0.3075
(B) Period of Analysis: Long (22 yrs)							
1	171	0.6814	<0.0001	0.0265	<0.0001	0.6842	<0.0001
2	29	0.8689	0.0019	-0.0047	0.8983	0.4483	0.7111
3	34	0.1964	<0.0001	0.1803	<0.0001	0.9118	<0.0001
4	27	0.6984	<0.0001	0.0658	0.0007	0.8148	0.0015
5	19	0.3964	<0.0001	-0.0020	0.9217	0.5263	1.0000
6	14	0.8033	0.0055	0.0741	0.1189	0.7857	0.0574
7	16	0.4098	<0.0001	0.0769	0.0577	0.7500	0.0768
8	13	0.6996	0.0006	0.0429	0.0479	0.8462	0.0225
9	12	0.7066	0.0010	0.1040	0.1294	0.6667	0.3877
0	26	0.2133	<0.0001	0.0295	0.5995	0.6154	0.3269

Source: Research Data.

Appendix D.1 Descriptive Statistics for SDRC, for Anticipation, Deferral, Opening and Closing for specific categorization

	(A) Period of Analysis: Short (7 yrs)				(B) Period of Analysis: Long (22 yrs)			
	Anticipation		Deferral		Anticipation		Deferral	
	Opening	Closing	Opening	Closing	Opening	Closing	Opening	Closing
Min.	0.0627	0.0169	0.0076	0.0005	0.0455	0.0582	0.0140	0.0047
1st Q.	0.5002	0.4531	0.1718	0.0955	0.9579	0.8701	0.3403	0.1808
Median	0.9247	0.8420	0.3587	0.2116	1.5134	1.4558	0.6519	0.4020
Mean	4.4172	4.2038	1.1267	0.8363	5.8004	4.4655	2.1246	1.3291
3rd Q.	2.2382	2.0910	0.8181	0.4893	2.9826	2.9366	1.4740	0.9652
Max.	493.1088	483.6938	61.1707	61.4551	554.3701	128.2823	159.3169	75.6172
Std.Dev.	22.847	22.1177	3.8515	3.4373	31.5217	13.4779	9.7306	4.9561
N	805	805	805	805	357	357	359	360

Source: Research Data.

Appendix D.2 Tests Estimates for the Differences between Anticipation, Deferral, Opening and Closing, for the SDRC metric and specific categorization

	(A) Period of Analysis: Short (7 yrs)				(B) Period of Analysis: Long (22 yrs)			
Difference	Anticip. – Deferral		Opening – Closing		Anticip. – Deferral		Opening – Closing	
	Opening	Closing	Anticipation	Deferral	Opening	Closing	Anticipation	Deferral
W	0.1666	0.1597	0.0951	0.1164	0.1506	0.3437	0.0333	0.0531
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
P.-median	0.6164	0.7016	0.0797	0.1081	0.9439	1.1598	0.0968	0.1895
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pos. Signs	0.7830	0.8504	0.8298	0.8758	0.7662	0.8315	0.9020	0.9666
p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Conclusion: Positive differences for all comparisons.

Source: Research Data.