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Anatomy of timing uncertainties in accruals[i]

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Abstract

We propose that timing uncertainties in accruals are heterogeneous, related to differences between expected and realized cash flows, and to differences between estimates and actual economic changes. In a single framework, through theoretical reasoning and with intuitive algebra, we articulate accruals in two temporal dimensions, in their role of anticipating or deferring economic impacts of cash flows, and in their effect of opening and closing balance sheet amounts. We 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. We expect to contribute by demonstrating how timing uncertainties in accruals articulate regarding their heterogeneity. 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. Preliminary empirical results indicate that there is a positive relationship between timing uncertainties in accruals and the unpredictability of earnings, showing that greater uncertainties are associated with lower earnings persistence. Additionally, the consistent positive difference for the means of unpredictability of earnings between the top extreme and the bottom extreme of the uncertainty in accruals reflects that lack of earnings predictability is related to timing uncertainties in accruals. Therefore, understanding timing uncertainties in accruals, for accountants, is a matter of being aware of the implications of accounting choices, that relates closely to the accounting procedures as input.

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1. Introduction

We propose that timing uncertainties in accruals are heterogeneous. Part of accruals anticipates economic

impacts of future cash flows. They register estimates of expected cash flows, which may differ from realized cash flows. We name differences between expected and realized cash flows as deviations. In addition, part of accruals registers estimates of changes in the economic situation of the firm, which may differ from actual changes. We name differences between estimated and actual changes in firms' economic situation as errors. Deviations and errors are distinct timing issues in accruals that we articulate in a single framework.

Dechow and Dichev (2002) approach uncertainties regarding estimation of future cash flows, focusing on the short-term of accrual accounting. They associate the recognition of economic impacts before the cash realization to the need of estimates about how much cash will be received or disbursed in the future. Such estimates embrace two distinct sources of uncertainty, which are the difference between expected and realized cash flows and the difference between estimated and actual values of expected cash flows. Because of the focus on the short-term, timing uncertainties of Dechow and Dichev (2002) are mainly associated with differences between expected and realized cash flows. We name those differences deviations because they are values in accruals regarding expectations of future cash flows that deviate from their realization.

Dichev and Owens (2025) embrace uncertainties in accruals more broadly. They propose that there are other estimates besides future cash flows, and uncertainties in accruals are related to the time horizon of estimates. In turn, Nikolaev (2018) disregards differences between expected and realized cash flows, under the argument that those relate to changes in cash flows, and addresses only uncertainties related to estimates of economic impacts registered by accruals. We propose that those uncertainties relate to differences between estimates and actual changes in the economic situation of firms, and name them errors, in alignment to Nikolaev (2018).

Those three studies mainly motivate our proposal. We argue that differences between expected and realized cash flows and differences between estimates and actual economic changes are distinct timing issues in accruals. While the former relates to the order of economic and cash impacts, the latter relates to the time extension between them. They are treated isolated in the literature, as Dechow and Dichev (2002) consider only deviations by approaching the short-term, and Nikolaev (2018) considers only errors by disregarding differences between expected and realized cash flows; or altogether, as Dichev and Owens (2025) indistinctly approach both sources of uncertainty, as discretionary accruals. We treat both individually, exposing how the different parts of earnings are articulated and examining the anatomy of timing uncertainties in accruals regarding their different sources.

To articulate the different parts of earnings, we present them under two complementary perspectives, which allows pinpointing accruals regarding different events. We also use a single framework that considers their role of accruals in anticipating or deferring economic impacts of cash flows and their effect of opening and closing balance sheet amounts. From that, we analytically propose a categorization for accruals that captures both sources of timing uncertainties.

This paper is about timing uncertainties in accruals, under a theoretical approach. It is about accruals quality, considering that accruals of higher quality are closer estimates of actual economic changes. Similar to other studies, our intentions are to make efforts for the evolution of accounting discipline (Etheridge, 1991) towards a better understanding about the costs and benefits of using accounting accruals (Dichev & Owens, 2025; Nikolaev, 2018) and with the reasoning that without conceptual or a construction analysis about accruals, it is hard to access measurement alternatives (Ohlson, 2014).

In this research, we advance theoretically by mapping on the timing uncertainties in accruals to a single and articulated framework. That may lead to new insights for familiarized researchers, and for the less familiar with the theme, an introduction to how accruals and cash flows articulate to compose earnings.

That may also 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. In this study we show preliminary results for the impact in the earnings persistence.

Besides the specialized literature, heterogeneity in timing uncertainties is also relevant for users of accounting information, whom may benefit from better informed decisions; regulators, in their shared responsibility for the uncertainties in accounting numbers; and practitioners, whose discretion, combined with the application of policies and regulation, generates useful information about economic changes.

After this first introductory section, we present the theoretical development of the timing uncertainties in accruals. We present a definition for accruals, how they relate with cash flows and balance sheet amounts, and how timing uncertainties associate with those relations. In sequence, we discuss the consequences for empirical research, with some initial results about impacts in earnings persistence. Finally, we 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[1]. 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, we 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 we 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, we explain that one can refine that distinction, since not all accruals come from estimates.

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

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; Ohlson, 2014; Richardson, Sloan, Soliman, & Tuna, 2005).

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.

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, Sloan, and Sweeney (1995) and Sloan (1996) etc.

Therefore, both perspectives of accruals, as earnings components and as changes in non-cash net assets, converge as we 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.
Source: Ohlson (2014)

[1] Robinson (1982) elaborates 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.

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[2]. 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, we adopt the term "cash flow" for the cash component of earnings, in order to maintain equivalence with other studies. We also disregard dividends and capital contributions in the development of our 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) and Larson, Sloan, and Zha Giedt (2018).

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.

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, we note that this criterion is not absolute, neither the most used in empirical researches.

Dechow, Ge, and Schrand (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. (2018) 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) combines both balance sheet amounts and their changes as accruals. Although we understand that it suited the researcher's purposes of investigating the informational content of accounting items, in this paper, we 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

[2] To develop the comparison between flows and changes in net assets perspectives, we 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, we 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.

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. (2018) 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, we make efforts to keep as close as possible with the original terminology, but in order to converge the flows and changes perspectives, we also sought to generalize them when possible. Consequently, as an adjustment, we 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. We 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.

We 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 (2025) apply the terms "accruals proper" and "deferrals". We use these researchers' framework, but their work did not need specific naming for categorization, whilst it is not the case. We also chose not to reapply Dichev and Owens (2025) naming, due to our interest to contrast more evidently with the "deferral" term – which we judged it is neither "proper" nor "appropriation", but it would be "anticipation". Summarily, to avoid confusion, we opted to use the term "accruals" generally and for classification according to their roles, we 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 (2025) resume the idea, which we 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. We 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	$\Delta NA = 0$ $\boldsymbol{\Delta OA = -\Delta CA}$	−

Note: [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 we marked the changes in non-cash assets related to represented flows and in italic we 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 we 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, we 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. We 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 we did to anticipation accruals, we 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	$Accrual^{Open}_{Deferral} = -\ CF^{t+\tau}_{t}$	–	$\Delta NA = 0$ $\boldsymbol{\Delta OA = -\Delta CA}$	ΔCA = 0 ΔOA = ΔNA
Close	$Accrual^{Close}_{Deferral} = CF^{t}_{t-\tau}$	ΔNA = 0 ΔOA = **- ΔCA**	$\Delta CA = 0$ $\boldsymbol{\Delta OA} = \Delta NA$	–

Note: [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 we marked the changes in non-cash assets related to represented flows and in italic we 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 we 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 $FC_{t-\tau}$ 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, we 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 we 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 $t-\tau$ or $t+\tau$, of Tables 2 and 3, denote. We 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 (2025). They define accrual duration as the time extension between the accrual and its associated cash flow, which have important implications to discretion, as we will approach further. In contrast, we 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 (2025) 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 , we 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. We 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.

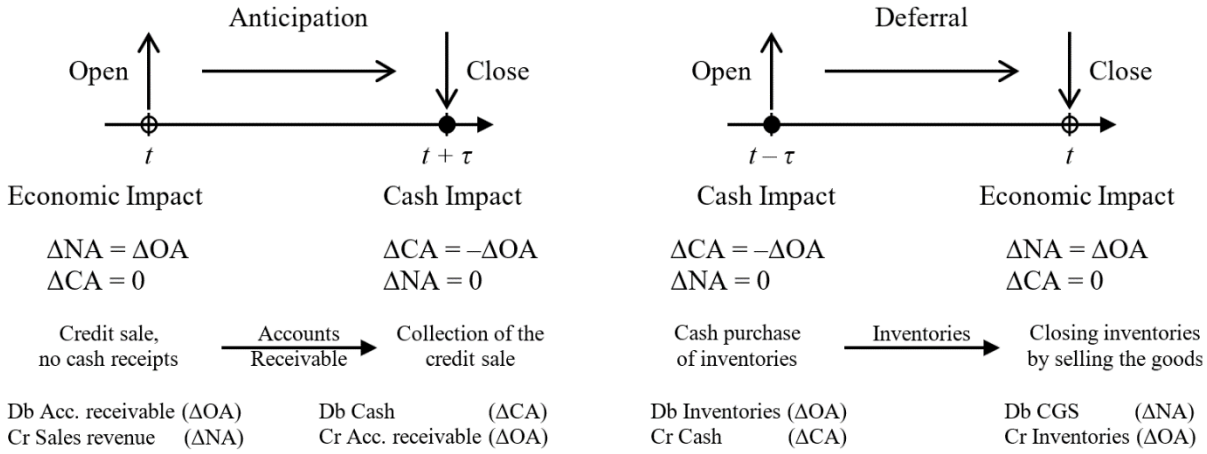

Figure 1. General overview of the accruals mechanism.

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. Etheridge (1991) and Dichev and Owens (2025) consider the informative content of accruals broadly. In our efforts to disentangle concepts and ideas about accruals, we consider both opposition and permanence relating to their opening and closing effects on balance sheet amounts and their role to anticipate and defer cash flows. We 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, we show the relation between accruals and their associated cash flows in Table 4. That allows refining the basic equation of flow perspective.

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

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:

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

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

Note: [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).

By flows perspective, we 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 sheet 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 (2025) 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[3]. 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 (2025) reinforce.

2.3. Uncertainty Over Events Recognition: Errors and Deviations

2.3.1. Deviations of Expected from Realized Cash Flows in Anticipation Accruals

[3]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. We discuss the presence of estimates in accruals in the next section.

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; Dichev & Owens, 2025; Richardson et al., 2005).

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 (2025). 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 (2002) model embraces both accounting errors and cash flow shocks. Dichev and Owens (2025) approach, that we 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. We 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. We 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, we 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. We represent those ideas in relations 3.1 and 3.2.

$$\Delta OA = \Delta OA^* + \delta \qquad (3.1)$$

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

$$\Delta NA = \Delta NA^* + \delta \qquad (3.2)$$

Thus, as we show the opening and closing anticipation accruals in Table 2 without errors and deviations, in Table 5 we introduce the recognition of estimate deviations. For anticipation accruals, we 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	$\Delta NA = - \delta$ $\boldsymbol{\Delta OA = -\Delta CA - \delta}$	–

Note: [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 we marked the changes in non-cash assets related to represented flows and in italic we highlighted the changes in net assets in current period, t.

From changes in net assets perspective, we 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, we 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. We 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	

Note: [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, $\Delta CA = 100$, and the closing anticipation accrual, $\Delta OA = -100$, 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 $\Delta CA = 70$, and the accrual reversal $\Delta OA = -100$, reflecting the previously overvalued amount, resulting in a negative impact on earnings of $\Delta NA = -30$.

We 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 ($\Delta OA = \Delta OA^* + \delta$). 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 ($\Delta OA = - \Delta CA - \delta$), as represented in Table 5. As Dichev and Owens (2025) 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[4]. 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. We illustrate that in Table 3 and further develop some reasoning about it, after Table 9. 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. Errors Between Estimated and Actual Changes in Wealth in Anticipation and Deferral Accruals

Dichev and Owens (2025) 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 we 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 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, we already presented that mechanism from changes in net assets perspective, in Tables 2, 3 and 5, under the current period *t* column.

We 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. We reinforce that, what is new in Dichev and Owens (2025) is that the idea of a *time horizon* deepens previous work of Dechow and Dichev (2002) and we 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, we 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.

[4] 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, we 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.

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, we highlight current changes in net assets.

In addition, while Dichev and Owens (2025) propose a timing error approach to accruals as a more general version of Dechow and Dichev (2002) model, we argue that part of the differences between accruals and cash flows realization can be approached separatedly from order deviations, which we 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 we previously associated the cash flow shocks to deviations in accruals that affect only anticipation accruals, both opening and closing, we also associate such accounting errors to time extension errors, that affect both anticipation and deferral accruals.

An immediate example for the use of 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. 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⌋, we 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. We illustrate this situation in Panel A of Table 8.

As illustrated in Panel A of Table 8, 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⌋ we 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. We provide further a similar example with both errors and deviations to enhance such difference.

In contrast, in Panel B of Table 8, we 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, we understand that Panel B is equally valid for discussion purposes.

The comparison between Panels A and B of Table 8 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.

Table 8. 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

Note: [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.

2.3.3. Errors and Deviations in Accruals and Impacts on Earnings

The advance of Dichev and Owens (2025) 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 (2025) 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 we previously associated cash flow shocks to deviations in accruals that affect only anticipation accruals, we also associate accounting errors to time extension errors, that affect both anticipation and deferral accruals.

We 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 9 we jointly present the effects on earnings caused by deviations from the order of impacts, δ, and time extension errors, ϵ, in accruals. We 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, we 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.

Table 9. 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

Note: [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, we highlight current changes in net assets.

Non-discretionary accruals relate to cash flows compensation, in alignment with Dichev and Owens (2025) 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, we used the same reasoning of sign attribution than Dechow and Dichev (2002). For time extension errors, we used a plus and minus sign to represent errors that happen or reverse along periods. That demands a more extensive explanation.

Since Equation 2 we 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.

We illustrate how errors and deviations articulate with the accruals mechanism, in Figure 2. We 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.

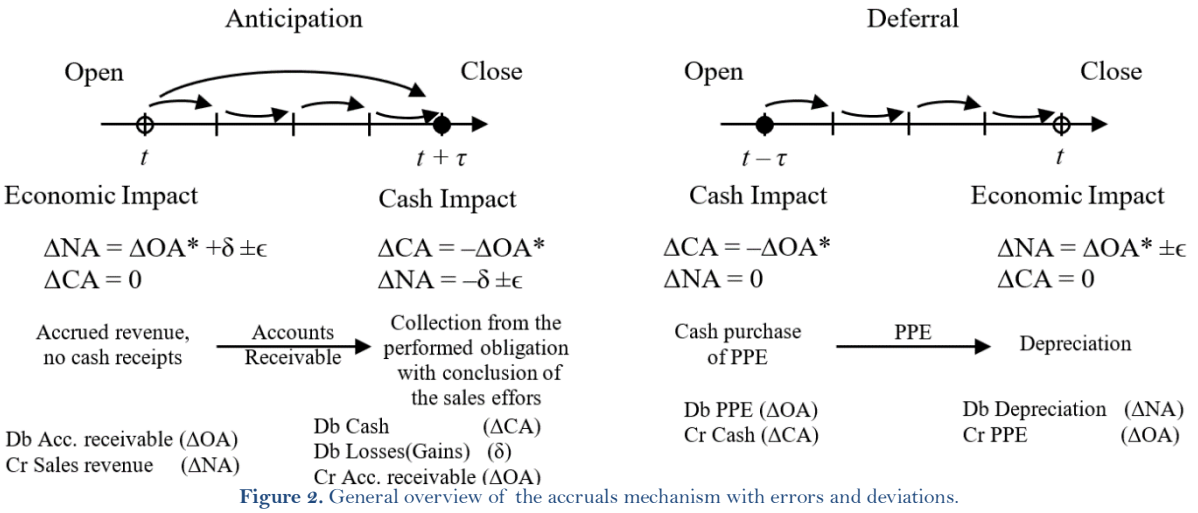

Figure 2. General overview of the accruals mechanism with errors and deviations.

While deviations relate only to anticipation accruals, 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 8.[5]

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 we 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 8, in Table 10, we also represent three distinct situations. In situation ⁅A⁆, we 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

[5] Regarding opening and closing accruals of fixed assets, one may observe closing accruals behaving better than 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 IX. However, the potential confusion arises because to compare asset acquisitions with depreciation is a comparison between opening and closing accruals, while our 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 VIII, 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.

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], we 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 9 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.

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 = ΔCA + ΔOA
Cr	Sales revenue	50		ΔNA = 50	50 = 0 + 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.*					
Db	Accounts receivable	50	$(Accrual^{Open}_{Anticipation})$	ΔOA = 50	ΔNA = ΔCA + ΔOA
Cr	Sales revenue	50		ΔNA = 50	50 = 0 + 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	ΔNA = ΔCA + ΔOA
Cr	Accounts receivable	10	$(Accrual^{Close}_{Anticipation})$	ΔOA = - 10	-10 = 0 − 10
				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

Note: [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, we 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[6].

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 (2025). 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 (Joint Committee for Guides in Metrology, 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 IX. 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 Joint Committee for Guides in Metrology (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) and Dichev and Owens (2025) 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, we nominate separately deviations from errors. We agree with the reasoning that changes in expectations because of new information are not accounting errors, but we 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, we 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 9. The distinction between deviations and errors, in our study, relies on the distinct nature of the source of uncertainty.

3. Discussion and Consequences for Empirical Research

3.1. Initial Discussion

An important step from Dechow and Dichev (2002) is the idea that there are inherent factors that influence discretion in accruals estimates. Based on economic intuition, they propose natural elements from operations that demand higher discretion for estimates, or alter the realization of cash flows. From that, empirical researches about accruals may appropriately refine their approach, in improvement efforts, separating estimates in three levels.

A first and more general level consists of estimating total accruals, by changes in net assets from balance sheets or by excluding cash flows from earnings. The changes in balance sheets approach is common in the literature and Dechow et al. (2010) propose to consider circumstances more adequate for one or other approach. As we stated in section 2.1, balance sheets approach requires attention to the adherence of changes in net assets involved in research problem, like short or long-term issues, comprehensiveness and reliability.

Then, empirical research usually applies a model to estimate discretionary accruals, or abnormal accruals. There are diverse models, like Jones (1991); Dechow et al. (1995); Kothari, Leone, and Wasley (2005) and Dechow, Hutton, Kim, and Sloan (2012) among others. This second level is useful to capture discretionary accruals, although not necessarily from earnings management – simply because a higher earnings management would come with higher discretionary accruals, but that does not imply reciprocity.

A careful refinement for earnings management empirical research, therefore, is to adopt a third step, using

[6] 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 9. 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:

ΔNA = ΔCA + deviations reversals + ΔOA*(opening, anticipation) + errors and deviations +
+ ΔOA*(closing, deferral) + errors reversals.

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

the standard deviation of discretionary accruals in order to obtain new residuals under the control of inherent operations. Dechow and Dichev (2002) originally proposed such measurement and Dechow et al. (2010) warn it is a non-signed measure and so it does not access the sign of deviations. Based on existing theory, results and economic intuition, Dechow and Dichev (2002) attribute intrinsic factors that show significant correlation with volatility of discretionary accruals measured by their model residuals, which are operating cycle, size, volatility of sales, earnings, cash flows and accruals, frequency of reported negative earnings, and the magnitude of accruals. Francis, LaFond, Olsson, and Schipper (2004) use this third step to segregate accruals.

A pertinent criticism to that terminology is the maintenance of "discretionary" term separately from what would be a regular procedure of accounting. It conflicts with our positioning in this paper, that discretion is part of accrual accounting, under earnings management or not. Therefore, the effective contribution for this third step is not only to enhance discretion estimate, but also to make possible identifying, within discretion as a whole, what would be from inherent to operations, i.e. an innate or normal discretion, and what would be excessive, then attributed to abnormal discretionary accruals, from earnings management.

As another possible adjustment for Dechow and Dichev (2002) model, McNichols (2002) proposed to use it jointly with Jones (1991) model, considering jointly past, current and future cash flows, changes in sales and PPE. The results show a higher explanation power from both models together than when from them alone. The researcher understands that such change allows controlling for omitted variables in Dechow and Dichev (2002) model, that are correlated with fundamental economics. We note, however, that the insertion of additional variables and controls, is still in development in practice, may it be with mixing distinct models (McNichols, 2002) based solely on economic intuition (Dechow & Dichev, 2002; Francis, LaFond, Olsson, & Schipper, 2005) or jointly with other empirical evidences (Francis et al., 2004). Such options are possible, in efforts to segregate innate discretion from abnormal discretion.

Research that follows models for estimating discretionary accruals, like Jones (1991) by Dechow et al. (1995) and subsequent developments, typically assume homogeneity of timing uncertainties in 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 related to such characteristics but not regarding timing uncertainties. Our discussion relates to those studies, leading to questions like how the innate characteristics of the firms relate to deviations and errors and to what extent those uncertainties are associated with abnormal exercises of managerial discretion over the accounting numbers, for example.

One way to explore discretion relates to the distinct nature of accruals leading to errors and deviations that impact earnings differently, as we articulate in Table IX. Considering specific situations or approaches, e.g. for business life cycles, in different industries or under different sets of accounting rules, it is plausible to expect higher or lower levels of discretion in accruals, because of the different proportions of different kinds of accruals. We highlight that such errors and deviations relate primarily to the innate part of discretion, and consequently, unexpected levels of errors and deviations in accruals could be in consequence of abnormal discretion. We also note, however, that in order to associate to abnormal levels of discretion, extrinsic factors remain necessary, providing motivations to opportunistic behavior.

It is also possible to focus on working capital accruals in order to capture uncertainty, similarly to Dechow and Dichev (2002) and others. In terms of Table 9, that would enhance order deviation impacts on earnings in comparison to time extension errors, under the consideration of a balance between anticipation and deferral accruals, which would be equivalent to consider time extension errors as zero ($\epsilon = 0$) and to work only with order deviations ($\delta \neq 0$). From that, some refinement could also embrace opening and closing accruals.

We highlight that we developed our reasoning with intuitive algebra and arguments, e.g. it is plausible that there is higher discretion on a credit sale than on the consumption of acquired inventories, but the general frame of Table 9 provides a foundation to adequate reasoning and avoidance of potential conflation. A natural extension for the reasoning we developed so far is to consider the size of the accrued amounts, cash flows and accruals.

It is also possible to classify accruals differently. Etheridge (1991) relies on the communication theory to segregate between accruals that convey new information and accruals that restate information provided by cash flow accounting, named as syntactic and semantic accruals, respectively. Dechow (1994) in Appendix A, offers a development, departing from the basic accounting equation, for obtaining aggregate accruals, that represent all adjustments from accrual accounting. Richardson et al. (2005) classify accruals from operations, investment and financing activities and Larson et al. (2018) go further, proposing to identify the nature of the event that generates the accrual, relating to conditional conservatism or special events, these last being non-articulating accruals. Penman (2013) relates accruals to their effects on valuation, with revenue accruals representing non-cash inflows and expense accruals representing non-cash values that the firm gives up in its operational activities. From what we approached in this paper, those alternatives open room to new perspectives that may articulate to changes in net assets. For example, the association with value offers a third perspective under which would be possible to sign non-cash changes.

Therefore, another approach for the heterogeneity in accruals regards their influence on the quality of earnings. Etheridge (1991) investigates the information content in accruals on their ability to predict future

earnings, while Richardson et al. (2005) and Larson et al. (2018) relate what types of activities accruals represent with their reliability in provide information about earnings. Considering the role of accruals in anticipating or deferring economic impacts of cash flows, or their effect of opening and closing balance sheet amounts, it is possible to investigate how those dimensions influence the quality of accounting information, like the persistence of earnings or the predictive ability of the accruals categories.

In this paper, we discussed errors and deviations of accruals, from order and time extension issues, under the assumption of no errors in cash flows. Dechow and Dichev (2002) briefly discuss this point, in Appendix B, that was unexplored in our work. We approach both order and time deviations independently of the size of accruals and their respective accrued amount, a trait that can be explored relating to impacts in earnings. We also disregarded the value of time and inflation effects on balance sheet amounts, that could be further developed.

3.2. Mensuring Timing Uncertainties

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.

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 11.

Table 11. Initial sample composition.

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.

Accordingly to the annual data availability, we opted for using two periods of analysis, being a shorter one, of 7 years, and a longer one, 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 12.

Table 12. 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.

To attribute accruals to each category, we measure them at account-level, similar to some previous studies that investigated their specific characteristics. We present the corresponding categorization of those previous studies, in Table 13.

Etheridge (1991) 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, we consider as accrued amounts, such as total receivables and total inventories, while accruals as we 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 13. Categorization of accruals in previous studies.

Panel A: Etheridge (1991)– 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); Richardson et al. (2005) and 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 13, 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 we would need more detailing to segregate between categories.

Considering those previous studies, we 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). 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 14 we 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. We 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 14. 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	

Note: 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.
Source: Research data.

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.

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, since 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 14, 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 14. 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 14. 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.

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

$$\Delta OA = OA^{Open} - OA^{Close} \quad (4.2)$$

On the other hand, to generally classify between opening and closing accruals, income and cash flows

variables complement the composition, as presented in Table 14. 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 15 we use this relation to estimate the opening and closing flows related to each of those accounts.

Table 15. 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

Note: 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.
Source: Research data.

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, we 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, we 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. We 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.

We 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, we 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, we applied a two-step procedure. Initially, we associate positive or negative values of the pertinent variables to the

opening or closing category, and we 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, we 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.

We present the variables associated to the opening and closing accruals for the balance sheets amounts that use this two-step procedure in Table 16.

Table 16. 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		+	–

Note: 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 we 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.

Source: Research data.

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, we 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 we present a general overview at the end of the section. The same applies to the analyses of the results.

According to Joint Committee for Guides in Metrology (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 Joint Committee for Guides in Metrology (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, we 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, we combined both procedures, as presented in Equations 9.1 to 9.4.

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

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

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

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

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.

3.3. Mensuring Earnings Persistence and Its Relationship with Timing Uncertainties: Some Inicial Empirical Results

Sloan (1996) investigates the persistence of accruals and cash flows as components of earnings, as they distinctly provide information in the assessment of future earnings. The reasoning is that some earnings performance that is due to its cash flows component is more likely to persist than if that was due to its accruals component. In turn, Richardson et al. (2005) investigate accruals reliability, focusing on the differences between the persistence of earnings components. They argue that as the more uncertainty in accruals, the lower is their persistence on earnings, in comparison to cash flows persistence. Following those studies, we propose that the timing uncertainties of distinct accruals categories, regarding their role of anticipation or deferral of economic impacts of cash flows and their effect of opening and closing balance sheets amounts, reduces the earnings persistence estimates.

Persistence measures how much changes on the object remain in the future, in the sense that, if the changes are transitory, then there is no persistence. The parameter of persistence is defined between 0 and 1,

from transient to persistent. The higher the persistence parameter, represented by α_1 in Equation 10, the more changes in current earnings affect future earnings. Therefore, earnings persistence is a measurement of how much impacts on earnings decay or remain in future earnings.

$$Earnings_{i,\,t+1} = \alpha_0 + \alpha_1 Earnings_{i,\,t} + \varepsilon_{i,\,t+1} \quad (10)$$

From a flow perspective, earnings may be understood as a measurement of performance, consequently, changes in earnings may occur because of changes in the performance itself or changes in the measurement, such as by using different accounting policies. From changes in net assets perspective, earnings represent changes in the owners' wealth, consequently, changes in earnings represent changes in improvements of the owners' economic well-being, using Hicks (1946) approach, or result from changes in wealth measurement. Earnings persistence is, therefore, a metric of performance/changes in owners' wealth combined with the effects of measurement of earnings themselves.

We calculated the earnings persistence for each company, considering the periods established for measuring the RSD, through autoregressive model of earnings for each company. Thus, for each company in each period of analysis we had data for the timing uncertainties in accruals and the persistence of earnings.

We consider the unexplained variance portion by the autoregressive model of earnings persistence for each company in each period. That is, our proxy of earnings persistence is a measure of non-persistence, and the higher its value, the less persistent are the earnings.

Thus, we expect a positive relationship between non-persistence and timing uncertainties in accruals, that is, the greater the timing uncertainties in accruals, the lower the earnings persistence.

In Table 17, we present the correlation between the uncertainties in earnings by the persistence model, and the timing uncertainties in accruals captured by the RSD in the different categories of accruals for both periods of analysis.

Evidence in Table 17 is similar for both periods. There is strong evidence of Spearman correlation between all categories of uncertainty, measured by the RSD metric, and the unpredictability of earnings, captured by the variance of the time-series not explained by the autoregressive model. The Pearson correlation resultas are significative only for anticipation and deferral categories. Despite the non-significant results for the Pearson correlation in some categories, the results for the Spearman correlation point to the result that greater timing uncertainties in accruals are associated with lower earnings persistences (greater unexplained variance portion by the autoregressive model of earnings persistence).

Table 17. Pearson e Spearman Correlation Results.

RSD	**Short Period - N = 811**[1]				**Long Period - N = 361**			
	Pearson		**Spearman**		**Pearson**		**Spearman**	
Anticipation	0.1469	****	0.2477	****	0.1758	****	0.2273	****
Deferral	0.1969	****	0.2769	****	0.2305	****	0.3449	****
Opening	0.0282		0.2310	****	-0.0168		0.2245	****
Closing	0.0273		0.2258	****	-0.0166		0.2332	****
Opening Anticipation	0.0238		0.2419	****	0.0038		0.1930	****
Closing Anticipation	0.0216		0.2299	****	0.0041		0.1946	****
Opening Deferral	-0.0094		0.1721	****	-0.0173		0.1611	***
Closing Deferral	0.0039		0.2451	****	-0.0170		0.1852	****

Note: 1. For the short period, 811 companies had non-zero anticipation, opening and closing accruals uncertainty, and 805 had non-zero deferral accruals uncertainty (RSD). That results in a small overlap when the split is into 2 groups for RSD using deferral accruals, for the short period. We consider that the effects of the overlap are negligible.
2. Test correlation of each RSD category with the variance of the time series not explained by the autoregressive model, with alternative hypothesis of correlation different than zero.
3. Significance is indicated as follows: **** is significant at 0.1%, *** is significant at 1%, ** is significant at 5%, * is significant at 10%.

To stress this results, we compare differences between the unpredictability of earnings, captured by the variance of the time-series not explained by the autoregressive model, by splitting the observations according to the levels of uncertainty for each accruals category, for both periods of analysis (Table 18). We split the observation in two, three, five and ten levels of uncertainty in accruals and test the means of the unpredictability of earnings for top extreme versus bottom extreme.

For all cases, there is a significant positive difference, indicating that the higher the uncertainty in accruals, less predictable will be earnings.

That is an interesting result because is shows consistency between two different approaches to uncertainty. RSD captures uncertainty in accruals related to variation, where each category addresses different timing uncertainties. The time series variance in the persistence model, captures uncertainty in a sense of lack of predictability, in this case applied to earnings. Therefore, the consistent positive difference between the top extreme and the bottom extreme reflects that lack of earnings predictability is related to timing uncertainties in accruals, where the stress splitting acts as an enhancer of such differences.

Table 18. Results of the Difference of Means Test for Earnings Non-Persistence at Differents RSD Levels.

Split	**2 Parts**			**3 Parts**		
Group	**Bottom**	**Top**		**Bottom**	**Top**	
	Short Period					
RSD	N = 405			N = 270		
Anticipation	0.0019	0.0067	****	0.0015	0.0077	****
Deferral	0.0021	0.0065	****	0.0018	0.0080	****
Opening	0.0026	0.0060	****	0.0013	0.0065	****
Closing	0.0025	0.0061	****	0.0013	0.0068	****
Opening Anticipation	0.0024	0.0062	****	0.0012	0.0066	****
Closing Anticipation	0.0024	0.0062	****	0.0016	0.0063	****
Opening Deferral	0.0038	0.0048	****	0.0039	0.0048	****
Closing Deferral	0.0023	0.0063	****	0.0018	0.0064	****
	Long Period					
RSD	N = 180			N = 120		
Anticipation	0.0021	0.0053	***	0.0017	0.0061	****
Deferral	0.0019	0.0056	****	0.0012	0.0065	****
Opening	0.0025	0.0050	****	0.0020	0.0058	****
Closing	0.0025	0.0049	****	0.0020	0.0057	****
Opening Anticipation	0.0025	0.0050	***	0.0020	0.0056	***
Closing Anticipation	0.0026	0.0049	***	0.0018	0.0056	****
Opening Deferral	0.0033	0.0042	**	0.0035	0.0045	***
Closing Deferral	0.0032	0.0043	***	0.0029	0.0047	****
Split	**5 Parts**			**10 Parts**		
Group	**Bottom**	**Top**		**Bottom**	**Top**	
	Short Period					
RSD	N = 162			N = 81		
Anticipation	0.0011	0.0077	****	0.0012	0.0081	****
Deferral	0.0019	0.0096	****	0.0024	0.0098	****
Opening	0.0011	0.0053	****	0.0010	0.0049	****
Closing	0.0010	0.0053	****	0.0008	0.0048	****
Opening Anticipation	0.0010	0.0060	****	0.0008	0.0046	****
Closing Anticipation	0.0010	0.0062	****	0.0009	0.0048	****
Opening Deferral	0.0027	0.0047	****	0.0024	0.0042	***
Closing Deferral	0.0014	0.0063	****	0.0006	0.0060	****
	Long Period					
RSD	N = 72			N = 36		
Anticipation	0.0014	0.0070	****	0.0009	0.0048	****
Deferral	0.0010	0.0074	****	0.0009	0.0072	**
Opening	0.0018	0.0049	****	0.0015	0.0044	***
Closing	0.0018	0.0057	****	0.0016	0.0044	**
Opening Anticipation	0.0021	0.0058	***	0.0017	0.0048	***
Closing Anticipation	0.0021	0.0057	***	0.0016	0.0048	****
Opening Deferral	0.0034	0.0051	**	0.0019	0.0054	****
Closing Deferral	0.0032	0.0050	**	0.0033	0.0055	****

Note: 1. For the short period, 811 companies had non-zero anticipation, opening and closing accruals uncertainty, and 805 had non-zero deferral accruals uncertainty (RSD). That results in a small overlap when the split is into 2 groups for RSD using deferral accruals, for the short period. We consider that the effects of the overlap are negligible.
2. Test distributions of top and bottom groups locations, with alternative hypotesis that they differ.
3. Significance is indicated as follows: **** is significant at 0.1%, *** is significant at 1%, ** is significant at 5%, * is significant at 10%.

In Figure 3 we illustrate the effect of the splitting on the lack of predictability of earnings, for the main RSD categories. The splitting effect is clear around the reference line in red, of the No Split group, where the groups with the higher uncertainty also show higher uncertainties of earnings persistence, and the bottom groups show lower uncertainties.

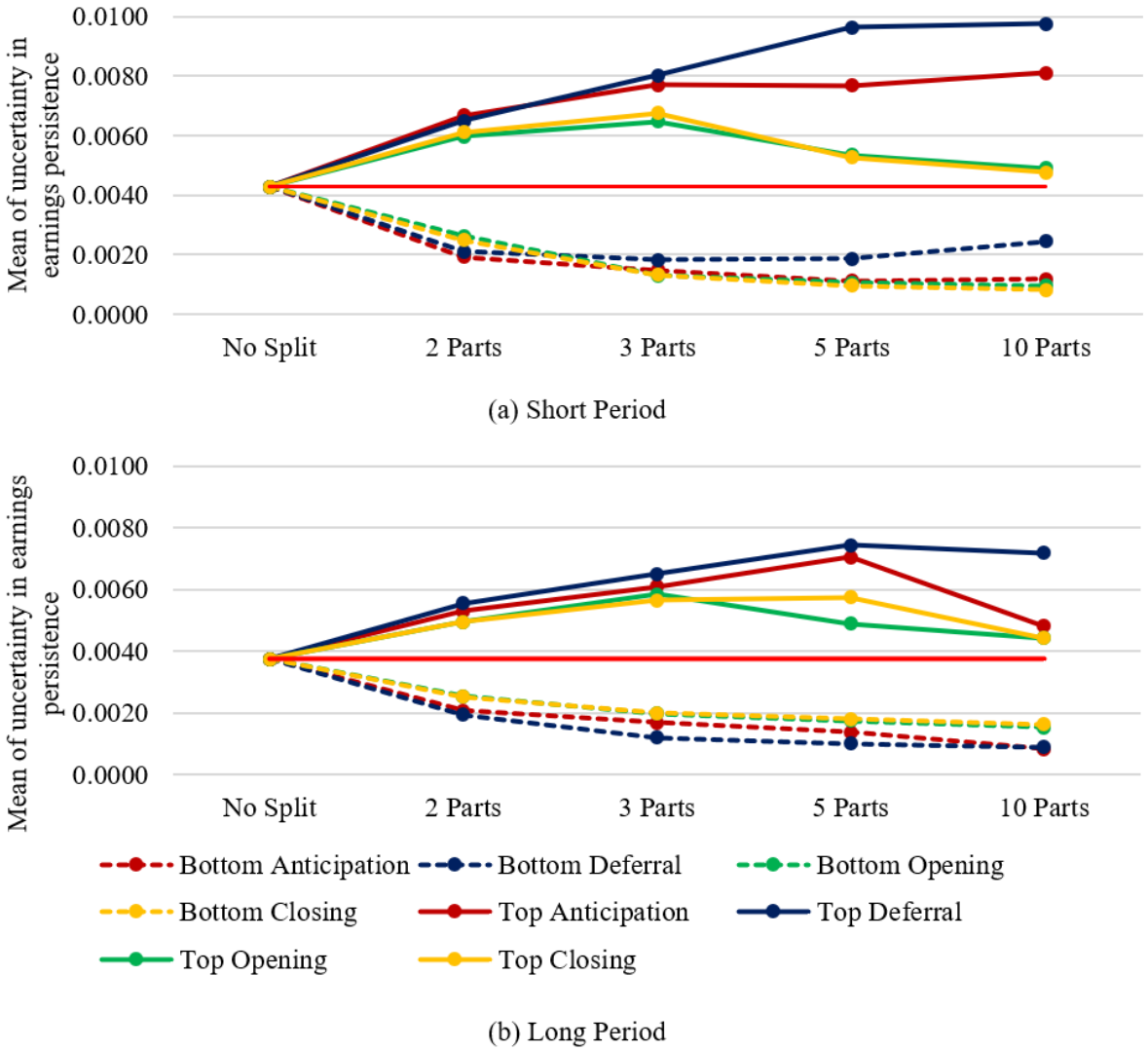

Figure 3. Mean of uncertainty in earnings persistence by stress split for top and bottom extremes in main RSD categories, for both Short (a) and Long (b) periods of analysis.

Some reversal effect starts to appear by the split in 5 parts. For the short period (a), the top opening and closing groups show a decrease in earnings persistence in comparison to the split in 3 parts, and the bottom and anticipation and deferral show an increase in the same comparison. For the long period (b), the top opening group shows a similar decrease.

That indicates a broad sensibility in the stress splitting, not related specifically to a top or bottom group, neither anticipation and deferral versus opening and closing accruals. Yet, the difference between higher and lower persistence uncertainties for earnings remain positive in all situations, even when the split is in 10 different groups, for all RSD categories, in both periods of analysis.

4. 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); Dechow and Dichev (2002); Richardson et al. (2005); Ohlson (2014); Larson et al. (2018); Nikolaev (2018) and Dichev and Owens (2025). 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. Considering that those objects are also connected and their estimates carry uncertainties, we examine the anatomy of timing uncertainties in accruals. From two complementary perspectives, we elaborate on how accruals articulate with cash flows and balance sheet amounts to build a single framework. We 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, we 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, we 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 sheet amounts to the opening and closing categories. Using this framework, we provide a distinction of the timing uncertainties in accruals, based on discussions of Dechow and Dichev (2002); Nikolaev (2018) and Dichev and Owens (2025). 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 we 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 we denominate as time extension errors. Both deviations and errors affect the categories of accruals distinctly.

We propose some extensions for empirical research. There is the possibility to investigate abnormal discretion regarding the different categories in accruals, and to study how heterogeneous timing uncertainties affect the quality of earnings. It is possible to also extend our discussion by embracing the size of accruals and accrued amounts, or articulating how effects of policies and regulation, or inflation, may affect timing uncertainties in accruals.

Some initial results showed that there is a significant positive correlation (Spearman) between the timing uncertainties (for all categories) and the unpredictability of earnings, captured by the variance of the time-series not explained by the autoregressive model. In addition, means difference tests (Mann-Whitney) showed that at higher levels of timing uncertainties in accruals there are lower levels of earnings persistence. These results indicate that timing uncertainties in accruals negatively affect earnings quality, showing less persistent earnings.

The implications of the heterogeneity of timing uncertainties in accruals go beyond academic research. Owners and investors that aware of such uncertainties may benefit of better informed decisions. Not only shareholders but also lenders and creditors 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.

Future research could investigate implications of the timing uncertainties in accruals for the quality of earnings, like the predictive ability, as in Etheridge (1991) and deepen the preliminary showed results of the present study about earnings persistence. Other possibilities are to investigate the perceived uncertainty in the presence of earnings management practices or their assessment by investors in financial markets.

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