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**Piecewise Linear Accrual Models:
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Abstract

The asymmetric recognition of gains and losses underlying conservative accounting is not taken into account by Jones (1991)-type accrual models. Recently, Moreira (2002) and Ball and Shivakumar (2005a) have proposed piecewise linear accrual models designed to control for this asymmetric impact.

Our paper first discusses the sign of the expected measurement error in discretionary accruals (DAC) estimates when models do not control for the asymmetry underlying conservatism. We find that DAC in firms with bad news (BN) are expected to be understated, while those in good news (GN) firms will be overstated. Based on this original result we empirically test, using graphical and statistical tools, whether piecewise linear accrual models correct such a measurement error. The empirical evidence shows mixed results. For GN firms the estimates are corrected downwards, as expected; for BN firms, unexpectedly, part of the estimates is also corrected downwards. The reason for this unexpected result seems to lie in a non-linear relationship between accruals and the proxy for BN that the models are unable to control for. Thus, DAC estimates under piecewise linear models are not deemed to be of better quality than those of traditional accrual models.

Key words: accrual models; piecewise linear accrual models; conservatism; earnings management.

Data availability: Data are available from the commercial source identified in the paper.

JEL classification: M41, C2.

1. Introduction

A broad interest in the findings of the literature on discretionary accruals' estimation (DAC) seems to persist, despite the recognized weaknesses in accrual models and the poor quality of their estimates (McNichols, 2000).¹ According to Kothari (2001) this interest is related to the importance of such models to researchers and to the capability of the latter to draw correct inferences from capital market and other research. Nevertheless, such interest may also be related to the ongoing discussion on GAAP flexibility, and to the impact of earnings management on the quality of accounting information and on resource allocation. The comments of Dechow and Skinner (2000) point in the same direction, suggesting that regulators are paying attention to all earnings management related issues in order to assess whether their beliefs on the pervasiveness of this type of managerial behavior make sense. Thus, the improvement of available solutions for measuring DAC, or the design of new ones, is an important issue on the current accounting research agenda. In-depth, continuous assessment of the quality of old and new solutions is also crucial to the perception of insufficiencies in the estimates they provide.

The Jones (1991) accrual model has been a seminal contribution to earnings management research. New models have been offered thereafter but most of them are based upon it or may be reconcilable with it (e.g. "Modified-Jones", after Dechow et al., 1995a; the "margin model", in Peasnell et al. 2000; the "cash flow" model; "Dechow and Dichev, 2002" model).² Although the literature widely recognizes that such models do not work well in identifying earnings management practices (e.g.

¹ In the literature, as in this paper, "abnormal accruals" and "discretionary accruals" are understood to have the same meaning.

² Throughout the paper we label them as Jones (1991)-type models or "traditional" models.

Dechow et al., 1995a; Guay et al., 1996; Young, 1999; Thomas and Zhang, 2000), they are still in use. Many suggestions for improving accrual models performance have been “lost” in the literature. Some, fortunately, are rescued and implemented. It is the case of Healy’s (1996:113). In his discussion of the paper by Guay et al. (1996), argues that “There are also opportunities for improving the existing accrual models by incorporating the effect of accounting principles. For example, the conservatism doctrine, which requires firms to recognize gains and losses asymmetrically...”. Moreira (2002) and Ball and Shivakumar (2005a) proposed accrual models that attempt to control for conservatism effects.

Watts (2003) and Roychowdhury and Watts (2005) extensively discuss the meaning of accounting conservatism. In the current paper we understand conservatism as the prudence managers must use in recognizing expected gains and losses, adopting an asymmetric recognition of these earnings components that is more stringent for the latter than for the former. Expected losses (bad news, BN) must be recognized immediately they become expected, while expected gains (good news, GN) will be recognized only when they become realizable/realized. Thus, accounting is timelier in recognizing BN than GN, and the impact of conservatism over accruals (earnings) is negative.³ Following evidence in Basu (1997), Moreira (2002) and Ball and Shivakumar (2005a), amongst others, we relate the impact of conservatism to accruals. Cash flows are originated on a realization basis and thus are not expected to be contemporaneously affected by conservatism. It therefore seems intuitive that accrual models should be able to control for this asymmetric impact when estimating DAC, otherwise accrual estimates are measured with error. Recent research (e.g.

³ This definition of conservatism appears in the literature known as “conditional conservatism” (Ball and Shivakumar, 2005a) or “ex-post conservatism” (Pope and Walker, 2001). It means that the impact of conservatism we discuss is driven by the accounting principle with the same name rather than managers’ discretionary actions.

Moreira, 2002; Ball and Shivakumar, 2005a) has proposed solutions based on piecewise linear accrual models controlling for the asymmetric recognition of gains and losses. However, such a solution has not yet been assessed for its impact on the quality of DAC estimates.

In this paper we first discuss the sign of the expected measurement error in discretionary accruals (DAC) estimates when no control for the impact on accruals of the conservatism is undertaken. We then test whether a solution based on piecewise linear accrual models is able to improve the quality of DAC estimates. For firms with expected losses (bad news, BN) in the period analyzed, we predict that traditional accrual models understate such estimates, and overstate those of firms with expected gains (good news, GN). We also predict that better DAC estimates are provided by piecewise linear accrual models controlling for the asymmetric recognition of the gains and losses underlying conservatism.

The analysis shows that traditional accrual models are unable to control for the asymmetric recognition of gains and losses underlying conservatism and their DAC estimates contain a conservatism-induced measurement error that is expected to understate such estimates for GN firms and overstate them for BN firms. The empirical evidence on the quality of DAC estimates derived from piecewise linear accrual models is mixed. For GN firms, these models correct DAC estimates downwards, as predicted. However, for BN firms, unexpectedly, part of the estimates is also corrected downwards. The reason for this unpredicted result seems to lie in a non-linear relationship between accruals and the proxy for BN that the models are unable to control for. Thus, the evidence does not support the notion that DAC estimates computed with piecewise linear models are of better quality than those provided by basic accrual models.

The paper proceeds as follows. In the next section we discuss the impact of conservatism on accrual models. In Section 3 we develop and motivate a piecewise linear accrual model controlling for the asymmetric recognition of gains and losses. In Sections 4 and 5 we discuss the research design and the data sample. Section 6 analyses the empirical results, and Section 7 summarizes the main sensitivity tests performed. Finally, in Section 8 we present a summary of the main conclusions.

2. The impact on accrual models of the asymmetric recognition of gains and losses

In this section we first describe the structure of Jones (1991)-type accrual models. Afterwards, we show why these models do not control for the asymmetric recognition of gains and losses, and discuss the consequences for the quality of DAC estimates.

2.1. Jones (1991)-type accrual models

A wide range of accrual models appear in the literature, ranging from a simple random walk of total accruals (DeAngelo, 1986) to the econometrically sophisticated Kang and Sivaramakrishnan (1995) model.⁴ Although the technical motivations invoked to use more sophisticated techniques are theoretically defensible, the time-series data requirement associated with such methods tends to act as a practical constraint to their widespread use. Moreover, the comparative assessment of accrual estimates derived from different models (e.g. Thomas and Zhang, 2000) does not

⁴ This model uses an instrumental variable technique that attempts to mitigate problems of simultaneity and errors-in-variables usually said to affect most accrual methods. An identical econometric technique is used by McCulloch (1998) in a model that allows the estimation of the new DAC made in the current period and takes into account the reversal of DAC made in prior periods.

show meaningful differences between those of “sophisticated” and those of “non-sophisticated” models. This is probably the main reason why a simpler solution, the Jones (1991) model, remained popular for more than a decade amongst the models that deal with aggregate accruals, and is still one of the most widely used in the literature (e.g. Peasnell et al., 2000), acting almost as a benchmark. Because of its central role in the literature, and because most other available solutions are based upon it, or may be reconcilable with it, the analysis that follows uses this model as its starting point.

The structure of a Jones-type accrual model (1991) is based on a single linear equation that takes the form

$$(1) \quad ACC_{it} = \alpha_0 + \alpha_1 Y_{it} + \varepsilon_{it},$$

where ACC is an aggregate measure of accruals, Y is a vector with one or more earnings components (“accrual drivers”, such as revenue or cash flow) designed to explain the dependent variable, ε is the residual of the regression, α_0 and α_1 are parameters, t designates the specific time period, and i represents the firm.⁵ These parameters can be estimated by running the model for a given firm using time-series data or, as is currently more common, cross-sectionally for an industry. It is then possible to have, for a firm i , an estimate of its expected (normal) accruals conditional on the realized values of Y at period t :

$$(2) \quad \hat{ACC}_{it} = \hat{\alpha}_0 + \hat{\alpha}_1 Y_{it}.$$

An estimate of discretionary accruals ($\hat{\varepsilon}$) is given by:

⁵ Y may also contain a balance sheet variable. For instance, Plant, Property and Equipment (PPE) used in Jones (1991) model. Usually the use of a balance sheet variable, aiming to explain the long-term accrual depreciation, involves the use of Total Accruals as the dependent variable of the model.

$$(3) \quad ACC_{it} - \hat{ACC}_{it} = \hat{\varepsilon}_{it} = DAC_{it}.^6$$

Behind this simple way of estimating DAC ($\hat{\varepsilon}_{it}$) there are two main assumptions that may potentially condition the quality of the estimates. Firstly, Y is assumed not to be affected by managers' discretionary actions towards earnings management.⁷ Otherwise, the estimated coefficients ($\hat{\alpha}_1$) would be biased and inherently the same would occur with the accruals estimates (e.g. Dechow et al., 1995a). Secondly, it is assumed that omitted variables are uncorrelated with the explanatory variables in the model. If this does not happen, the estimation suffers from an omitted-variables problem, and the coefficients will also be biased (Dechow et al., 1995a; Greene, 2000).

2.2. The impact of the asymmetric recognition of gains and losses on accruals, and on the estimation of DAC

The conservatism principle refers to the prudence managers must use in recognizing expected gains and losses, adopting an asymmetric treatment of these earnings components that is more stringent for the latter than for the former. Ball and Shivakumar (2005a) label this accounting principle "conditional conservatism". Losses (bad news, BN) must be recognized immediately they become expected, i.e. on a timely basis, while expected gains (good news, GN) need only be recognized when they become realizable/realized. Thus, the asymmetric treatment of expected losses and gains implies a negative impact on accruals (earnings). The evidence in Basu (1997), Moreira (2002) and Ball and Shivakumar (2005a), amongst others, is supportive of conservatism effects impacting earnings exclusively through accruals

⁶ If the model is estimated in time-series, DAC is the residual of the regression. Otherwise, when estimated cross-sectionally by industry, DAC can be understood as a forecast error.

(ACC), consistent with cash flow recognition on a realization basis.⁸ Moreover, because of the BN connection to future events, it seems intuitive to expect that the impact of this type of news will affect not only current but also long-term ACC (e.g. Ball and Shivakumar, 2005a).

Let us return to the above model (equation 1) and its accrual drivers. Our aim is to provide a better perception of how conservatism may affect the estimation of discretionary accruals. First we split this variable into two components as follows: a discretionary component (DAC), related to managers' interventions towards earnings management; and a non-discretionary component (NDAC), related to firms' normal business activity. It can then be written:

$$(4) \quad ACC = NDAC + DAC.^9$$

Because of its character, NDAC can be written as a function f that relates this non-discretionary component positively to the earnings drivers of normal accruals and negatively to the (conditional) conservatism embodied in the general accepted accounting principles (GAAP).¹⁰ This is,

$$(5) \quad NDAC = f(\text{accrual drivers} ; \text{GAAP conservatism}).^{11 12}$$

⁷ Models using instrumental variables are presumed not to invoke this assumption. Nevertheless, there is no hard evidence to show that they overcome the problem completely.

⁸ The relationship between conservatism and accruals is also intuitive if one considers that the former is driven by the revision of expected future cash flows (CFO), and thus does not affect current-period CFO. The existence of potential positive correlation between accruals and current-period cash flows, discussed in Ball and Shivakumar (2005a) for cases where the downward revision of expected future CFO occurs in parallel with an impact in current-period CFO, is only an accidental effect that cannot be directly related to the conservatism principle. Moreover, the negative relationship between ACC and CFO documented in the literature cannot be used as an argument to defend the position that conditional conservatism affects contemporaneous CFO.

⁹ For the sake of simplicity and because there is no loss of precision, we do not include the subscripts for time and firm.

¹⁰ E.g. Jones (1991); Basu (1997); Peasnell et al. (2000); Moreira (2002); Ball and Shivakumar (2005a).

¹¹ For the sake of simplicity, we are assuming earnings drivers only (e.g. revenue and cash received, as in Peasnell et al., 2000; change in revenue, as in Jones, 1991; cash flows, as in Dechow and Dichev, 2002). However, as we mention above, if accruals are inclusive of the depreciation charge then a balance sheet driver (e.g. Plant, Property and Equipment) has to be included in the model. The relationship between ACC and this driver will be negative.

¹² Common to all earnings drivers is the fact that they are recognized in accounting on a "realization basis", i.e. at the moment of their occurrence there is no uncertainty about their amounts and thus they are not expected to be contemporaneously affected by conservatism. (e.g. Moreira and Pope, 2005).

Re-writing expression (1) after adjusting it for expressions (4) and (5) allows a better perception of the impact of conservatism on accrual models. Expression (1) becomes:

$$(1') \quad NDAC [f(\text{accrual drivers}; \text{conservatism})] + DAC = \\ = \alpha_0 + \alpha_1 Y [\text{accrual drivers}] + \varepsilon .$$

This expression highlights some important aspects for the correct understanding of the impact of conditional conservatism on accrual models and their estimates. First, accruals are asymmetrically impacted by conservatism. BN will make ACC more negative (less positive), while GN will have no expected impact on ACC. Conversely, on the right hand side of this expression, the accrual drivers are unaffected by conservatism. There is empirical evidence in the literature to support the notion that conservatism impacts ACC (e.g. Basu, 1997; Pope and Walker, 1999; Moreira, 2002; Ball and Shivakumar, 2005a) and accrual drivers are not contemporaneously affected (Moreira and Pope, 2005).

Second, the differentiated impact of conservatism on both sides of expression (1') suggests that DAC may contain a measurement error. If there is no control for conservatism on the right hand side of this expression, and because the accrual drivers are independent from conservatism effects, then the intercept and the error term will tend to pick up the impact of conservatism on ACC, thus influencing DAC measurement.¹³ However, this potential effect on the estimation of DAC will be non-systematic given the asymmetric impact of GN and BN on ACC. The intercept of the equation (1') is expected to be higher for firms with GN than for those with BN, consistent with the depressive impact of bad news on ACC. When firms have both

¹³ If there are uncorrelated omitted variables, then the coefficients of the explanatory variables will be unbiased, but the intercept will pick up the mean effect of those omitted variables, unless, of course, DAC are intended to offset the negative impact of conservative bad news. In this case the global impact on the intercept is difficult to predict.

type of news over time (potentially the most frequent case), or when the model is estimated cross-sectionally by industry, one may expect that, with no control for conservatism, the size of the intercept will lie somewhere in between the extreme cases characterized by having only one type of news. Let us call this the “average intercept”. Given the asymmetric impact of conservatism on accruals, this intercept is understated for GN firms and overstated for BN firms. On examining equations (2) and (3), the consequences of this situation for the estimation of DAC are easy to predict. For GN firms, estimated normal accruals will tend to be smaller than they should be and DAC will be overstated. For BN firms the opposite occurs, and DAC are understated. Exhibit 1, Fig. 1, illustrates such a situation.

Defining

$$(6) \quad \Delta DAC = DAC_C - DAC_{NC},$$

where DAC_C are discretionary accrual estimates from models controlling for the asymmetric recognition of gains and losses and DAC_{NC} are estimates from models not controlling for such an asymmetry, we predict that the change in discretionary accruals (ΔDAC) will be positive for BN firms and negative for GN firms.

The expectations we discuss in the current subsection undoubtedly represent a significant contribution to the literature and in particular to empirical research. Firstly, they may help to understand and reinterpret some previous results. Secondly, they may foster the improvement of available accrual models and the design of better empirical research. Thirdly, they introduce a new question on the quality of accrual models that attempt to control for the asymmetric recognition of gains and losses. This paper is a first contribution to answer such a question.

In 1996, Healy, commenting on the paper by Guay et al. (1996), suggested that future research should include the impact of conservatism in accrual models. Recently two attempts have been made to overcome the insufficiency Healy pointed out. Moreira (2002) and Ball and Shivakumar (2005a) propose piecewise linear accrual models that control for the asymmetric recognition of gains and losses.¹⁴ Although the first of these studies made an attempt to assess the relative quality of DAC_c estimates, neither of them contains a thorough discussion of this quality. We intend to do so in this paper.

In the following section we develop a piecewise linear accrual model as a first step in assessing the quality of DAC estimates using these models.

3. A piecewise linear accrual model that controls for the asymmetric recognition of gains and losses

In this section we model accruals, and control for the asymmetric recognition of gains and losses. The modeling process converges to a Jones-type (1991) accrual model structure. This outcome has the advantage that it allows the modeling, and the control underlying it, to be extended to many current accrual models. As discussed in the previous section, the Jones (1991) model is a type of umbrella for most accrual models in current use.

¹⁴ Piecewise linear models are recommended to describe nonlinear relationships that contain one or more explanatory variables taking a two-state-of-the-world form, also known as a “binary form” (Greene, 2000). In the case under analysis, the binary variable is the proxy for conservatism and takes the states GN/BN.

3.1. The theoretical model

Following Dechow et al. (1995b), we assume revenue (total sales) to follow a random walk pattern. For firm i belonging to industry j ,

$$(7) \quad REV_{ijt} = REV_{ijt-1} + e_t. \text{ }^{15}$$

Assuming additionally that a proportion of sales remains uncollected at the end of the period, that a proportion of purchases remains unpaid and that there are no inventories, accruals (ACC_t) can be expressed as a function of the change in revenue,

$$(8) \quad ACC_t = \alpha_0 + \alpha_1 \Delta REV_t + \varepsilon_t,$$

where α_0 and α_1 are parameters, and ε_t is the mean zero regression error term. The structure of this model is similar to that of equation (1) in the previous section.¹⁶

Basu (1997), Pope and Walker (1999) and Moreira (2002), amongst others, extensively discuss the asymmetric impact of conservatism on earnings. Based on their findings and on the definition of conservatism adopted in this paper, we mentioned above that such an impact affects accruals only. Hence, it is possible to use the theoretical framework developed in Pope and Walker (1999) and explain accruals through a piecewise linear model:

$$(9) \quad ACC_t = \gamma_0 + \gamma_1 D_t + \gamma_2 RET_t + \gamma_3 D_t * RET_t + u_t$$

where γ_m are parameters; RET_t is a proxy for information on the asymmetric recognition of gains and losses underlying conservatism (good/bad news); D_t is a dummy variable that takes value one when the news is bad, zero otherwise; $D_t * RET_t$ is an interactive variable reflecting the incremental impact of bad news on ACC_t ; and

¹⁵ For the sake of simplicity, and because it does not imply any loss of precision for the analysis, hereafter we leave out the subscripts for firm and industry.

¹⁶ The Jones (1991) model can be seen as an empirical application of this model. Its original version includes a term (Property, Plant, and Equipment) that controls for the depreciation accrual. Assuming

u_t is an error term with the usual characteristics. Hence, the model relates ACC_t to the impact of this asymmetric recognition.

Given that the impact of conditional conservatism affects accruals only, we do not expect the accrual driver in expression (8) to be affected. Empirical evidence in Moreira (2002) and Moreira and Pope (2005) supports such an expectation. Hence, ΔREV_t is expected to be economically independent of the variables on the RHS of expression (9).¹⁷ This allows us to combine expressions (8) and (9), thereby obtaining the following expression:

$$(10) \quad ACC_t = \beta_0 + \beta_1 \Delta REV_t + \gamma_1 D_t + \gamma_2 RET_t + \gamma_3 D_t * RET_t + \xi_t.$$

β_1 is expected to be positive (Jones, 1991). GN, proxied by the positive sign of stock returns ($RET_t > 0$), are not expected to affect ACC_t and thus γ_2 is expected to be not statistically different from zero. Conversely, BN impacts ACC_t negatively. Because the proxy for this type of news is defined in negative terms ($RET_t < 0$), $\gamma_2 + \gamma_3$ is expected to be positive. This means, given the expectation on γ_2 , that γ_3 is predicted to be positive. There is no expectation for the signs of β_0 and γ_1 .

3.2. The empirical version of the model

To be faithful to the original version of the Jones (1991) model, which includes the inverse of the deflator used to mitigate heteroscedasticity ($1/defl$) rather than a true constant, we add this term to the model. However, because there is no theoretical

that the measure of accruals (ACC) does not contain the depreciation charge, equation (8) is the complete version of the Jones (1991) model.

¹⁷ The correlation between ΔREV and RET is fairly small (Table 2, Panel B), consistent with this expectation. It is even smaller when we control for good/bad news (untabulated evidence).

reason for forcing the regression through the origin (e.g. Peasnell et al., 2000) we also retain an intercept term in the regression (e.g. Kang, 1999).¹⁸

The empirical version of the model is:

$$(11) \text{ACC}_t = \beta_0 + \beta_{01} \left[\frac{1}{\text{defl}} \right] + \beta_1 \Delta \text{REV}_t + \gamma_1 D_t + \gamma_2 \text{RET}_t + \gamma_3 D_t * \text{RET}_t + \xi_t$$

Relative to the original model (equation 8), this final version takes into account the impact of the asymmetric recognition of gains and losses on accruals (through the coefficients γ_2 and $\gamma_2 + \gamma_3$, respectively).

For four other accrual models (the “Modified-Jones model”, after Dechow et al., 1995a; the “margin model”, in Peasnell et al., 2000; the “cash flow model”; the “Dechow and Dichev, 2002 model”) similar piecewise linear models are constructed and tested. All models are regressed cross-sectionally. For each year and industry a set of coefficients is estimated, and taken to compute each firm’s normal accruals ($NACC_{ijt}$). The difference between normal and reported accruals will give an estimate of the forecast error (abnormal accruals), which is a proxy for the discretionary accruals of firm i , from industry j , in year t ,

$$(12) \text{DAC}_{ijt} = \text{ACC}_{ijt} - \text{NACC}_{ijt} .$$

¹⁸ According to Kang (1999), restricting the intercept to zero is a potential source of bias in the estimation of abnormal accruals. Increasingly, empirical studies using versions of the model tend to include an intercept (e.g. Kasznik, 1999; Hribar and Collins, 2002; Peasnell et al., 2000; Gore et al., 2001). In all these studies robustness tests to check the results of Jones (1991) with and without intercept do not find significant differences arising from using the intercept. Given the research design used in the current study, the results seem unaffected whatever the solution we adopt. Nevertheless, we empirically tested all possible combinations (intercept, intercept plus the inverse of the deflator, and the inverse of the deflator on its own) and the conclusions are not materially different.

4. Research Design

4.1. Methodology

In sub-section 2.2. we discussed the expected sign of DAC measurement error. Given the independence between the accrual drivers and the variables controlling for the asymmetry underlying conservatism, the statistical difference between DAC estimates controlling/not controlling for this asymmetry ($\Delta DAC = DAC_C - DAC_{NC}$) is the effect of such a control. Its sign is then compared with that of the expected measurement error in DAC_{NC} . If piecewise models work well, the sign of ΔDAC should offset that of the measurement error discussed above. The main advantage of this approach is that it provides a simple way of testing for the impact of controlling for conservatism with no need for particular assumptions on the statistical relationship between ACC and their drivers.

4.2. Variables and models: measurement and definition

4.2.1. Accrual measures

Exhibit 2, Panel A, contains the definition of the main accounting variables used in the analysis, and the corresponding *Compustat* codes.

There is no guidance in the literature about the measure of aggregate accruals to use, although there is some empirical evidence to suggest that conservatism impacts on both short and long-term accruals (e.g. Moreira, 2002; Ball and Shivakumar, 2005a). Thus, for testing purposes, we selected three measures of accruals: i) non-cash working capital accruals (WCA), which is a measure of current accruals; ii) total

accruals minus depreciation charge (TACC_D),¹⁹ that contains current and long-term accruals other than depreciation, and iii) total accruals (TACC).

4.2.2. Good and bad news proxies

In the previous section we introduced RET as a proxy for information on the asymmetric recognition of gains and losses underlying conservatism, following the work of Basu (1997) and Pope and Walker (1999). RET are firms' annual stock returns. If they are positive, it is assumed that they reflect economic good news (expected gains), and if negative, bad news (expected losses). A dummy variable D_t that takes value one when $RET_t < 0$ (bad news), zero otherwise, allows us to control for returns signs.²⁰

As in Ball and Shivakumar (2005a, b), we also use other proxies for the asymmetric recognition of gains and losses: i) abnormal returns, after controlling firms' returns for industry performance; ii) cash flows from operations; iii) change in cash flows from operations.²¹ In all three proxies, the positive sign of the variable is taken as GN, the negative as BN.

¹⁹ The depreciation charge is excluded from TACC_D for three main reasons. Firstly, income statement depreciation tends to reflect normal depreciation only. If BN implies extraordinary depreciation, the accounting record will tend to be reflected in accruals related to extraordinary items, not in the current depreciation charge. Secondly, because accrual models that use total accruals (inclusive of depreciation charge) must control for the source of depreciation. According to Young (1999) this tends to produce DAC estimates with higher measurement error. Thirdly, because of the visibility and predictability of the depreciation charge, its potential use as an instrument for earnings management is limited (e.g. Peasnell et al., 2000).

²⁰ This is not a perfect proxy. Firstly, the use of this proxy in reverse price-earnings relations is not free of criticism. Moreira (2002: Part II, Appendix B) discusses and defends its use, and how it performs in the presence of losses. Secondly, as Roychowdhury and Watts (2005) point out, RET may reflect components ("economic rents of non-separable assets") not related to conservatism effects, potentially introducing noise in the analysis.

²¹ Cash flow based proxies are not consistent with the definition of conservatism we discussed above. Moreover, those proxies are not independent of the accrual drivers in the model and thus conflict with the basic assumptions of the regression analysis and with the methodology adopted in the paper. Nevertheless, we used them to run a set of preliminary tests.

4.2.3. Accrual models

Exhibit 3 introduces the accrual models to be tested. For the sake of simplicity, we do not display all the basic models but they may be easily deduced from their piecewise versions. For the same reason, we do not show the “Modified-Jones model”, since it is the same as in Jones (1991).

4.2.4. Industry structure

The cross-sectional regression of accrual models should control for industry effects, following current trends in the literature. This involves the adoption of an industry structure. The classification widely used in the literature is that of the two-digit SIC code, although the drawback of this classification is the small number of observations per year that some industries have.²² To avoid this problem, an important factor in (piecewise) models with a larger number of variables, we adopt the classification used in Barth et al. (1999). Exhibit 2, Panel B, presents the SIC code composition of each of the fifteen industries in the classification.²³

5. Sample selection and descriptive statistics

Table 1 describes the sample selection. All the firms included in the 2004 version of *Compustat Primary, Secondary and Tertiary, Full Coverage and Research Annual Industrial Files* were used. Because cash flow from operations (#308) disclosed in the Cash Flow Statement (SFAS 95) is unavailable prior to 1987, the sample covers the

²² Ball and Shivakumar (2005a) used 3 digits, and imposed a minimum of 30 observations per industry, but did not control for yearly effects, a common feature of this type of empirical research.

²³ Given the specific research design used in the current study, where the piecewise linear version of each model (controlling for the impact of conservatism) is tested against its own basic version, the industry structure, whatever it may be, does not seem to have a significant impact on the results.

period 1987-2003.²⁴ As in Barth et al. (2001), their different accruals structure justifies the exclusion of firms from financial industries, codes 12 and 13 (Exhibit 2, Panel B). The residual character of industry 15 (“other”), which potentially affects the reliability of DAC cross-sectional estimates, also led to its exclusion from the sample (e.g. Barth et al., 1999).²⁵ This set of procedures originated a raw sample with 275,472 firm-years. All variables in the sample are deflated by Average Total Assets to mitigate potential heteroscedasticity in the variables (e.g. Gore et al., 2001).²⁶ After deleting missing observations, and mitigating the effect of potential outliers through the yearly trimming of the top and bottom 1 percent of each variable (e.g. Barth et al., 1998), the final working sample has 71,409 firm-years.^{27 28}

Table 2, Panel A, contains some basic descriptive statistics. The mean of TACC_D is negative, and the median is also negative, but close to zero. This situation shows some left skewness, consistent with the asymmetric conservative recognition of unrealized economic losses and gains (e.g. Basu, 1997; Ball and Shivakumar, 2005b) and is common to the samples of other related studies (e.g. Barth et al., 1999; Thomas and Zhang, 2000). As expected, the change in revenue (ΔREV) and returns (RET_t) show some right skewness. However, the sub-sample of negative returns (RET_n)

²⁴ Because of the role cash flow plays in the analysis, we decided not to mix balance sheet and SFAS 95-cash-flow-data measures of this variable. We attempted to avoid potential measurement errors arising from the use of the balance sheet measure (Hribar and Collins, 2002). This attempt was successful for TACC and TACC_D (using the difference between earnings and cash flows), but not for WCA (because of the difficulty to get in the database an estimate for the long term accruals).

²⁵ Some studies do not include the Utilities industry because of the regulated nature of its firms (e.g. Burgstahler and Dichev, 1997; Givoly and Hayn, 2000). However, as they were deregulated in 1991 (Blacconiere et al., 2000), we decided to retain them in the sample. Performing the analysis without utility industry firms slightly reduces the final sample size but does not materially affect the results.

²⁶ It is quite common for variables in accrual models to be deflated by lagged total assets (e.g. Thomas and Zhang, 2000; Gore et al., 2001). We replicated the analysis using both the deflator variable and the lagged market value (e.g. Guay et al., 1996) and find no significant impact on the results.

²⁷ The sample used to test the “cash flow” and “Dechow and Dichev, 2002” models has 61,720 firm-years only and has been assembled in the same way as that described above. To test for robustness we also repeated the whole analysis using a common sample with 59,455 firm-years.

²⁸ Performing the analysis for the non-trimmed sample does not materially affect the results.

shows strong left skewness.²⁹ This indicates that the distributions of positive returns and TACC_D do not have a similar shape.

Panel B shows the correlations amongst the main variables. The higher correlations appear in variables that are strongly related in accounting terms, such as EBEI, CFO and accrual measures (TACC_D and WCA). The correlation of RET_t with the accounting variables is fairly small and tends not to surpass 10 percent. It is even smaller for both measures of accruals (around 3 percent for TACC_D). However, the correlations are much higher when we consider only RET_n . For example, the correlations with EBEI, TACC_D and CFO are above 20 percent. This evidence is consistent with that in Panel A for the differences in the distributions of RET_t and RET_n relative to accounting variables. A relatively high positive correlation between RET_n and CFO is not consistent with conditional conservatism and may reflect the existence in the former variable of changes in economic rents (Roychowdhury and Watts, 2005). A positive correlation between CFO and TACC_D supports such an interpretation. The correlation of ΔREV with both measures of accruals is fairly low, and slightly higher for WCA than for TACC_D. This suggests that the change in revenue explains current accruals better than long-term accruals other than depreciation.

The sample and industry structures (untabulated) match our expectations. As in Givoly and Hayn (2000), the number of observations increases throughout the period, evolving smoothly from around 4 percent in 1989 up to 7 percent in 2003. The industry structure shows that one industry, code 7 - Durable Manufactures, dominates

²⁹ To be precise, RET_n corresponds to the stock returns sample after the positive returns have been set equal to zero. In this way, RET_n emulates the variable D1_RET in piecewise accrual models.

all others in terms of size. Other research using the same industry classification shows a similar pattern for different time periods (e.g. Barth et al., 1999; Moreira, 2002).

6. Empirical results

We now discuss the main results of the analysis.³⁰

6.1. Piecewise linear accrual models that control for the asymmetric recognition of gains and losses

Table 3, Panel A provides a comparison of the results for the Jones (1991) model, and its piecewise linear version (EXTJON), using pooled regressions (left columns) and year-industry specific regressions (right columns). The measure of accruals is TACC_D. It can be observed from the table that the signs of the variables tend to be broadly consistent with those discussed earlier in sub-section 3.1. For both regressing techniques, the coefficients on good news (RET, stock returns) although statistically significant are very small and close to zero. The coefficients on the incremental impact of BN (D1_RET) are positive and highly significant, also consistent with our expectation. This means that BN have a negative impact on TACC_D, and that the GN impact is almost non-existent, both consistent with the asymmetric recognition of gains and losses underlying conditional conservatism. The coefficient on Δ REV also coincides with our expectation and remains quite stable when controlling for GN and BN, lending support to the assumption about the independence of this variable from RET.

³⁰ For the sake of parsimony, throughout this section the statistical and graphical analyses of the Modified-Jones model (Dechow et al., 1995a) and of the “margin model” (Peasnell et al., 2000) are not tabulated or discussed. They very closely follow those of Jones (1991).

The explanatory power of the piecewise linear versions, assessed by the R^2 metrics, is higher than that of the basic accrual model. For the Jones (1991) model it increases by 16 and 29 percent for the pooled regression and year-industry specific regressions respectively. Ball and Shivakumar (2005a) show similar evidence and implicitly interpret it as an improvement in the quality of DAC estimates. We do not think that such a conclusion can be drawn from the global R^2 . We return to this issue below.

Panel B presents similar results for the cash flow and Dechow and Dichev (2002) models, using pooled regressions. There are two main differences from the results in Panel A. First, in the cash flow model, the coefficient on current CFO is positive. This result goes against our expectation of a negative coefficient and the evidence in Ball and Shivakumar (2005a). These authors argue that in some particular cases the relationship between accruals and CFO may be positive. However, despite the positive correlation between CFO and TACC_D discussed above in Table 2, Panel B, we do not consider that their argument explains the positive coefficient in this specific case. Untabulated results for the year-industry regression technique show that the coefficient on CFO is negative as expected. The second difference is that controlling for GN and BN involves a reduction in the size of the coefficient on current CFO, consistent with some degree of correlation between this variable and RET. The descriptive statistics in Table 2, Panel B, reveal this.

Thus, the evidence in Table 3 concerning the piecewise linear accrual models is broadly consistent with the expected asymmetric impact of conditional conservatism on accruals. BN are more timely recognized in accruals than GN, and

For the same reason we limit our comments to the results for the TACC_D measure.

the overall results follow the evidence in Basu (1997), Pope and Walker (1999), Moreira (2002) and Ball and Shivakumar (2005a), amongst others.

6.2. Controlling for the asymmetric recognition of gains and losses: the statistical impact on discretionary accrual estimates

The evidence discussed so far shows that controlling for GN and BN increases the explanatory power of accrual models. Given that such models are regressed cross-sectionally and discretionary accruals (DAC) are computed for each firm based upon year-industry coefficients, one cannot conclude that such an increase in the R^2 implies higher quality DAC estimates.

In sub-section 2.2 we discussed the expected sign of the measurement error in DAC estimates: for GN firms an overstatement, and an understatement for BN firms. This means that controlling for the asymmetric recognition of gains and losses underlying conditional conservatism must produce a negative change in DAC estimates for GN firms ($\Delta DAC < 0$) and a positive change for BN ($\Delta DAC > 0$).

Table 4 contains the changes in DAC (ΔDAC) estimates for the three accrual models we have specifically discussed in previous sub-sections. For each of them and the whole distributions we provide quartiles of ΔDAC deriving from controlling for GN and BN. For example, the median of the GN sample and the Jones (1991) model (-0.01) corresponds to the difference between the median of the distribution of DAC that controls for conservatism (0.005) and the median of the distribution whose estimates have not been controlled for (0.015).

At first sight, it would appear that the sign of ΔDAC entirely supports our predictions. There is a positive change for BN firms and a negative one for GN firms. The change is negative for the global sample given the relative size of ΔDAC for

each of the other two sub-samples. ΔDAC medians are all different from zero at the conventional levels of confidence.

The absolute size of ΔDAC is around 1 percent of Average Total Assets (ATA) for GN firms, and slightly lower for BN firms. The overall change, for the global sample, is around 0.5 percent of ATA. In both cases, it is not a negligible measurement error. The size of ΔDAC is relatively constant throughout the distribution of GN firms for all models, but for BN firms it decreases in size as we move from the left to the right of the ΔDAC distribution. This shape is more visible in the Jones (1991) model distribution.³¹

Although we did not make any specific prediction for the shape of ΔDAC distribution, we were to a certain extent expecting the absolute measurement error to be quite stable across the BN sub-sample, as it is in the GN sub-sample. When we trim the sample and retain only firms with deflated earnings in the interval [-25%; +25%], the first quartile of the BN sub-sample becomes negative (untabulated result). When this interval is restricted even further, the effect is more visible and even the median becomes negative. However, for the GN sub-sample the moments of the ΔDAC distribution are not significantly affected by any trimming. Thus, contrary to our preliminary conclusion above, these results do not fully support our expectation of positive ΔDAC for all moments of the BN sub-sample.

6.3. Controlling for the asymmetric recognition of gains and losses: a graphical analysis

The evidence provided in Exhibit 4 corroborates what has been said in the previous sub-section about the impact of controlling for good and bad news on DAC

estimation.³² Figure 3.1 shows the distribution of DAC by intervals of deflated earnings.³³ The graph plots ΔDAC , i.e. the difference between DAC estimates controlled (C) and not controlled (NC) for BN (dashed line) and GN (solid line). The horizontal (zero) axis of each graph corresponds to a situation where C and NC estimates are equal (zero difference), and the vertical distance between the line and the axis is the effect of controlling for conservatism news (ΔDAC).

In section 3 and sub-section 4.1 we discussed how the independence between basic accrual drivers and the variables controlling for the asymmetric recognition of gains and losses (GN/BN) in the piecewise linear accrual models allows us to obtain ΔDAC reflecting only the effect of this control.³⁴ Thus, the shape of the plotted lines tends to be driven only by the relationship between GN/BN and the accrual measure (TACC_D). It is here that the explanation for such a shape must be sought.

From the lower part of the graph it can be seen that GN-C tends to be smaller than GN-NC ($\Delta DAC < 0$) by around 1 percent of Average Total Assets in the central part of the distribution. This graphical evidence is consistent with that of Table 4 and fully supports our prediction on the sign of the measurement error in DAC estimates for GN firms.

The dashed line in the upper part of the graph represents ΔDAC for BN firms. The left part shows $\Delta DAC > 0$, consistent with our prediction that DAC not controlled for conservatism effects are understated. However, we were not expecting ΔDAC to decrease from the left to the right of the earnings distribution. Even more

³¹ This slightly different shape across models seems to be related to differences in the correlation of RET with the other accruals drivers (change in sales for the Jones (1991) model; cash flow for the other two models).

³² For the sake of parsimony this discussion refers only to the mean. However, the evidence for the median is not qualitatively different.

³³ The intervals are 0.005 width and the earnings deflator is Average Total Assets (ATA). We constrained the distribution to +/- 25 percent for graphical reasons only.

³⁴ A very low statistical correlation for the Jones (1991) model supports this assumption.

surprising is the negative change that occurs on most of the positive side of this distribution. Exhibit 5 shows comparatively similar graphs for the Jones (1991) model (Fig. 4.1) and the Dechow and Dichev (2002) model (Fig. 4.2). These graphs are derived from a common sample with 59,455 firm-years.³⁵

A potential explanation for this unexpected outcome may be the market over-reaction to firms' unexpected news. This effect is documented in the literature. For example, Dechow et al. (2000) refer to it as the "torpedo effect" and discuss it for the specific case of firms failing to meet analysts' forecasts. Thus, mainly for firms reporting positive earnings (and/or accruals) there may be negative returns that the current analysis interprets as reflecting BN and are to a certain extent due to this over-reaction.³⁶

Another potential and related explanation may be earnings management that investors perceive as such. Firms tend to avoid reporting losses through fear of market (over)reaction and also because of the effect losses may have on their cost of capital (e.g. Burgstahler and Dichev, 1997). They achieve this by managing accruals upwards. Although they may end up on the right hand side of the earnings distribution, if investors perceive this manipulation, firms will be penalized. Also in this case, we may have negative returns that do not translate into a negative impact on accounting accruals, i.e. negative returns that are not related to conservatism bad news. Nevertheless, this proposed explanation tends not to be convincing for firms on the RHS of the distribution and far from its center.

³⁵ For the Dechow and Dichev (2002) model (Fig. 4.2), ΔDAC are slightly positive on the right hand side of the distribution. Although this result is closer to what we would expect, it seems to be partly determined by the correlation between RET and the accrual driver (CFO). In the discussion of Table 3 results in sub-section 6.1, we highlighted the change in the coefficients of CFO when good and bad news are controlled for. Thus, in Figure 4.2 the vertical difference between the lines and the horizontal axis may not be completely related to this control. Nevertheless, even in Figure 4.2 there are differences between the left and the right hand side of the distribution that need to be explained.

A third and more plausible explanation builds on the relationship between the role of accounting and the market value of equity. Roychowdhury and Watts (2005) discuss the theory of conservatism and show that if accounting is not intended to report the value of the firm, then the market value of equity is not the appropriate proxy for the asymmetric impact of conservatism on earnings (accruals). A change in the market value of equity reflects not only the change in the value of separable net assets, but also potential changes in economic rents related to non-separable assets (goodwill). Because only the first of these changes is caught by accounting (conditional conservatism), the relationship between earnings (accruals) and RET weakens when changes in the market value of equity reflect changes in these rents. One may expect that throughout the earnings distribution, the proportion of rents in RET will not be constant and thus a non-linear relationship between RET and accruals will appear.

To summarize, all the above explanations suggest a non-linear relationship between accruals and negative returns throughout the earnings distribution. We now discuss some statistical evidence that lends support to such a type of relationship between the proxy for BN and accruals (earnings).

6.4. A non-linear relationship between (the proxy for) bad news and accruals

Table 5 displays GN and BN coefficients by sign of accruals and earnings.³⁶ As the empirical evidence is very similar for all the three models, we discuss the Jones

³⁶ The evidence in Table 5, showing a negative coefficient for BN and positive accruals (earnings) seems to support this explanation. Such evidence implies that on average accruals show a positive change (2.7%) for a negative return (-1%), inconsistent with a conservatism explanation.

³⁷ Similar evidence is produced when we run the models by (up to 5) ranks of these variables.

(1991) model, and the sign of accruals as the partitioning variable, only.^{38 39} It is apparent that the proxies for GN and BN have different relationships with accruals. For GN the coefficients are close to zero (-0.013 and 0.005, for negative and positive accruals respectively), consistent with the intuition underlying conditional conservatism, and not very different across classes based on the sign of accruals.

Conversely, for BN the situation is mixed. For negative accruals, the coefficient is high (0.199) and different from that for positive accruals (-0.027), which is much lower and closer to zero. As mentioned above, the sign of the latter is inconsistent with a conditional conservatism explanation.

This evidence therefore supports the notion that the relationship between the proxy for BN and accruals (earnings) is non-linear, being consistent with the explanation offered in the previous sub-section. From a statistical perspective, when no control for the sign of accruals (TACC_D) is undertaken, the “average coefficient”⁴⁰ on BN is understated for firms with negative TACC_D, and overstated for firms with positive TACC_D. This evidence seems to be consistent with the findings of Roychowdhury and Watts (2005). They show that for firms with higher market-to-book ratios, potentially those with higher earnings, the rents of non-separable assets are higher and the relationship between earnings (accruals) and RET is weaker. Hence, this evidence lends support to the idea that this relationship is not linear throughout the earnings distribution.

In sum, the advantage of a piecewise linear model like those discussed in the current paper is that it controls for one type of non-linearity, the asymmetric impact of

³⁸ Untabulated results show that running the piecewise accrual models by ranks of CFO gives relatively stable coefficients across ranks for GN and BN. This means that the non-linearity of BN for the earnings distribution is mainly driven by its non-linearity with accruals.

³⁹ For negative accruals and earnings, the coefficients on BN for CF and DD models are slightly smaller than that of Jones. Also in this case, the difference may be related to the correlation between RET and CFO.

conditional conservatism. However, it does not control for another type of non-linearity, the relationship between the proxy for BN and accruals, which is different throughout the distribution of accruals (earnings). The result is that it introduces (or does not prevent) a measurement error in DAC estimates.⁴¹ Therefore, the evidence does not support the hypothesis that DAC estimates computed under a piecewise linear model that controls for the asymmetric recognition of gains and losses underlying conservatism, mainly those of BN firms, are of better quality than DAC estimates derived from basic accrual models.

7. Sensitivity tests

This section summarizes the main additional analyses performed to test the robustness of the results. The central role in the analysis of classifying firms according to the type of conservatism news they received during the period recommended the usage of alternative measures. We used two industry-related stock abnormal return measures as alternative proxies for the asymmetric recognition of gains and losses. However, re-performing the analysis for these proxies did not qualitatively change the conclusions.

Following the suggestion in Ball and Shivakumar (2005a), we also adopted the sign of (change in) CFO as a proxy for the type of conservatism news firms faced during the period.⁴² The evidence we obtained differs greatly from what we had

⁴⁰ Similarly to the discussion in sub-section 2.2, the “average coefficient” is the coefficient estimated under a linear regression that does not control for the non-linearity within BN.

⁴¹ We attempted to control for the sign of accruals through the use of an interactive variable $D1_Ret_A2$, which is the product of $D1_RET$ (the incremental impact of BN) and $A2$ (a dummy variable controlling for the sign of accruals). However, because the sign of accruals is correlated with the accrual drivers (change in sales in Jones, 2001), the methodology we use is no longer appropriate to measure the effects of controlling for conditional conservatism. The results we obtained vary only slightly from those reported, but are less reliable because of that correlation.

⁴² Given the expected independence between the impact of conditional conservatism and cash flow, discussed in Section 2, it is difficult to find an argument to support the use of CFO (or its change) as a

expected. For example, using the the Jones (1991) model, the graphical analysis (not depicted) revealed GN firms as having positive mean ΔDAC , and BN having negative, precisely the opposite result to the one we were expecting.⁴³

We tested for different accrual measures. In addition to TACC_D, whose results have been tabulated, we also used TACC (i.e., total accruals inclusive of depreciation charge) and WCA (working capital accruals). The empirical evidence is not qualitatively different from that reported in the paper.

Another series of tests included the use of non-trimmed samples; lagged market value and lagged total assets as deflators; the exclusion of firms from the Utilities industry because of the potential impact of regulation; different solutions for the Jones (1991) model intercept; no control for yearly and industry intercept effects when models were tested with pooled samples; different interval widths in the graphical analyses; varying numbers of rankings to test the non-linearity of the relationship between the BN proxy variable and accruals. In all these analyses the results were not qualitatively different from those reported.

8. Conclusion

The current study begins by discussing the sign of the measurement error in DAC estimates in accrual models that do not control for the impact of the asymmetric recognition of gains and losses (conditional conservatism) on accruals. Based on a statistical reasoning and a Jones-type model (1991) accrual structure we find that this

proxy for conservatism news. We discuss this issue above. Some of the coefficients tabulated in Ball and Shivakumar (2005a), and in many of our untabulated tests, do not appear to support a conditional conservatism explanation.

⁴³ For CF and DD models, given the correlation between the dummy variable controlling for the asymmetric recognition of gains and losses (the sign of CFO/change in CFO) and accrual drivers

measurement error varies according to the type of events (GN/BN) firms faced during the year. Firms with GN are expected to have overstated DAC estimates, a positive error. Firms with BN are expected to face the opposite situation, with understated DAC implying a negative error. This is an important and original result. To date the literature has not provided an assessment of the consequences to DAC estimates arising from the absence of controlling for the asymmetric impact of conservatism.

Based on this result, the second aim of the paper was to assess whether piecewise linear accrual models that control for the impact of this asymmetric recognition (e.g. Moreira, 2002; Ball and Shivakumar, 2005a) are able to offset such measurement error. The evidence shows that these models increase the mean size of the estimates in GN firms by around 1 percent of Average Total Assets ($\Delta DAC < 0$), throughout the earnings distribution, consistent with our prediction.

For BN firms the situation is mixed. The left part of this distribution shows positive ΔDAC (around 2 percent), also consistent with our prediction that DAC estimates of traditional models are understated. The right part shows $\Delta DAC < 0$ (around 0.2 percent), inconsistent with the expected impact of controlling for the asymmetric recognition of gains and losses underlying conservatism. This result seems to be related to a non-linear relationship between the proxy for BN and accruals. The fact that RET may reflect changes in economic rents not related to changes in separable assets (Roychowdhury and Watts, 2005) is one of the most plausible explanations for this non-linearity. Thus, the poor quality of the proxy for the asymmetric impact of conservatism on earnings (accruals) is not overcome by piecewise linear accrual models and thus DAC estimates, mainly those of BN firms, contain a non-systematic measurement error. This is also an important contribution, as

(CFO), our methodology is not deemed appropriate to conduct the tests seeking evidence on the sign of

it enhances our understanding of the relationship between conditional conservatism and the limitations in controlling for it.

This paper can thus be credited of two main contributions. Firstly, it introduces to discussion a new question, on the quality of current accrual models that attempt to control for the asymmetric recognition of gains and losses. Secondly, it adds to the literature on the poor quality of DAC estimates computed by traditional accrual models, and shows evidence of the measurement error they contain. In summary, the findings of the current study are of importance for future research on the estimation of DAC and detection of earnings management. For accounting researchers in particular, they may help in re-interpreting findings from earlier studies using discretionary accruals, and highlight the insufficiencies of the technology available to produce such estimates.

Healy (1996:113), in his discussion of Guay et al. (1996) paper, highlights the importance of "... improving the existing accrual models by incorporating the effect of accounting principles. For example, the conservatism doctrine, which requires firms to recognize gains and losses asymmetrically...". The first step has been taken by Moreira (2002) and Ball and Shivakumar (2005a), with their proposal of piecewise linear models designed to control for the asymmetric impact of conditional conservatism. This paper presented evidence on the insufficiencies of such solutions. Further steps are needed on what may be a long journey in the search for better proxies for the impact on earnings (accruals) of the asymmetric recognition of gains and losses underlying conditional conservatism.

the measurement error in DAC. We therefore did not perform the analysis for these proxies.

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Table 1: **Sample selection. Period 1987/2003**

<i>Description</i>	N. firm-years
<i>COMPUSTAT (2004) Primary, Secondary, and Tertiary, Full Coverage, and Research Annual Industrial Files, after lagging variables and deleting financial, real estate and “others” industries (see Exhibit 2, panel B)</i>	275,472
After deleting missing observations	77,336
Basic working sample after trimming all deflated (by Average Total Assets) variables by 1% at top and bottom	71,409

Table 2: **Descriptive statistics. Pairwise correlations.**

Panel A: Descriptive statistics (71,409 firm-years, deflated by Average Total Assets)

Variable	MEAN	STD	Q3	MEDIAN	Q1
EBEI	-0.079	0.393	0.070	0.024	-0.082
TACC_D	-0.033	0.197	0.034	-0.006	-0.055
WCA	0.002	0.109	0.046	0.005	-0.032
Δ REV	0.092	0.309	0.213	0.066	-0.026
CFO	0.008	0.280	0.125	0.063	-0.021
Δ CFO	0.013	0.229	0.061	0.008	-0.044
PPE	0.573	0.395	0.824	0.485	0.257
RET _t	0.159	1.077	0.339	-0.015	-0.337
RET _n	-0.186	0.251	0.000	-0.015	-0.337

Panel B: Correlations: Pearson (above) / Spearman (below) [71,409 firm-years]

Variable	EBEI	TACC_D	WCA	Δ REV	CFO	Δ CFO	PPE	RET _t	RET _n
EBEI		0.719	0.283	0.145	0.860	0.011	0.096	0.031	0.264
TACC_D	0.422		0.489	0.161	0.279	-0.164	0.026	0.027	0.199
WCA	0.290	0.670		0.322	0.039	-0.164	-0.039	0.067	0.143
Δ REV	0.363	0.265	0.354		0.088	0.072	-0.055	0.097	0.159
CFO	0.700	-0.153	-0.136	0.167		0.141	0.172	0.023	0.213
Δ CFO	0.179	-0.298	-0.235	0.172	0.425		0.011	0.044	0.026
PPE	0.121	-0.011	-0.052	-0.061	0.292	0.026		-0.000	0.131
RET _t	0.295	0.139	0.107	0.189	0.216	0.106	0.078		0.471
RET _n	0.331	0.154	0.108	0.175	0.250	0.092	0.118	0.939	

Note: RET are market returns estimated using the *Compustat* fiscal-year-end closing price (#199) and dividends per share (#26). RET_t are based on the whole sample of stock returns, and RET_n on a sample that has positive returns set to zero. EBEI is earnings before extraordinary items and discontinued operations; TACC_D is total accruals minus depreciation; WCA is working capital accruals; Δ REV is change in revenue; CFO is cash flow from operations; PPE is property, plant and equipment (#7). All variables are deflated by Average Total Assets (except RET). Bold numbers are not significantly different from zero at less than 5%.

Table 3: **Comparison of linear accrual models with their piecewise linear versions controlling for the asymmetric recognition of gains and losses.**

Panel A: Jones (1991) model *versus* its piecewise linear version (EXTJON). [71,409 firm-years]

$$\text{EXTJON: } ACC_t = \beta_0 + \beta_1 \left[\frac{1}{ATA} \right] + \beta_2 \Delta REV_t + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \xi_t$$

Variable	Expect. Sign	POOLED REGRESSIONS		YEAR-INDUSTRY SPECIFIC REGRESSIONS	
		[1] JONES (t-stat)	[2] EXTJON (t-stat)	[3] JONES (t-stat)	[4] EXTJON (t-stat)
Intercept	?	0.004 (0.54)	0.017 (2.1)	-0.022 (-12.1)	-0.008 (-5.0)
[1/ATA]	?	-0.177 (-84.32)	-0.172 (-82.7)	-0.190 (-10.6)	-0.167 (-9.8)
ΔREV_t	+	0.083 (36.8)	0.070 (31.1)	0.072 (13.1)	0.062 (10.7)
D1	?		0.022 (11.1)		0.016 (5.5)
RET_t	0		-0.006 (-9.0)		-0.007 (-2.9)
$D1_RET_t$	+		0.165 (40.2)		0.138 (8.7)
AdjR ² (%)		14.8	17.1	11.7	15.1

Note: The accrual measure is TACC_D; ATA is Average Total Assets; RET are stock returns; D1 is a dummy variable that takes value 1 if RET<0, value 0 otherwise; and D1_RET is an interactive variable equal to D1 times RET. EXTJON is the Jones (1991) piecewise linear model controlling for good (GN) and bad news (BN). The results have been controlled for industry and yearly intercept effects (not tabulated). The t-statistics (estimated using Fama and McBeth, 1973 methodology for year-industry specific regressions they) are given in parenthesis. The definition of other variables is as in Table 2 and Exhibit 2.

Panel B: “Cash Flow” (CF) and “Dechow and Dichev (2002)” (DD) accrual models and their piecewise linear versions. [61,720 firm-years]

$$\text{CF: } ACC_t = \alpha_0 + \alpha_1 CFO_t + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \vartheta_t$$

$$\text{DD: } ACC_t = \phi_0 + \phi_1 CFO_t + \phi_2 CFO_{t-1} + \phi_3 CFO_{t+1} + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \mu_t$$

POOLED REGRESSIONS					
Variable	Expect. Sign	CASH FLOW MODEL (CF)		DECHOW-DICHEV MODEL (DD)	
		[1] (t-stat)	[2] (t-stat)	[3] (t-stat)	[4] (t-stat)
Intercept	?	-0.005 (-0.75)	0.004 (0.6)	-0.012 (-1.7)	-0.004 (-0.6)
CFO _t	-	0.155 (47.11)	0.123 (36.8)	-0.179 (-33.5)	-0.213 (-39.8)
CFO _{t-1}	+			0.265 (61.8)	0.262 (61.6)
CFO _{t+1}	+			0.169 (39.5)	0.177 (41.8)
D1	?		0.019 (9.9)		0.018 (9.8)
RET _t	0		-0.001 (-1.4)		0.004 (4.7)
D1_RET _t	+		0.135 (33.2)		0.124 (31.9)
AdjR ² (%)		8.3	10.5	16.6	18.8

Note: The accrual measure is TACC_D, RET are market returns, D1 is a dummy variable that takes value 1 if RET<0, value 0 otherwise; D1_RET is an interactive variable equal to D1 times RET; and CFO is cash flow from operations. The results have been controlled for industry and yearly intercept effects (not tabulated). The t-statistics are displayed in parenthesis. The definition of other variables is as in Table 2 and Exhibit 2.

Table 4: Differences in abnormal accruals estimates arising from controlling for the asymmetric recognition of gains and losses, for different samples.

Distribution	Expect. Sign	Δ ABNORMAL ACCRUALS (Δ DAC)			
		EXTJON [1]	CF [2]	DD [3]	Pr [1],[2],[3]
Global Sample:					
3 rd quartile	?	- 0.002	- 0.000	- 0.000	
Median	?	- 0.005	- 0.003	- 0.002	*
1 st quartile	?	- 0.005	- 0.003	- 0.003	
“Good News” sample [GN]:					
3 rd quartile	-	- 0.012	- 0.014	- 0.015	
Median	-	- 0.010	- 0.011	- 0.010	*
1 st quartile	-	- 0.010	- 0.012	- 0.012	
“Bad news” sample [BN]:					
3 rd quartile	+	0.010	0.012	0.013	
Median	+	0.002	0.007	0.008	*
1 st quartile	+	0.004	0.009	0.012	
<i>Pr</i> Median [GN]=[BN]		< 0.0001	< 0.0001	< 0.0001	

Notes:

- 1) EXTJON stands for the piecewise linear version of the Jones (1991) model; CF for the Cash Flow model and DD for the Dechow and Dichev (2002) model. They are all regressed cross-sectionally by year and industry;
- 2) “ Δ Abnormal Accruals” are the differences between the values of the quartiles for the distribution of abnormal accruals estimated using the basic accrual models and the same values when piecewise linear versions controlling for good and bad news are used. For example, for EXTJON and GN, the median value -0,01 is the difference between the median of the distribution of DAC estimated under control for good and bad news, and the same moment of the distribution of DAC when no control is undertaken;
- 3) The accrual measure is TACC_D. Variables and model definitions are as in Exhibits 2 and 3;
- 4) Pr represents the probabilities attached to Wilcoxon tests for the equality in median differences. “ * ” indicates that the difference is statistically significant at less than 1 percent;
- 5) For “Global”, GN and BN samples, the number of observations is 71,409; 35,060 and 36,349 for Jones; 61,720, 29,378 and 32,342 for CF and DD models.

Table 5: Good and bad news coefficients by sign of accruals and earnings.

$$\text{EXTJON: } ACC_t = \beta_0 + \beta_1 \left[\frac{1}{ATA} \right] + \beta_2 \Delta REV_t + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \xi_t$$

$$\text{CF: } ACC_t = \alpha_0 + \alpha_1 CFO_t + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \vartheta_t$$

$$\text{DD: } ACC_t = \phi_0 + \phi_1 CFO_t + \phi_2 CFO_{t-1} + \phi_3 CFO_{t+1} + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \mu_t$$

Variables / / Coefficients	EXTJON		CF		DD	
	Sub-sample Negative	Sub-sample Positive	Sub-sample Negative	Sub-sample Positive	Sub-sample Negative	Sub-sample Positive
Accruals						
D1 (γ_1)	0.026	-0.004	0.020	-0.003	0.019	-0.002
Good news (γ_2)	-0.013	0.005	-0.009	0.005	-0.005	0.007
Bad News ($\gamma_2 + \gamma_3$)	0.199	-0.027	0.125	0.005	0.123	0.007
AdjR2 (%)	20.9	9.4	21.6	18.4	26.2	21.2
N. Obs.	38,937	32,472	32,654	29,066	32,654	29,066
Earnings						
D1 (γ_1)	0.025	0.000	0.024	-0.002	0.021	-0.002
Good news (γ_2)	-0.008	0.002	-0.003	0.006	0.001	0.008
Bad News ($\gamma_2 + \gamma_3$)	0.152	-0.020	0.120	0.002	0.126	-0.001
AdjR2 (%)	14.6	6.8	8.5	54.7	15.1	57.7
N. Obs.	27,479	43,930	22,885	38,835	22,885	38,835

Notes:

- 1) EXTJON stands for the piecewise linear version of the Jones (1991) model; CF for the Cash Flow model and DD for the Dechow and Dichev (2002) model. The coefficients are from regressions by year and industry;
- 2) D1 is a dummy variable that takes value 1 if $RET < 0$, zero otherwise; RET are market returns estimated using the *Compustat* fiscal-year-end closing price (#199) and dividends per share (#26); D1_RET is an interactive variable equal to D1 times RET; accruals measure is TACC_D and Earnings is EBEL;
- 3) Bold numbers are not significantly different from zero at less than 5%.

Exhibit 1: **Traditional accrual models: the impact of uncorrelated omitted variables on discretionary accrual estimates**

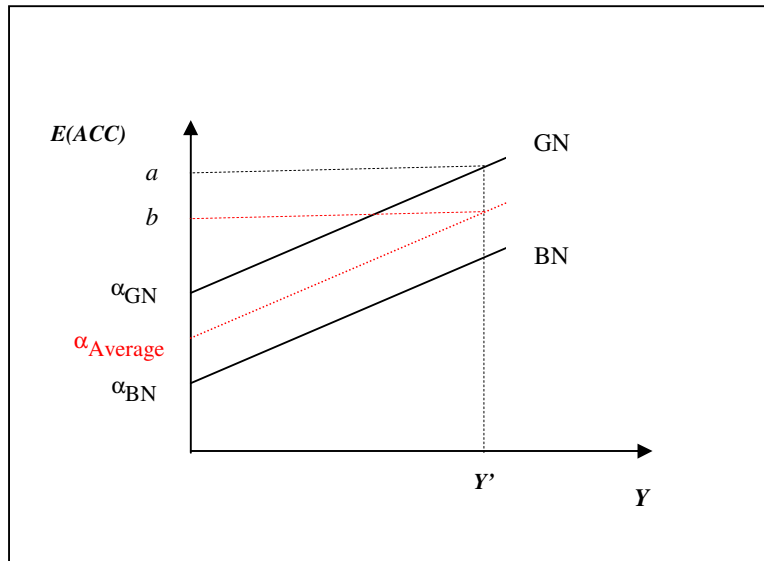


Fig. 1: When accrual models do not control for conservatism, and firms have both GN and BN over time, the size of the intercept will pick up the effect of the uncorrelated omitted variables and lie somewhere in between the extreme cases characterized by having only one type of news ($\alpha_{Average}$). This intercept is understated for GN firms and overstated for BN firms. The consequences are as follows. For a GN firm and a given value of the accrual driver (Y'), the estimated normal accruals [$E(ACC)$] is “ b ”. The vertical difference between “ b ” and “ a ” is the understatement in normal accruals, translating into an overstatement of DAC (not visible in the graph). For BN firms the opposite occurs, and DAC are understated.

Exhibit 2: **Earnings structure and definition of variables. Industry composition.**

Panel A: Earnings Structure and definition of variables

	Variable	Description	Compustat annual codes
	CFO	Cash flow from operations	#308
	WCA	(non-cash) Working capital accruals	($\Delta\#4-\Delta\#1$)-($\Delta\#5-\Delta\#34-\Delta\#71$)
	TACC	Total accruals	#123-#308
	TACC_D	Total Accruals minus Depreciation	#123-#308+#14
	EBEI	Earnings before ext. items disc. operat.	#123
\pm	CR	Cash received	#12- $\Delta\#151$
+	Δ REC	Change in trade receivables	$\Delta\#151$
=	REV	Revenue (sales)	#12
-	EXP	Expenses (administrative and selling)	#12-#13
-	DEP	Depreciation and amortization	#14
-	OER	Other expenses net of other revenues	#13-#123-#14
=	EBEI	Earnings before ext. items disc. operations	#123

Note: Compustat codes: #1 (cash and short-term investments); #4 (total current assets); #5 (total current liabilities); #34 (debt in current liabilities); #71 (income taxes payable); #13 (operating income before depreciation).

Panel B: Industry composition (Barth et al., 1999)

Code	Industry	Primary Sic Codes
1	Mining and Construction	1000-1999, except 1300-1399
2	Food	2000-2111
3	Textiles, printing and publishing	2200-2799
4	Chemicals	2800-2824, and 2840-2899
5	Pharmaceuticals	2830-2836
6	Extractive Industries	2900-2999, and 1300-1399
7	Durable Manufacturers	3000-3999, except 3570-3579, and 3670-3679
8	Computers	7370-7379, 3570-3579, and 3670-3679
9	Transportation	4000-4899
10	Utilities	4900-4999
11	Retail	5000-5999
12	Financial Institutions	6000-6411
13	Insurance and real estate	6500-6999
14	Services	7000-8999, except 7370-7379
15	Other	> 9000

Exhibit 3: Specification of accrual models.

Jones (1991) model [JONES]

$$ACC_t = \beta_0 + \beta_1 \left[\frac{1}{defl} \right] + \beta_2 \Delta REV_t + \varepsilon_t$$

Piecewise linear Jones (1991) model [EXTJON]

$$ACC_t = \beta_0 + \beta_1 \left[\frac{1}{defl} \right] + \beta_2 \Delta REV_t + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \xi_t$$

Piecewise linear “margin model” (Peasnell, et al. 2000) [PPY]

$$ACC_t = \gamma_0 + \gamma_1 REV_t + \gamma_2 CR_t + \gamma_3 D1 + \gamma_4 RET_t + \gamma_5 D1_RET_t + \xi_t$$

Piecewise linear Cash Flow model [CF]

$$ACC_t = \alpha_0 + \alpha_1 CFO_t + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \vartheta_t$$

Piecewise linear Dechow and Dichev (2002) model [DD]

$$ACC_t = \phi_0 + \phi_1 CFO_t + \phi_2 CFO_{t-1} + \phi_3 CFO_{t+1} + \gamma_1 D1 + \gamma_2 RET_t + \gamma_3 D1_RET_t + \mu_t$$

Notes:

- 1) Definition of variables: RET are stock returns estimated using the *Compustat* fiscal-year-end closing price (#199) and dividends per share (#26); D1 is a dummy variable taking value one if $RET < 0$, zero otherwise; D1_RET is an interactive variable equal to D1 times RET; ACC is a measure of accruals; *defl* is the deflator, i.e. Average Total Assets; other variables are as in Exhibit 2, panel A;
- 2) For the sake of parsimony the Modified-Jones models (Dechow et al., 1995a) are not reproduced here. Their specifications to estimate the coefficients are the same as in Jones (1991), and Extended Jones (1991). The estimation of “normal accruals” uses these coefficients, and corrects the change in revenue for the change in trade receivables (#151), i.e. uses $(\Delta REV_t - \Delta REC_t)$;
- 3) Whenever other proxies for conservatism are used, they replace RET.

Exhibit 4: Jones (1991) – Difference between DAC estimates controlling/not controlling for the asymmetric recognition of gains and losses, by intervals of deflated earnings.

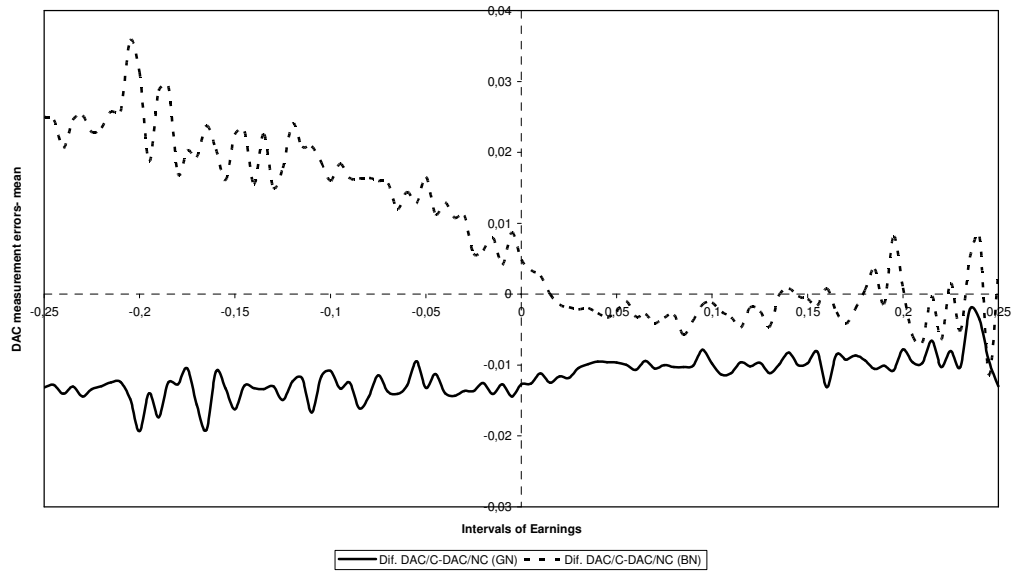


Fig. 4.1: For GN (solid line) and BN (dashed line), the graph plots the difference between the mean of DAC controlling (C)/not controlling (NC) for the asymmetric recognition of gains and losses, by intervals of deflated earnings. The interval width of earnings deflated by average total assets is 0.005. For example, a point on the dashed line can be read as the mean of BN/C minus the mean of BN/NC for the relevant interval. The sample size is 71,409 obs.

Exhibit 5: Difference between DAC estimates controlling/not controlling for the asymmetric recognition of gains and losses, by intervals of deflated earnings – Jones (1991) and Dechow and Dichev (2002) models, using a common sample.

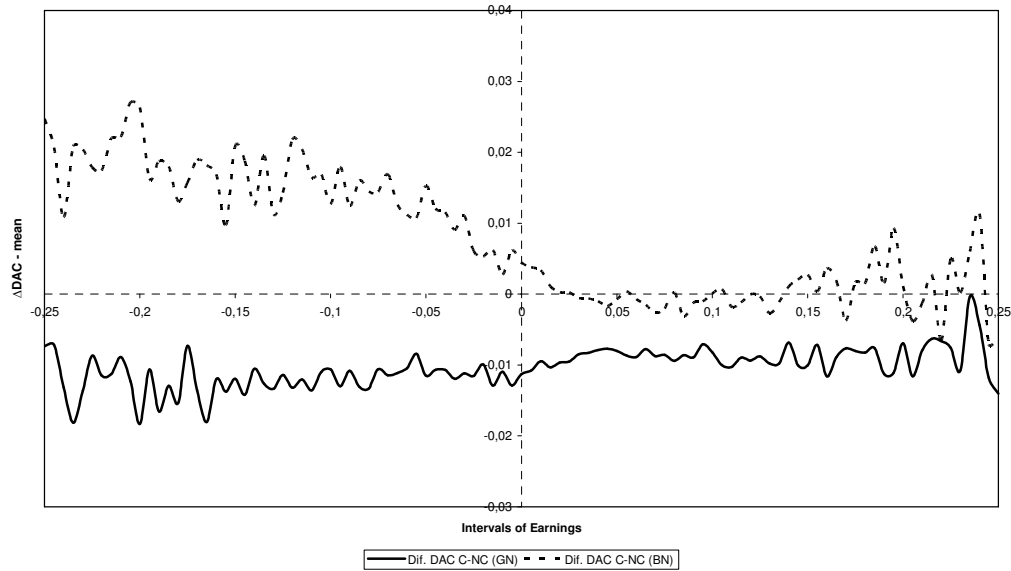


Fig. 5.1: JONES (1991) model. For GN (solid line) and BN (dashed line) the graph plots the difference between the mean of DAC controlling (C)/not controlling (NC) for the asymmetric recognition of gains and losses, by intervals of deflated earnings. The interval width of earnings deflated by average total assets is 0.005. For example, a point on the dashed line can be read as the mean of BN/C minus the mean of BN/NC for the relevant interval. The sample size is 59,455 obs.

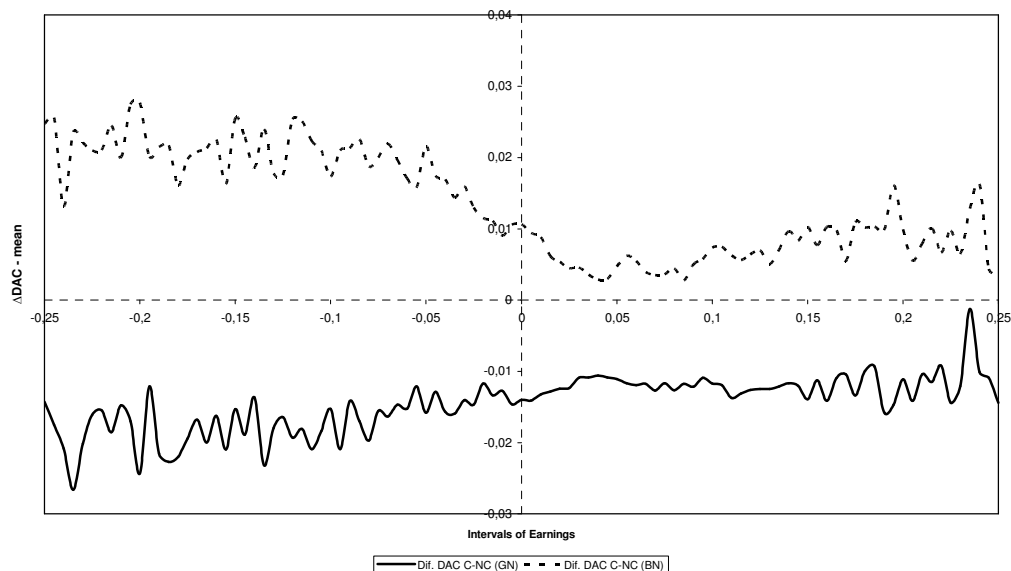


Fig. 5.2: DECHOW and DICHEV (2002) model. For GN (solid line) and BN (dashed line) the graph plots the difference between the mean of DAC controlling (C)/not-controlling (NC) for the asymmetric recognition of gains and losses, by intervals of deflated earnings. The interval width of earnings deflated by average total assets is 0.005. For example, a point on the dashed line can be read as the mean of BN/C minus the mean of BN/NC for the relevant interval. The sample size is 59,455 obs.