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Chapter 1

Earnings Quality and Firm Valuation:

A "New" Perspective Deriving From the Literature

Liliana Marques Pimentel
University of Coimbra, Portugal

Susana Jorge

https://orcid.org/0000-0003-4850-2387
University of Coimbra, Portugal

ABSTRACT

The quality of earnings is a summary metric in firm performance evaluation and a focal question to assess the quality of accounting information. A high-quality earnings figure will reflect a firm's current operating performance, being a good indicator of future operating performance; it also accurately annuitizes the intrinsic value of the firm. The multidimensional nature of the earnings quality (EQ) concept has given form to a multiplicity of constructs and measures. This chapter offers a systematic literature review on EQ and its implication on firm value. On the one hand, it discusses the different existent definitions of EQ and the multidimensional nature of the concept; on the other hand, it highlights a "new" EQ perspective taking into account the virtuosities of the residual income model. An empirical model is proposed that reinterprets rebuilding the linear information dynamics in relation to market value added and captures, in a composite measure, the three-dimensional facet of the EQ concept: persistence, predictability, and informativeness of earnings.

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1. INTRODUCTION

The subject of earnings quality (EQ) is a complex area and no researcher has this far been able to provide a unique definition of EQ, neither to find an adequate measure for it.

However, there is an overall agreement that EQ is a summary measure in firm performance evaluation and a crucial question to assess the quality of accounting information. A high-quality earnings figure will reflect firm's current operating performance, being a good indicator of future operating performance. Although EQ is a useful summary measure for assessing firm value, determining EQ and its implications for firm value, is rather difficult.

Knowing that earnings are important for evaluation effects and investors see in the earnings management a valuable information source to assess firm value, valuation models based on earnings, and based on book value, are viewed typically as an alternative approach to assess firm value. The use of earnings in various valuation models can be theoretically justified. The higher EQ, the more useful the earnings data are as a forecasting metric and the more accurate the firm valuation. Ohlson's (1995) model, and its subsequent refinements by Feltham and Ohlson (1995). Ohlson (1999) and Barth et al. (1999, 2005), offer a formal link between valuation and accounting numbers, being cited frequently as the theoretical foundation of such research.

This chapter offers a systematic literature review on EQ and its implications on firm value. On the one hand, it discusses the different EQ definitions and, on the other hand, it presents the relevant literature on studies about the relationship between financial statement data and firm value.

The discussion on these models allows to conclude that, determining the value of a company on the basis of accounting and financial variables in a framework of nonlinear relationships, presents a high potential for future research. Therefore, the chapter summarizes a theoretical basis for future researches on what determines a firm's value, starting from the accounting and financial statements figures.

Finally, the chapter also highlights a "new" EQ perspective taking in account the virtuosities of the residual income model. An empirical model is proposed, which reinterprets rebuilding the linear information dynamics in relation to market value added and captures, in a composite measure, the three-dimensional facet of the EQ concept: persistence, predictability and *informativeness* of earnings.

Henceforth, the chapter is organized as follows. Section 2 offers an overview of the relevance of the EQ concept and its multidimensional nature. Section 3 starts by highlighting the relationship between financial statement data and firm value, followed by a review of the relevant models in the literature that addressed that relationship. Section 4 continues the literature on models that started to evidence the importance of looking at the earnings components. Section 5, finally proposes a model on a "new" EQ perspective. The chapter finalizes with a short summary and conclusions.

2. DEFINING EARNINGS QUALITY

The subject of EQ is a complex area of research. So far, theoretical literature and empirical studies have not been able to provide a consensual definition of EQ, neither to find an adequate measure for it.

In what concerns the definition, some of the most important definitions, constructs and measures of EQ relate with persistence, predictability and variability (time-series properties) of earnings. Another stream of knowledge relates EQ with the relationship between income, accruals and cash, taking the view that earnings that map more closely into cash are more desirable (e.g. Penman, 2001). Others, in

turn, consider that EQ is "conditional on the decision-relevance of the information", hence considering that EQ is defined only in the context of a specific decision model (Dechow *et al.*, 2010: 344).

Many studies give a definition on EQ. All of them agree that the concept is complex and nebulous, there is not a unique definition, neither an adequate measure for it. Although the concept is of common use, there is no consensus between academics and practitioners on its content, that is, there is no single definition of EQ. In fact, as mentioned, namely, by Bernstein (1996: 749) "virtually, there is no general agreement as regard to the definitions or assumptions on this term (earnings quality)". Or, as stated by Ghosh *et al.* (2005: 34) "the earnings quality is a nebulous concept".

Earnings are of high quality when the earnings number accurately annuitizes the intrinsic value of the firm. Such earnings are referred to as "permanent earnings" in the accounting literature (*e.g.*, Black, 1980; Beaver, 1998; Ohlson and Zhang, 1998).

Beaver (1999: 41) explains that "earnings are of high quality if they are sustainable", thus they are a good indicator of future earnings. Or, according to Penman and Zhang (2002: 237), "earnings can be regarded as good quality if it is a good indicator of future earnings".

EQ and, more generally, financial reporting quality, are of interest to those who use financial reports for contracting purpose and for investments decision making (Schipper and Vincent, 2003).

Some of the most important definitions, constructs and measures are related with the persistence, predictability and variability of earnings (time-series properties of earnings). Persistence has to be understood in the sense that current earnings provide a good indication of future earnings, capturing the extent to which a given innovation remains in future realizations. Predictability is a function of the distribution (especially the variance) of the innovation series: "the ability of past earnings to predict future earnings" (Lipe, 1990). Variability measures the time-series variance of innovations directly (Leuz *et al.*, 2003). Hermanns (2006) considers an additional measure derived from time-series properties of earnings – *informativeness* of earnings: the capacity to explain stock returns (Warfield *et al.*, 1995) or the information content with respect to future earnings (Ahmed *et al.*, 2004).

Others relate EQ to the relation between income, accruals and cash, taking the view that earnings that map more closely into cash are more desirable (*e.g.*, Penman, 2001). According to several authors (*e.g.*, Sloan, 1996; Graham *et al.*, 2005; Richardson *et al.*, 2005 and 2006), one can assess EQ considering the relation between accruals and cash flows. In line with this point of view, the results of Graham *et al.* (2005) indicate that financial officers believe that earnings, not cash flows, are the key metric to outsiders. Managers are focused on short-term earnings benchmarks, especially the seasonally lagged quarterly earnings number and the analyst consensus estimate. Managers also work to maintain predictability in earnings and financial disclosures. This finding could reflect superior informational content in earnings over the other metrics.

In fact, several studies document the benefits of the accruals process, finding that earnings are a better measure of performance than the underlying cash flows (*e.g.*, Dechow *et al.,* 1998; Dechow and Dichev, 2002; Dechow and Schrand, 2004), that earnings explain more of the cross-sectional variation in stock returns or stock prices relative to operating cash flows (*e.g.*, Bernard and Stober, 1989; Dechow, 1994; Barth *et al.*, 2001b; Liu *et al.*, 2002). Being the accrual accounting more ambitious than a "cashflow-oriented accounting system" (Beaver and Demski, 1979: 43). Dechow (1994) finds that accruals improve earnings' ability to measure performance relative to cash flows.

Sloan (1996) finds that the accruals portion of earnings is less persistent than the cash flow portion. This suggests that firms with high levels of accruals have low quality of earnings. Dechow and Dichev (2002), analysing the interrelations between accrual quality, level of accruals, and earnings persistence suggests a reconciliation of the findings of Dechow (1994) and Sloan (1996). Their reconciliation is based on the observation that a high level of accruals signifies both earnings that are a greater improvement over underlying cash flows, and low-quality earnings.

This emphasis on earnings, indicating that they have more information content about firm value than cash flow is noteworthy, because cash flows continue to be the measure emphasized in the finance literature.

In the path of Sloan (1996), academic researchers focused on the development of simple empirical models that objectively assess EQ in order to predict future return performance (see, for example, Penman and Zang, 2002; Richardson *et al.*, 2005 and 2006; Chan *et al.*, 2006). For Richardson *et al.* (2005 and 2006) EQ is the degree to which earnings performance persists into the next period.

Another EQ dimension is derived from qualitative concepts in the IASB/FASB's conceptual framework. The conceptual framework focuses on decision usefulness, defined in terms of relevance, reliability, and comparability, as the criterion for assessing quality. Some authors, namely Schipper and Vicent (2003) and Hermans (2006), consider another EQ category, which is derived from implementation decisions. EQ is seen as the accurate representation of underlying economic transactions and events as in Penman and Zhang (2002).

Schipper and Vicent (2003: 98) view EQ in relation to Hicksian income[1], more precisely, they see it as the extent to which reported earnings faithfully represent Hicksian income. The term "faithfully representing" means the "correspondence or agreement between a measure or description and the phenomenon that it purports to represent".

Dechow *et al.* (2010: 344) consider that EQ is "conditional on the decision-relevance of the information", so, in this sense the authors consider that the term "earnings quality" alone is meaningless; EQ is defined only in the context of a specific decision model. The quality of earnings could be evaluated with respect to *any* decision that depends on an informative representation of financial performance and it depends on many aspects, which are unobservable.

Table 1 summarizes some main EQ definitions found in literature.

In the view of the authors of this chapter, following particularly Dechow and Schrand (2004), the quality of earnings is a summary metric in performance evaluation and a central question to assess the quality of accounting information. A high-quality earnings figure will reflect current operating performance, being a good indicator of future operating performance, and it accurately annuitizes the intrinsic value of the firm.

In order to explore the determining of EQ and its implications for firm value, we present in the next section the relevant literature on studies about the relationship between financial statement data and firm value based on valuation models (*e.g.*, Ohlson, 1995; Feltham and Ohlson, 1995; Ohlson, 1999).

3. THE RELATIONSHIP BETWEEN FINANCIAL STATEMENT DATA AND FIRM VALUE

The quality of accounting information is a function of its relevance, which means of its predictive, *informativeness* and confirmatory value. Information has predictive value if it has value as an input to predictive processes used by investors to form their own expectations about the future.

The accounting model communicates an asset-based view of the organizational reality, which is consistent with the assertion that the "primary focus of financial reporting is information about a com*Table 1. Definitions on earnings quality*

Author	Definition
Bernstein and Siegel (1979: 73)	"Earnings figures should have integrity – that is, they should not be the product of manipulations designed purely to increase the reported income of the company. Earnings figures should also be reliable, in the sense that they provide a good indication of the firm's earning power. But it is important to keep in mind that the notion of 'quality', in the context of earnings evaluation, is one of *comparative*, integrity, reliability and predictability. There are no absolute elements of earnings quality".

Bernstein (1996: 749)	"Virtually, there is no general agreement as regard to the definitions or assumptions on this term (earnings quality)".
Penman and Zhang (2002: 237)	"(...) earnings can be regarded as good quality if it is a good indicator of future earnings".
Schipper and Vicent (2003: 98)	"We define earnings quality as the extent to which reported earnings faithfully represent Hicksian income, where representational faithfulness means correspondence or agreement between a measure or description and the phenomenon that it purports to represent".
Dechow and Schrand (2004: Preface)	"A high-quality earnings number, as we define it, will do three things: it will reflect current operating performance; it will be a good indicator of future operating performance; and it will accurately annuitize the intrinsic value of the firm. Not all earnings are created equal. Earnings quality depends on the composition of the earnings, the stage of the company's life cycle, the time period, and the industry."
Ghosh *et al.* (2005: 33)	"With respect to earnings quality, firms with revenue-supported increases in earnings have more persistent earnings, exhibit less susceptibility to earnings management, and have higher future operating performance."
Dechow *et al.* (2010: 344)	"Higher quality earnings provide more information about the features of a firm's financial performance that is relevant to a specific decision made by a specific decision-maker".

pany's performance provided by measures of comprehensive income and its components. Earnings and its components measured by accrual accounting generally provide a better indication of enterprise performance than information about current cash receipts and payments" (FASB, 1978, §43). The FASB position finds support in the empirical evidence documenting that earnings constitute a more relevant proxy of the future cash flows comparatively to the contemporaneous values of cash flows (Barth *et al.*, 2001b; Dechow *et al.*, 1998). It is also important to add that in the medium and long term, firm earnings and cash flows tend to be synchronic.

The financial and economic models establish relationships between earnings or cash-flows of the companies and their market value (*e.g.*, Fama and Miller, 1972: Chapter 2). The earnings role, as well as the one of other financial variables, in many of these models consists of supplying investors with information on stock returns (*e.g.*, Ohlson, 1988). In that context, the quality of the company's performance is assessed by its contribution to predict future stock returns.

Earnings are important for evaluation effects; in other words, the investors see in earnings a valuable information source to assess the firm's value, and, in this sense, the EQ concept is a way to assess the relevance and reliability of earnings, in short, the *informativeness* of earnings, in terms of value relevance.

The link between accounting values and contemporaneous equity values have been extensively studied. Valuation models based on earnings, and based on book value, are viewed typically as an alternative approach to assess the firm's value. When market assumptions are more realistic and markets are imperfect, book values and earnings act as complementary indicators of equity values (*e.g.*, Feltham and Ohlson, 1995; Ohlson, 1995; Penman, 1998). Ohlson's (1995) model, which offers a formal link between valuation and accounting numbers, is cited frequently as the theoretical foundation of such research. In fact, Ohlson's (1995) paper became a classic (Lo and Lys, 2000), being the paper most cited in the last decades, into this research area[2].

The next subsections move backwards in time and in terms of relevant literature, to look at studies about the relationship between financial statement data and firm value.

3.1 The Feltham-Ohlson Framework

The Ohlson (1995) and Feltham and Ohlson (1995) studies stand among the most important developments in capital markets research in the last several years (Beaver, 2002)[3]. These studies provide a foundation for redefining the appropriate objective of research on the relation between financial statement data and firm value. At the same time, they provide some structure for modelling in a field where structure has been sorely lacking.

Ohlson's model (Ohlson, 1995) derives of the Residual Income Valuation Model (hereafter RIV) or Edwards-Bell Model (hereafter EB) (Edwards and Bell, 1961). Those models are already thoroughly recognized in the literature. It is important to highlight that the initial theoretical framework is the neoclassical model of the present value of future expected dividends (hereafter PVED) and well-known for the Gordon Model[4], which assumes an economy where the agents beliefs are homogeneous and individuals are risk-neutral. Note that RIV is a specific case of PVED model.

Ohlson' (1995) and Feltham and Ohlson's (1995) studies provide a logically consistent framework for thinking about the value relevance of accounting numbers. They show how:

- To link the market value of equity (MVE_t) with the past and future financial information of the firm, that is: i) with the contemporaneous and future net income; ii) with the book value and how to use book value and income together in the same valuation model; and iii) with dividends;
- The valuation model can be used to capture different properties of different asset classes, such as operating and financial assets, and different value relevance of earnings components;
- To illustrate the effect of conservative accounting on the relation between equity value, accounting book value, and future earnings.

Feltham and Ohlson (1995: 726) said that "one can view abnormal earnings as a contraction of "above normal earnings", where normal earnings equal the risk-free interest rate times the book value of firm's equity". Table 2 presents some definitions about "abnormal earnings". However, the accounting literature typically refers to it as "residual income".

Given the competition effect, it is expected that the abnormal earnings follow a mean reverting process, that is, it is expected that abnormal earnings quickly revert for the sector/industry mean. Thus under unbiased accounting, in the medium and long period, the book value of the common equity (BVE_t) constitutes an unbiased estimator of the firm market value of equity (MVE_t).

Knowing that Feltham-Ohlson (1995) framework came through the Ohlson (1995) model, adding some complexity, one will begin by presenting the Ohlson's (1995) model (assumptions and definitions based on residual income valuation model) in the next sub-section (3.2), the linear information dynamics and the "other information" will be presented in sub-section 3.3, and finally the linear information dynamics extensions based on Feltham and Ohlson (1995) in sub-section 3.4.

Table 2. Definitions on abnormal earnings

Author	Definition
Canning (1929) and Preinreich (1938)[5]	These authors refer to "abnormal earnings" as "excess earnings".
Edey (1957)[6]	Refers to abnormal earnings or abnormal profits as "super-profits".
Edwards and Bell[7] **(1961)**	Refers to abnormal earnings as "excess realizable profit".
Ohlson (1995: 663)	"(...) this variable (abnormal earnings) is defined as current earnings minus the risk-free rate times the beginning of period book value, that is, earnings minus a charge for the use of capital".
Feltham and Ohlson (1995: 691)	"(...) abnormal earnings are defined to equal reported earnings minus the risk-free interest rate times the book value of the firm's equity".
Myers (1999)	Throughout the paper, the author uses the term "residual income" (RI) rather than the standard "abnormal earnings" because readers tend to relate abnormal earnings with abnormal stock market returns or unexpected earnings. Residual income (RI) may be completely anticipated. In fact, RI valuation depends on the anticipation of future RI.
Barth *et al.* (2005)	Abnormal earnings are based on the definition provided in Ohlson (1995).

3.2 The Ohlson's (1995) Model

The analytical model of Ohlson (1995) proposes an approach consistent with a measurement perspective, revealing that the fundamental value of a company can be expressed by the fundamental components of balance sheet and profit and loss account. Ohlson (1995) does not explicitly consider the uncertainty, assuming a neutral position towards the risk, the absence of information asymmetry, non-stochastic interest rates and a term structure of horizontal interest rates, the cost of capital being given by the risk free interest rate. In other words, connected to the Ohlson's framework is the concept of an ideal market functioning, which does not accept the existence of information asymmetry between companies and investors, and of a set of assumptions that secure the consistency with the basic principles of the financial theory.

There are three crucial assumptions in the Ohlson's model, displayed in Table 3, all based on Residual Income Valuation Model (RIV).

Analysing the mathematical expressions [1.1], [1.3] and [1.5], one can found that Ohlson's framework is a direct descendant of the research done in the 1960s (*e.g.,* Edwards and Bell, 1961; Modigliani and Miller, 1958; Miller and Modigliani 1961) and also Preinreich (1938). In fact, the valuation expression of accounting data writing succinctly as the sum of book value and the present value of future abnormal earnings is not new; it can be found in Preinreich (1938), and in Edwards and Bell (1961). Its revival constitutes a major contribution to modern financial accounting. By using earnings, book value, and the clean surplus equation to carry the dividend information, one can rewrite the discounted dividend valuation as a discounting of accounting figures.

In mathematical expression [1.5]:

$$MVE = BVE + \sum_{\tau=1}^{t} \frac{E_t[x_{a,t+\tau}]}{(1+r_f)^{t}} + \sum_{\tau=1}^{\infty} \frac{E_t[x_{a,t+\tau}]}{(1+r_f)^{t}}$$

Table 3. The residual income valuation model development: Ohlson's model assumptions

Crucial Assumptions	Analytic Formulation
Assumption A_1 is the **equilibrium condition**: the market value of the firm in time t (MVE_t) is equal to the present value of expected dividends. By reference to Ohlson (1995), it actually follows a more primitive assumption about the economy. In particular, assumption A_1 is the no intertemporal arbitrage price that results when: – Interests rates are nonstochastic; – Beliefs are homogeneous; – Individuals are risk-neutral. Ohlson's formulation requires a valuation assumption based on the present value of expected future dividends, on the irrelevancy of dividends politics for the determination of the firm value (Modigliani and Miller, 1958 and 1961).	**[1.1]** $MVE_t = \sum_{\tau=1}^{\infty} \frac{E_t[d_{t+\tau}]}{(1+r_f)^{t}}$ Where: MVE_t - price of the firm's equity at time t ; d_t - net dividends paid at time t ; R_f - risk-free return, $R_f = 1 + r_f$. r_f is a risk-free discount rate, which is an intertemporal constant rate; and $E_t[\ldots]$ - expected value operator conditioned on date t information.

Assumption A_2 defines the clean-surplus relation as: this year's book value equals last year's book value plus income minus dividends (and, therefore, a capital contribution corresponds to a negative dividend). This assumption allows future dividends to be expressed in terms of future earnings and book values.	**[1.2]** $BVE_t = BVE_{t-1} + x_t - d_t$ Denote that: BVE_t - book value of equity at time t ; x_t - earnings for the period from $t-1$ to t ; and d_t - net dividends paid at time t .
With these two assumptions (A_1 and A_2) and with simple algebraic manipulation, Ohlson derives the following relation between price and accounting information.	[1.3] $MVE_t = BVE_t + \sum_{\tau=1}^{\infty} \frac{E[x_{t+\tau} - r\,BVE_{t+\tau-1}]}{(1+r_f)^{\tau}} - \frac{E[BVE_{t+\infty}]}{(1+r_f)^{\infty}}$
The "residual income" or "abnormal earnings" is defined as the amount the firm earns in excess of the risk-free rate of interest on the book value.	**[1.4]** $x^a_{t+\tau} \equiv x_{t+\tau} - r \times BVE_{t+\tau-1}$
With this definition the valuation expression can be written even more succinctly as the sum of book value and the present value of future abnormal earnings: Equation [1.5] presents the company's fundamental value defined in terms of accounting variables.	**[1.5]** $MVE_t = BVE_t + \sum_{\tau=1}^{\infty} \frac{E[x^a_{t+\tau}]}{(1+r_f)^{\tau}}$
Assumption A_3 is a final assumption in Ohlson's paper referred as the "linear information model". This third assumption provides the additional structure necessary to yield dividends irrelevancy. It defines the stochastic process for abnormal earnings and non-accounting information (v_t) as:	$x^a_{t+1} = \omega\, x^a_t + v_t + \varepsilon_{1t+1}$ [1.6] $v_{t+1} = \gamma v_t + \varepsilon_{2t+1}$ Where ω and γ are fixed and known parameters between zero and one, and ε s are mean zero and uncorrelated with other variables in the model[8]. Assumption A_3 says that both abnormal earnings and non-accounting information are autoregressive. In *lato sensus*, these exogenous parameters to the model are determined by the environmental context that characterizes the firm.

"A firm's value equals its book value adjusted for the present value of anticipated abnormal earnings" (Ohlson, 1995: 667). This value is a function of book value of equity, with unit coefficient, and infinite geometric series of expected abnormal earnings, "unrecorded goodwill" in the authors' terminology, or the "market valued added", for the proposers of EVA™ terminology. The goodwill equals the current value of the expected abnormal earnings, and the firm's value or the firm's evaluation can be centred on the prediction of these. In other words, behind this formula there is a connection that can be summarised in the following way:

$$MVE_t = BVE_t + g\omega_t$$

Considering $g\omega_t$ the value of the company's goodwill, in other words, the intangible assets value not expressed on the balance sheet, measured from the abnormal earnings that the company will generate in the future. The value of the company's goodwill ($g\omega_t$) becomes the component that corrects the asset value (BVE_t) in order to obtain the company's fundamental value.

The transformation of the expression [1.5] in others, which include only contemporaneous accounting information, requires the definition of an evaluation process of the future abnormal earnings (x_t^a). This is the third assumption considered in Table 3, **Assumption A_3**.

3.3 Linear Information Model (LIM) and *Other Information*

Ohlson assumes that the abnormal earnings of the period $t + 1$ $(x_t^a{}_{+1})$ are dependent of the earnings observed in the previous period $(\ )x_t^a$ and of the *other information* $(\ )v_t$ that may affect the prediction of $x_t^a{}_{+1}$ and is not reflected in x_t^a. The relationship between these components completes the following stochastic process.

$$vx_{tta++11} == \omega\ x_{ta} + v\gamma_t\ v_{+t} + \varepsilon_{1t+}\varepsilon_{12t+1} \qquad [1.6]$$

This **assumption A_3** (see Table 3) is a final assumption in Ohlson's model, referred as the "linear information dynamics". This third assumption provides the additional structure necessary to yield dividends irrelevancy.

The parameters ω and γ are fixed and known, they assume values between zero and one, and ε 's are mean zero variables and uncorrelated with other variables in the model. These parameters are exogenous to the model and are determined by the environmental context that characterises the firm[9]. The only restriction to which they are subjected is that they are inferior to the unit, which means that the process will converge to zero. The prediction of the *other information* (v_{t+1}) is not a function of the earnings, considering that it synthesises the information not yet reflected in the financial statements.

Ohlson's (1995) innovation in relation to the Residual Income Valuation Model (RIV) or EdwardsBell Model consists in the treatment that he gives to the structure of the abnormal earnings time-series (x_t^a). In order to define the stochastic process that follows the x_t^a variable, Ohlson (1995) introduces the v_t variable – *other information*: a variable that captures important events in terms of informative content and that affect the market prices (market value of equity – MVE_t), but that are not yet reflected in the financial statements. This means that *other information* variable captures the extent to which the accounting variables do not explain market value of equity. This is a time *lag* that mediates the occurrence of certain events important for the formulation of economic agents' expectations, and its inclusion in the financial statements conveys information for the beliefs formulation on the firm abnormal earnings growth. *Other information* is one of the limitations pointed out to the financial statements, or better, to its capacity in disclosing all the important information and in opportune time – *lack of timeliness* (Beaver, 2002). Non-accounting information (or *other information*) is an "additive shock to next period's abnormal earnings". In order to correct this *gap*, Ohlson (1995) used the dynamics of information to characterise the abnormal earnings dynamics: a first-order autoregressive process (AR(1)).

Table 4 presents the main definitions of *other information*.

Kothari (2001) notes that the current performance of a firm (as represented in accounting reports) is an important information source but not the only for assessing the firm market value. Dechow *et al.* (1999) point out that academic literature recognizes that stock prices reflect information about future

earnings that are not contained in current earnings. Such information "cannot be observed directly" (Ohlson, 2001: 112). In operational terms, candidates for these *other information* (v_t) are new patent, laws to approve a new product in pharmaceutical firms, long-term contracts, among others (Myers, 1999).

Ohlson (1995) defines *other information* as a scalar variable, but not specifically establishes its analytical content. Ohlson (2001: 112) referred to v_t as a "mysterious variable". The fuzzy and abstract character of this idea, *other information*, has led that some empirical applications, based on Ohlson's model, use this variable in an *ad hoc* form or simply neglect it. Hand (2001) notes that, until 1998, almost all empirical research on Ohlson's model neglected the information content of this variable (*other in-*

Table 4. Definitions on other information

Author	Definition
Ohlson (1995: 668)	"(...) *other information* (v_t) as capturing all nonaccounting information used in the prediction of future abnormal earnings".
Feltham and Ohlson (1995: 702 and 703)	"(...) nonaccounting data, provide the basis for predicting future abnormal operating earnings". "(...) The *other information* acts as serially correlated, but convergent, noise in the prediction of abnormal earnings and operating assets".
Barth *et al.* (2005: 315)	"(...) *other information*, v_t, is defined as $MVE_{t-1} - \overline{MVE}_{t-1}$, where $\overline{MVE}_{t-1}$ is the fitted value of MVE_{t-1} on the equation: $MVE_{it} = \alpha_0 + \alpha_1 NI_{it}^a + \alpha_2 BV_{it} + \alpha_3 v_{it} + \mu_{it}$ that does not include v_t. MVE is market value of equity, NI^a is abnormal earnings, defined as earnings minus the normal return on equity book value, BVE, μ_{it} is the error term and i and t subscripts denote firm and year".

formation). The few papers that not neglected the *other information* variable chose an intuitive way rather than a formal construction (*e.g.*, Myers, 1999; Barth *et al.*, 2005).

Ohlson (2001) states that, although there may be an analytical interest in not specify the value of v_t, such procedure reduces the empirical content of the Ohlson's model. It is highlighted that, for example, the financial analysts' predictions constitute a reasonable tool to measure the expected future profits and that there is no reason to eliminate v_t of the model, since the variable can be supported in observable data. Hand (2001) adds that to consider v_t equal to zero is to assume that the accounting data publicly available are sufficient to explain the behaviour of the stock prices.

Table 5 summarises some important aspects in order to correctly understand the model, and finally, the intrinsic value of the company is also presented, as well as the linear solution of the model's coefficients.

So, the current intrinsic value of the company, defined by the expression [1.7], can be attained based on the current values of the book value equity, the abnormal earnings and the *other information*, considering the above specification of the linear information dynamic (expression [1.6]). The impact on the company's value of these variables will depend on the persistence of earnings and on the discount rate of future profitability flows[10].

"Larger values of ω and γ make MVE_t more sensitive to $\left(x_t^a, v_t\right)$ realisations" (Ohlson, 1995: 669). However, the bigger the "persistence parameters" are, ω and γ, the faster the decline process will be.

Anyway, these two parameters are enough in this context to characterise the earnings persistence. "The function $\alpha\omega_1(\ )$ and $\alpha\omega_2(\ ,\gamma)$ are increasing in their arguments. The property reflects that ω and γ act as persistence parameters in the (x_t^a, v_t) process" (Ohlson, 1995: 669).

3.4 Extensions to the LIM Based on Feltham and Ohlson (1995)

Feltham and Ohlson (1995) extend the Ohlson's model (Ohlson, 1995) introducing two new effects: "conservatism accounting effect" and the "growth in the operating assets".

The "conservatism accounting effect" reflects the persistence of the difference between the market value of equity (MVE_t) and book value of common equity (BVE_t), which originates the "unrecorded goodwill", in the authors' terminology or the "market valued added". This "unrecorded goodwill" can result of an undervaluation of assets and/or of an overestimate expected abnormal earnings.

Taking into consideration that "conservatism accounting effect" results in goodwill, Feltham and Ohlson (1995) admit that the current accounting value offers information about future abnormal earnings and they introduce the distinction between the value of operating assets (oa_t) and financial assets (fa_t). In this way, in order to consider the abnormal earnings persistence effect, the conservatism accounting effect, as well as the growth in both operating assets (oa_t) and operating earnings (ox_t), Feltham and Ohlson (1995) redefine the information dynamics initially specified on the Ohlson's model (1995). Thus, the linear information model (LIM) is now defined as in Table 6.

In this context, and based on the mathematical expression [1.9], the goodwill ($g\omega_t$) is identified as:

$$MVE_t - BVE_t = g\omega_t = \alpha_1 ox_{ta} + \alpha_2 oa_t + \beta \bullet v_t \quad [1.10]$$

Table 5. Linear information model (LIM) and other information: key issues

Key Issues	Explanations
1) Linear information model (LIM)	$x_{ta+1} = \omega\, x_{ta} + v_t + \varepsilon_{1t+1}$ [1.6] $v_{t+1} = \gamma v_t + \varepsilon_{2t+1}$
2) *Other information* $(\ )v_t$	– The *other information* is incorporated in the residual income with a discrepancy, having a gradual impact on the earnings; in other words, v_t follows a first order auto-regressive process; – Ohlson (1995) defines v_t as a scalar variable, independent from x_t^a, which should be considered as summarising the relevant events in terms of value which did not yet have an impact on the financial statements.
3) Random terms $(\varepsilon_{1t+1};\ \varepsilon_{2t+1})$	All the components of the model introduced are known. The only sources of uncertainty are the random terms $(\varepsilon_{1t+1};\ \varepsilon_{2t+1})$, which can be associated to new information (not expected), which is translated into equally in unexpected earnings.

4) Parameters $(\omega\ \gamma;\ )$	– They are determined by the entity's economic environment and by the accounting principles; – They are positive and lower than one, $0 \le \omega < 1$ and $0 \le \gamma < 1$. The model introduces in the theory the concept of earnings persistence, represented by the parameter ω . The persistence reflects the degree in which the current abnormal earnings are reproduced in the next period: - If $\omega = 0$ there is no earnings persistence. In each period these would be only function of the other information and of the new information (unexpected). The events that affect the current earnings are transitory; - If $\omega = 1$, current earnings would be fully reproduced in the next period, which means that the growth opportunities persisted indefinitely; this is not consistent with the empirical evidence; - If $0 \le \omega < 1$, as predicted in the model, the earnings persistence is not total and current events that affect the current earnings tend to have a decreasing impact on future earnings.
5) The linear solution – the intrinsic value	The combination of the earnings' dynamic [1.6] with the model introduced in [1.5] allows to obtain a model in which the intrinsic value depends only on the contemporaneous accounting information: [1.7] $MVE_t = BVE_t + \alpha_1 x_t^a + \alpha_2 v_t$ Being: $\alpha_1 = \frac{\omega}{1} + r_f - \omega \ge 0$ and $\alpha_2 = \frac{1 + r_f}{(1 + r_f - \omega)(1 + r_f - \gamma)} > 0$

This is, the goodwill is a growing function of the abnormal operating earnings, whose persistence is measured by parameter ω_{11} (the higher ω_{11} is, the greater α_1 will be), of the operating assets (oa_t) only if these are under evaluated, due to the fact that the necessary condition to $\alpha_2 > 0$ is that $\omega_{12} > 0$ and of the variable v_t. Note also that in both models (Ohlson' model and Feltham and Ohlson's model) the tax effect is ignored.

However, and since both models assume a perfect capital market (for which costs derived from information asymmetry, agency and transaction are not equally admitted), the Feltham and Ohlson's model also assumes that financing decisions do not create value. The tax effect will not have relevant consequences on the evaluation function.

Table 6. Linear information model extensions (Fetham and Ohlson, 1995)

Key Issues	Explanations

Linear information model extensions by (Feltham and Ohlson, 1995)	[1.8] $oxoavv_{12,,tttta++++1111} ==== \omega_{11}ox_{ta} ++\omega_{12}\omega oa_{22}oa_t +_t +v_{1t}v\gamma_2\gamma +_{t12}vv+\varepsilon_{12t1t,t}\varepsilon +_+ +_{21,t+}\varepsilon\varepsilon_{134,t,t++11}$ Where: $ox_t^a \left(= x_{t+1} - r_f * oa_{t+1}\right)$ - operating abnormal earnings after taxes at time t ; r_f is a discount rate, which is an intertemporal constant rate; oa_t - operating assets at time t ; v_{1t} ; v_{2t} - *other information*; ε_{1t+1};ε_{2t+1};ε_{3t+1};ε_{4t+1} - random terms. With: $0 \le \omega_{11} < 1,\ 0 \le \gamma_k < 1\ (k = 1\ 2;\ ),\ \omega_{12} \ge 0$ and $1 \le \omega_{22} < (1 + r_f)$.
ω_{12} coefficient	The parameter ω_{12} allows to introduce the dichotomy in the analysis "unbiased accounting" *versus* "conservative accounting", that is, the problem of the operating assets understatement (the problematic of subvaluation of the operating assets): – If $\omega_{12} > 0$, there is conservatism in accounting (undervaluation of the operating assets). More conservatism indicates that bigger abnormal earnings are expected.
ω_{22} coefficient	The parameter ω_{22} reflects the operating assets growth effect. It assumes values belonging to the interval $1, R_f$, with $R_f = (1 + r_f)$. R_f is the risk-free return and r_f is a discount rate, which is an intertemporal constant rate. Accordingly, restrictions to the operating assets long term growth are introduced to ensure the convergence on the calculus of the abnormal operating earnings present value (ox_t^a).

continued on following page

Table 6. Continued

Key Issues	Explanations

The linear solution – the intrinsic value	$BVE_t = oa_t + fa_t$ Considering: Note that: bv_t - book value of equity at time t ; oa_t - operating assets at time t ; fa_t - financial assets at time t ; $MVE_t = BVE_t + \alpha ox^a_t + \alpha_1 oa_t + \beta_1 v_{1,t} + \beta_2 v_{2,t}$ [1.9] With: $\alpha_1 = \frac{\omega_{11}}{1 + r_f - \omega_{11}} \geq 0$, $\alpha_2 = \frac{\omega_{12}(1 + r_f)}{\left(1 + r_f - \omega_{11}\right)\left(1 + r_f - \omega_{22}\right)} \geq 0$ And, $\beta_1 = \frac{1 + r}{(1 + r_f - \omega_{11})(1 + r_f - \gamma_1)} > 0$, $\beta_2 = \frac{\alpha_2}{1 + r_f - \gamma_2} \geq 0$

Earnings persistence or the EQ is not just a function of the "conservatism accounting effect", but also a function of the different value relevance of the different earnings components. The different value relevance of the different earnings components leads Ohlson (1999) to extend Ohlson (1995) by modelling the earnings components. In this way, Ohlson's (1999) model incorporates a x_2 variable, defined as transitory earnings, which can be any earnings components (cash flows or accruals), that evidences an incremental explanatory power on the prediction of future abnormal earnings.

In the next section, a very brief presentation of the Ohlson's (1999) model is done, followed by the generalized version used by Barth *et al.* (1999 and 2005).

4. THE DIFFERENT VALUE RELEVANCE OF THE DIFFERENT EARNINGS COMPONENTS

Ohlson (1999) considers concepts of "transitory earnings", and analyses how this source of earnings differs from other income items.

The Ohlson (1999) modelling follows Ohlson's (1995), but with an extension to permit two earnings components: "core" earnings (x_{1t}) and "transitory" earnings (x_{2t}). In Table 7, Ohlson's (1999) model is presented, as well as its assumptions and definitions:

Considering the linear solution introduced by Ohlson (1999):

$$MVE_t = BVE_t + \alpha_1 x_t^a + \alpha_2 x_{2t} + \beta \cdot v_t \quad [1.13]$$

The value-irrelevance occurs if $\alpha_1 + \alpha_2 = 0$. This condition implies that core abnormal earnings alone, rather than a combination of core abnormal earnings and transitory earnings, determine the goodwill.

4.1 Barth *et al.*'s (1999 and 2005) Models

As said before, in the next section, the authors propose a model, which is based on the generalized version of the Ohlson's (1999) model, in turn extending the Ohlson's and Feltham-Ohlson's framework (Ohlson, 1995; Feltham and Ohlson, 1995). This proposed model allows modelling earnings components, just as in Barth *et al.*'s (1999 and 2005). Accordingly, it seems important to offer a very brief presentation of the Barth *et al.*'s (1999 and 2005) models.

In developing predictions on how the accruals and cash flows components of earnings relate to equity value, Barth *et al.* (1999) consider a generalized version of the Ohlson's (1999) model. The basic

Table 7. Ohlson's (1999) model: assumptions and definitions

Crucial Assumptions	Analytic Formulation
Equations [1.1] and [1.2] correspond to the first two assumptions of the Ohlson's (1999) model, which are standard of the residual income model and are used in Ohlson's (1995) model, explained previously in Table 3. According to Ohlson (1999: 148), "in words, the present value of expected dividends determines value, and regular owners' equity accounting applies. One can think of x_t as including any dirty surplus items which have bypassed the "official" income statement. Alternatively, one can think of equation [1.2] as a definition rather than as an assumption". Equations [1.1] and [1.2] imply the well-known residual earnings valuation formula: equation [1.5].	**[1.1]** $MVE = {}_t\sum_{\tau=1}^{\infty} \frac{E\, d_{t+\tau}}{(1+r_f)}$ **[1.2]** $BVE_t = BVE_{t-1} + x_t - d_t$ Where: MVE_t - price of the firm's equity at time t ; d_t - net dividends paid at time t ; R_f - risk-free return, $R_f = 1 + r_f$. r_f is a discount rate, which is an intertemporal constant rate; E_t[...] - expected value operator conditioned on date t information. BVE_t - book value of equity at time t ; x_t - earnings for the period from $t-1$ to t . [1.5] $MVE_t = BVE_t + \sum_{\tau=1}^{\infty} \frac{E\, x_{t+\tau}}{(1+r_f)^{\tau}}$

continued on following page

Table 7. Continued

Crucial Assumptions	Analytic Formulation

Equation [1.11] is the critical assumption introduced by Ohlson (1999). It specifies the forecasting of the sequence of expected abnormal earnings in terms of the current information. Some important comments are:

– It may seems inevitable that ω_{22} should be zero if one wants to label x_{2t} transitory earnings. $\omega_{22} = 0$ means transitory earnings unpredictability, that is, an attribute of transitory earnings.

– If $0 < \omega_{22} < 1$ is interesting because it leads to serially correlated transitory earnings whose long run average equals zero.

– The second sub-equation of the main equation [1.11] excludes a term $\omega_{21}x_t^a$, which means that $\omega_{21} = 0$. Core earnings and book value do not influence the evolution of transitory earnings (Ohlson 1999). This assumption may appear somewhat restrictive, but it is, in fact, merely an assumption of analytical convenience.

– $\omega_{12} \neq 0$ is an essential model ingredient since the concurrent predictor variable x_t^a includes transitory earnings. The real issue concerns the condition $\omega_{11} + \omega_{12} = 0$, as an assumption or conclusion – the forecasting-irrelevance.

$$x_{ta+1} = \omega_{11}x_{ta} + \omega_{12}x_{2t} + \varepsilon_{1t+1} \quad [1.11]$$

$$x_{2t+1} = \omega_{22}x_{2t} + \varepsilon_{2t+1}$$

Where x_{2t} are transitory earnings.

To generalize equation [1.11], consider the dynamic equations

[1.12] $= \omega \quad {}_t^a + \omega \; x \quad + \gamma \cdot v_t + \varepsilon_{1t+1}$

□□□□□□□□□□□□vxx$_{tt2\ 1o++t+11}$ == $_{11}$ x$\omega_{12\ 222}$x$_{2tt}$ + γ_{12} ·G vv$_{t}$·+$_{t}$ ε+$_{2\ 1t+}$ε$_{3t+1}$

Where v_t is a vector of K random variables representing "other information"; γ_1 and γ_2 are two K-dimensional vectors of fixed constants, and G is a square matrix of size $K \times K$.

The linear solution – the intrinsic value

Applying the dynamic equation [1.12] to the residual income valuation formula [1.5], one obtains:

[1.13]

$$MVE_t = BVE_t + \alpha_1 x_{ta} + \alpha_2 x_{2t} + \beta \cdot v_t$$

Where β is a K-dimensional vector. It can be shown that the parameters γ_1, γ_2, G do not affect α_1 and α_2, they still are: ω

$$\alpha_1 = \frac{\omega_{11}}{1 + r_f - \omega_{11}} \geq 0$$

$$\alpha_2 = \frac{\omega_{12}(1 + r_f)}{\left(1 + r_f - \omega_{11}\right)\left(1 + r_f - \omega_{22}\right)} \geq 0$$

,

The elements in the vector β depend generally on ω ω_{11}, ω_{12} ω γ_1 γ_2 and ω_{22}, as well as γ_1, γ_2, G, but the related mathematical expressions are of no interest here. Thus one can think of $\beta \cdot v_t$ as "background" information that influences value without violating the idea that accounting data provide kernel information.

Ohlson (1999: 156) explain that "to be sure, this feature works only because the information dynamics has a triangular structure".

structure of the Barth *et al.*'s (1999) model is analogous to the *other information* model of Ohlson (1995) and of the linear information dynamics of Myers (1999). The model of Barth *et al.* (1999) comprises four equations, as follows:

□□□□□(.(.1 141 14*ba*))$xx_{2ta}{}_{t+1}{}_{1} = \omega_{11}x_{ta} + \omega\omega_{1222}xx_{2t2t} + \omega\omega_{1323}BVEBVE_{t\,t} + \varepsilon_{1}\varepsilon_{t2+t1+1}$

□

□□□□□(.1 14*c*)$BVE_{t+1} = \quad + \omega_{33}BVE_{t} + \varepsilon_{3t+1}$ [1.14]

□□□□(.1 14*d*) $MVE_t = BVE_t + \alpha_1 x_{ta} + \alpha_2 x_{2t} + \mu_t$

Equation [1.14a] is the abnormal earnings prediction equation, where abnormal earnings, x_t^a, are defined in the usual way as earnings less a normal return on equity book value. Although x_2 in Ohlson (1999) is modelled as transitory earnings, the model applies to any component of earnings. In Barth *et al.* (1999), x_2 is either accruals or cash flows. If all earnings components have the same ability to forecast abnormal earnings, x_2 will equals zero, and thus knowing that component of earnings does not aid in forecasting abnormal earnings; as in Ohlson (1999), this assumption is considered the "forecastingirrelevance".

Barth *et al.* (1999) conclude empirically that accruals are a less persistent component of the abnormal earnings in comparison with the cash flows. Sloan (1996) also documents that the high levels of accruals are associated with systematic reductions of future earnings.

Barth *et al.* (1999) additionally conclude that there is a significant variation in the importance of the abnormal earnings coefficients among industries. Anyway, these components being less persistent, or more transitory, are relevant in terms of value. However, they would not be so, as Ohlson (1999) demonstrates, if they would not be relevant in the future earnings prediction or if the "forecasting-irrelevance assumption" would not be predictable.

Equation [1.14b] describes the autocorrelation of each earnings component.

Equation [1.14a] and equation [1.14b] include equity book value (*BVE*). According to Feltham and Ohlson (1995 and 1996), "including equity book value allows for the effects of conservatism to manifest themselves and partially relaxes the assumption that the cost of capital associated with calculating abnormal earnings is a predetermined cross-sectional constant" (Barth *et al.*, 1999: 208).

In Barth *et al.* (1999 and 2005), equation [1.14c] permits to preserve the triangular information structure of the generalized version of Ohlson's (1999) model. In theory, this triangular structure ensures that parameters relating to equity book value have no effect on the valuation multiples on abnormal earnings and the earnings components in equation [1.14d].

Finally, equation [1.14d] is the valuation equation based on the information dynamics in equations [1.14a] through [1.14c].

Later, Barth *et al.* (2005) extended the previous model, considering three levels of earnings disaggregation based on the Feltham-Ohlson framework: aggregate earnings, cash flows and total accruals, and cash flows and four major components of accruals. At each level of earnings disaggregation, Barth *et al.* (2005) called three linear information models (LIMs), respectively.

The first linear information model, LIM1, is based on Ohlson (1995), and comprises four equations, as follows:

$$BVEvNIMVE_{it\,t}=_{a\,t}=_{t}\omega=_{30}=\omega_{10}\omega+\alpha_{200}+\omega+_{33}\omega v_{11}\alpha_{it}NI_{1-}NI_{1\,t}+_{a-ta}+_{1}\varepsilon++_{3}\omega_{t\,22}\alpha\omega BVE_{212}BVEBVE_{t-t1t}+-+_{1}\alpha+\varepsilon_{32}v_{t}\omega_{it13}+v_{t-}\mu_{1t}+\varepsilon_{1t} \quad [1.15]$$

MVE is market value of equity; NI^{a} is abnormal earnings, defined as earnings minus the normal return on equity book value, BVE ; the ε_k and μ are error terms.

Equation [1.15a], equation [1.15b] and equation [1.15c] are forecasting equations, and equation [1.15d] is the valuation equation implied by the linear information dynamics of the forecasting equations.

In relation to the previous model, Barth *et al.* (2005) also added the *other information* variable (v_{it}).

For these authors, the *other information* (v_{it}) is defined as $MVE_{t-1} - \overline{MVE}_{t-1}$, where $\overline{MVE}_{t-1}$ is the fitted value of MVE_{t-1} (market value equity), based on a version of equation [1.15d] that does not include v_{it}.

The second linear information model, LIM2, is based on Bart *et al.* (1999). It relaxes the assumption that the total accruals,ACC , and cash flows components of earnings have the same model parameters. LIM2 comprises five equations, as follows:

$$ACCBVENI_{ta}=_{t\,t}==\omega_{10}\omega\omega_{30}{}_{20}+++\omega_{11}\omega\omega NI_{33}{}_{22}BVEACC_{ta-1}+_{t\,t-}-\omega_{1}{}_{112}++ACC\varepsilon\omega_{3t}{}_{23}BVE_{t-1}+_{t-}\omega_{1}{}_{13}+BVE\varepsilon_{2t}{}_{t-1}+\omega_{14}v_{t-1}+\varepsilon_{1t} \quad [1.16]$$

$$MVEv_{it}=_{t}\omega=_{40}\alpha+_{0}\omega+_{44}\alpha v_{it1}NI_{-1}+_{ta}+\varepsilon_{4t}\alpha_{2}ACC_{t}+\alpha_{3}BVE_{t}+\alpha_{4}v_{it}+\mu_{t}$$

In LIM2, equations [1.16a] through [1.16d] are forecasting equations, and equation [1.16e] is the valuation equation implied by the linear information dynamics of the forecasting equations.

Finally, the third linear information model, LIM3, further relaxes the assumption relating to earnings components by permitting the model parameters for four major accrual components to differ from one another as well as from those for other components of earnings, including cash flow. LIM3 comprises the following eight equations:

$$\omega_{14}\Delta PAY_{t-1} + \quad (1.17f)$$

$$+ \omega_{15}DEP_{t-1} + \omega_{16}BVE_{t-1} + \omega_{17}v_{t-1} + \varepsilon_{1t}$$

$$\Delta REC_t = \omega_{20} + \omega_{22}\Delta REC_{t-1} + \omega_{23}\Delta INV_{t-1} + \omega_{25}DEP_{t-1} + \omega_{26}BVE_{t-1} +$$

$$+ \omega_{27}v_{t-1} + \varepsilon_{2t}$$

$$\Delta INV_t = \omega_{30} + \omega_{32}\Delta REC_{t-1} + \omega_{33}\Delta INV_{t-1} + \omega_{34}\Delta PAY_{t-1} + \omega_{35}DEP_{t-1} +$$

$$+ \omega_{36}BVE_{t-1} + \varepsilon_{3t} \quad (1.17hg))$$

$$NI_{ta} = \omega_{10} + \omega_{11}NI_{ta-1} + \omega_{12}\Delta REC_{t-1} + \omega_{13}\Delta INV_{t-1} +$$

$$\Delta PAY_t = \omega_{40} + \omega_{43}\Delta INV_{t-1} + \omega_{44}\Delta PAY_{t-1} + \omega_{46}BVE_{t-1} + \varepsilon_{4t} \quad [1.17]$$

$$DEP_t = \omega_{50} + \omega_{55}DEP_{t-1} + \omega_{56}BVE_{t-1} + \varepsilon_{5t}\, BVE_t = \omega_{60} +$$

$$\omega_{66}BVE_{t-1} + \varepsilon_{6t}$$

$$v_{it} = \omega_{70} + \omega_{77}v_{it-1} + \varepsilon_{7t}$$

$$MVE_t = \alpha_0 + \alpha_1 NI_t^a + \alpha_2\Delta REC_t + \alpha_3\Delta INV_t + \alpha_4\Delta PAY_t + \alpha_5 DEP_t + + \alpha_6 BVE_t + \alpha_7 v_t +$$

$$\mu_t$$

ΔREC is the annual change in receivables, ΔINV is the annual change in inventory, ΔPAY is the annual change in payables and DEP is the annual depreciation and amortization expense.

For LIM3, equations [1.17a] through [1.17g] are forecasting equations, and equation [1.17h] is the valuation equation implied by the linear information dynamics of the forecasting equations.

In the next section the authors of this chapter propose an empirical model (based on Ohlson, 1995; Feltham and Ohlson, 1995; Ohlson, 1999; and Barth *et al.*, 1999 and 2005), which reinterprets rebuilding the linear information model (LIM) in relation to the market value added, and captures, in a composite measure, the three EQ constructs: persistence, predictability and *informativeness* of earnings.

5. A PROPOSAL FOR AN ACCOUNTING-BASED VALUATION MODEL AND EARNINGS QUALITY

The evaluation is always based, direct and indirectly, on earnings predictions and the earnings predictions are an important information source both as an evaluation element for management and, as well as for investors, i.e., for the capitals market.

As starting point to the proposed model it is acknowledged that:

- "Ohlson's model incorporates the earnings prediction; however, this prediction must be placed in a theoretical duality that underlines the model – evaluating and signalling. That is, firm intrinsic value contains information about earnings quality" (Canadas, 2004: 241).
- The unrecorded goodwill is defined as the excess of the intrinsic value (market value of equity - MVE_t) in relation to the accounting value (book value of equity - BVE_t), that is, $MVE_t - BVE_t$. In these terms, the goodwill presents itself as a measure for the abnormal earnings generation. As such, the goodwill captures all the "hidden assets", as well as the difference between the sum of

the cost value of the assets shown on the balance sheet, individually considered, and their market value or the intrinsic value.

In the following, the linear information model (LIM) structure is explained, as well as its link with the composite measure of EQ, namely the proxies to persistence, predictability and informativeness of the earnings components – the EQ measures. As said, the proposed model is based on the generalized version of the Ohlson's (1999) model, which extends the Ohlson's and Feltham-Ohlson's framework (Ohlson, 1995; Feltham and Ohlson, 1995), allowing for modelling earnings components, just as in Barth *et al.* (1999, 2005).

5.1 Earnings Quality: The Proposed Rebuilding LIM

It should be noteworthy that the authors reinterpret rebuilding the base models (Ohlson, 1995; Feltham and Ohlson, 1995; Ohlson, 1999), analysing them and introducing some modifications, taking into consideration their fundamental lines. More specifically:

1. Considering the "conservatism accounting effect", introduced by Feltham and Ohlson (1995), which reflects the persistence of the difference between the market value of equity (MVE_t) and the book value of common equity (BVE_t), originating the "unrecorded goodwill", and knowing that this "unrecorded goodwill" can result of an undervaluation of assets and/or of an overestimate of expected abnormal earnings;
2. The model examines the EQ in terms of value relevance, namely because it can contemplate the distinction between the permanent and transitory earnings components and the different weighing among them;
3. The information dynamics can be expressed in terms of the profitability rates and it should highlight not the expected earnings for the next period but its permanent component, i.e., the one which has relevance in what concerns value;
4. On the linear information dynamics, it is highlighted the role of *other information*, i.e., the fact that the accounting values predictions depend on information not present in the current accounting data. The apparently vague and abstract essence of this idea can lead some empirical applications of the model to treat it in an *ad hoc* manner or to neglect it (Barth *et al.*, 1999; Lara *et al.*, 2009; just to mention some studies). However, the potential of this idea is stressed by many authors, so the *other information* variable cannot just be equal to zero. If the *other information* is ignored, the model according to Ohlson's hypothesis (1995) must produce similar results to the mere capitalization of the accounting price-value or price-earnings ratios, as stated by Lee *et al.* (1999);
5. The *other information* variable is not directly observed but it can be calculated from the earnings predictions for the next period, as Ohlson (2001) suggests.

In the rebuilt linear information model (LIM), **three main aspects** were retained.

A. First of all, and knowing that "firm's value equals its book value adjusted for the present value of anticipated abnormal earnings"(Ohlson, 1995: 667) and that, such value is a function of the equity accounting value, with unitary coefficient, in the proposed model the dependent variable of the valuation equations is the market value added ($Dif_{MBV} = MVE_{it} - BV_{it}$), which means the difference

between the current market and book values of common equity. Therefore, the valuation function is expressed in terms of *goodwill*.

If one considers the valuation formula in line with earnings response coefficient (ERC) literature, one can also (re)interpret the β *coefficients* of the valuation equations as a *score*. As such, they can be a *proxy* of the *informativeness* of market value added, with LIM structureβ *coefficients* providing a composite measure of EQ that simultaneously captures the persistence (ω_{11},γ_{22}), the predictability (ω_{12}) and the *informativeness* of earnings (β) and its components, building a composite and three-dimensional measure of EQ. Accordingly, the valuation formula is written in terms of market value added, in order to capture in the β *coefficients* the *informativeness* of earnings. In section 5.2, further and better explanation will be provided regarding the coefficients ω_{11}, ω_{12}, γ_{22} and β .

B. In the linear information dynamic formulation, the role of the *other information* (v_{it}) is underlined. In spite of the vagueness and fuzzy nature of this variable, its potentialities are pointed out by many authors that recognize its importance in the industry-specific or entity-specific treatment of the model. Accordingly, and knowing that *other information* (v_{it}) is reflected in abnormal earnings, it is not defined as a first-order autoregressive process AR(1), but instead as difference between abnormal earnings (x_{it}^{a}) and the fitted value of abnormal earnings equation that does not include

v_{it}, that is, $\overline{x_{it}^{a}} - \overline{x_{it}^{a}}$, where $\overline{x_{it}^{a}}$ is the fitted value of MVE_{t-1} based on a version of abnormal earnings equation that does not include ½t..

According to Feltham and Ohlson (1995) and Ohlson (1995), v_{it} captures the extent to which the accounting variables do not explain market value added. Therefore, v_{it} is the difference between two residual income values for the next period. Being certain that the difference between two earnings variables is an earning variable, in the model's context, v_{it} is not just a difference between two earnings variables; it is by itself a earning variable (Canadas, 2004: 237).

C. Third, one also redesign the linear information model (LIM) in order to examine whether differences between the market and book value of common equity (market value added) can be explained by the different value relevance of earnings components: accruals and cash flows. A test was run on whether the disaggregation of earnings into cash flow and total accruals (or in the major components of accruals) results in different predictive ability of accounting numbers and the composite measure of EQ towards market value added, this means, this disaggregation was tested to check whether it has a different impact in β *coefficients* information content.

5.2 The Development of the Proposed Model

According to Ohlson (1995), market value of equity, MVE_{it}, is defined as the sum of current equity book value, BVE_{it}, and expected future abnormal earnings, x_{it}^{a}, discounted at a constant rate, r_f (mathematical expression [1.5] already presented above):

$$t \qquad t \quad \infty E\, x_t \square\square\square\, t\alpha+\tau \square\square\square \qquad [1.5]$$

$MVE = BVE + \sum_{\tau=1}^{\tau} \left(1 + r_f\right)$ In order to determine whether and to what extent, disaggregating earnings provides a composite measure of EQ, the relation between MVE_{it}, BVE_{it} and x_{it}^{a} was rebuilt, considering the persistence, in terms of earnings sustainability, the predictability and the *informativeness* of earnings, which means taking into account the EQ concept.

To achieve the intended objective, the valuation formula is written in terms of market value added [$\left(MVE^{t} - {}^{BVE_t}\right)$], in order to capture in the β *coefficient* (see the following equation 2.2c) the *in-*

formativeness of earnings:

$$\left(MVE_{Dif\ t_{MBV}} - BV\right) = E_t \square\square\square\square\square \sum_{t\infty=1} \left(\_\_\_\_\_ 1x + t\alpha + r_\tau\right)_\tau \square\square\square\square\square \,. \qquad [2.1]$$

As one of the objectives is to obtain a composite measure of EQ, one have to isolate the earnings variables (x_{it}^{a}), in one of the sides of the equation. In this context, the dependent variable will be a measure of the excess between the market value of equity, MVE_{it}, and the equity book value, BVE_{it}. Subsequently, the proposed general model comprises three main equations:

$$x_{t\alpha+1} = \omega_{10} + \omega_{11} x_{t\alpha} + \omega_{12} x_t + \omega_{13} v_t + \varepsilon_{1t+1}$$

$$x_{t+1} = \gamma_{20} + \gamma_{22} x_t + \varepsilon_{2t+1}$$

$$\left(MVE_t - BVE_t\right) = \beta_0 + \beta_1 x_{t\alpha} + \beta_2 x_t + \beta_3 v_{it} + \mu_t \qquad [2.2]$$

Dif_{MBV}

Equation [2.2a] is the abnormal earnings prediction equation, where abnormal earnings, x_{it}^{a}, are defined in the usual way as earnings less a normal return on equity book value (BVE_t). In the context of the proposed model, as in Barth *et al.* (2005), x_{it} is either accruals or cash flows or four major components of the total accruals.

Equations [2.2a] through [2.2b] are forecasting equations, and equation [2.2c] is the valuation equation: market value added equation as a function of contemporaneous abnormal earnings, any component of earnings (cash flows, total accruals, or four major components of the total accruals) and *other information* imposing LIM structure, that is:

$$\_\_\_\omega_{11}\_\_\_ ,$$

$\theta_1 = R_f - \omega_{11}$

$$\theta_2 = \frac{\omega_{12} \times R_f}{\left(\omega_{11} - R_f\right)\left(\omega_{22} - R_f\right)}$$

With $R_f = (1 + r_f)$, R_f is the risk-free return and r_f is a discount rate, which is an intertemporal constant rate.

As in Barth *et al.* (2005), three levels of earnings disaggregation are considered based on the FelthamOhlson's framewok: aggregate earnings, cash flows and total accruals, and cash flows and four major components of accruals.

The signs and magnitudes of the θ_j in [2.2c] depend on the ω in equations [2.2a] through [2.2b]. The relations between the θ_j and the ω are complex because of the number of explanatory variables in equation [2.2c], each of which has its own forecasting equation. The signs of θ_j are determined by the signs of ω . For example, the sign of ω_{12} determines the sign of θ_2 . Also, the higher the predictive ability of the component for future abnormal earnings, the larger, in absolute value, will be θ_2 .

Abnormal Earnings Equation: Persistence (ω_{11}) and Predictability (ω_{12}) Coefficients

Equation [2.2a], allows us to measure the persistence of abnormal earnings. The autoregressive coefficient (ω_{11}) reflects the persistence of abnormal earnings. Prior research (*e.g.*, Dechow *et al.*, 1999; Barth *et al.*, 1999, 2005) leads us to predict that ω_{11} is positive. So, the autoregressive coefficient (ω_{11}) is an EQ construct that captures the persistence of earnings (earnings sustainability).

The coefficient of the earnings component (x_t), ω_{12}, reflects the incremental effect on the forecast of abnormal earnings of knowing x_t. As said before, x_t is either accruals or cash flows or four major components of the total accruals, i.e., different components of earnings. If all earnings components have the same ability to forecast abnormal earnings, ω_{12} will equals zero, and thus that component of earnings does not aid in forecasting abnormal earnings. Accordingly, in the proposed model, similarly with Barth *et al.* (1999, 2005), the coefficient ω_{12} measures the predictability of earnings components. In this context, predictive ability is the ability of current earnings components to predict future earnings.

Barth *et al.* (1999: 208), citing Sloan (1996), argue that "accruals possess less predictive ability with respect to future earnings. The reason is that accruals involve a higher degree of subjectivity than cash flows, are more likely the object of management discretion, and are more apt to contain unusual accruals that are less likely to recur in future periods. Sloan's evidence supports lower predictability of accruals with respect to future earnings". So, in particular, the authors would predict $\omega_{12} < 0$ for accruals, and $\omega_{12} > 0$ for cash flows.

Earnings Component Autoregressive Equations: Persistence (ω_{22}) Coefficients

Equation [2.2b] describes the autocorrelation, or persistence, of each earnings component[11]. Transitory earnings can be characterised as a process in which $\omega_{22} = 0$, as in Ohlson (1999). For earnings components those are not entirely transitory; the higher ω_{22} is, the more predictable the component will be because one expects accruals and cash flows to be positively auto correlated. One predicts $\omega_{22} > 0$ for each component.

Valuation Equations: Informativeness or Valuation (β) Coefficients

Finally, equation [2.2c] is the valuation equation based on the information dynamics in equations [2.2a] through [2.2b]. The goodwill (market value added – Dif_{MBV}) is a growing function of abnormal earnings, whose persistence is measured by the parameter ω_{11}: the bigger ω_{11} is, the bigger β_1 will be. β_2 is the valuation multiple on x_{it}, i.e., accruals or cash flows or four major components of accruals. Analogous to the interpretation of ω_{12} in equation [2.2a], β_2 reflects the incremental effect on valuation from knowing x_t. If both earnings components have the same relation with the market value added, β_2 will equal zero, knowing that component of earnings does not aid in explaining market value added. Thus, if $\beta_1 + \beta_2 = 0$, x_t is irrelevant for valuation. Ohlson (1999) labels this condition as "value irrelevance". Conversely, if $\beta_1 + \beta_2 \neq 0$, then x_t is "value relevant".

Barth *et al.* (1999: 209) explain that, "this positive relation between persistence and value relevance is consistent with predictions made and tested in prior research (*e.g.*, Lipe (1986), Kormendi and Lipe (1987) and Barth *et al.* (1992))". β_2 is similarly dependent on the persistence of abnormal earnings ω_{11}, *i.e.*, the higher the persistence of abnormal earnings, the higher β_2 is.

The "β *Coefficient*" can be seen, simultaneously, as a type of earnings response coefficient (ERC), which can be used as a measure of earnings information content and as a *proxy* of reported EQ. Prior research demonstrates that firms with sustained increases in earnings have higher ERCs than other firms (Barth *et al.*, 1999). EQ concept, in terms of informative content, is a way of assessing the relevance and reliability of earnings, to explain future earnings (Ahmed *et al.*, 2004) or to explain stock returns (Warfield *et al.*, 1995), as one will see on EQ constructs derived from time-series properties.

6. SUMMARY AND CONCLUSION

The quality of earnings is a summary metric in performance evaluation and a fundamental question to assess the quality of accounting information.

The literature on EQ currently embraces various aspects of this nebulous concept. No unique definition of EQ can be found. On the contrary, several definitions are suggested, as it was presented in this chapter. Aspects often mentioned are the persistence, predictability, variability of earnings (time-series properties of earnings) and the *informativeness* of earnings. Different studies focus on just one aspect of EQ. In several studies, accruals and cash flows have been established as indicators of EQ. Moreover, many authors have used abnormal or unexpected accruals to measure EQ.

Despite such diversity, it is overall acknowledged that a high-quality earnings figure will reflect firm's current operating performance, being a good indicator of future operating performance; it accurately annuitizes the intrinsic value of the firm.

Understanding that earnings are important for firm's evaluation effects and that investors recognise earnings management as relevant for their assessment and decisions, firm valuation models based on earnings, and based on book value, have been developed. Ohlson´s (1995) model and its subsequent refinements by Feltham and Ohlson (1995) and Ohlson (1999), are perhaps the paramount works, offering a formal link between valuation and accounting figures.

In summary, the fundamental lines of the models presented in this chapter (Ohlson, 1995; Feltham and Ohlson, 1995; Ohlson, 1999; Barth *et al.*, 1999 and 2005) are:

– The model is centred on the two base accounting variables, book value equity (BVE_t) and earnings. It respects the accounting system properties, namely the clean surplus accounting relation, which being just a mere identity, is the identity that gives unity to the system.

- The earnings persistence or EQ is not only a function of the "conservatism accounting effect", but also a function of the different value relevance of the different earnings components.
- Earnings components have a different value relevance, being accruals component less persistent than cash flows component. In other terms, for the future earnings predictions accruals are less persistent than cash flows (Beaver, 2002).
- "Firm's value equals its book value adjusted for the present value of anticipated abnormal earnings" (Ohlson, 1995: 667). Such value is a function of the accounting value of equity, with unitary coefficient, and of the infinite geometric series of expected abnormal earnings, "unrecorded goodwill" in the authors' terminology, or the "market value added" in the proposers of EVA™ terminology.
- The "goodwill equals the present value of the future expected abnormal earnings" and the evaluation can be centred on their prediction (Ohlson, 1995: 662).
- The "unrecorded goodwill" is defined as the excess of the intrinsic value (market value of equity – MVE_t) in relation to the accounting value (book value of equity – BVE_t), i.e., $MVE_t - BVE_t$. In these terms, the goodwill presents itself as a measure for the abnormal earnings generation. As such, the goodwill captures all the "hidden assets", as well as the difference between the sum of the cost value of the assets shown on the balance sheet, individually considered, and their market value or the intrinsic value.

The description points to the fact that, determining the value of the company using accounting and financial variables in a framework of nonlinear relationships, presents a high potential for future research. Indeed, Bernard (1995: 735) noted that:

The Ohlson model represents the base of a branch (for) capital market research ... Ohlson (1995) and Feltham and Ohlson (1995) return to "step one" and attempt to build a more solid foundation for further work. Our challenge is clear.

Knowing that firm intrinsic value contains information about EQ, earnings persistence or EQ is a function of the different value relevance of earnings components, and earnings or earnings components

are important for evaluation effects, this chapter also proposed a model which reinterprets rebuilding the link between contemporaneous and future earnings, taking into account the three-dimensional facet of the EQ concept: persistence, predictability and *informativeness*.

This model is based on the models by Feltham and Ohlson (1995) and Ohlson (1999), which in turn were an extension of the one by Ohlson (1995), and it models earnings components just as in Barth *et al.* (2005). It contributes to the literature because it highlights a "new" EQ perspective taking into account the virtuosities of the residual income model. The empirical model proposed reinterprets rebuilding the linear information dynamics in relation to market value added, and captures, in a composite measure, the three-dimensional facet of the EQ concept, referred above.

Given that investors see in earnings a valuable information source to assess the firm value, the EQ concept raises as significant as a way to assess the relevance, the reliability and the *informativeness* of earnings, in terms of value relevance. The evaluation is always based on earnings predictions and the model proposed in this chapter, as Ohlson's (1995, 1999) model, incorporates this aspect.

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KEY TERMS AND DEFINITIONS

Abnormal Earnings: Current earnings minus the risk-free rate, times the book value at the beginning of period (i.e., earnings minus a charge for the use of capital). Abnormal earnings are defined to equal reported earnings minus the risk-free interest rate times the book value of the firm's equity. The accounting literature typically refers to it as "residual income," excess earnings, or super-profits.

Earnings Quality (EQ): A complex and nebulous concept with a multidimensional nature. EQ is a summary measure in firm performance evaluation and a crucial issue to assess the quality of accounting information. A high-quality earnings figure will reflect firm's current operating performance, being a good indicator of future operating performance; it also accurately annuitizes the intrinsic value of the firm. The multidimensional nature of the EQ concept has given form to a multiplicity of constructs and measures.

Firm Valuation: To assess and to evaluate the firm' value. There are different methodological approaches to evaluate companies. This work highlights that earnings are important for firm evaluation effects. Investors recognize earnings management as relevant for their assessment and decisions; accordingly, firm valuation models based on earnings, and based on book value, have been developed.

Linear Information Model: Determining the value of the company using accounting and financial variables in a framework of nonlinear relationships.

Market Value Added: The excess of the intrinsic value (market value of equity) in relation to the accounting value (book value of equity). It is also known as "unrecorded goodwill." In these terms, the goodwill presents itself as a measure for the abnormal earnings generation. As such, the goodwill captures all the "hidden assets," as well as the difference between the sum of the cost value of the assets shown on the balance sheet, individually considered, and their market value or the intrinsic value.

Other Information Variable: A variable that captures important events in terms of informative content, which affect the market prices (market value of equity), but that are not yet reflected in the financial statements. This variable captures the extent to which the accounting variables do not explain the market value of equity.

Residual Income Model: Is an approach to equity valuation that formally accounts for the cost of equity capital. Here, "residual" means in excess of any opportunity costs measured relative to the book value of shareholders' equity; residual income is then the income generated by a firm after accounting for the true cost of capital.

ENDNOTES

[1] Hicksian income (Hicks, 1939) corresponds to the amount that can be consumed (that is, paid out as dividends) during a period, while leaving the firm equally well off at the beginning and the end of the period, that is, the maximum amount that can be consumed consistent with the maintenance of wealth.

[2] Brown (1996) characterizes the papers cited in the SCCI – Social Sciences Citation Index, as been a classic, when the mean quotation is situated, at least between 4.00 and 8.35. According to Lo and Lys (2001), in 1999, and with reference to the Ohlson's model (1995), the citations mean was already superior to 9.

[3] Beaver (2002: 457): "The F-O approach [Ohlson, 1995 and Feltham and Ohlson, 1995] is, in my opinion, one of the most important research developments in the last ten years".

[4] Gordon and Shapiro (1956) rewrite the initial model, admitting the assumption that the growth rate for the dividends is constant.

[5] *Apud* in Feltham and Ohlson (1995: 726).

[6] *Apud* in Feltham and Ohlson (1995: 728).

[7] *Apud* in Feltham and Ohlson (1995: 728).

[8] ω and γ parameters assume values bigger than zero, due to economic conditions and values inferior to the unit in order to guarantee the model's stability/stationarity. This condition implies that $E\,x_t\left(\,{}_{t^{a}+\tau}\right) \to 0$ and $E\,v_t\left(\,{}_{t+\tau}\right) \to 0$ with $\tau \to \infty$. If indeed $\omega = 1$, this means that the growing opportunities persisted indefinitely, which is not consistent with the empirical evidence.

[9] As referred by Mota et al. (2004), the value of a company depends of multiple factors that involve the detailed analysis of a set of variables associated to the company (market position, profitability, financial structure, management characteristics, human resources quality, etc.), as well as an analysis of the environment in which the company operates (macro-economic, political, activity sector, competition variables, among others.).

[10] It is important to highlight that the company's value does not depend on the dividend policy, consistent with the assumption adopted regarding its irrelevance.

[11] Ohlson labels "predictability" as the autocorrelation, or persistence, of each earnings component expressed in equation [2.2b], but the model proposed here considers the autocorrelation of each earnings component, as persistence. The autoregressive coefficients (MVE_t, BVE_t) are earnings quality constructs that capture the persistence of earnings or the earnings components persistence. In the proposed model, similarly with Barth *et al.* (1999, 2005), the coefficient ω_{12} measures the predictability of earnings components, being predictive ability, the ability of current earnings components to predict future earnings.