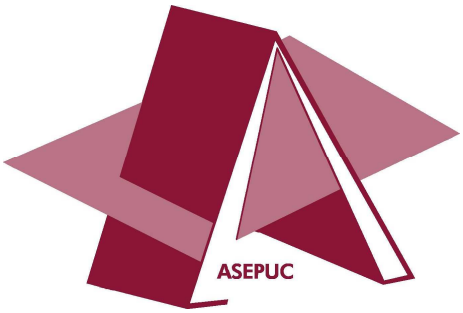
UNIVERSITAT DE BARCELONA



VIII JORNADAS DE CONTABILIDAD FINANCIERA

BARCELONA, 28-29 DE MAYO DE 2009

FAIR VALUE VERSUS HISTORIC COST VALUATION FOR BIOLOGICAL ASSETS: IMPLICATIONS FOR THE QUALITY OF FINANCIAL INFORMATION

Josep Mª. Argilés. University of Barcelona (Department of Accounting)

Josep Garcia Blandón. IQS, (Faculty of Economics)

Teresa Monllau. Universitat Pompeu Fabra (Department of Economics and Business)

Resumen: Este trabajo realiza un estudio empírico sobre los efectos, que se señalan en las discusiones teóricas, de la utilización del valor razonable (VR) frente al coste histórico (CH), utilizando dos muestras de explotaciones agrícolas, una de las cuales valora sus activos biológicos a CH y la otra a VR. No se encontraron diferencias significativas en los beneficios e ingresos entre ambas muestras, ni siquiera en sus volatilidades. Tampoco se encontraron diferencias significativas en rentabilidad, manipulación contable, ni en el poder de ambos criterios de valoración para predecir los flujos de tesorería. Por el contrario, la mayor parte de los tests realizados revelan un mayor poder de los beneficios calculados bajo el VR para la predicción de los beneficios futuros, respecto de cuando son calculados bajo el CH. El estudio proporciona también evidencia empírica de prácticas contables defectuosas de CH en el sector agrícola, concluyendo que el VR puede representar un criterio de valoración interesante para un sector, como el agrícola, caracterizado por el predominio de pequeñas explotaciones familiares.

Palabras clave: Contabilidad agrícola, valor razonable, coste histórico, activos biológicos, predicción de beneficios, predicción de flujos de tesorería, relevancia contable.

Abstract:

This paper performs an empirical study on the consequences of using fair value (FV) and historic cost (HC) for biological assets in agriculture. It concludes that the use of FV provides neither significant differences in earnings and revenues, nor an increase in their volatility. It does not bring about differences in profitability and accounting manipulation either. Future farm cash flows and earnings are not less predictable with FV than with HC. The study also provides empirical evidence on flawed HC accounting practices due to complexities of cost calculation and the predominance of small holdings in the agricultural sector.

Keywords: Agricultural accounting, fair value, historic cost, biological assets, earnings prediction, cash flow prediction, accounting relevance.

JEL: M41

Address for correspondence:

Josep Mª. Argilés. Department of Accounting. Facultat d'Econòmiques. Universitat de Barcelona. Av. Diagonal, 690. 08034 Barcelona. Spain.

Phone: 00 34 93 4021956
00 34 93 4021957
Fax. 00 34 93 4029099
e-mail: josep.argiles@ub.edu

Acknowledgements: The authors would like to thank the firm *CABSA* for providing the data that made this paper possible, and the Spanish *Ministerio de Educación y Ciencia* for granting this research (SEJ2005-04037/ECON).

FAIR VALUE VERSUS HISTORIC COST VALUATION FOR BIOLOGICAL ASSETS: IMPLICATIONS FOR THE QUALITY OF FINANCIAL INFORMATION

Introduction

The reform of the accounting standards towards fair value accounting has raised an intense debate in recent years. Major accounting groups and institutions worldwide, such as The International Accounting Standards Board (IASB), the U.S.A. Financial Accounting Standards Board (FASB), and the Accounting Regulatory Committee and the European Financial Reporting Advisory Group in the European Union (EU) have encouraged the convergence of international accounting towards standards based on market prices, opposite to traditional accounting measurement based on historic cost.

The FASB early issued several standards requiring recognition or disclosure of fair values estimates for assets and liabilities, mainly for financial instruments. For example, Statements of Financial Accounting Standards number 87 in 1985 on employer's accounting for pensions, number 105 in 1990 on disclosure of information about financial instruments, number 107 in 1991 on disclosures about financial instruments, etc. The International Accounting Standards Committee issued International Accounting Standard (IAS) requiring measurement at FV and value changes to be recognised in profit or loss. The most important were the IAS 32 on disclosure and presentation of financial instruments, issued in 1995 and revised in 1998 by IAS 39, and the IAS 41 on Agriculture, issued in 2000. The EU adopted the whole existing IAS by the Commission Regulation (EC)1725/2003, with the exception of IAS 32 and 39, that were adopted in 2004 by Commission Regulations (EC)2086/2004 and (EC)2237/2004.

Fair value is defined as the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction (e.g. IAS 39, IAS 41, SFAS 107). In 2006 the SFAS 157 redefined FV as the price that would be received to sell the asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date[1].

In spite of this persistent trend towards FV, the reform has raised controversial stances, usually debating around financial instruments, in the practitioner ground (e.g. Day 2000; Economist 2007). Together with enthusiastic supporters for fair valuation (e.g. Chartered Financial Analyst Institute 2007), there are also sceptics (e.g. Joint Working

Group of Banking Associations on Financial Instruments 1999). A rapport of the European Central Bank (2004) summarizes the potential drawbacks and advantages of a FV accounting framework from the point of view of financial institutions. There is also an unsolved debate in the academic ground.

Academic debate is usually concerned with financial instruments and framed within the agency theory, assuming information asymmetry between market participants and the existence of perfect versus imperfect market conditions. Barth and Landsman (1995) conclude that in perfect and complete markets an FV accounting-based balance sheet reflects all value-relevant information. However, in more realistic market settings management discretion applied to fair valuation can detract from balance sheet and income statement relevance. Watts (2003) argues that fair valuation is subject to more manipulation and, accordingly, is a poorer measure of worth and performance than HC. He argues that any attempt to ban accounting conservatism is sure to fail and that accounting can not compete with the market in valuing the firm (Watts 2006). Ball (2006) complains that fair valuation does not necessarily make investors better off, and that its usefulness has not been demonstrated. Rayman (2007) concludes that FV accounting is liable to produce absurdities and misleading information, if it is based on expectations that turn out to be false. Ronen (2008) complains that FV suffers from a lack of reliability and can be subject to manipulation. In the same vein, Liang and Wen (2007) are critical with the beneficial effects of moving to FV because it inherits more managerial manipulation and induce less efficient investment decisions than cost valuations. Plantin and Sapra (2008) conclude that, when there are imperfections in the market, there is the danger of the emergence of an additional source of volatility as a consequence of fair valuation, and thus a rapid shift to full mark-to-market regime may be detrimental to financial intermediation and therefore to economic growth. On the contrary, Bleck and Liu (2007) find that HC accounting makes it easier to hinder bad investment projects, preventing their liquidation therefore accumulating volatility to hit the market at a later date and producing crash prices, increasing overall volatility and reducing efficiency (i.e. reducing profitability). Gigler et al. (2006) conclude that even in the case of mixed attribute report (i.e., some items are valued at market while others are carried at HC), FV performs better: it provides stronger signals of financial distress. Finally, Choy (2006) shows that for FV to be relevant, necessary and sufficient conditions must be fulfilled.

Almost all existing empirical studies on FV test its relevance when applied to financial instruments, analyzing associations between accounting numbers and share prices. They provide conflicting findings; while Nelson (1996) does not find FV relevance, Barth (1994), Barth et al. (1996) and Bernard et al. (1995) do. Ahmed and Takeda (1995), Carrol et al. (2003), Eccher et al. (1996) and Barth and Clinch (1998) do find relevance, but under certain conditions. A recent study of Hann et al. (2007) finds FV pension accounting not improving the informativeness of the financial statements and even impairing it. Laswad and Baskerville (2007) do not find association between cash flow and unrealized earnings from revaluation of assets to FV, under pension schemes required in New Zealand. Ahmed et al (2006) find that recognition of derivative financial instruments at FV is relevant, while disclosure is not. Danbolt and Rees (2008) find that FV is consistently more value relevant than HC, although this value relevance can be conveyed via asset values and need not be incorporated into income computations. They also find evidence consistent with earnings manipulation under FV.

Choy (2006) complains that the predictive power of FV has never been tested, in spite of the fact that both the Statement of Financial Accounting Concepts (SFAC) 2 and the current project of the IASB (2006b) emphasize the need of predictive value of financial information. More predictable earnings and cash flows may help managers to anticipate financial problems, adjust inventories, negotiate funding, adjust resources, exercise judgement in financial reporting, increase or reduce production, etc. Improved accuracy may also lessen agency problems, because managers are considered to be more accountable. Empirical research has found that firms with lower forecast errors have lower implied costs of capital (Gebhardt et al. 2001)[2] and valuations in the stock market (Lang et al. 2003). To our knowledge, only Chen et al. (2006) test the predictive power of FV, finding that it reduces the ability to predict future cash flows. However, they study this relation indirectly, comparing the association between accounting numbers and future cash flows over time, assuming that accounting has been evolving to fair value. Kim and Kross (2005) find an increasing relationship between earning and one-year-ahead operating cash flows over time, but they attribute it to the increasing conservatism in accounting rather than to the influence of fair valuation.

Slightly related to these issues, Beaver et al. (2005) find a small decline in the ability of financial ratios to predict bankruptcy from 1962 to 2002, and an incremental explanatory power of market-related variables over this period. They explain the

deterioration of predictive ability of financial ratios in terms of an insufficient improvement of FASB standards.

The IAS 41 brings the debate into the agricultural accounting domain. Most authors are critical with the requirement of fair valuation for biological assets and value changes to be recognised in profit and loss statement. Penttinen et al. (2004) claim that fair valuation would cause unrealistic fluctuations in net profit of forest enterprises. Herbohn and Herbohn (2006) and Dowling and Godfrey (2001) stress on the increased volatility, manipulation and subjectivity of reported earnings under this standard. Both studies are performed in the context of the Australian of Accounting Standards Board 1037 (similar to IAS 41) and provide empirical evidence of Australian entities preference for cost valuation or delaying the adoption of FV. Specifically, Herbohn and Herbohn (2006) calculate coefficients of variation of profits, and of gains and losses from timber assets, of eight public companies and five state and territory government departments. The authors argue that figures provide an insight into the volatility caused by the fair value measurement[3]. Elad (2004) complains that the IAS 41 is a major departure from historic cost accounting; this could signal the demise of the French *Plan Comptable Général Agricole* (PGCA) model, entail the recognition of unrealized gains and increase profit volatility. However, Argilés and Slof (2001) welcome fair value measurement for biological assets because it avoids the complexity of calculating their costs, given the predominance of small family farms in Western countries, and specifically in the European Union (EU), with no resources and skills to perform accounting procedures and valuations. The nature of farming makes historical-based valuation of biological assets inherently difficult because they are affected by procreation, growth, death, as well as joint-cost situations. Allocation of indirect costs is another source of complexity for cost calculation in farms. This is an especially acute problem for small family households. The American Institute of Certified Public Accountants (1996) and the Canadian Institute of Chartered Accountants (1986) recommend historic cost, considering also the possibility of realizable value as an alternative. The 1986 French PGCA adheres also to the historic cost principle. However, Kroll (1987) regrets that the complexity in asset valuation and accounts is an important barrier to its use in the French PGCA. Elad (2004) points out that where there is not an active market for a biological asset, simplicity is not a merit of fair value. Argilés and Slof (2001) state that IAS 41 conceptual framework has already been widely and successfully implemented in the EU through the Farm Accountancy Data

Network (FADN). The latter has been fulfilling the role of a quasi-standard-setting body in the absence of previous pronouncements on agricultural standards from other authorities (Poppe and Beers 1996).

Therefore, an assessment of the convenience of FV for agriculture should balance its advantages and drawbacks. Simplicity is the main advantage of using FV for biological assets with respect to HC. But there is no unanimous pronouncement in previous literature with respect to whether volatility in income and profits, relevance, income smoothing and profitability are improved or worsened with FV. The present study contributes to this debate providing empirical evidence in valuation of biological assets in agriculture. No previous study has empirically contrasted the predictive power of FV versus HC valuation with respect to income and cash flow comparing two samples of firms each one using one valuation criteria. Comparing data from two samples of farms, one using HC and the other FV for biological assets, we find no significant differences in profitability, income smoothing, volatility in income and revenues, as well as in future cash flow predictive power. Most tests performed reflect lower earnings predictive power for farms using HC with respect to those using FV. In-depth interviews maintained with agricultural accountants help to explain these results, as generalized flawed accounting practices are found. Given the real setting in which agricultural accounting is produced, accurate and reliable cost calculations can not be expected.

The remainder of the paper is organized as follows. Section 2 explains the research design used in this study. Results are provided in the third section and discussed in the fourth. Finally, section five presents the conclusions.

Research design

Empirical design

The first purpose of the study is to empirically test the effects of the valuation method used for biological assets in revenues, earnings, volatility and accounting manipulation.

We perform mean comparison tests between samples of farms that use fair value and historic cost for biological assets valuation. The tests have been performed for revenues, earnings and assets.

We test the contradictory existing hypotheses of increase-decrease in volatility with fair valuation through comparisons for standard deviation of revenues, earnings, assets and return on assets. In order to control for relative variations we also compare coefficients of variations.

In order to test whether it is fair valuation or historic cost that entails less efficient investment decisions, we compare return on assets between both samples of farms.

In order to test the hypothesis that fair value increases accounting manipulation, we use the income smoothing index (*ISI*) suggested by Eckel (1981) and employed by Iñiguez and Poveda (2004) to test the market valuation of income smoothing:

$$ISI_i = \frac{CV_{\Delta E_i}}{CV_{\Delta CFO_i}} \qquad (1)$$

where $CV_{\Delta E_i}$ is the coefficient of variation of the first difference in annual net earnings (E) of farm i, while $CV_{\Delta CFO_i}$ is the coefficient of variation of the first difference in annual cash flow from operations (CFO) of farm i, thus comparing variation in accounting income with income that is free from accounting discretion. We use a well established calculation method for CFO (e.g. Kim and Kross 2005; Dechow 1994; Dechow et al. 1998; Chen et al. 2006)[4].

Only farms with at least three observations are considered for calculating standard deviations and coefficient of variations, and at least four consecutive observations for calculating first differences of earnings and cash flows.

Tests on the influence of the valuation method on earnings volatility are reinforced with regression models. We consider earnings volatility as a dependent variable of the valuation method employed, controlling for the volatility of farm CFO, that is supposed to be reliable data and independent on accruals and accounting manipulation. On the other hand, we consider earnings volatility depending on the valuation method, but controlling for volatility of farm revenues. We thus define the following regression models:

$$STD_{E_i} = \beta_0 + \beta_1 \cdot STD_{CFO_i} + \beta_2 \cdot FV_i + \varepsilon_i \quad (2)$$

$$\left|\Delta E_{ij}\right| = \beta_0 + \beta_1 \cdot \left|\Delta CFO_{ij}\right| + \beta_2 \cdot FV_i + \varepsilon_{ij} \quad (3)$$

$$STD_{E_i} = \beta_0 + \beta_1 \cdot STD_{REVENUE_i} + \beta_2 \cdot FV_i + \varepsilon_{ij} \quad (4)$$

$$\left|\Delta E_{ij}\right| = \beta_0 + \beta_1 \cdot \left|\Delta REVENUE_{ij}\right| + \beta_2 \cdot FV_i + \varepsilon_{ij} \quad (5)$$

where STD_{E_i} is the standard deviation of E of farm i, STD_{CFO_i} is the standard deviation of CFO generated by farm i, FV is a dummy variable, whose value is 1 when the farm applies FV to biological assets and 0 otherwise; ΔE_{ij} is the first difference (annual variation) of E of farm i in year j with respect to the previous year; ΔCFO_{ij} is the first difference (annual variation) of CFO generated by farm i in year j with respect to the previous year; $STD_{REVENUE_i}$ is the standard deviation of annual revenue of farm i, and $\Delta REVENUE_{ij}$ is the first difference (annual variation) of revenue of farm i in year j with respect to the previous year. We perform ordinary least squares (OLS) regressions for equation (2) to (5).

The second purpose of the paper is to compare the predictive power of income under HC and FV for biological assets. It is tested through differences in errors provided by the following parsimonious prediction models:

$$E_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \varepsilon_{ij} \quad (6)$$

$$CFO_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \varepsilon_{ij} \quad (7)$$

$$CFO_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \beta_2 \cdot CFO_{ij-1} + \varepsilon_{ij} \quad (8)$$

Carnes et al. (2003) use similar parsimonious models to equation (6) to estimate forecasting earnings. Kim and Kross (2005) use similar variable definitions and models

to equations (7) and (8) in the investigation of earnings and cash flow prediction. In the same vein, Dechow et al. (1998) and Chen et al. (2006) also estimate similar models to equations (6) to (8).

Different estimation methods have been performed for equations (6) to (8): OLS and panel regression models. Additionally, we run Arellano-Bond estimator for equations (6) and (8). This estimator is obtained through autoregressive dynamic panel data models that use the orthogonality conditions that exist between lagged values of variables and the disturbances (Baltagi 2005, p. 136-142).

With equations (6) to (8) we perform estimations and calculate subsequent errors, for samples of farms using HC and FV. Following Carnes et al. (2003) we then calculate the mean absolute percentage error (MAPE):

$$MAPE = \frac{1}{N}\sum_{N}^{1}\left|\frac{A_{ij} - F\left(A_{ij}\right)}{A_{ij}}\right| \qquad (9)$$

where N represents the total number of farm-years in the sample, A_{ij} is the actual value of earnings and cash flows for farm i in a year j and $F(A_{ij})$ is the forecast of earnings and cash flows for farm i in a year j as generated by each forecasting model. We then test differences in *MAPE* for both samples: farms using HC and those using FV for biological assets. We thus test the ability of incomes to predict future earnings and cash flows, where A_{ij} applies for E_{ij} and CFO_{ij} in equations (6) to (8).

Sample

The Spanish firm CABSA is a firm that provides analysis and financial data of Spanish firms, including 462 Spanish farms with notes to financial statements, which it provided to us. We classify the sample in two groups: those disclosing fair valuation for biological assets in their notes, and those disclosing historic cost valuation. We then select financial data from those farms available in SABI, which is a database of financial statements of about 1,000,000 Spanish and 150,000 Portuguese firms. It covers a larger number of firms than CABSA, but they do not provide notes to financial statements. Our review of notes to financial states yields 13 farms valuing biological

assets at FV and 334 at HC, while 115 are discarded because they do not provide information about their valuation method, the method applied is not clear, or there is no available financial data for them. Through SABI we collect the available twelve-year data for these firms.

CABSA and SABI databases collect information of financial statements of companies obliged to file in the Spanish *Registro Mercantil*. Most farms have no legal obligation to disclose financial information because of their small size and legal form, and usually do not write up accounting. Only the farms which, by their legal form, are trading companies must file financial statements in the mentioned *Registro Mercantil*, which is the primary data source for financial statements from Spanish farms.

The small proportion of farms from our sample using FV can be explained in terms of the requirement from Spanish accounting standards to use HC, stated in the accounting standards number 3 and 13 of the Spanish *Plan General Contable*. Market value is only allowed when cost price is higher. The 8th rapport of accounting principles from the *Asociación Española de Contabilidad* (AECA) recognising the possibility of using market prices in agricultural and mining companies under certain conditions, is a mere recommendation from this association. The 13 farms using FV in the sample apply it consistently, independently of the cost, would it be higher or lower. Some of these farms disclosing FV allege difficulties in calculating HC, the mentioned recommendation from AECA and the IAS41 requirement of FV.

SABI provides a rough item on cash flow data, consisting in adding depreciation to earnings. We however calculate a more reliable cash flow as previously indicated (see footnote 4). We get all the necessary items to calculate CFO for 97 farms valuing biological assets at HC and 8 at FV, thus yielding 449 year-data observations for the former and 58 for the later.

Results

Table 1 displays results (from data recorded in annual values) about the incidence of the valuation method applied to biological assets in earnings, assets, revenues, volatility and profitability.

As none of the items from table 1 in our samples fits normality (revealed through skewness-kurtosis tests) and/or presents unequal variances (revealed through Barlett's tests), we perform Mann-Whitney tests.

Table 1 displays significantly higher assets for farms valuing at FV compared to those valuing at HC. However, they are not transformed into differences in earnings and revenues, as tests performed do not find significant differences in these items between samples.

Table 1 displays significant differences in standard deviation of earnings with $p<0.05$, but they do not exist anymore when standard deviation is referred to mean values of earnings: no significant differences are found for the coefficient of variation of earnings. The table displays no significant differences in volatility of revenues, whether measured through standard deviation or coefficient of variation. Results do not support for the agricultural sector the commonly accepted hypothesis (e.g. Plantin and Sapra 2008; Dowling 2001; Pentinen et al. 2004) of greater volatility with FV. Bleck and Liu's (2007) hypothesis of greater volatility with HC is not supported either. However, there are significant differences with $p<0.01$ for the coefficient of variation of assets. According to our sample, the use of FV yields higher valuations for biological assets with respect to HC, whereas it provides lower volatility of asset values across periods, and does not significantly affect volatility of earnings and revenues.

(insert table 1 approximately here)

The fact that return on assets is not significantly different between groups of farms confirms neither Liang and Weng's (2007) hypothesis of less efficient decisions under FV, nor Bleck and Liu's (2007) argument that under HC bad investment projects would be pooled with good projects and prevented from liquidation, thus worsening firm profitability. In a similar way, no significant differences in standard deviation and coefficient of variation of return on assets indicate the absence of greater volatility of profits under any valuation method.

Table 1 displays higher ISI mean and median values for farms applying FV, but differences are not significant with respect to farms applying HC in our sample, suggesting that there are no differences in transfers of gains and loses across periods between both valuation methods. Thus, results from our sample do not support our

expectations about stronger accounting manipulation under FV (e.g. Watts 2003; Liang and Wen 2007; Ronen 2008) or under HC (Bleck and Liu 2007).

Regressions performed for equations (2) to (5) are displayed in table 2. All estimations present significant goodness-of-fit. Control variables present the expected significant positive signs in all estimations, while in none of the columns the dummy variable for valuation method presents a significant sign, whether the control variable would be CFO or revenues volatility. Results suggest no influence of the valuation method of biological assets on earnings volatility, thus reinforcing previous findings from table 1.

(insert table 2 approximately here)

Table 3 displays comparison of predictive power of farms under historic cost and fair valuation. OLS, as well as the more robust estimation methods of panel data and Arellano-Bond have been employed. Skewness-kurtosis tests reveal that errors from our estimations are no normally-distributed. Bartlett's tests yield that equal-variance assumption between errors of our samples is implausible. We thus perform two sample t-tests with unequal variances and further check them with nonparametric Mann-Whitney U tests.

(insert table 3 approximately here)

Panel A displays comparison of errors from earnings prediction parsimonious model one year ahead. Estimations with OLS yield significantly lower errors in our sample of farms under FV than under HC. The commonly used Hausman test (Hsiao 2005) rejects the null hypothesis of no correlation between individual effects and explanatory variables (χ^2=985.58 with $p<0.01$). As individual effects are correlated with the regressors in all estimations, the random effects estimator is inconsistent, while the fixed effects estimator is consistent and efficient. Errors from fixed effects estimations are significantly higher (with $p<0.01$) for the sub-sample of farms under HC with respect to the sub-sample under FV, while they do not exist with Mann-Whitney test, which is more reliable under non-normal distributions. Similar results (not displayed) are obtained with random effects estimations. Arellano-Bond estimation considerably reduces errors with respect to previous estimations, and also provides smaller errors for the sub-sample of farms under FV than for the sub-sample of farms valuing at HC. T-

test adjusted for unequal variances shows significant differences in errors with $p<0.05$, while they do not exist with Mann-Whitney test. It can be thus concluded that under FV accounting for biological assets, earnings are more, or at least no less, predictable than under HC. This fact is in accordance with the existence of no significant differences for coefficients of variation of earnings for both types of farms (as shown in tale 1).

Panel B from table 3 displays no significant differences in errors between both valuation methods with parsimonious OLS and panel regression models forecasting farm *CFO* from previous year earnings. The Hausman test provides an insignificant p-value (χ^2=0.34 with $p>\chi^2$ =0.5584), thus indicating that the random effects model is more efficient. However, fixed effects estimations (not displayed) also yield no significant differences in errors. Panel C also displays no significant differences in absolute percentage errors with OLS, panel regressions and Arellano-Bond estimations, where *CFO* is forecasted with earnings from both valuation methods and *CFO* from the previous year. Results display MAPE from fixed effects estimations (χ^2=18.33 with $p<0.01$), but random effects estimations (not displayed) also provide no significant differences in errors. Neither t-test adjusted for unequal variances, nor Mann-Whitney tests show significant differences between both samples, in absolute percentage errors obtained with all regressions referring to panels B and C. Results displayed in both panels suggest no significant differences in the relevance of earnings, calculated according to HC and FV, to predict future cash flows.

Given the few farms found applying FV we have examined the consistency of our results with a jackknife procedure. It is a well-established technique employed under the absence of available hold-out samples, and widely used in empirical accounting studies (e.g. Argilés 2001; Landsman et al. 2006). Results (displayed in table 4) confirm those of table 3.

(insert table 4 approximately here)

Discussion

A question that arises when interpreting these results is why, given the importance of random factors derived from climate and market conditions in agriculture, farms

applying FV do not present higher volatility, accounting manipulation or unpredictability for future earnings and cash flows. Given that market prices present pronounced fluctuations in the agricultural sector, less reliable accounting under FV would be expected. Bleck and Liu's (2007) provide an interesting argument. They contend that FV does not increase volatility; on the contrary, HC transfers volatility across time and even increases it overall. Thus, given that market prices fluctuate sharply, volatility would emerge anyway at the point of sale. Barlev and Haddad (2003) argue that, as a consequence of giving priority to reliability and conservatism, HC accounting is a source of irrelevance.

In the introduction, we have referred to an array of arguments about the drawbacks of FV. Many of them criticise FV because its advantages in relevance and informativeness are based on an unrealistic assumption about the existence of perfect and complete markets, rational investors, lack of information asymmetry, etc. (e.g. Barth et al. 1995). Consequently, fair values of some assets can not be clearly determined in practice, more specifically in the case of many agricultural assets (Elad 2007). According to this judgement, the discussion on the appropriateness of both valuation methods makes full sense in the natural setting in which accounting is produced and used. We agree on this point and on the need to require verifiability in accounting. Watts (2006) contends that lack of verifiability in accounting enhances the risk of deliberately injecting noise into earnings and ultimately the manipulation of accounting numbers. Tomkins and Groves (1983) remark the need for accounting research to acquire knowledge of relevant behaviours of agents involved in the natural setting in which accounting interacts. Relevant HC accounting requires accurate and reliable cost calculations. However, this is an assumption that is far rebbuttable in most farms. On the one hand, cost calculations are inherently complex in agriculture. The fact that farmers usually try to reduce random factor risks through product diversification, requires accurate cost allocations. The existence of joint-cost situations, seasonality, as well as the typical characteristics of procreation and growth of biological assets, entails additional complexities. On the other hand, agriculture in advanced western economies is predominantly characterized by small business units (Schmitt 1991). According to Allen and Lueck (1998) seasonality and randomness are the key factors that explain the predominance of small farm businesses and prevent farm organization gravitating towards factory processes. These small family holdings have neither accounting skills, nor resources to accurately perform the required complex cost calculations. Chittenden et al. (1998) warn about the

significant burden for small firms that may represent formal procedures such as record keeping systems or quality standards implementation. We have already mentioned that Kroll (1987) regrets that the complexity in asset valuation and accounts of the French PGCA was an important barrier to its use in practice.

In order to better interpret our results we need to know how financial statements are prepared in agriculture. Accordingly, we have carried out in-depth interviews with farmers, accountants and private and Government consulting firms specialized in agriculture. From these interviews the following picture emerges. Farmers generally view accounting procedures as unnecessary, being mainly useful for tax purposes. Accordingly, they only show a modest involvement in the preparation of accounting information. Common complaints from all the interviewed accountants are the scarce collaboration and the lack of detailed information from their clients. Accountants recognise that according to Spanish standards, they should apply HC. However, they admit that due to the amount of detailed information and work required, in most cases they apply an average of insurance companies' valuations calculated some years ago. In addition, they never depreciate livestock, because they find its calculation and monitoring very difficult, and financial statements usually rely on rough standard costs, which they usually apply to many of their clients. All interviewed accountants admit trying to apply the required HC valuation in Spanish accounting standards. However, none of the private nor Government agency prepare accurate cost accounting, with the exception of one consulting firms, which admits to do it in only 5% of the cases, while approximate data is provided for the remaining 95% of the cases. In the specific case of reproductive livestock, in approximately 75% of the cases they estimate a cost for any specific livestock in some geographical areas, and then apply the same cost to any farm in these areas. These costs have not been updated for years. As can be seen, in most cases HC means the same cost for all farms, independently of their real performance. Many farms that attempt to apply (or disclose) HC valuations, finally rely on market values, as for example when in some cases the interviewed accountants admitted to calculate HC with market price minus the percentage applied in the Spanish tax procedure to get the profit for tax calculations[5].

Beyond the theoretical discussion about unrealistic HC and FV accounting regimes and taking into account the characteristics of accounting practices in the agricultural sector, it can not be expected that HC would be free of problems of volatility, smoothing and predictability. It is not more reliable and relevant than FV, given the real setting

described above. This seems to be a plausible explanation for our empirical findings. Lewis and Jones (1980) and Sturgess (1994) also warned that HC is generally not very informative to users in agriculture and that allocations to individual assets are arbitrary in most cases.

Conclusions

This paper reviews recent literature on the debate about the convenience of moving from HC toward the FV principle. There is a lack of agreement about the advantages and drawbacks of this movement. No unanimous pronouncement can be ascertained in previous literature with respect to whether volatility in earnings, revenues and assets, relevance, manipulation and profitability are improved or worsened with the use of FV principle. However, a claim against the requirement of IAS 41 of fair valuation for biological assets prevails in the existing literature. Most authors complain that it is a major departure from the convenient valuation method required and will entail serious drawbacks for the agricultural sector.

Tests performed in this study provide empirical evidence that the use of FV for biological assets neither discloses significant differences in earnings and revenues, nor increases their volatility. Differences in profitability and accounting manipulation are not brought about either. Farm cash flows are not less predictable with fair valuation than with HC. Consequently, there is no difference in the relevance of accounting information. On the contrary, most tests reveal higher predictive power of future earnings under FV (but not confirmed by most robust estimations and tests). Other significant differences have been found in values and volatility of assets. Under FV, assets volatility is lower. None of the alleged drawbacks of FV were empirically confirmed by this research. On the other hand, FV avoids the unaffordable complexities of cost calculation in the agricultural sector. Therefore, when reliable marked prices exist, fair valuation appears to be a useful simple valuation method to get a more widespread use of accounting in the agricultural sector.

Our findings reflect the realistic conditions under which the HC accounting is performed. The accounting agents interviewed unveil rough practices of cost

calculations. Under such practices HC cannot be expected to be more reliable and relevant than FV.

From the point of view of the craft of accounting, HC is far more appealing than FV, when skills and resources are available. For management purposes, information about historic costs (or better said, current costs) is essential. We acknowledge that FV ignores the social and environmental relations of production that lie beneath market exchanges, and risks to legitimate unjust socio-economic relations, as pointed out by Elad (2007). However, we do not believe that HC is able to deal with these issues. Costs recorded in financial statements also lie beneath market exchanges. Market transactions always reflect often unjust social and environmental relations. Opportunity costs of family work, externalities, environmental and social costs are also absent from HC in financial accounting. These are important factors that should be studied and analysed, whatever the valuation method applied, but there is no glimpse whether HC would add any advantageous solution to these issues with respect to FV. Tools such as Global Reporting Initiative or any other disclosure on this respect is equally compatible with FV in agriculture, provided that farms would be big enough to overcome formal procedures and administrative costs to do it. As an example, the European FADN uses market valuations for biological and fixed assets, and this is not a greater handicap than the use of HC would be for the analysis of opportunity costs of family work, social or environmental costs. Tax inconveniences can be easily solved, but these issues are out of the scope of the present article. We are just claiming the advantage of FV from the point of view of simplicity, when market values are available, considering the complexities of cost calculations in agriculture, the characteristics of most farms and the real setting where accounting is produced. There is no reliable accounting information from unreliable costs. Our empirical research does not support the existence of the alleged disadvantages of FV with respect to HC. On the contrary, given the real setting of agricultural accounting, FV entails a more consistent valuation method, as well as a more reliable and comparable source of information. Thus, the advantage of its simplicity as a useful tool for the widespread of accounting across the agricultural sector remains.

The small samples used in this research study, especially in the sub-sample of farms applying FV, are one of the drawbacks of this study. Therefore, further research with wider samples and segmented studies for big/small agricultural businesses and different

countries is needed. The setting in which accounting in agriculture is produced requires also in-depth research.

Notes

1. The IASB started a project on fair value measurement and issued a discussion paper (IASB, 2006a) aiming at a providing a single source of guidance on fair valuation, adopting the same definition as in SFAS 157, but stating that "it will neither introduce nor require any new fair value measurements" (IASB 2008).
2. However, their results are not conclusive to the extent that multivariate results, partially contradicting this finding, are not satisfactorily explained.
3. Barth et al. (1995) find that fair value based earnings and capital are more volatile than historical cost earnings and capital with a sample of banks. However, they do not find this incremental volatility to be associated with bank share prices.
4. According to these authors, and to the available data in the financial statements of the *Spanish* SABI data base, we perform the most feasible calculation for cash flow from operations: CFO = operating income + depreciation – change in inventory – change in debtors – change in prepayments and accrued income + change in current liabilities (excluding bank loans) + change in provisions.
5. In Spain only incorporated business (*sociedades*) have the obligation to disclose financial statements. Most farms, as well as most small business in other sectors, determine their taxes on the basis of a hypothetical profit calculated by means of a standard percentage of sales, previously specified by the Spanish Ministery. This procedure is called *Estimación Objetiva Singular*. Only when sales exceed certain level, it is necessary to determine a direct estimation of earnings through recorded revenues and expenses.

References

Ahmed, A.S., Kilic, E. and Lobo, G.J., 2006, 'Does recognition versus disclosure matter? Evidence from value-relevance of banks' recognized and disclosed derivative financial instruments', *Accounting Review*, 81, 3: 567-588.

Ahmed, A.S. and Takeda, C., 1995, 'Stock market valuation of gains and losses on commercial banks' investment securities. An empirical analysis', *Journal of Accounting and Economics*, 20: 207-225.

Allen, D.W. and Lueck, D., 1998, 'The nature of the farm', *Journal of Law and Economics*, XLI, 2: 343-386.

American Institute of Certified Public Accountants 1996, *Audits of Agricultural Producers and Agricultural Cooperatives*, AICPA, New York.

Argilés, J.M., 2001, 'Accounting information and the prediction of farm non-viability', *European Accounting Review*, 10, 1: 73-105.

Argilés, J.M. and Slof, J., 2001, 'New opportunities for farm accounting', *European Accounting Review*, 10, 2: 361-383.

Ball, R., 2006, 'International Financial Reporting Standards (IFRS): pros and cons for investors', *Accounting and Business Research*, 36, special issue: 5-27.

Baltagi, B.H., 2005, *Econometric analysis of panel data*, John Wiley & Sons, Chichester.

Barlev, B. and Haddad, J.R., 2003, 'Fair value accounting and the management of the firm', *Critical Perspectives on Accounting*, 14: 383-415.

Barth, M.E., 1994, 'Fair value accounting: evidence from investment securities and the market valuation of banks'. *Accounting Review*, 69,1: 1-25.

Barth, M.E., Beaver, W.H. and Landsman, W.R., 1996, 'Value-relevance of banks' fair value disclosures under SFAS nº 107', *Accounting Review*, 71, 4: 513-537.

Barth, M.E. and Clinch, G., 1998, 'Revalued financial, tangible, and intangible assets: Associations with share prices and non-market-based value estimates', *Journal of Accounting Research*, 36, Suplement: 199-233.

Barth, M.E. and Landsman, W.R., 1995, 'Fundamental issues related to using fair value accounting for financial reporting', *Accounting Horizons*, 9, 4: 97-107.

Barth, M.E., Landsman, W.R. and Whalen, J.M., 1995, 'Fair value accounting: effects on banks' earnings volatility, regulatory capital, and value of contractual cash flows', *Journal of Banking and Finance*, 19, 3-4: 577-605.

Beaver, W.H., MchNichols, M. and Rhie, J.-W., 2005, 'Have financial statements become less informative? Evidence from the ability of financial ratios to predict bankruptcy', *Review of Accounting Studies*, 10: 93-122.

Bernard, V., Merton, R. and Palepu, K., 1995, 'Mark-to-market accounting for banks and thrifts: lessons from the Danish experience', *Journal of Accounting Research*, 33, 1: 1-32.

Bleck, A. and Liu, X., 2007, 'Market transparency and the accounting regime', *Journal of Accounting Research*, 45, 2: 229-256.

Canadian Institute of Chartered Accountants, 1986, *Comptabilité et Information Financière des Producteurs Agricoles*, CICA, Toronto.

Carnes, T.A., Jones, J.P., Biggart, T.B. and Barker, K.J., 2003, 'Just-in-time inventory systems innovation and the predictability of earnings', *International Journal of Forecasting*, 19, 4: 743-749.

Carroll, T.J., Linsmeier, T.J. and Petroni, K.R., 2003, 'The reliability of fair value versus historical cost information: evidence from closed-end mutual funds', *Journal of Accounting, Auditing and Finance*, 18, 1: 1-23.

Chartered Financial Analyst Institute, 2007, A comprehensive business reporting model: financial reporting for investors, http://www.cfapubs.org/doi/pdf/10.2469/ccb.v2007.n6.4818

Chen, K., Sommers, G. A. and Taylor, G. K., 2006, "Fair value's affect on accounting's ability to predict future cash flows: a glance back and a look at the potential impact of reaching the goal", http://ssrn.com/abstract=930702

Chittenden, F., Poutziouris, P. and Mukhtar, S.M., 1998, 'Small firms and the ISO 9000 approach to quality management', *International Small Business Journal*, 17,1: 69-84.

Choy, A.K., 2006, 'Fair value as a relevant metric: a theoretical investigation', http://ssrn.com/abstract=878119

Danbolt, J. and Rees, W., 2008, 'An experiment in fair value accounting: UK investment vehicles', European Accounting Review, 17, 2: 271-303.

Day, J.M., 2000, Speech by SEC staff: fair value accounting-let's work together and get it done, http://www.sec.gov/news/speech/spch436.htm

Dechow, P.M., 1994, 'Accounting earnings and cash flows as measures of firm performance. The role of accounting accruals', *Journal of Accounting and Economics*, 18: 3-42.

Dechow, P.M., Kothari, S.P. and Watts, R.L., 1998, 'The relation between earnings and cash flows', *Journal of Accounting and Economics*, 25: 133-168.

Dowling, C. and Godfrey, J., 2001, 'AASB 1037 sows the seeds of change: a survey of SGARA measurement methods', *Australian Accounting Review*, 11, 1: 45-51.

Eccer, E.A., Ramesh, K. and Thiagajaran, S.R., 1996, 'Fair value disclosures by bank holding companies', *Journal of Accounting and Economics*, 22, 1-3: 79-117.

Eckel, N., 1981, 'The income smoothing hypothesis revisited'. *Abacus*, 17, 1: 28-40.

Economist, 2007 'A book-keeping error', *Economist*, 384, 8544: 69.

Elad, Ch., 2004, 'Fair value accounting in the agricultural sector: some implications for the international accounting harmonization', *European Accounting Review*, 13, 4: 621-641.

Elad, Ch., 2007, 'Fair value accounting and fair trade: an analysis of the role of International Accounting Standard Nº. 41 in social conflict', *Socio-Economic Review*, 5: 755-777.

European Central Bank, 2004, 'Fair value accounting and financial stability', *Occasional Paper Series*, 13.

Gebhardt, W., Lee, C. and Swaminathan, B., 2001, 'Toward an implied cost of capital', *Journal of Accounting Research*, 39, 1: 135-176.

Gigler, F. Kanodia, Ch. And Venugopalan, R., 2007, 'Assessing the information content of market-to-market accounting with mixed attributes: the case of cash flow hedges', *Journal of Accounting Research*, 45, 2: 257-276.

Hann, R.N., Heflin, F. and Subramanayam, K.R., 2007, 'Fair-value pension accounting', *Journal of Accounting and Economics*, 44: 328-358.

Herbohn, K. and Herbohn, J., 2006, 'International Accounting Standard (IAS) 41: what are the implications for reporting forest assets?'. *Small-scale Forest Economics, Management and Policy*, 5, 2: 175-189.

IASB, 2006a, Fair value measurements. Part 2: SFAS 157 fair value measurement, *Discussion paper*, http://www.iasb.org/NR/rdonlyres/5D20E453-26D3-4E0A-AB08-FC391917FD89/0/DDFairValue2.pdf

IASB, 2006b, Discussion paper: preliminary views on an improved conceptual framework for financial reporting, http://www.iasb.org/NR/rdonlyres/4651ADFC-AB83-4619-A75A-4F279C175006/0/DP_ConceptualFramework.pdf

IASB, 2008, Fair value measurement, where are we in the project?, http://www.iasb.org/Current+Projects/IASB+Projects/Fair+Value+Measurement/Fair+Value+Measurement.htm.

Iñíguez, R. and Poveda, F., 2004, 'Long-run abnormal returns and income smoothing in the Spanish stock market', *European Accounting Review*, 13, 1: 105-130.

Joint Working Group of Banking Associations on Financial Instruments, 1999, Accounting for financial instruments for banks, http://www.aba.com/aba/pdf/GR_tax_va4.PDF

Kim, M. and Kross, W., 2005, 'The ability of earnings to predict future operating cash flows has been increasing – not decreasing', *Journal of Accounting Research*, 43, 5: 753-780.

Kroll, J.C., 1987, 'Le nouveau plan comptable: les occasions perdues', *Économie Rurale*, 180: 20-25.

Landsman, W.R., Peasnell, K.V., Pope, P.F. and Yeh, S., 2006, 'Which approach to accounting for employee stock options best reflects market pricing?', *Review of Accounting Studies*, 11: 203-245.

Lang, M.H., Lins, K.V. and Miller, D.P., 2003, 'ADRs, analysts, and accuracy: does cross listing in the United States improve a firm's information environment and increase market value?', *Journal of Accounting Research*, 41, 2: 317-345.

Laswad, F. and Baskerville, R.F., 2007, 'An analysis of the value of cash flow statements of New Zealand pension schemes', *British Accounting Review*, 39: 347-355.

Lewis, A.E. and Jones, W.D., 1980, 'Current cost accounting and farming businesses', *Journal of Agricultural Economics,* 31: 45-53.

Liang, P.J. and Wen, X., 2007, 'Accounting measurement basis, market mispricing, and firm investment efficiency', *Journal of Accounting Research*, 45, 1: 155-197.

Nelson, K.K., 1996, 'Fair value accounting for commercial banks: an empirical analysis of SFAS nº 107', *Accounting Review*, 71, 2: 161-182.

Penttinen, M., Latukka, A. Meriläinen, H., Salminen, O. and Uotila, E., 2004, 'IAS fair value and forest evaluation on farm forestry', *Proceedings of Human dimension of family, farm and community forestry international symposium*, March 29-April 1.

Poppe, K.J. and Beers, G., 1996, 'On innovation management in Farm Accountancy Data Networks', *Agricultural Economics Research Institute LEI,* 535: 1-37.

Plantin, G. and Sapra, H., 2008, 'Marking-to-market: panacea or Pandora's box?', *Journal of Accounting Research*, 46: 435-436.

Rayman, R.A., 2007, 'Fair value accounting and the present value fallacy: the need for an alternative conceptual framework', *British Accounting Review*, 39: 211-225.

Ronen, J., 2008, 'To fair value or not to fair value: a broader prerspective', *Abacus*, 44, 2: 181-208.

Schmitt, G., 1991, Why is the agriculture of advanced western economies still organized by family farms? Will this continue to be so in the future?, *European Review of Agricultural Economics,* 18: 443-458.

Sturguess, I., 1994, 'Ce qu'apporte la théorie économique à la mesure et l'interpretation des revenues agricoles', *Économie Rurale*, 220: 11-15.

Tomkins, C. and Groves, R., 1983, 'The everyday accountant and researching his reality', *Accounting Organizations and Society*, 8, 4: 361-374.

Watts, R.L., 2003, 'Conservatism in accounting. Part I: explanations and implications', *Accounting Horizons*, 17, 3: 207-221.

Watts, R.L., 2006, 'What has the invisible hand achieved?', *Accounting and Business Research*, 36, special issue: 51-61.

Table 1. Mean and median comparisons between samples of farms using fair value and historic cost (form data recorded in annual values)

	Number of observations		Mean		Median		
	HC	FV	HC	FV	HC	FV	
E: Earnings (in €)	3648	147	161,003.10	224,417.60	33,319.96	52,637	
Assets (in €)	3653	147	4,464,189	5,686,498	1,744,346	3,781,143	***
REVENUE: Revenues (in €)	3632	147	4,966,970	4,670,715	2,378,165	1,909,216	
STD_E: Std. dev. of earnings	334	13	319,425.60	332,843.70	78,020.88	252,094.60	**
Std. dev. of assets	334	13	1,240,429	887,817.70	451,801.40	716,459.10	
$STD_{REVENUE}$: Std. dev. of revenues	333	13	1,274,262	996,484.20	656,184.30	562,459.40	
Coefficient of variation of earnings	334	13	-0.8767701	-2.542746	1.005028	0.739634	
Coefficient of variation of assets	334	13	0.2921988	0.1660403	0.2350004	0.149725	***
Coefficient of variation of revenues	333	13	0.3043578	0.2282905	0.2405416	0.1559959	
Return on assets (in percent)	3649	147	2.978	2.892	1.97	2.892	
Std. dev. of return on assets	334	13	7.392014	5.767836	4.528184	4.863414	
Coefficient of variation of return on assets	334	13	-20.53559	9.721508	0.9579515	0.7118995	
ISI: Income smoothing index	46	7	2.587624	13.74994	0.2905268	0.3048174	

Notes:

Mann-Witney test

Significance levels: * $p<0.1$, ** $p<0.05$ and *** $p<0.01$

Table 2. OLS estimations relating earnings volatility to cash flows and revenues volatility (t-statistics in parenthesis)

	(A) Eq. (2)		(B) Eq. (3)		(C) Eq.(4)		(D) Eq.(5)	
Variables	STD_E		$\lvert \Delta E \rvert$		STD_E		$\lvert \Delta E \rvert$	
Constant	118,734.60		120,444.10		98,999.89		139,418.60	***
	(1.57)		(1.53)		(1.61)		(5.92)	
FV	-38,522.48		-160,637.40		60,857.03		59,896.84	
	(-0.19)		(-0.83)		(0.22)		(0.54)	
Control variables:								
STD_{CFO}	0.454536	***						
	(12.19)							
$\lvert \Delta CFO \rvert$			0.4184609	***				
			(18.35)					
$STD_{REVENUE}$					0.1735971	***		
					(6.89)			
$\lvert \Delta REVENUE \rvert$							0.1608458	***
							(14.60)	
Fitness of the model:								
R-square	0.6841		0.4834		0.1216		0.0591	
F	74.72	***	171.25	***	23.73	***	106.74	***
Number of observations	72		369		346		3,399	

Significance levels: * p<0.1, ** p<0.05 and *** p<0.01

Table 3. Comparison of error forecasting under historic cost and fair value

	Number of observations		Mean absolute percentage error (*MAPE*)			
	HC	FV	HC	FV	t-test uneq. var.	Mann-Whitney
Panel A: Earnings prediction parsimonious model one year ahead: equation (6) $E_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \varepsilon_{ij}$						
OLS estimation	3,286	134	13.38284	3.855784	***	***
Panel data estimation (fixed effects)	3,286	134	17.59503	6.331572	***	
Arellano-Bond estimation	2,813	119	5.134423	1.960496	**	
Panel B: Cash flow prediction depending on earnings of previous year: equation (7) $CFO_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \varepsilon_{ij}$						
OLS estimation	437	57	3.922158	4.718276		
Panel data estimation (random effects)	437	57	3.614197	5.045603		
Panel C: Cash flow prediction depending on earnings and cash flow of previous year: equation (8) $CFO_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \beta_2 \cdot CFO_{ij-1} + \varepsilon_{ij}$						
OLS estimation	322	48	2.628344	3.610359		
Panel data estimation (fixed effects)	322	48	3.954732	7.733764		
Arellano-Bond estimation	236	40	1.264479	2.094354		

Significance levels: * p<0.1, ** p<0.05 and *** p<0.01

Table 4. Comparison of jackknife error forecasting under historic cost and fair value

	Number of observations		Mean absolute percentage error (*MAPE*)			
	HC	FV	HC	FV	t-test uneq. var.	Mann-Whitney
Panel A: Earnings prediction parsimonious model one year ahead: equation (6) $E_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \varepsilon_{ij}$						
OLS estimation	3,286	134	13.38926	3.89817	***	***
Panel data estimation (fixed effects)	3,286	134	17.60172	6.38673	***	
Arellano-Bond estimation	2,813	119	5.137836	2.046517	**	
Panel B: Cash flow prediction depending on earnings of previous year: equation (7) $CFO_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \varepsilon_{ij}$						
OLS estimation	437	57	3.948018	4.854139		
Panel data estimation (random effects)	437	57	3.630547	5.114437		
Panel C: Cash flow prediction depending on earnings and cash flow of previous year: equation (8) $CFO_{ij} = \beta_0 + \beta_1 \cdot E_{ij-1} + \beta_2 \cdot CFO_{ij-1} + \varepsilon_{ij}$						
OLS estimation	322	48	2.666814	3.829859		
Panel data estimation (fixed effects)	322	48	3.991621	7.920008		
Arellano-Bond estimation	236	40	1.407788	1.355967		

Significance levels: * p<0.1, ** p<0.05 and *** p<0.01