



THE RISE AND SIGNIFICANCE OF MODERN ANALYTICAL METHODS IN ACCOUNTING

Part I - A Review Essay of Accounting Theory - An Information Content Perspective, of John A. Christensen and Joel Demski

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Abstract

This is Part I of two review essays dealing with the development of analytical accounting and, particularly, the application of information economics to accounting. This perspective tries to substitute the notions of probabilistic information for the deterministic notion of valuation. It deals with both financial as well as managerial accounting (the latter in form of agency theory). After a concise survey of the earlier (deterministic) phases of accounting, the present paper reviews the book by J. A. Christensen and Demski [2003], one of the two prominent introductions for advanced and graduate students to the “information content perspective”. While this book offers a host of examples and illustrations, the other work (to be reviewed later in this journal, i.e., in Part II), the two volume work by O. P. Christensen and Feltham [2003-2004], though also designed for graduate students, is a more complete survey and overview of the pertinent literature, offering a host of propositions (theorems with rigorous proofs) of this perspective. Despite the excellence of those books, it is regrettable that they do not sufficiently integrate this relatively “new” material with the conceptual apparatus of traditional accounting—as do, for example, two German texts by Ewert and Wagenhofer [1997/2003] and Wagenhofer and Ewert [2003].

1. The Advent and Development of Analytical Accounting

The literal translation of certain terms from one language into another often harbours dangers and misunderstandings. This may be the case for the expression “analytical accounting” which, in Spanish, French and Italian, usually means what in English is referred to as cost or managerial accounting. In the Anglo-American

literature, however, “analytical accounting” conveys the representation of accounting in modern deterministic and, particularly, probabilistic mathematical terms (such as set-theoretical and stochastic concepts). In a previous issue of *Energeia* [Mattessich, 2002, note 5, p. 35 (Spanish translation, p. 77-78)] I distinguished four phases of analytical accounting and outlined the development of this literature and its major authors. Here, however, we are only concerned with the last (i.e., the longest and most important) phase of this research.

This phase slowly began in the late 1960s and early 1970s when a great change made itself felt in the academic business literature of North America. The phenomenal rise of finance theory and information economics, and the exploitation of probability theory, stimulated young accounting scholars to apply those concepts and tools to their own subject matter—a trend that greatly accelerated since the 1980s. But these young scholars soon distanced themselves from the older and predominantly deterministic approach of analytical accounting—possibly because of the greater prestige promised by this new and more sophisticated trend. Hence they proceeded on a path that rarely used traditional accounting concepts. Instead, such terms as information (private vs. public, and ex-post vs. ex-ante), content and value of information, action choice and information system choice, prior vs. posterior beliefs, performance evaluation, decision-facilitating vs. decision-influencing, risk aversion and risk neutrality, efficient risk sharing, etc., became commonplace. Yet, it was not only the use of novel concepts, but the change of direction that was decisive. The analytical accounting of the pioneers was still “accounting”, while that of the “young Turks” was rather “economics of accounting”.

The stochastic information economics approach was created by economists in publications such as Marschak [1959], Radner [1961], Marschak and Miyasawa [1968], Marschak and Radner [1972], Stigler [1961] and others. This methodology, in turn, was applied to accounting, first, by Feltham [1967] in his doctoral thesis in Berkeley. Many other publications followed: Feltham [1968, 1972, 1984, 1999] and (through his collaboration with a colleague, then also at Stanford university) Feltham and Demski [1970], Demski and Feltham [1972, 1974, 1976, 1978] and Demski [1972, 1993, 1994] as well as a series publications with and by other authors.

Later on, Ohlson [1983, 1987a, 1987b, 1988, 1990, 1995, 1999, 2001]—sometimes in collaboration with Feltham [e.g., Feltham and Ohlson, 1995, 1999]—joined this trend with a somewhat different emphasis that returned, at least to some extent, to more traditional accounting notions [e.g., the use of “clean surplus” vs. “dirty surplus” in financial statements—see Mattessich, 2002].

Meanwhile Coase's [1937, 1938] revolutionary, but long-neglected ideas on *agency theory*, were revived by a different group of scholars [e.g., Jensen and Meckling, 1976]. This was an opportunity for Demski, Feltham and others to reformulate agency theory in more rigorous mathematical terms. After accomplishing this, the two main constituents of modern analytical accounting were in place, namely *information economics* (with its probabilistic framework and the emphasis on the content and value of information) and *agency theory* (with its orientation towards managerial behaviour). In a way, these two fields have now been fused under such terms as the "information economic approach" or the "information content perspective", as it is called in Christensen and Demski [2003].

Although this theoretical body began to impact academic accounting from the late 1960s and, particularly, from the 1970s onwards, the trend has not spread much beyond the American continent, and even there it is limited to the elite schools—though sporadic interest in this approach in other countries is undoubtedly growing.¹ Whether this geographical limitation is partly due to the mathematical rigor required for mastering this approach is difficult to say, but there seems to be less doubt that it is due to the "novelty" of the *information-oriented* outlook. The majority of accountants (whether practitioners or academics) are basically conservative. Thus they are reluctant to abandon the deeply ingrained *value orientation* and might be distrustful to adopt a totally different outlook. And how different it is, is well explained in the book under review.

2. Accounting Theory-An Information Content Perspective

This textbook by Christensen and Demski [2003] is a pedagogically excellent work to make the reader acquainted with the "information content perspective" that the two authors emphatically juxtapose to the traditional "valuation perspective". They characterize this difference by pointing at the main thrust of the book:

A popular idiom is that accounting is, or should be, designed to measure value. Ideally the argument goes, assets would be stated at fair value, income would be a fair and true measure of economic accomplishment relative to the net asset employed,...Once market structure departs from the textbook extreme of a perfect and complete set of markets, the very notion of a well-defined concept of value disappears....We hasten to add that if valuation is the purpose, accounting is an abject failure on a worldwide basis....The information perspective, the notion that accounting is designed to provide information, views accounting as using the language and algebra of valuation but for the purpose of conveying information. The distinction is subtle but profound....The information content school...views the financial measures as measures of information events, not as values. [Christensen and Demski, 2003, pp.4-5].

The authors give no indication of the level for which this book is intended, but the most likely use will be in graduate seminars for accounting students with a background in economics, finance, probability and decision theory as well as familiarity with the appropriate mathematical notations (expressing statistical expectations, conditional statements, etc.). The mathematics required for comprehending the material is not particularly daunting, but the greatest hurdle to be overcome might be the particular conceptual apparatus used in this book—so very much different from what most accountants are used to. The book may also be well suited for accountants (academics and possibly some practitioners) unfamiliar with this promising area, but ambitious enough to familiarize themselves with it.

3. Structure and Content of the Book

Chapter 1 serves as a general introduction. Part I (Chapters 2 to 7) is concerned with explaining the Foundations by examining the entity and its allocation of resources (labour, capital and management) from an *ideal economic* point of view (i.e., with well-defined economic value and income).² Then this situation is depicted (by means of practical examples) under conditions of *traditional accounting*, providing an opportunity to compare and connect accounting with economic valuation. Next, the notion of information as an event that changes expectations (usually lying between “*perfect information* ...equivalent to learning exactly which *state* [i.e., economic state, state of nature, etc.—in the following shortly called ‘state’] will occur” and “*null information* from which we learn nothing about which state will occur” [p.81]. Hence without *uncertainty* there is no information, save the latter trivial case. Then information (and the systematic *revision of probabilities*) is applied to resource allocation by emphasizing that information usually does not come ready-made but must be carefully “extracted from the carrier”. However, most importantly, information is also defined as “a *partition* of state space” [p.137—in the following page numbers, brackets always refer to Christensen and Demski, 2003]. And this becomes clearer if we remind ourselves that information economics is based on the *mapping of states into information signals*; and the better an information system (i.e., the finer the set of possible signals), the closer it will match the set of possible states (“state space”).

Part I closes with the crucial Chapter 7 that examines “The Accounting System as an Information Channel”. Here the two authors try to show what it means for an accounting system to function as an information system by introducing major “uncertainties” into their illustrations of an accounting system (covering a period of three years). For example, expected prices in previous illustrations assumed as cer-

tain, are now subject to variations (e.g., by “plus or minus 10”), or additional charges for depreciations or doubtful receivables are introduced. This brings home some important insights. First, that cash flows and accrual accounting themselves are information sources. Second that such additional charges must not be made mechanically but accountants need to concentrate on the reasons or substance behind them to become aware of the actual source of information. Here the authors vividly *illustrate* how this information ultimately boils down to certain partitions of the state space (mapping states into information signals).

Part II (Chapters 8 to 13) constitutes the core of the information perspective and its exploitation in accounting systems. The first three chapters of this part focus on the proper valuation of a particular firm. The authors continue their stepwise exploration by beginning with a situation (under uncertainty) where accounting is the only source of information. Then they introduce other information sources and illustrate the importance of distinguishing non-accounting information from accounting information. Subsequently (in Chapters 11 and 12), they change to evaluating managers by means of information for contracts between proprietors and agents. Here the major problems of mathematical agency theory are discussed and elaborated. This is finally extended to situations where information is used for valuation of assets and equities, as well as for the evaluation of management. But wherever information possesses content and usefulness in one situation, it does not necessarily so in another. This seems to conform to the need for purpose-orientation in accounting [repeatedly emphasized in Mattessich, 1995, pp.10, 60, 82, 85, 142, 183, 187-88, 201].

Part III examines the advantages of accounting information, above all, in relation to auditing aspects. Here major issues are the rules of “recognition” and the “conditional recognition” (i.e., determining when income, expenses, etc. are recognized, and that, in the case of “conditional” recognition, it may depend on information sources other than accounting). The authors examine what information is relevant enough to be included in the accounting and auditing process—and there, the managers’ self-reporting plays an important role. “A picture of conservatism emerges here based on the simple idea that it is better to check ‘good news’ rather than ‘bad news’ when this news is being self-reported by the manager” [Christensen and Demski, 2003, pp.9-10]. This part closes with a discussion of “intratemporal” accruals, relevant in the case of multi-product firms [Chapter 18].

Part IV attempts to relate this theory to the institutional setting of governmental or

semi-public accounting regulations. Here the authors' confidence in the information content perspective seems to vanish, and they even feel obliged to make the following admission:

The aggregation approach [as entailed by public accounting regulations], however leads us to social choice and Arrow's celebrated impossibility theorem...The problem is that the four conditions [required for aggregating individual preferences, as stated by Arrow] are mutually incompatible...At present we see this theme played out in the international arena where the FASB and the IASB offer competing views of a 'global GAAP.'...Can we unequivocally say which is better? [Christensen and Demski 2003, pp.430-431].

4. Evaluation of the Book

There is little doubt that this text is a strong candidate for becoming an accounting classic [together or in competition with the two volumes of P. O. Christensen and Feltham, 2003-2004, to be reviewed in a later issue of *Energieia* — see Mattessich, 2004b]. Both of these works ultimately deal with improving the selection of the "proper" accounting system through the application of information economics, agency theory and related subjects to accounting. But the book by Christensen and Demski [2003] contains a host of numerical illustrations that greatly facilitate the understanding of the material by graduate students and academic accountants eager to improve their knowledge of an aspect of their field that harbours considerable future potential. Yet, such illustrations are scarce in the two volumes by Christensen and Feltham [2003-2004]; these volumes rather serve the expert as a survey of the major research areas and accomplishments in this field. Although there is bound to be some overlap between these two works, in a way they can be considered complementary. For the uninitiated (with serious intentions to get acquainted with this perspective of accounting), a thorough study of Christensen and Demski [2003] is first recommend. Having digested this material, it should be easier to comprehend the more exacting work by Christensen and Feltham [2003-2004].

However, a review essay as this is obliged to take a critical look at this entire sub-field from a scientific and pedagogic as well as practical vantage point. Despite some criticism from anti-analytical quarters, one can hardly question the scientific seriousness and rigor of the information economic perspective. As part of modern accounting, our entire discipline and all its adepts ought to be proud of possessing such an achievement, hardly rivalled in any other branch of accounting. If it were for no other reason, merely the pedagogic rigour engendered by the information

perspective ought to be sufficient for praising many of the numerous publications generated in this area—including the integrating and synthesizing efforts of the two works under review in Part I [i.e. of Christensen and Demski 3003, and in Part II of Christensen and Feltham 2003-2004].

Two major questions that might be raised are: First, who should study this sub-area? Second, will it benefit accounting practice? Above all, for whom is the considerable intellectual investment in the study of the information economic approach to accounting likely to be worthwhile? This is a cost-benefit question sometimes frowned upon in pedagogic circles. There may come a time when material like this becomes obligatory for accountants, just as the differential and infinitesimal calculus (considered in the 17th century as quite esoteric) is nowadays obligatory for high-school students. But such a general and wide adoption of the information perspective would hardly be imminent. To confine a thorough study of the information content perspective to doctoral students and future accounting academics seems to be a reasonable suggestion. Of course, such persons would, in turn, teach this material to future professors, and so on. To interrupt this circle, some break-through in practical application or, at least, in connecting this relatively esoteric field with traditional accounting concepts would be of considerable benefit. Indeed, there exist some German books [by Ewert and Wagenhofer, 1993/2003; and Wagenhofer and Ewert, 2003] that offer a somewhat better integration of the information perspective with notions of traditional accounting — for details see, Mattessich [2004a].

As regards practical applications, the jury is still out. Only few practitioners might be able to transfer such abstract knowledge to their every-day activity so as to become better accountants or auditors. And the same effort invested in a more emphatic and penetrating training in business ethics might (in view of the numerous financial, accounting and auditing scandals in North America) have a higher pay-off from a practical point of view. But scientists have to look at such things from a more long-run point of view.

Another major obstacles of the information perspective, lies in the fact that most of its achievements are difficult to comprehend outside the context of its own esoteric conceptual framework—or so it seems. Admittedly, Christensen and Demski [2003] try their very best to explain the information economic perspective in a way that makes it accessible to eager students and non-experts prepared to invest considerable effort to comprehend it. And for this effort they must be congratulated.

Notes

¹ In Germany, for example, authors like Ewert [1987] and Wagenhofer [1996], have made contributions to this field, and their textbooks, i.e., Ewert and Wagenhofer [2003/1993] as well as Wagenhofer and Ewert [2003], offer an introduction to the information perspective that is even better integrated with the traditional conceptual apparatus of accounting than either Christensen and Demski [2003] or Christensen and Feltham (2003-2004). Furthermore, the fact that the (first) co-authors of J. A. Christensen and Demski [2003] as well as P. O. Christensen and Feltham [2003-2004] are both teaching in Denmark, points at a growing interest in this area in some European countries.

² One peculiarity of this book is, perhaps, a specific use of the term “value”. Traditionally this term refers to the result of a valuation process, thus applying equally well to stocks (assets, capital, etc.) as well as to flows (income, cash flows, etc.). However, when Christensen and Demski [2003] use this term they usually refer to *stocks* only—probably because flows are usually considered to be “derived” variables.

Bibliography

Christensen, J. A., and J. Demski (2003). *Accounting Theory—An Information Content Perspective*. New York: McGraw-Hill.

Christensen, P. O., and G. A. Feltham (2003-2004). *Economics of Accounting; Volume I: Information in Markets; Volume II (forthcoming): Performance Evaluation*. Boston, MA: Kluwer Academic Publishers.

Coase, R. H. (1937). “The Nature of the Firm”. *Economica*, 4, pp.386-405.

_____(1938). “Business Organizations and the Accountant”. *The Accountant*, (October 1 -December 17), [reprinted in David Solomons, ed., *Studies in Costing*. London: Sweet & Maxwell, Ltd., 1952, pp.105-158].

Demski, J. S. (1972). *Information Analysis*. Reading, MA: Addison-Wesley [second edition, 1980].

_____(1993). “Rational Choice of Accounting Method for a Class of Partnerships”. *Journal of Accounting Research*, 11, pp.176-190.

_____(1994). *Managerial Uses of Accounting Information*. Boston: Kluwer Academic Publications.

Demski, J. S. and G. A. Feltham (1972). "Forecast Evaluation". The Accounting Review, 47, pp.533-548.

Demski, J. S. and G. A. Feltham (1974). "Market Response to Financial Reports". Journal of Accounting and Economics, 17, pp.3-40.

Demski, J. S. and G. A. Feltham (1976). *Cost Determination—A Conceptual Approach*. Ames, IO: Iowa State University Press.

Demski, J. S. and G. A. Feltham (1978). "Economic Incentives in Budgetary Control Systems". The Accounting Review, 53, pp.336-359.

Ewert, R. (1987). "The Financial Theory of Agency as a Tool for an Analysis of Problems in External Accounting". *Agency Theory, Information, and Incentives*. G. Bamberg and K. Spremann, eds. Berlin: Springer Verlag, pp.281-309.

Ewert, R., and A. Wagenhofer. (1993/2003) *Interne Unternehmensrechnung* (Managerial accounting). Berlin: Springer Verlag [5th ed.: 2003].

Feltham, G. A. (1967). *A Theoretical Framework for Evaluating Changes in Accounting Information for Managerial Decisions* (doctoral dissertation). Berkeley, CA: University of California.

_____(1968). "The Value of Information". The Accounting Review, 43 (October 1968), pp.684-696.

_____(1972). *Information Evaluation*. Sarasota, FA: American Accounting Association.

_____(1984). "Financial Accounting Research: Contributions of Information Economics and Agency Theory". *Modern Accounting Research: History, Survey and Guide*. R. Mattessich, ed. Vancouver, BC: Canadian Certified General Accountants Research Foundation, pp.179-207.

_____(1996). "Valuation, Clean Surplus Accounting, and Anticipated Equity Transactions". Working Paper, University of British Columbia.

Feltham, G. A. and J. S. Demski (1970). "The Use of Models in Information

Evaluation". The Accounting Review, 45 (October), pp.623-640.

Feltham, G. A. and J. Ohlson. (1995). "Valuation and Clean Surplus Accounting for Operating and Financial Activities". Contemporary Accounting Research, 12, pp.689-731.

Feltham, G. A. and J. A. Ohlson. (1999). "Residual Earnings Valuation With Risk and Stochastic Interest Rates". The Accounting Review, 74, pp.165-183.

Jensen, M., and W. Meckling (1976). "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure". Journal of Financial Economics (October), pp.305-360.

Marschak, J. (1959). "Remarks on the Economics of Information". *Contributions to Scientific Research in Management*. Graduate School of Business Administration, Division of Research, University of California, Los Angeles, CA, pp.79-100 [reprinted in J. Marschak, (1974). *Economic Information, Decision and Prediction*. Dordrecht-Holland: D. Reidel Publishing Co., pp.91-117].

Marschak, J. and K. Miyasawa (1968). "Economic Comparability of Information Systems". International Economic Review, 9, pp.137-174.

Marschak, J. and R. Radner (1972). *Economic Theory of Teams*. New Haven, CT: Yale University .

Mattessich, R. (1995). *Critique of Accounting—Examination of the Foundations and Normative Structure of Accounting*. Westport, CT: Quorum Books, Greenwood Publishing Group, Inc.

_____(2002). "The Theory of Clean Surplus and Its Evolution: A Survey and Recent Perspectives" (with Spanish translation). *Energeia—Revista Internacional de Filosofía y Epistemología de las Ciencias Económicas*, 1 (2), pp.9-79.

_____(2004a). "The information economic perspective of accounting—its coming of age". Vancouver, BC: Sauder School of Business, Accounting Working Paper.

- _____(2004b). "The Rise and Significance of Modern Analytical Methods in Accounting—Part II: A Review Essay of the *Economics of Accounting*, Vols. I and II, by P.O. Christensen and G.A. Feltham" (with Spanish translation). *Energeia—Revista Internacional de Filosofía y Epistemología de las Ciencias Económicas* (forthcoming).
- Ohlson, James A. (1983). "Price-Earnings Ratios and Earnings Capitalization Under Uncertainty". *Journal of Accounting Research*, 21, pp.141-154.
- _____(1987a). *The Theory of Financial Markets and Information*. New York: North-Holland Publishing.
- _____(1987b). "On the Nature of Income Measurement: The Basic Results". *Contemporary Accounting Research*, 4, pp.1-15.
- _____(1988). "The Social Value of Public Information in Production Economies". *Economic Analysis of Information and Contracts*. Gerald A. Feltham, Amin H. Amershi and William T. Ziemba, eds. Boston, MA: Kluwer Academic Publishers, pp.95-119.
- _____(1990). "A Synthesis of Security Valuation Theory and the Role of Dividends, Cash Flows, and Earnings". *Contemporary Accounting Research*, 6, pp.648-676 (reprinted in R. Mattessich, ed., *Accounting Research in the 1980s and Its Future Relevance*, and its French translation). Vancouver, BC: Canadian Certified General Accountants Research Foundation, 1991, pp. 157-181).
- _____(1995). "Earnings, Book Values, and Dividends in Equity Valuation". *Contemporary Accounting Research*, 11, pp.661-687.
- _____(1996). "Accounting Earnings, Book Value, and Dividends: The Theory of the Clean Surplus Equation (Part I, presented January 1989), published in R. P. Brief and K. V. Peasnell, eds., *Clean Surplus, A Link Between Accounting and Finance*. New York: Garland Publishing, Inc., pp.165-227.
- _____(2001). "Earnings, Book Values, and Dividends in Equity Valuation: An Empirical Perspective". *Contemporary Accounting Research*, 18, pp.107-120.
- Radner, R. (1961). "The Evaluation of Information in Organizations". *Proceedings of the 4th Berkeley Symposium on Mathematical*

Statistics, Vol. 1. Berkeley, CA: University of California, pp.492-530.

Stigler, J.G. (1961). "The Economics of Information". Journal of Political Economy, 69, pp.213-25.

Wagenhofer, A. (1996). "Anreizsysteme in Agency-Modellen mit mehreren Aktionen" (Incentive systems in agency models with several actions). Die Betriebswirtschaft, pp.155-165.

Wagenhofer, A., and R. Ewert (2003). *Externe Unternehmensrechnung* (Financial accounting). Berlin: Springer Verlag.