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Toward a Theory of Financial Accounting

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I. Introduction

THE PURPOSE OF financial information (including accounting information), concerning the outcomes of business enterprises, is to facilitate the decision process utilized by rational investors in determining their consumption-investment plans. At the very least, any logical framework purporting to be a theory of accounting should be able to explain explicitly what the effects of information are on this process. Unfortunately, to date, this goal remains unrealized. The purpose of this paper is to discuss what we believe to be the setting necessary to analyze the role of information in the investors' decision process and to consider the details that characterize such a setting.

Obviously, much effort has been devoted to analyzing many different aspects of the relationship between accounting information and the investors' decision process, but unfortunately very few noteworthy results have been derived. While it is not necessary to review these efforts, it is *crucial* to note that almost without exception they fail to explicitly recognize the implications which arise because use of accounting information in the decision process takes place *within* the context of a *market*[1] which allocates goods, resources and, implicitly, "risks." Conclusions regarding the effects of information or changes in information that are developed outside of a market context are most often incorrect. For example, if one considers the effect of more (costless) information on an isolated investor, one might conclude that the investor is no worse off since the set of available alternatives and "more" information contains as a subset the set of alternatives available with "less" information. However, if more information is to be provided by increased disclosure on published financial statements, the conclusion is not in general true. The analysis fails to recognize that some of the parameters (e.g., prices in the budget constraint) in the investors' decision problem are, in fact, endogeneously generated by the simultaneous action of all investors participating in the market. Indeed, this is what Hirshleifer [15] demonstrated in his seminal article.

A necessary prerequisite for the general equilibrium approach is the judicious characterization of those specifics of the market setting which are crucial in capturing the effects of information. Indeed, judicious characterization is an art requiring an understanding of the results desired, the alternative characterizations available, insight and luck. With the hope that we will facilitate this process and hasten the development of a theory of accounting, the next section of the paper

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[1] Some notable exceptions are Hakansson [10], Hirshleifer [16], Ng [26], and Wilson [34].

discusses the specifics or attributes of the market setting which may be relevant in analyzing the effects of information and discusses alternative characterizations of these attributes. Before proceeding, we define the decision problem in detail.

The problem with which we are concerned is defined to be the simultaneous maximization of utility levels by investors operating in a market setting with specified commodities and trading points (i.e., a trading arrangement), with a specified capability of transferring wealth between individuals and across states by engaging in transactions in firms' shares or securities (i.e., a securities-states tableau, or matrix) and with a specified information structure available. It might appear that firms' production plans should be included in the economic arrangement. There are fundamental problems pertaining to such model development and these matters will be considered in (v) of the next section of this paper. However, it should be emphasized that firms are included in the problem defined to the extent that firm shares or securities are the mechanism which permits wealth transfers between individuals as a function of the realized end of period state. A solution to the problem defined, which we will call an allocation, specifies for each investor the amount to be invested (and hence the amount to be consumed) and the portfolio of firm shares chosen.

It will also be necessary to consider what characteristics of "welfare" are appropriate for comparing different combinations of trading arrangements, securities-states tableau, and information structures. Section III discusses the measures which are appropriate for such comparisons. Finally, Section IV gives a description in very broad terms of the results that the authors derived [28] (hereafter referred to as O.B.) which utilizes the approach suggested to describe the effects of information.

II. Alternative Characteristics of General Equilibrium Models

The discussion in the previous section suggests that basic insights with respect to the economic role of information-production and dissemination have to be developed within the context of general equilibrium analysis. This amounts to saying that the concern is about economic mechanisms, which allocate commodities and other resources across individuals ("households" or "consumers"), firms ("productive entities"), time periods, etc., and how information affects the final allocative outcomes of these mechanisms. Depending upon the nature of the mechanism in question, the preferences and beliefs of individuals, the distribution of endowments across individuals, the number and types of commodities, the opportunities created by the productive technologies, etc., information can, presumably, have substantially different welfare implications. This kind of perspective raises a rather difficult yet basic question: what should be the "essential" ingredients, or model-characteristics, of any analysis of its basic purpose pertains to the welfare analysis of information? As is usually the case, it makes no sense to consider a model of great generality and "realism"; the sheer complexity will virtually guarantee the absence of any discernible implications. The alternative approach is one of making "strategically simplifying assumptions." Yet, any such model must capture attributes of the economic environment which cannot be

dispensed with if meaningful conclusions about the role of information are to be drawn. What these attributes are is perhaps not that clear. Hence, it is worthwhile to consider what features one might want to include (or exclude) in equilibrium analysis more generally. This also gives us the opportunity to make pertinent comments with respect to the state-of-the-art. Needless to say, much of the focus will be on contributions which have had, or are likely to have, an impact on how information is analyzed within equilibrium settings.

Since one must decide which aspects of the model are to be included or excluded and/or what simplifying assumptions should be exploited, the following characteristics of general equilibrium models would (as a minimum) have to be considered.

(i) *Certainty versus Uncertainty in the Economic Environment.* This issue does not pose much of a problem. It goes almost without saying that "information," as usually thought of, cannot exist in a certain world. (From this point of view, it is quite surprising to find that there are many papers which have considered information-issues in certainty models.) It should further be mentioned that the modeling of information and uncertainty, as developed by Marschak-Radner [23], can at least on a basic level be incorporated into general equilibrium frameworks; these well-known extensions of the classical model are to be found in Debreu [3], Arrow [2] and Radner [29]. These papers deal with uncertainty and resource allocation in a most general fashion—too general if anything—and in that sense they must be considered as very basic building blocks in more complex and specialized settings. At the present it is difficult to conceive of any anslysis which is inconsistent or "outside" these general paradigms.

(ii) *Number of Consumption Points (or "Time Periods").* A review of the literature suggests four possibilities: one point, two points, three or greater but finite, and infinite. In the analysis of information issues, much of the literature has focused on the first two cases (or cases for which the dimension does not make any substantive difference). Although these two typically are quite similar, it is not correct to suggest that conclusions obtainable in one-period models are also obtainable in two-period models; see in particular Hakansson-Kunkel-Ohlson [11]. It has not always been appreciated that in the welfare analysis of information one needs to distinguish between one and two periods.

As far as the analysis of information when there are more than two consumption points, the literature is exceedingly sparse. The single exception appears to be a paper by Kanodia [19], but his model is severely restricted on other dimensions. At least a partial explanation for this paucity is to be found in a paper by Hart [14]: three period models in which there are not a full set of contingent future markets (and at least two different individuals) are fundamentally different from two (and one) period models. Roughly speaking, the presence of three periods entails future prices and opportunity sets which are now not only endogenous, but also state contingent and this is in sharp contrast to one and two period models.

Although many important and basic information issues have been successfully addressed in a one or two-period framework, it might be that deeper and/or

fundamentally different questions will require three (or more) periods. At the very least, it is not clear to what extent, and under what circumstances, results derived in two-period models can be generalized to T-period models. As a consequence, it is tempting to suggest these models could be important vehicles for future research.

Finally, and somewhat paranthetically, we should mention that $T = \infty$ models can be quite different from $T < \infty$ models. With $T = \infty$ there might be much richer solution spaces (in terms of prices) and this could then permit such phenomena as "speculative bubbles" (see Harrison and Kreps [13]).

(iii) *Degree of Heterogeneity of Individuals in the Economy.* A number of possibilities have been considered in the literature. Traditionally, this has been one area in which "strategically simplifying assumptions" are to be found. First, and this is by no means an unimportant case, all individuals are assumed to be completely identical. As a practical matter this is equivalent to assuming that there is only one individual in the economy (often referred to as a "consensus" individual). As is demonstrated in the work by LeRoy [22] and Rubinstein [31], among others, the assumption can be of great use in multi-period capital market theory. (In Capital market theory pure exchange economies comprised of only one individual typically address questions which deal with asset valuation and intertemporal changes in values.) This setting has also been utilized in the analysis of information issues (see, for example, Kanodia [19] and Kunkel [20]). However, and this goes almost without saying, in pure exchange economies there will be no interesting information questions to address. Put simply, in these economies there is no question what the final allocation will be.

Moving beyond economies comprised of identical individuals one has to consider whether (prior) beliefs are homogeneous or not, and the same applies with respect to utility-of-consumption-bundles. The former issue is of great significance in much of modern finance, especially when combined with other restrictions on preferences such as time-additive utilities and/or HARA-class utilities (e.g., in the derivation of the CAPM). The latter assumptions have the advantage that the individuals end up being "almost" identical. Hence, this approach has been particularly helpful in the analysis of the social value of information in productive economies (see Kunkel [20]). Nevertheless, one can make the argument that an assumption of uniformly homogeneous beliefs is a notch too restricted in the welfare analysis of information. There is evidence that many results are likely to be quite sensitive to the assumption of homogeneous beliefs. For example, Hakansson, Kunkel and Ohlson [11] have shown that homogeneity (or lack thereof) plays an essential role in determining whether public information can have social value in a pure exchange economy. (See also Jaffee [18] and Ohlson [27].)

(iv) *The Dimension of the Commodity Space.* Most general equilibrium models have involved only one consumptive commodity, the commodity being indexed across states and dates. The analysis of information issues in general equilibrium has been similarly confined to single-good economies. The only exceptions appear to be those cases in which extension are trivial and immediate (e.g., there are a complete set of contingency markets). It has been shown by Grossman [9] that in

equilibrium models with incomplete markets the introduction of many goods (indexed not only by state and date but also type) will imply that the standard notions of economic efficiency have to be reconsidered. The problem here is that Diamond's [5] characterization of constrained optimality (i.e., constrained Pareto efficiency) is no longer applicable. The same actually applies when there are more than two consumption periods; this is implicit from Hart's [14] work. Hence, much of what was said under point (ii) is equally applicable here. The most interesting problems analyzing the role of information might require models which do not (even) attain constrained optimality if there is no information.

(v) *Endogenous versus Exogenous Production* (*Pure Exchange*). Models investigating the role of information in productive economies are few and far between. The only ones of which we are aware are those by Starr [32], Hakansson [10], Kanodia [19] and Kunkel [20]. Not surprisingly, most of these impose either severe constraints on the settings or make use of ad hoc assumptions (for example, Kanodia relies on a single individual economy; and Kunkel restricts himself to homogeneous beliefs, two dates, and HARA-class utilities). The basic query in endogenous production economies is, of course, one of identifying under what conditions information will have positive social value. It is naturally quite tempting to believe that this should be easier than in pure exchange economies. It might therefore be suggested that endogenous production models are worthwhile targets of research. However, these models easily get exceedingly difficult. There are fundamental problems which are essentially unresolved such as the well-known issues pertaining to the theory of the firm in incomplete markets; these have been discussed by Drèze [6] and Leland [21]. A recent paper by Grossman and Hart [8] revisits the problem. They develop a theory of the firm in a competitive economy with incomplete markets.

(vi) *Economic Regimes or the Structure of Trading Arrangements.* A competitive market economy can be described in terms of its available securities (or firm shares) and a set of rules determining the sequence of opening (and closing) of general and specific markets. Naturally, there are numerous possibilities in choosing among arrangements. The importance of this has long been recognized in general equilibrium analysis, as is evident in Arrow [2], Radner [29] and Hart [14]. There are also papers which deal specifically with information issues in alternative regimes: these show that the welfare implications can be quite sensitive. In particular, see Marshall [24], Murota [25] and Hirshleifer [16]; see also Rubinstein [31], Huber [17], Townsend [33] and Ohlson [27]. The differential welfare implications stem from the fact that alternative regimes have different efficiency implications (for example, any specified arrangement may or may not attain full Pareto efficiency). While these matters have been discussed, at least to some extent in the previously mentioned papers, a far more complete and extensive synthesis is needed and is provided in O.B. In order to fix ideas, several alternative types of trading arrangements will be illustrated. Unfortunately, there appears to be no generally agreed upon terminology regarding these arrangements so we will utilize the nomenclature developed in O.B.

First, consider a trading arrangement in which all trading takes place *after* the receipt of a (random) signal from a publicly available information source. The

available commodities consist of a current consumption claim and future consumption claims (or, more generally, firm securities). This regime was first considered by Hirshleifer [15] and we have named it the no signal insurance regime since individuals have no opportunity to enter trades which allow the transfer of wealth between individuals across signals. Put another way, this trading arrangement is not set up to exploit the trading opportunities made possible by the information structure nor is it capable of coordinating allocations across signals.

As an "improvement" suppose the trading arrangement allows two rounds of trading in the same set of instruments (i.e., current consumption and firm shares). The first round will take place before information is received and the second round after the signal is received. The efficiency achieved by this regime depends upon characteristics of the price structure which is endogeneously generated during the second round of trading. It suffices to point out that this trading structure, termed an iterated market, may or may not achieve a desired level of efficiency.

The problem is that the commodities used in the previous regimes do not permit direct transfers of wealth between individuals as a function of the signal received. Arrow [2] introduced a trading structure, which we shall call an Arrow regime, which is based on two rounds of trading but provides commodities that permit the desired transfer of wealth across signals in the first round of trading. In this regime individuals can completely coordinate their plans across signals. Arrow also demonstrates that two rounds of trading are not necessary. Indeed, one round of trading is sufficient provided the commodities allow for transfer of wealth across signals, i.e., provided the commodities are indexed by signals as well as firms. (This latter trading arrangement has been termed a standard regime.)

By way of summary, a crucial element determining the degree of efficiency achieved by the trading arrangement is its ability to transfer wealth and coordinate plans across signals. Thus, instead of purchasing a specified number of shares in a firm irrespective of what signal is received, the Arrow regime and the standard regime allow the commodities to be indexed or labeled by the potential signal. Each such labeled or indexed security is a separate commodity.

As was indicated, none of these trading structures is new. However, the way in which they would be utilized in analyzing the effect of information on the investors' decision problem differs from earlier uses in several respects. First, a primary concern is with the (relative) efficiency of alternative arrangements and how they compare to each other. Such comparisons will make it necessary to consider not only competitive market economies but also "benchmark" or "planned" economies. Second, both complete and incomplete securities markets must be considered. Finally, different information structures will have to be considered and the effects of each compared.

(vii) *Heterogeneous versus Homogeneous Information.* These two cases are profoundly different in terms of how they affect the analysis and questions raised. Homogeneous information is, of course, much easier to work with, and standard competitive equilibrium conditions can be stated without complications. Such

simplicity will not be applicable when it comes to heterogeneous information. The whole notion of the meaning of individual rationality has to be re-examined within these settings. There are also other related problems: the existence of competitive equilibrium and appropriate formulations of economic and informational efficiency. (See Grossman [9] for a summary.) A review of this literature will also reveal that questions addressed in the two cases are markedly different. Welfare analysis poses particular problems as final allocations might be difficult to characterize due to the complexity of equilibrium conditions (see Wilson [35]).

The above review of previous work and different characteristics of general equilibrium models suggests that individual models permit only limited complexity. For example, there is no paper which has considered rigorously the role of information when there are incomplete markets, many different individuals and endogenous production. No paper has considered information, incomplete markets, different individuals and more than two periods. And so it goes, there is no question that much work remains.

The one class of models which is fairly well understood involves two consumption points (or one), heterogeneous individuals, one commodity (indexed across the two dates and states), fixed supplies of consumptive goods (i.e., exogenous production), a variety of economic regimes, and homogeneous information. A fairly complete analysis of this class of models is available in O.B. and as indicated previously a broad summary of the conclusions is provided in section IV of the current paper.

III. Research Perspective in Accounting

As was previously stipulated, the purpose of information is to facilitate and improve upon the consumption investment plans of individuals transacting in a market setting. This must be viewed as a very weak requirement since it simply means that somewhere along the line (accounting) information has to be related to individuals' well being. Naturally, a major research implication will then be one of investigating the effects of information, and changes in information, on the welfare induced by the resulting allocation(s) of goods. Classically, economics has utilized two basic concepts to analyze and compare the outcomes of any (changes of) economic mechanism(s).

First, alternative notions of efficiency have been used to describe "benchmark" characteristics of economies which are typically judged to be more or less desirable. Loosely speaking, these efficiency concepts satisfy different kinds of economy-wide optimality conditions. In models involving uncertainty, there are currently three concepts in use: full Pareto efficiency (generally attributed to Arrow [2] in uncertainty models); constrained Pareto efficiency (due to Diamond [5]); and social Nash optimality (due to Grossman [7]).

A given allocation is said to be fully Pareto efficient with respect to a specified information structure if it is Pareto efficient with respect to all allocations outside of the market setting (i.e., irrespective of the combination of trading arrangement

and securities-state tableau). A given allocation is said to be constrained Pareto efficient with respect to a particular information structure if it satisfies a set of constraints restricting transfers between individuals across states and given these constraints is Pareto efficient. Fully Pareto efficient allocations are not constrained in such a fashion and as a result are never Pareto inferior to an allocation which is constrained Pareto efficient. The condition of social Nash optimality is difficult to explain without considerable overhead. Suffice it to say that if the allocations chosen are *not* coordinated across potential messages then these allocations will be less efficient than they otherwise might be. Thus these allocations will satisfy some but not all optimality conditions. Social Nash optimality captures this inefficiency in an appealing way.

Each of the efficiency measures describes the extent to which a particular market setting exploits the opportunities for trade between individuals across states and dates, i.e., foregone exchange oportunities represent inefficiencies. In any event, systematic analysis of the role and effects of information in general equilibrium should consider the presence (or absence) of changes in such optimality conditions. It is, of course, to be understood that the analysis will require a specification and identification of market settings, and any conclusions regarding the effect of information will be highly contingent on the specifics of the market setting.

Second, there is the question of how changes in the economic system (e.g., the information environment) induce changes in expected utilities of the individuals in the economy. This kind of perspective provides a partial ordering of social alternatives in that, *a fortiori*, a setting which Pareto dominates another setting is socially preferred.

It is worthwhile to note that there is generally no direct relationship between notions of efficiency and the partial ordering induced by the Pareto criterion. One allocation might well achieve a higher level of efficiency than another, but this does not mean that *everybody* is better off. This point has been illustrated by Hakansson [12] in an area which is closely related to the topic at hand. Suppose that some additional market(s) is introduced into a pure exchange economy; this move will typically improve the overall (constrained Pareto) efficiency of the economy, and yet there is no prior reason to presume that everybody will be better off. (More concretely, the introduction of a market in fire insurance will probably not be supported by those who own houses which are made completely out of stone.) Further, it should also be stressed that Pareto dominance does not in itself imply efficiency: economic system A may be preferred to B by everyone, and yet at the same time it is possible that A satisfies no efficiency or optimality properties whatsoever, although B does.

Superficially, it might appear that the effects of information on an individual's wealth level constitutes another dimension by which the allocative outcomes associated with different economic regimes and/or alternative information structures could be compared and evaluated. In fact, much of the empirical research investigating the effect of various accounting alternatives on security prices could be interpreted as attempts to ascertain the effect of accounting information on investor wealth. For example, the first issue of *Journal of Accounting and*

Economics contains two articles which analyze full cost accounting versus successful efforts accounting. With some oversimplification, the issue is to what extent (if at all) a switch in accounting principle affects shareholders' wealth because of changes in stock prices. If this effect is present, then this might suggest that they are worse off and that the accounting switch is undesirable from the shareholders' point of view. However, as Hakansson [12] has shown, changes in wealth will, in general, have no direct functional relationship with changes in utility levels and individuals' well being.

Thus, the perspective taken here is that research in accounting should assess the effect of information both in terms of the allocational efficiency attained and in terms of the utility levels achieved by market participants in various settings of information and markets.

These kinds of questions are to be clearly distinguished from the question raised by Denski [4]. The contention there is that the "Possibility Theorem" in Arrow [1] implies there is no mechanism to establish a social (group) ordering over alternative information structures which is complete (and which is based on the orderings of the market participants involved and additionally satisfies some seemingly acceptable assumptions). This contention is true but irrelevant. The questions raised in the current paper are more basic in that the concern pertains to the (endogeneous) characterization of economic outcomes as opposed to the social choice of (exogenous) outcomes. It should therefore be noted that we are *not* avoiding the thrust of Arrow's "Possibility Theorem" by imposing a special relationship (e.g., the relationship of "finer than") between the information alternatives considered. While such assumptions facilitate the analysis, it does not avoid nor is it related to the conclusion of Arrow's theorem.

IV. Conclusion

The conclusions obtained in O.B. may be summarized as follows. First, the dissemination of information in an economy enlarges the set of feasible allocations of goods. An immediate consequence is that the overall efficiency of the economy cannot decrease because of information dissemination, *unless* the economic regime does not function "properly." That is, for some reason the final allocation generated by a specific market setting can be Pareto dominated by some other allocation(s). Conversely, if the regime operates efficiently (with and without information), then the introduction of information leads to a higher (or no less than) level of efficiency. For cases in which the market setting potentially generate inefficient allocations, it can be shown that the allocations will be efficient or inefficient depending upon the specific context such as the individual's endowments. This illustrates a point implicitly made earlier: if information is disseminated in trading structures which are not designed to exploit the opportunities it provides, then there is no prior reason to expect that information will serve a useful purpose.

Second, and of equal importance, information can serve as a substitute for securities (firms). This means that in a properly functioning economic regime a

given level of efficiency can be attained through the use of either securities or information.

Finally, the conditions under which information does, and does not, Pareto dominate economies without information are developed. The key point here is that the conditions really depend on only two things: initial endowments and whether information generates "desirable" allocational opportunities which would otherwise not be present. However, in sharp contrast to questions of efficiency, no particular restrictions have to be imposed on the trading arrangement.

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DISCUSSION

MARK A. WOLFSON:* The Ohlson-Buckman (1979) paper (hereafter O-B) and the Hakansson-Kunkel-Ohlson (1979) paper come very close to concluding a chapter which Hirshleifer began to write almost ten years ago. the chapter analyzes the role of public information in a single-good, two-period pure exchange economy in which agents have equal endowments of information. Since some of us were getting a little tired of reading additional sections of the chapter and were even becoming a little confused about the role of public information in this context, the O-B paper provides a welcome synthesis.

Besides this contribution, the present paper, taken largely from the front end of O-B, adds important insights by moving towards what Reiter (1977) has recently referred to as the new (squared) welfare economic perspective. This general equilibrium approach views the choice of economic system as endogenous to society's resource allocation problem.[1] The research efforts which preceded O-B were in the spirit of the (older) new welfare economics, which operated in the context of a single, exogenously specified market regime. Ohlson and Buckman point out that the effects of information on resource allocations must be consid-

* Stanford University. I am grateful for helpful discussions with Joel Demski, David Kreps, and James Patell.

[1] See Hurwicz (1972, 1973) and Reiter (1977), among others, for a discussion.