A MODEL ANALYSIS OF ACCOUNTING MEASUREMENT

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I Foreword

In this paper, the term "accounting measurement" is used to mean the operation by which economic events pertaining to an entity (business enterprise in particular) are converted into monetary measured values. Our purpose is to build up purely theoretical models that could be deduced from operational characteristics of accounting measurement and then to conduct theoretical analysis of the cognitive and measuring process in each model.[1)]

Conventional accounting constituting the prevailing basis of accounting practices is made up of a large number of varying principles and standards, some of which are mutually contradictory. Because of this, it is practically impossible to derive a set of systematic theories capable of providing consistent explanation for all of conventional accounting. Yet, the fact that it does exist in reality as a institutional system of accounting means that there must be more or less consistent view of accounting measurement. The author's intention is to derive, by means of the theoretical analysis, approximate pattern of accounting measurement which should underlie conventional accounting and to clarify its cognitive and measuring characteristics.

A large literature has glared at conventional accounting with censorious looks.[2)] Moreover, in the recent years, emergence of issues concerning off-balance-sheet financing and of other new problems has given rise to discussions regarding "transition" of views of financial accounting, that is, "transition" from the Revenue and Expense View to the Asset and Liability View.[3)] This paper aims at making some theoretical and analytical contribution to understanding the implications of this

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1) In this paper, the term "measurement" is used in two different means (as it is done in accounting researches in the United States). Firstly, it means "measurement" in a narrow sense, to mean choice of attributes to be measured and determination of monetary amount arising from such attributes. Secondly, "measurement" is used in a broader sense, including "recognition". In this paper, "measurement" in the broader sense is generally used in combination with other words, such as "accounting measurement", "measurement model" and so on.

2) For instance, see R.T. Sprouse and M. Moonitz, *A Tentative Set of Broad Accounting Principles for Business Enterprises*, Accounting Research Study No. 3, AICPA, 1962, pp. 10–18; AAA, Committee to Prepare a Statement of Basic Accounting Theory, *A Statement of Basic Accounting Theory*, AAA, 1966, pp. 30–36; AICPA, Report of the Study Group on the Objectives of Financial Statements, *Objectives of Financial Statements*, AICPA, 1973, pp. 15–16.

3) FASB, *An Analysis of Issues Related to Conceptual Framework for Financial Accounting and Reporting: Elements of Financial Statements and Their Measurement*, Discussion Memorandum, FASB, December 2, 1976, pars. 25–70.

"transition" arising within the theory of contemporary accounting.

II Accounting Measurement as Linear Aggregation of Unitary Prices and Quantities

In this section, we are going to clarify operational characteristics of accounting measurement which provides the base of measurement models. These characteristics obviously have to be universal and applicable to different types of measurement models.

First of all, let us take up the most simple case in which one type of homogeneous economic event x is converted into monetary measured value. Here, unitary price of the economic event x is expressed by p, while quantity is given by q. Then, the monetary measured value of x can be expressed as:

$$V(x) = p\,q \qquad \cdots\cdots (1)$$

In other words, the monetary measured value of x is given as the product of unitary price p and quantity q. As it is, in order to convert economic event x into monetary measured value $V(x)$, both price p and quantity q must be known, and conversely, where p and q are both known, it is always possible to convert economic event x into monetary measured value $V(x)$. For the sake of convenience, we shall from now on call "unitary economic event" one type of homogeneous economic event.

Well, we known that actual economic events are made up of plural unitary economic events which are not homogeneous in most cases. Therefore, the operation (1) must be developed into more general one. If we assume that unitary economic events constituting actual economic event X are given by $(x_1, x_2, \ldots, x_n)$, unitary prices for each of the unitary events by $(p_1, p_2, \ldots, p_n)$ and their quantities by $(q_1, q_2, \ldots, p_n)$, respectively, then the monetary measured value of X can be expressed as:

$$\begin{aligned} V(X) &= V(x_1) + V(x_2) + \cdots\cdots + V(x_n) \\ &= p_1 q_1 + p_2 q_2 + \cdots\cdots + p_n q_n \\ &= \sum_{j=1}^{n} p_j q_j \qquad \cdots\cdots (2) \end{aligned}$$

This means that in a broader sense, accounting measurement can be formulated as a linear aggregation of unitary prices and quantities.

Here, we should not forget that regardless of how unitary price and quantity are defined, accounting measurement can *almost always* be formulated as a linear aggregation like in (2),[4] that is to

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4) For the universality of formula (2), see Y. Ijiri, *The Foundations of Accounting Measurement: A Mathematical, Economic, and Behavioral Inquiry*, Prentice-Hall, 1967, pp. 118–119.

Note, however, that in case of extraordinary transactions such as large scale replacement of assets and mergers/acquisitions, goodwill is usually involved, so that:

$$V(X) \neq \sum_{j=1}^{n} p_j q_j$$

In such a case, linear aggregation in the formula (2) cannot become valid. This is why we say "almost always", and for the purpose of our present study, these exceptional cases are not considered.

say, regardless of nature of views underlying accounting measurement, economic events can be automatically converted by means of the linear aggregation as shown in (2) into monetary measured values once unitary prices and quantities become known. In this sense, the linear aggregation shown in (2) can be considered a universal operational characteristic of accounting measurement. In this paper, our measurement models are to be built up based on such operational characteristics.

III Type *A* of Measurement Model

Ⅲ—1 Model

First, let us consider the measurement model embodying simply what are implied in the formula (2), that is to say, a measurement model which considers economic event as an aggregate of unitary economic resources and attempts to convert the aggregate into a monetary measured value.

We all know that resources recognized as such in accounting are usually called "assets". Thus, the measurement model recognizes as assets all resources constituting a real economic event and proceeds on this basis to measure attributes of these assets. Because it takes up as object to be recognized and measured those existing resources at a given point of time, the accounting measurement based on this model necessarily becomes an on-the-spot measurement.

Accordingly, if we express as A_i the aggregate of individual assets $(a_{i1}, a_{i2}, \ldots, a_{in})$ at the end of the period i, then the monetary measured value of A_i is given as:

$$\begin{aligned} V(A_i) &= V(a_{i1}) + V(a_{i2}) + \ldots\ldots + V(a_{in}) \\ &= p_{i1}\, q_{i1} + p_{i2}\, q_{i2} + \ldots\ldots + p_{in}\, q_{in} \\ &= \sum_{j=1}^{n} p_{ij}\, q_{ij} \end{aligned} \qquad \cdots\cdots (3)$$

Here, $(p_{i1}, p_{i2}, \ldots, p_{in})$ show unitary prices of $(a_{i1}, a_{i2}, \ldots, a_{in})$, and $(q_{i1}, q_{i2}, \ldots, q_{in})$ their quantities, respectively.

In this formula (3), all of individual measured values need not be positive. If $p_{ij}\, q_{ij}$ becomes negative, it means that a_{ij} is in fact a negative asset, which is usually called "liability". If the formula (3) aggregates not only assets having positive values (i.e., assets) but also those having negative values (i.e., liabilities), then it is clean that $V(A_i)$ expresses the net asset of an entity at the end of the period i.

Then, if there is no increase or decrease of net asset itself during the period i (such as capital contributions or capital withdrawals), the income I_i for the period i can be expressed as:

$$I_i = V(A_i) - V(A_{i-1}) \qquad \cdots\cdots (4)$$

This means that, in the present case, income is determined as increase in value of net asset arising from economic activities of an entity during the period i.[5] Moreover, the increase in value of net asset always has the corroboration of increase of net resources pertaining to the entity.

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5) The income determination process is also influenced by selection of capital maintenance concept, but this aspect is not to be considered in this paper.

Now, let us call such a measurement model the Type *A* of Measurement Model (or simply the *A*-Model). Also, from now on, we shall assume that assets include liabilities as negative assets, unless specific mention is made otherwise.

Ⅲ—2 Analysis of the Model

(1) Measurement Approach

To consider economic events of an entity as an aggregate of individual resources and to convert the aggregate into a monetary measured value means that the model is trying to make accounting measurement on the basis of realistic correspondence between economic events of an entity (principal relation) and their monetary measured values (surrogated relation). In such an accounting, the emphasis is given to determine value of asset as existing resources. In other words, the *A*-Model's approach is to recognize a *existing* resource as a *existing* asset and to measure a *existing* value of that asset.

To expatiate this approach in terms of its cognitive and measuring operations, the *A*-Model first recognizes existing resaurces at the end of a period as assets and then proceeds to measure existing value of each asset at that point of time. Such cognitive and measuring operations end on the spot by recognizing and measuring directly resources existing at the end of a period. This means that theoretically speaking, cognitive and measuring operations based on the *A*-Model do not require any recogds on transactions during a period.[6)]

In this type of operations, all resources — both those of which legal ownership is clearly established and those in which legal ownership is still unconfirmed or unclear (such as, for example, resources arising from executory contracts or financial instruments and transactions) — are to be recognized as assets if they exist within an entity at the end of a period. Moreover, according to this approach, the attributes to be measured are current values of assets, and for this reason, all holding gains or losses attributable to existing assets of an entity at the end of a period are recognized and measured as gains or losses which arose during the period, regardless of whether they are realized or not.

This type of operation is generally called "inventory" (physical inventory, to be more exact). In fact, cognitive and measuring approach based on the *A*-Model is reduced to that of inventory, and in this sense, the approach can be characterized as the "inventory approach".

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6) Another possibility is to record each fact every time the resource concerned is recognized to exist. If the record is maintained throughout a period, then it can constitute a sort of successive records.

However, in such a record, renewal must be made each time whenever a new change (such as that of value) takes place in regard of existence of resources, and once the record is renewed, then all earlier records become obsolete and turn into mere memorandum records. This is because a model determines the income for a period only on the basis of accounting records at the end of a period (i.e., the newest records).

Therefore, even if successive accounting records exist, income determination ends up with a process as formulated in the *A*-Model. We shall see in the following part that successive accounting records in the *A*-Model are useful at best for recognition and measurement of revenues and expenses as the explanatory elements to show how income is obtained.

It is clear, in consequence, that income determination based on the *A*-Model should be totally independent of recognition and measurement of revenues and expenses. These are by no means indispensable for income determination. At most, revenues and expenses are secondary elements to explain the process in which income is obtained. Historical records of transactions during a period in this sense is useful only for recognition and measurement of revenues and expenses as secondary elements.

(2) Determination of Unitary Price and Quantity

Now then, according to the *A*-Model, how the unitary prices $(p_{i1}, p_{i2}, \ldots, p_{in})$ of individual assets $(a_{i1}, a_{i2}, \ldots, a_{in})$ as well as their quantities $(q_{i1}, q_{i2}, \ldots, q_{in})$ are to be determined?

Determination of unitary prices $(p_{i1}, p_{i2}, \ldots, p_{in})$ is to be that of measurement basis. The measurement basis for unitary prices is determined by selecting attributes to be measured,[7] and for this selection there might be five typical attributes; that is, historical cost, current cost, current market value, net realizable value, and present value of future cash flows.

On the other hand, determination of quantities $(q_{i1}, q_{i2}, \ldots, q_{in})$ means physical measurement of assets. The problem here is how to identify assets to be quantified, that is to say, to determine what resources should be identified as assets. In order to find the answer, we must set up the definition of asset which can be used as recognition criteria for assets. Once the definition is set up and we know therefore which resources are to be recognized as assets, then quantity of each asset can be determined automatically.

As we have already seen, the *A*-Model uses inventory approach, in as much as it recognizes a *existing* resource as a *existing* asset and then proceeds to measure a *existing* value of that asset. To recognize a existing resource as a existing asset means that aggregate of existing resources is physically recognized as assets without questioning legal ownership of those resources. This physical recognition consists in search of existence of resources to be recognized, and for this reason, the recognition criteria has necessarily to be all-inclusive and more or less highly abstractive. For instance, the AAA's 1957 Standards define asset as the "aggregates of service-potentials available for or beneficial to expected operations",[8] and this is a typical example of recognition criteria in this context.

On the other hand, if we intend to measure a existing value of a existing asset, the attribute to be measured is to be selected from one of attributes other than historical cost (for the sake of convenience, we shall call all attributes other than historical cost from now on "current value").[9] In particular, when we need a high degree of theoretical consistency in the measurement model, then we

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7) The process of determining measurement basis for unitary price is also influenced by choice of the unit of measurement (that is to say, which of units of money or units of general purchasing power are to be selected), but we do not take this aspect into consideration here.

8) AAA, Comittee on Accounting Concepts and Standards, "Accounting and Reporting Standards for Corporate Financial Statements — 1957 Revision", *The Accounting Review*, Vol. XXXII, No. 4, October 1957, p. 538.

9) Those resources, of which legal ownership is not yet confirmed or clearly known, also become object to be recognized according to the *A*-Model, but normally, they do not have determinate-past exchange prices, that is, historical costs. For this reason, measurement of these resources cannot be done without selecting some kind of current value as an attribute to be measured.

have to select a attribute which has theoretical consistency with the recognition criteria for assets. According to the AAA's 1957 Standards already referred to, the attribute to be measured is "the sum of the future market prices of all streams of service to be derived, discounted by probability and interest factors to their present worths",[10] that is to say, the present value of future cash flows.[11]

If we draw the schema of balance sheet and income statement based on the preceding discussion on the *A*-Model, it will be shown as Figure 1 below.

Figure 1 Schema of Balance Sheet and Income Statement Based on the *A*-Model

Balance Sheet		Income Statement	
Assets as financial representations of aggregates of service-potentials	Liabilities as negative assets	Expenses as negative elements in net assets	Revenues as positive elements in net assets
	Net assets		
	Income ⟶	Income	

(3) Feasibility of Recognition and Measurement

Yet, there must be a considerable difficulty in executing such a physical recognition in accounting practices. This is because release of accounting recognition from questions of legal ownership, while making it possible to recognize as assets those resources whose legal ownership is either unconfirmed or unclear, causes on the other hand conceptual diffusion of resources to be recognized, making it extremely difficult to identify *uniquely* their existence.[12] How to "resolve" this difficulty inherent in the physical recognition depends finally on individual latitude of accountants.

10) AAA, *op.cit.*, p. 539.

The AAA's 1957 Standards themselves contain a statement as follows: "However, this conception of value is an abstraction which yields but limited practical basis for qualification. Consequently, the measurement of assets is commonly made by other more feasible methods". (*Ibid.*, p. 539).

11) The work done by R.T. Sprouse and M. Moonitz, *op.cit.*, pp. 23 – 24, is an example of early studies to formulate theoretical analysis of measurement process of *existing* value of *existing* asset.

The process for measurement of assets formulated by them consists of the following three steps: 1. a determination if future services do in fact exist, 2. an estimate of the quantity of services, and 3. the choice of a method or basis or formula for pricing (valuing) the quantity of services arrived at under 2, above. In general, the choice of a pricing basis is made from the following three exchange prices: (a) a past exchange price (e.g., acquisition cost or other initial basis), (b) a current exchange price (e.g., replacement cost), and (c) a future exchange price (e.g., anticipated selling price).

The process for measurement of assets as above, proposed by Sprouse and Moonitz, has been criticized by many experts for a variety of reasons, and above all, from a viewpoint of feasibility. The book (*Ibid.*, p. 60 et s.) contains some examples of these critical comments which could be of particular interest.

12) When adoption of specific method (or a specific standard) makes it possible to express a principal by means of only one surrogate, the surrogate is unique. In the present discussions, we use the word "uniquely" in this sense. Note that uniqueliness of monetary measured value as a surrogate is closely linked to verifiability which is one of the qualitative characteristics of accounting information. As to verifiability, see FASB, *Qualitative Characteristics of Accounting Information*, Statement of Financial Accounting Concepts No. 2, 1980, pars. 81 – 89.

For instance, new financial instruments (such as, specifically, unconditional receivable-payable contract, conditional receivable-payable contract, financial option contract, financial forward contract, financial guarantee or other conditional exchange contract, equity instrument and the like), in the course of transaction, generate resources, and these are typical of resources whose legal ownership is unconfirmed or unclear. For these resources, it might be practically impossible to determine *uniquely* whether they should be recognized as assets or not on the basis of their existence. If one makes a point of making such determination as an accounting practice in spite of all the difficulty, then the cognitive operation must depend largely on individual latitude of accountants, which would certainly make accounting measurement highly subjective.

On the other hand, and as noted earlier, the attribute to be measured in the *A*-Model is not historical cost but a current valve in a broader sense, and current value is radically different from historical cost in that it lacks factual confirmation. Measurement of assets by means of current value always necessitates some sort of estimation accompanied by assumption of contemplated transaction, but it is rarely possible to conduct such estimation in a *unique* sense, as with the case of physical recognition of resources, the difficulty cannot be resolved except by means of individual latitude on the part of accountants.

If we try to execute accounting measurement based on the attribute to be measured presented in the AAA's 1957 Standards already seen, we must estimate "all streams of service to be derived", "the future market prices" of those streams, and "probability and interest factors" by which those prices are to be discounted to their present worths, respectively. But, we have to say that it is extremely difficult (or practically impossible) to estimate uniquely and objectively these factors. If one makes a point of estimating these factors in spite of all the difficulty, then the estimation must depend highly on latitude of accountants.

All these observations show, therefore, that in spite of its normative approach for measurement, the *A*-Model presents a serious problems and difficulty in regard of feasibility. And this difficulty is radical one, in that it directly affects recognition and measurement in accounting, and that in most cases it cannot be resolved except by individual latitude of accountants.

IV Type *B* of Measurement Model

Ⅳ—1 Model

We are now going to study a measurement model which considers the operation represented by the formula (2) as a process of recording and valuation in which actual transactions are recognized and measured one by one at their occurrence.

According to the definition of accounting measurement as conversion of entity's economic events into monetary measured values, this model considers entity's economic events as an aggregate of unitary transactions and adopts the approach to convert that aggregate into monetary measured values. Inasmuch as the objects to be recognized and measured are a set of transactions occurring within an entity during a given period, the accounting measurement based on this model is essentially periodical.

If we take T_i to express aggregate of unitary transactions (t_{i1}, t_{i2}, ... , t_{in}) which occurred during

the period i, monetary measured value of T_i can be obtained by the following equation:

$$\begin{aligned} V(T_i) &= V(t_{i1}) + V(t_{i2}) + \cdots\cdots + V(t_{in}) \\ &= p_{i1}\, q_{i1} + p_{i2}\, q_{i2} + \cdots\cdots + p_{in}\, q_{in} \\ &= \sum_{j=1}^{n} p_{ij}\, q_{ij} \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (5) \end{aligned}$$

Here, $(p_{i1}, p_{i2}, \ldots, p_{in})$ and $(q_{i1}, q_{i2}, \ldots, q_{in})$ indicate unitary prices and quantities of $(t_{i1}, t_{i2}, \ldots, t_{in})$, respectively.

Now, a measured value $p_{ij}\, q_{ij}$ in the formula (5) represents inflow or outflow of cash or cash equivalent resulting from transaction t_{ij}.[13] The measured value $p_{ij}\, q_{ij}$, if it is positive, means cash inflow, and cash outflow if the value is negative. Assuming that all cash inflows and outflows taking place during the period i are aggregated in the formula (5), then $V(T_i)$ represents net cash inflows or outflows during the period i.

Here, if we tentatively express a positive measured value $p_{ik}\, q_{ik}$ as cash inflow c^{+}_{ik} and a negative measured value $p_{il}\, q_{il}$ as cash outflow c^{-}_{il}, then (5) can be transformed into:

$$\begin{aligned} V(T_i) &= (c^{+}_{i1} + c^{+}_{i2} + \cdots\cdots + c^{+}_{is}) \\ &\qquad - (c^{-}_{i1} + c^{-}_{i2} + \cdots\cdots + c^{-}_{it}) \\ &= \sum_{k=1}^{s} c^{+}_{ik} - \sum_{l=1}^{t} c^{-}_{il} \qquad (s + t = n) \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (6) \end{aligned}$$

This means that $V(T_i)$ is expressed as the difference between price-aggregate of cash inflows and that of cash outflows during the period i. In this measurement model, $V(T_i)$ is given as the original sum of income.

We shall call this type of measurement model the *B* type of measurement model (or simply the *B*-Model) in the discussions to follow.

Ⅳ—2 Analysis of the Model

(1) Measurement Approach

We already know that in the *B*-Model, actual transactions are to be recognized and measured one by one at the time of their occurrence. Here, it is important to keep in mind that any transaction as object to be recognized always involves a certain cash flow. It is obvious that cash flow is a special economic event because it *uniquely* embodies a specific monetary measured value by itself. For this reason, in the *B*-Model, the object to be recognized as well as the monetary measured value of that object are confirmed *uniquely* and instantly at the time of transaction. The operational process is purely automatic.

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13) Here, the term "cash equivalent" is used to mean money's worth, except cash, which is paid or received for good or service in an exchange, of which typical examples are trade account receivable and trade account payable. Price-aggregates of cash flows vary, however, depending on what criteria are used to identify "cash equivalent", and income amount is to be influenced by the variation of price-aggregates of cash flows. This issue may be said to converge into the traditional discussions regarding the "realization" concept.

This shows that in the *B*-Model, recognition and measurement are inseparably linked to each other as one single operation, and that recognition and measurement are led by the determinate-past fact of occurrence of actual transactions. In this sense, we may characterize the *B*-Model's cognitive and measuring approach as the "transaction approach".

We know that in the *B*-Model, recognition and measurement are possible only by successive recording of all transactions occurring during a period. Therefore, and in contrast to the *A*-Model, day-to-day accounting record is indispensable for accounting measurement.

(2) Meaning of Monetary Measured Value

With the *B*-Model, there arises no problem in regard of cognitive and measuring operations as was with the *A*-Model, because in the *B*-Model, unitary prices (p_{i1}, p_{i2}, ..., p_{in}) and quantities (q_{i1}, q_{i2}, ..., q_{in}) of unitary transactions (t_{i1}, t_{i2}, ..., t_{in}) are automatically confirmed on each occasion due to the sheer fact of occurrence of the transactions. Yet, there arises a new problem; what is meant by monetary measured value given by the *B*-Model, that is, the individual measured value $p_{ij}\ q_{ij}$ in the formula (5)? We of course know that it shows, outwardly, sum of the cash flow resulting from the unitary transaction t_{ij}, but the question here is what is the substance of that sum of cash flow.

In the *B*-Model, unitary prices (p_{i1}, p_{i2}, ..., p_{in}) and quantities (q_{i1}, q_{i2}, ..., q_{in}) are automatically confirmed on the basis of occurrence of unitary transactions (t_{i1}, t_{i2}, ..., t_{in}). According to such a process, unitary price p_{ij} is necessarily confirmed on the basis of original cost at the time of transaction t_{ij}, while the quantity q_{ij} is determined by units of the resources directly involved in t_{ij} (which, in principle, has no ambiguity or uncertainty of legal ownership or title). The aggregate of unitary price p_{ij} and quantity q_{ij}, thus confirmed, shows sum of the cash flow resulting from the unitary transaction t_{ij}, but there is no guarantee that the sum really reflects the increase or decrease in value of resources at the time of transaction. Moreover, after the transaction (for instance at the end of the period i), sum of the cash flow resulting from the unitary transaction t_{ij} becomes a mere *historical* record.

This means that the monetary measured value $p_{ij}\ q_{ij}$ given by the *B*-Model shows no more than a historical sum of the cash flow resulting from the unitary transaction t_{ij}, and nothing else in substance. If the measured value could have any substantial meaning (like, for instance, as financial representation of increment or decrement in economic resources), it is purely by coincidence and as an exceptional case where sum of the cash flow arising from a transaction accurately reflects increase or decrease in value of resources incidental to that transaction and where price level remains constant throughout the period.[14)]

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14) In general, views taken by the *B*-Model are far from normative in that it does not seek realistic correspondence between economic events of an entity (principal relation) and monetary measured values (surrogated relation). The main reason for this is that price-aggregates of cash flows, as a population from which elements of financial statements can be selected, are automatically determined by the determinate-past fact of occurrence of actual transactions.

Yet, as note (13) states, price-aggregates of cash flows vary depending on the criteria to be used to identify cash equivalent. If the concept of cash equivalent is restructurized on the basis of a certain kind of normative views, then accounting measurement based on the *B*-Model can take a normative character istic to that extent. This is also an issue convergent to discussions regarding the "realization" concept, and it is one of those issues which must be dealt with if we intend to find answers to emerging accounting problems of today.

At the same time, we must not overlook that in the *B*-Model, nominalization of monetary measured values is inevitable in order to realize linear aggregation of the formula (5); for the reason that confirmation of unitary prices (p_{i1}, p_{i2}, ..., p_{in}) based on historical cost means measurement of unitary transactions (t_{i1}, t_{i2}, ..., t_{in}) at different points of time, which means that each of monetary measured values ($p_{i1}\ q_{i1}$, $p_{i2}\ q_{i2}$, ..., $p_{in}\ q_{in}$) normally reflects fluctuation of prices and expresses price levels which are different from one time point to the other. In order to realize linear aggregation in the formula (5) with plural measured values, each of which representing different price level prevailing at the time of measurement, it is necessary to disregard the chronological difference of price levels and to nominalize each of monetary measured values.

To recapitulate the preceding discussion, each of monetary measured values in the *B*-Model is confirmed as the product of unitary price and quantity ($p_{i1}\ q_{i1}$, $p_{i2}\ q_{i2}$, ..., $p_{in}\ q_{in}$) at the time of transaction, but elapse of time deprives the monetary measured value of its substance because of fluctuation of price level, thus, the price-aggregate given by the formula (5) at the time of exercise (such as at the end of a period) represents no more than nominal sums of cash flows. Yet, we might say that the linear aggregation in the formula (5) becomes technically feasible by that nominalization of monetary measured values.

Readers will recall that when the formula (5) is transformed into (6), a positive measured value $p_{ik}\ q_{ik}$ is expressed as c^{+}_{ik}, while a negative value $p_{il}\ q_{il}$ is expressed as c^{-}_{il} for the sake of convenience. It is obvious that this means abstraction of concepts of unitary price and quantity for each of measured value, or nominalization in essence. Now we can say that the substitution is not a convenient trick to transform the formula. It is a substantial procedure necessary to express more clearly the basic measurement approach inherent in the *B*-Model.

(3) Process of Income Determination

As already mentioned, the monetary measured value $V(T_i)$ according to the formula (6) is the original sum of income determined by the *B*-Model, but it is not the income itself. This is because the price-aggregate of cash inflows ($c^{+}_{i1} + c^{+}_{i2} + \ldots + c^{+}_{is}$) and that of cash outflows ($c^{-}_{i1} + c^{-}_{i2} + \ldots + c^{-}_{it}$) both include those which have no relation to current period result.

In the *B*-Model, what is regarded as income is net increase in nominal cash stock as the results of transactions of an entity for a given period. In other words, in the *B*-Model, income is the difference between cash inflows as accomplishment during a period and cash outflows as effort needed to realize that accomplishment.

As it is, income determination based on the *B*-Model requires operation to eliminate those cash inflows and outflows nonrelated to the results in a period from the price-aggregates ($c^{+}_{i1} + c^{+}_{i2} + \ldots + c^{+}_{is}$) and ($c^{-}_{i1} + c^{-}_{i2} + \ldots + c^{-}_{it}$) in the formula (6). There are two kinds of cash flows that should be eliminated from the price-aggregates: (a) cash flows being related to the results of future periods (such as advance received, advance paid, investment in capital goods etc.), and (b) cash flows arising from exchange transactions (such as capital contributions, borrowings, loans etc.). We shall call the cash flows related to current period results "results-related cash flows", and those which are not related to current period results "results-nonrelated cash flows".

Both of results-related and results-nonrelated cash flows are classified according to their origin. For the purpose of classification, these cash flows are recorded in relation to their causal events in the

following manner:

Cash inflow	xxx	Causal event	xxx
Causal event	xxx	Cash outflow	xxx

This shows that income determination based on the *B*-Model requires comparative entries of cash flows and their causal event (flow of goods or services) in successive accounting records. Such recording technique (or recording/accounting system based on the technique) is generally called double-entry bookkeeping.

Causal events resulting in cash inflows are as follows: ① events representing results in current period, ② events representing results in future period, and ③ events representing exchange transactions. In contrast, events resulting in cash outflows are as follows: ④ events representing efforts expended to produce results in current period, ⑤ events representing efforts expended to produce results in future period, and ⑥ events representing exchange transactions.

Cash inflows arising from causal events ① and cash outflows due to causal events ④ represent result-related cash flows, the difference of which constitutes income in the *B*-Model.

Here, let us call "revenues" the cash inflows arising from causal events ①, and "expenses" the cash outflows due to causal events ④, respectively. Both revenues and expenses are incorporated into the income statement of an entity where income is shown as difference between revenues and expenses.

On the other hand, cash inflows arising from causal events ② and ③, as well as cash outflows due to events ⑤ and ⑥, represent results-nonrelated cash flows. These are to be eliminated from price-aggregates of cash flows for the purpose of income determination.

Those results-nonrelated cash flows eliminated for this purpose are incorporated into the balance sheet of an entity. Here, cash inflows arising from causal events ② and ③ are to be shown on the credit side of the balance sheet as "cash inflows which are not yet revenues" (cash inflows not yet revenues) and "cash inflows which are non revenues" (cash inflows nonrevenues), respectively. In contrast to this, cash outflows due to causal events ⑤ and ⑥ are to be shown on the debit side of the balance sheet as "cash outflows which are not yet expenses" (cash outflows not yet expenses), and "cash outflows which are non expenses (cash outflows nonexpenses), respectively.

These results-nonrelated cash flows are to be incorporated into the balance sheet of an entity through the following adjustment entries:[15]

Cash outflows (Cash outflows not yet expenses or nonexpenses: Debit side items of the balance sheet)	xxx	Causal events (Deductions from expenses)	xxx

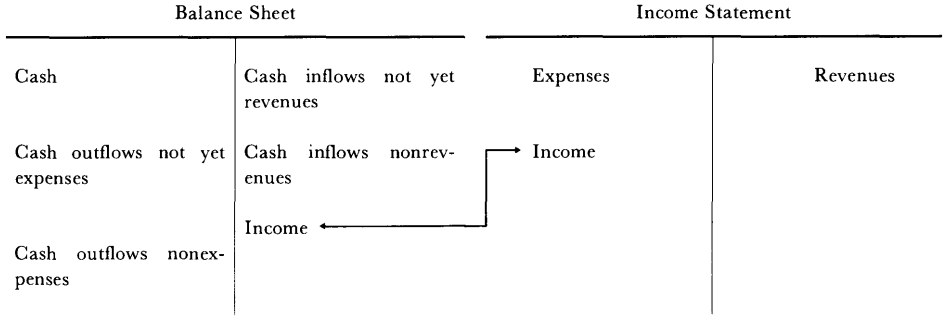
15) However, if revenues and expenses are recognized through the double-entry book keeping system as seen above, causal events ① themselves are to be recognized as revenues and those ④ themselves as expenses. To expatiate this cognitive process in the *B*-Model, the author intends to take up the task time in future.

Causal events xxx (Deductions from revenues)	Cash inflows xxx (Cash inflows not yet revenues or non-revenues: Credit side items of the balance sheet)

The debit side of the balance sheet also includes cash as the present cash balance.

Figure 2 shows the schema of balance sheet and income statement based on income determination process in the *B*-Model.[16)]

Figure 2 Schema of Balance Sheet and Income Statement Based on the *B*-Model



(4) Accountants' Latitude in Income Determination

As we have already seen, c^{+}_{ik} or c^{-}_{il} is *uniquely* determined by the occurrence of actual transaction concerned. Therefore, $V(T_i)$, which is obtained by linear aggregation of cash flows, is *uniquely* confirmed as well, and for this reason, there is no room left for accountants' latitude to intervene in this process.

Accountants' latitude does intervene, however, in the process where cash flows aggregated in $V(T_i)$ are classified into results-related cash flows and results-nonrelated cash flows. This is because the classification has to be made on the basis of nature of causal events producing cash flows, while the *B*-Model does not provide any theoretical criterion necessary to allow *unique* determination of nature of such causal events. Accountants are thus required to make judgement in person and interpret things in order to make up for the lack of theoretical criteria.

The process of classifying cash outflows (or cash outflows previously classified as cash outflows

16) It should be noted that the balance sheet in Figure 2 does not include so-called "accrued items" (i.e., accrued revenues, accrued expenses, reserves for future expenses and the like). This is a necessary consequence of application of the *B*-Model which recognizes only those cash flows resulting from determinate-past transactions. The model does not recognize transactions if they are not accompanied by actual cash flows. At this point, accounting measurement based on the *B*-Model is different from that of conventional accounting.

Notwithstanding, some of accrued items may be taken up as object to be recognized by enlarging the concept of "cash equivalent" in application of the *B*-Model.

not yet expenses) as expenses, or classifying them as cash outflows not yet expenses, is a typical case in which accountants' latitude has to come into play. To explain this in more explicit terms, the situation arises in the process of determination of depreciation expenses and balance remaining of fixed assets, determination of costs disposed and cost carried forward of inventory, and determination of sums written off and sums deferred of deferred charges. The *B*-Model does not provide any theoretical criterion to make *unique* determination of these costs or sums. Accountants are therefore required to make their discretionary judgement and to select what they believe to be the most reasonable answer or method (usually out of a set of generally accepted accounting policies).

Accountants' latitude, however, cannot change price-aggregates of cash flows. In other words, accountants have no influence, whatever judgement they might make, on the basic framework of the *B*-Model in which cash flows arising from actual transactions are recorded and evaluated at their original costs. Accountants' latitude can intervene only in the process where price-aggregates of cash flows are classified into results-related cash flows and results-nonrelated cash flows. To put this in simple expression, accountants' latitude comes into play only in determining the time at which one of given cash flows (excluding those arising from exchange transactions) is to be recognized as revenue or expense, that is, in timing recognition of revenues and expenses.[17]

We might say that the latitude the *B*-Model assigns to accountants is confined within the *border* set up by price-aggregates of cash flows given by the formula (6). The latitude cannot violate this border, but within this border, accountants can exercise their latitude and choose freely what they consider to be the most reasonable method to classify price-aggregates of cash flows and to determine the income for a period.[18]

V Implications of the Model Analysis

In this section, we shall summarize our discussions so far done in order to clarify what the model analysis implies for accounting research.

(1) Normativeness of the Models

First of all, it is clear that accounting measurement based on the *A*-Model is characterized by its strong normativeness.

We have already seen that the *A*-Model recognizes as assets all resources that actually seem to

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17) This corresponds with the cognitive approach in conventional accounting for which "when", and not "what", has always been the crucial point of recognition. In the *B*-Model, the question of "when" is dealt with in consideration of causal events of cash flows (flow of goods or services). As such, it is said to be goods-oriented, and normativeness of the accounting measurement based on the *B*-Model is tested in the course of this operational process. This issue can be said to converge into the traditional discussions regarding the "matching" concept.

18) Population of elements of financial statements is given basically as price-aggregates of cash flows also in case of conventional accounting, although there are certain accrued items (reserves, as typical example) to be added at the end of a period, thereby increasing the original population of elements. As note (16) shows, this represents a major difference between accounting measurement based on the *B*-Model and that of conventional accounting.

exist within an entity at the end of a period, and this regardless of whether or not these resources are validly owned from a legal point of view. Moreover, all these assets are incorporated into the balance sheet at their current values on the closing day. We also know that all gains or losses on assets held by an entity at the end of a period are recognized and measured as gains or losses, regardless of whether or not they have been realized. What is behind this cognitive and measuring operations is a normative (real-goods-oriented) view which attempts to recognize and measure as realistically as possible all resources held by an entity.

In contrast to this, the *B*-Model performs automatic recording and evaluation of cash flows arising from actual transactions. The balance sheet shows only those cash flows which are not related to the results during a period and are evaluated at their historical costs. Therefore, amounts shown on the balance sheet are no more than nominal deferred sums of cash flows, and these cannot have any real meaning unlike those shown on the balance sheet based on the *A*-Model.[19]

This does not mean that the *B*-Model is not at all goods-oriented, in that the model does allow for causal events (flows of goods or services incidental to cash flows) and according to them classifies cash flows into results-related ones and those which are otherwise. Yet, the basic framework of accounting measurement in the *B*-Model is strictly based on the records and evaluations of cash flows, and goods-oriented factors intervene only conditionally in timing recognition of revenues and expenses. In general, accounting measurement based on the *B*-Model can be said to be descriptive (nominal-money-oriented).

Consequently, for those who give prominence to disclosing of "economic reality"[20] of an entity in financial statements or to making accounting policy based on "substance over form",[21] the *A*-Model should be preferred for accounting measurement. If accounting measurement based on the *A*-Model is effectively applied to accounting practices, then most of the new accounting issues, such as accounting for leases, contingencies, financial instruments and employers' accounting for pensions, will be resolved completely and once for all.

(2) Accountants' Latitude

The second point to be made is that accounting measurement based on the *A*-Model cannot as such be done unless there is unlimitative latitude of accountants.

The latitude is needed also in accounting measurement based on the *B*-Model, but as we have already seen, the latitude there is confined within a border which is made up by price-aggregates of

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19) We might, after Eugen Schmalenbach, who completed the theory of dynamic accounting (Dynamische Bilanz), call "Vorleistung" (stock of entity's forces) the debit side items and "Nachleistung" (stock of entity's obligations) the credit side items, respectively (E. Schmalenbach, *Dynamische Bilanz*, 11 Aufl., Westdeutscher Verlag, 1953, S. 56), but such naming is no more than after-the-fact explanation of balance sheet items. These items are incorporated into the balance sheet because they represent result-nonrelated cash flows and not because they are "Vorleistung" or "Nachleistung". If these are taken up as objects to be directly recognized, then the accounting measurement will be that of the *A*-Model.

20) See, for instance, D. Solomons, *Making Accounting Policy: The Quest for Credibility in Financial Reporting*, Oxford University Press, 1986, p. 92 and p. 165 et s.

21) See, for instance, AICPA, *op.cit.*, p. 57; International Accounting Standards Committee, *Framework for the Preparation and Presentation of Financial Statements*, 1989, par. 35.

cash flows which in turn are determined objectively and uniquely on the basis of factual transactions. This border imposed on accountants' latitude ensures stability of accounting measurement based on the *B*-Model.[22)]

In contrast to this, the latitude intervenes directly and unlimitedly in case of the *A*-Model, and this causes the following issues; which resources are to be recognized as assets and which attributes of those assets are to be measured? In other words, how to determine the population from which elements of financial statements are to be selected? The objective and unique border does not exist for the *A*-Model, and it is why the accountants' latitude is said to be unlimitative here. This means that accounting information derived from accounting measurement based on the *A*-Model has only low degree of verifiability (or no verifiability at all in some cases) in spite of the strong normativeness of measurement principle the model embodies.

(3) Relationship between Accounting Practices and Measurement Models

Those two models we have studied so far are purely theoretical. They are used to represent two contrasting views that could be deduced from operational characteristics of accounting measurement, and they are not directed toward realistic modelling of existing accounting practices. As the author indicated at the beginning of this paper, conventional accounting consists of many different (and sometimes mutually contradicting) principles and standards, and this makes it impossible to derive systematic theories to explain consistently all of them. Rather, we might say that elements pertaining to the *A*-Model and the *B*-Model are both found in all aspects of conventional accounting.

Yet, it is clear from the above that conventional accounting is primarily that based on the *B*-Model. In other words, the pattern of recognition and measurement based on the *B*-Model represent approximate reconstitution of conventional accounting. For this reason, main characteristics of the *B*-Model (such as transaction approach, orientation toward nominal monetary value and bordering accountants' latitude) are considered to be descriptive of cognitive and measuring characteristics underlying conventional accounting.

If this is so, then merit and demerit of conventional accounting can also be explained by those of the *B*-Model. According to the model analysis we have undertaken, merit of the *B*-Model is found in the stability of accounting measurement, while its demerit consists in the lack of normativeness in accounting measurement. The merit and demerit both arise from the same characteristics inherent in and proper to the *B*-Model (i.e., transaction approach, orientation toward nominal monetary value and bordering accountants' latitude), and in this sense, we can say that they are no more than two sides of the same coin. The excellence in stability and the weakness in normativeness of accounting measurement based on the *B*-Model would be those of conventional accounting.

This allows us to introduce a hypothetical conclusion that the supremacy of conventional accounting is based primarily upon its stability, and that the stability is a condition *sine qua non* of

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22) The term "stability", as it is used in this paper, has a meaning close to what Yuji Ijiri calls "objectivity". In fact, he said: "The measure is relatively free of the personal feelings or prejudice of the measurer if it is objective. Therefore, the decision maker can use the measure without being concerned about who the measurer was" (Y. Ijiri, *op.cit.*, p. 137) and "This is the virtue of objectivity" (*ibid.*, p. 137). "Objectivity" (or "stability" in this paper) is therefore a state or characteristic which is not influenced by the personal feelings or prejudice of the measurer.

accounting measurement, which is superior to the normativeness. Although most criticism directed to conventional accounting has concerned its lack of normativeness, it still retains its supremacy in accounting practices. This fact would be an empirical proof in support of our hypothetical conclusion.

At the same time, we are also aware that many of new issues surrounding contemporary accounting (especially those concerning off-balance-sheet financing) arise from those characteristics inherent in the *B*-Model (i.e., transaction approach, orientation toward nominal monetary value and bordering accountants' latitude) providing the basis of stability of accounting measurement. To find solutions for these new issues, it would be necessary to mitigate the cognitive and measuring constraints arising from the basic characteristics of the *B*-Model, which means that we have to take a new look at the *A*-Model for solutions. The main problem here is to know how far and in which way we can be successful to incorporate elements pertaining to the *A*-Model into accounting measurement based on the *B*-Model. The difficulty in feasibility of the *A*-Model shows where the problems are for those who want to deal with these new issues.

VI Conclusion

The preceding discussions seem to accomplish our present task to set up purely theoretical models that could be deduced from operational characteristics of accounting measurement for the purpose of making analysis of cognitive and measuring process in each model.

The model analysis presented in this paper has come to be theoretical review of operational relevance of conventional accounting. However, it does not seem possible to explain why conventional accounting can still maintain its supremacy in accounting practices only by means of its operational relevance, because the relevance, however superior it may be, cannot ensure the supremacy of conventional accounting if it cannot ensure expected functions, and in particular the function to make adjustment of diverse economic interests surrounding an entity (such a character may be called "functional relevance").

In order to make clear assessment of functional relevance of conventional accounting, it will be necessary to study its characteristics from the viewpoint of behavioral science. The author intends to take up the task time in future.