

Accounting Dynamics

Rethinking about Theoretical Framework

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Abstract: Accounting Dynamics (AD) is a methodology of accounting as social science. We studied Accounting Dynamics from 1982 to 1994. We first proposed the concept of Accounting Dynamics on International System Dynamics Conference in 1987¹. We interrupted the study for a long time, because there were some difficulties to develop the real Accounting Dynamics models. The concept is still reasonable and so attractive that we have reviewed Accounting Dynamics again. This is first step to restart the project and show you Accounting Dynamics in order to organize the SIG. This paper shows what is "Accounting Dynamics" clearly.

1. Introducing Accounting Dynamics

Accounting is a most primitive quantification of social process which is composed of interactions of people. Here, most primitive means that accounting is a basic way of symbolizing measurements of relationships among people, especially those important ones related to day-to-day transactions. One could say that there is no other system that measures each and every routine transaction as much as accounting.

With society becoming more and more complex, many social institutions have been formed in order to regulate economic relationships. Accounting also has moved from a primitive level to a level of gigantic social institutions which regulate resource allocations in our society. However, this does not mean that accounting is no more the best way to quantify our everyday life. All economic bodies, whether they are individuals, corporations, municipals, or governments, still process their transaction data through generally accepted accounting procedures. And through this institutionally accepted accounting information, social relationships relating to resource allocations among people are decided.

¹ Co-researchers were Saburo Kameyama in Chuo University and Takahiro Kojima in Senshu University.

Looking from a different point of view, accounting is a vivid control system from a different point of view; accounting is a vivid control system of resource allocations in our society. As such, it can have a large influence on the dynamic behavior of social systems. However, it can be said that until now, accounting has not had an effective method which analyzes the resource allocation process and interprets the dynamic behavior of social systems macroscopically. But it will be necessary to bring the accounting method of quantifying everyday transactions to a method of operational modeling and simulation of social systems.

Accounting Dynamics (AD) is a new methodology of accounting as social science. In this context, Accounting Dynamics is a method of analyzing the dynamic behavior of social systems through accounting model simulation.

In order to simulate the real state of the resource allocation in the social system, it is necessary to convert the quantification process of accounting into an operational model. In other word, the accounting mechanism of processing transaction data must be build into the structure of the model. The model also has to be able to withstand simulation tests operationally. Only through this type of model simulation can we expect to accomplish our primary research objectives.

In this context, we use the System Dynamics method for our model operations. The reason for using SD is mainly the analogy of two basic variables (stock or level, and flow or rate) in SD to the balance sheet accounts and transaction concepts in AD.

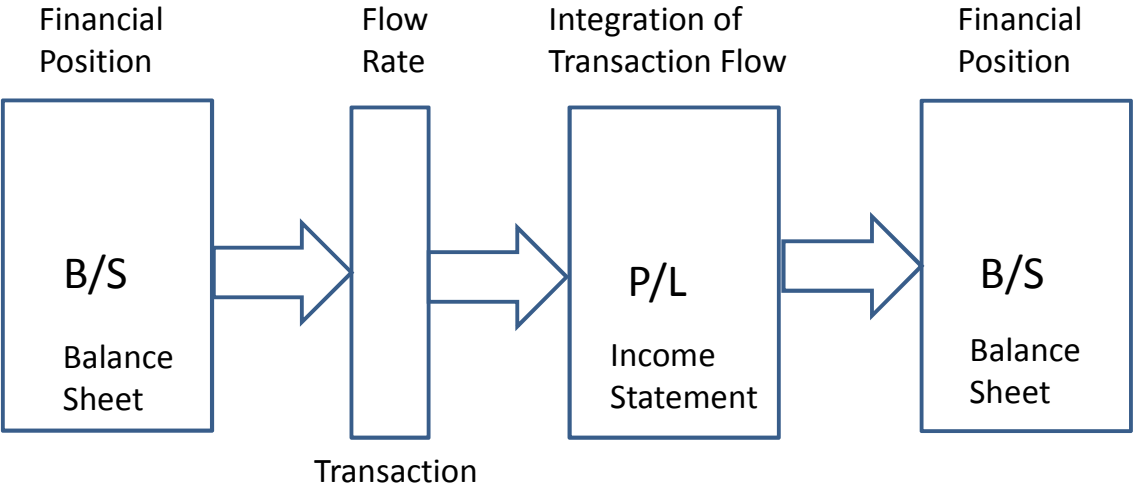


Figure 1 Basic Concept of AD Corporate Model

Furthermore, due to the structure-dependent nature of the SD model, an AD model based on the SD method can include the structure of account and institutional constraints which accounting data processing is subject to. A basic notion of AD is as the following. Corporate financial behavior can be represented as in figure 1. The income statement (P/L) is the integration of the transaction flow in a given period of time. By adding this to the first balance sheet the present balance sheet is obtained. The equation below figure 1 describes this relationship. The AD model formulated this relationship using the simulation language "DYNAMO". Of course we have many developing tools now.

The structure-dependent nature of AD model can be represented as in figure 2. Both the formal postulates of bookkeeping and the institutional postulates of accounting can be included in the model. The structure of balance sheet accounts of double entry bookkeeping forms level variables in causal loop diagram. Transaction flow which connects balance sheet accounts makes rate variables. Institutional constraints are formulated as constraints and parameters which are the sub-concepts of rate variables. Here it is noticeable that the structure of accounts reflects charge-and-discharge relationships of accountabilities. Therefore AD model is expected to have a close relationship to the real economic world.

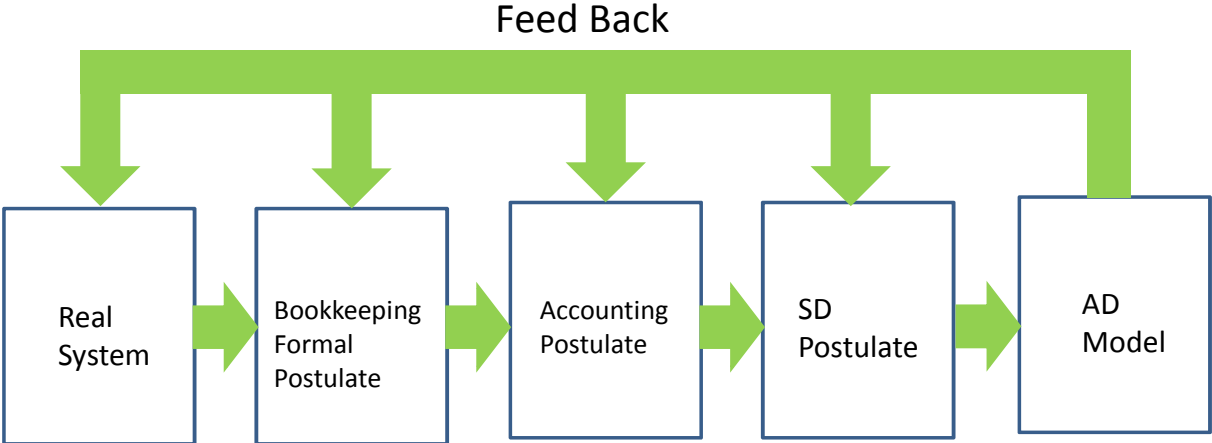


Figure 2 Postulates of AD Model

The initial conditions of the AD model are decided by the opening balance sheet. Through the simulation, we can calculate the B/S at any point of time and the P/L for any period in the future.

Of course the building of the AD model does not confine to the corporate level. The AD model can be considered in urban, national economics and all other higher levels in social systems. But, as can be seen in figure 3, it is important to notice that the AD model is built on the second order information space. The space, in which mutual economic transactions by economic bodies such as individuals and corporations are carrying out, can be called the real space. It is clear that an accounting system exists due to the necessity of a total optimization in this real space. Therefore, the accounting system is formed at the first order information space. AD tries to simulate the real conditions of the control of the economic activities, which performed by the accounting system. Due to this, AD must be a concept in which both the real space and the first order information space are its objects. Also it can be said that all accounting theory which focuses on accounting in practice is based on the second order information space just as AD. Furthermore, a meta theory, whose object is an accounting theory including AD based on the second order space, can be well conceived.

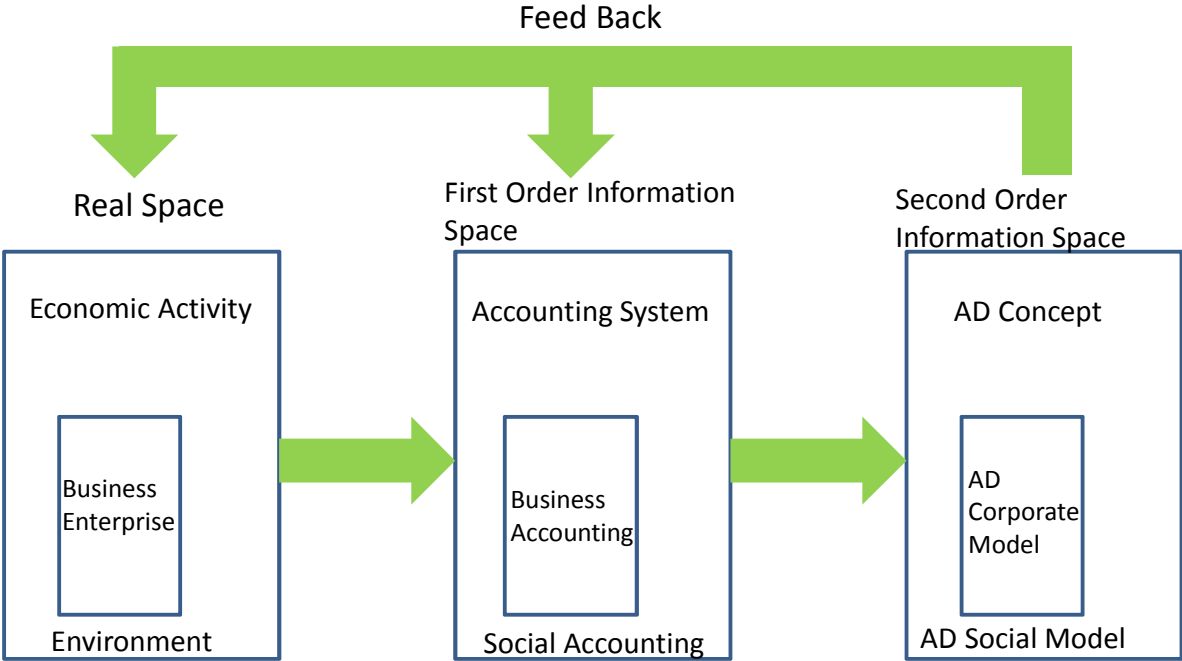


Figure 3. Relationship of Economic Activity, Accounting System and AD model

We think, through the accounting modeling and simulation based on the second order information space, as explained above, accounting has, for the first time, a positive accounting methodology such as said by Friedman (Friedman 1953). As Friedman says,

normative research is not possible without positive research. However, the most accounting theories are normative oriented without positive research. Positive research is also indispensable for the formation of mutual agreements of the related parties in our society. At the beginning of the corporate accounting principles, there is the principle of truth. However, until now, has there really been an effective method to test the truthfulness? In the light of this, we expect AD to be a breakthrough that allows accounting to become a true social science.

It goes without saying that the results of simulating of the AD model are fed back to economic activities that occur in the real space, and to accounting system that controls the real space. This is shown by the arrows in figure 2 and 3. At this point, the nature of the AD model which is structural dependent must be especially emphasized. The reason for this is that, through the simulation of AD model which have institutional rules in their structure, we could have an effective way to feedback simulation results to the improvement of our social institutions, Also, using the AD tests, that is, its applications for the DSS (Decision Support Systems) model in the management accounting area are very effective.

2. Purpose of Accounting Dynamics and Development Process

We aim modeling and simulation of Accounting Dynamics at 5 points in Table 1.

Table 1. Purpose of Accounting Dynamics

	microscopic	macroscopic
description and forecast	(1) description and forecast of financial behavior	(3) description and forecast of resource alloctions in social systems
supprt policy making	(2)supprt organizational decision making	(4) supprot policy making for socail systems
contribution toward accounting theory	(5) verification of accounting principles	

Our research development steps would be below.

- 1) First Step AD model
- 2) AD Corporate Model Prototype
- 3) AD model for real problem in a company level
- 4) Apply for real situation from company level to more higher social systems

We have shown a First Step AD model and an AD Corporate Model Prototype I in 1990s. It means we have finished 1) First Step AD model and 2) AD Corporate Model Prototype. But they could not bring us satisfaction. We now rethink Accounting Dynamics so that we should develop AD models from the first step.

3. Between Real Systems and Model Space

From accounting point of view, financial statements are greatly respected and the most important information. But if we use real financial data in a company level, we should make a whole model of a focused company. The behaviors of the AD model, as well as SD model, depend on the structure of the model. But financial statements include beyond model structure so that output of model behavior does not express the actual historical behavior very much. This is the first problem.

And the second problem is that purpose of simulation model in real situation differs from general purpose of simulation model. Prototype Model in theoretical company is barely accepted but for a real company model, we should concentrate model structure on the real problem. But it is very difficult to coordinate general model with real model.

We should explain the difference between real space and Ad model space in figure 4. We represent a part of social systems which have problems to solve. AD model space contains three information spaces. Of course, purpose of simulation, problems to solve, should provide whole model, AD model space. How to map the real space into real space, zero space, model is difficult for us.

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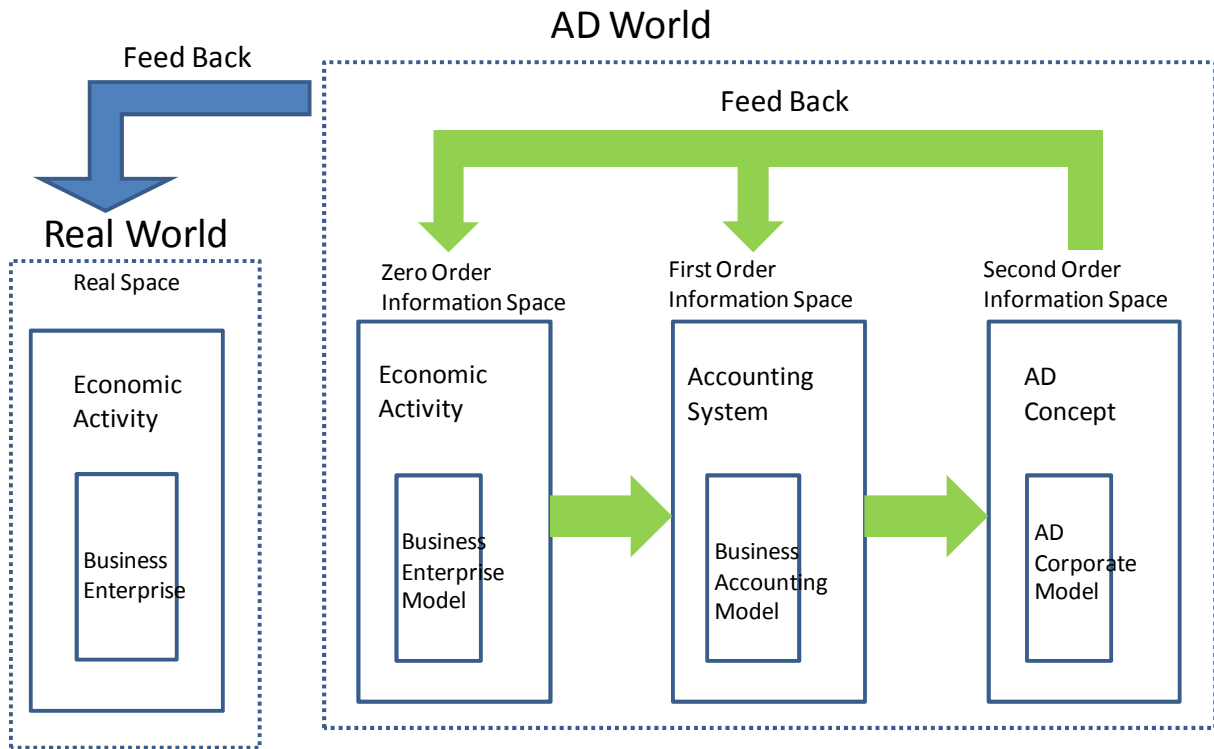


Figure 4. AD World and Real World

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