Profit and Value in Random System : On Professor Schefold’s Paper

Yoshihiro Yamazaki*

1. Introduction

Random matrices are firstly introduced into statistics in the 1920s. E. P. Wigner investigated those in the 1950s for applications to nuclear physics. Random matrices have random numbers as those elements. E. F. Dyson built a Brown movement model using random matrices.

The introduction of random matrices into quantum mechanics in the 1980s made mathematicians interested in eigenvalues of random matrices. Professor Schefold’s idea is to apply random matrices for a solution of K. H. Marx’s transformation problem. We check Schefold [2016] and make clear characters and implications of the method.

2. Transformation Problem and Random Matrices

Professor Schefold’s Sraffa vector means standard commodities.

---

*Faculty of Economics, Fukuoka University, Fukuoka, Japan

$$y = Ay + b + s \tag{1}$$

Here y, A, b and s are activity vector, input coefficient matrix, real wage vector and surplus production vector respectively.

$$y^* = (1 + R)\, Ay^* \tag{2}$$

R is the maximum profit rate that corresponds to Frobenius root. And we can deduce Sraffa vector as the right-hand-side eigenvector of input coefficient matrix.

We define the vector m whose elements are deviations from the standard activity level of Sraffa vector.

$$m = y - y^* \tag{3}$$

In contrast to Sraffa vector, Professor Schefold defines Marx vector.

$$p = (1 + r)\, pA + wl \tag{4}$$

Here p, r, w and l are production price vector, profit rate, wage rate and labor vector respectively.

$$p^* = (1 + R)\, p^* A \tag{5}$$

Then p^* is the left-hand-side eigenvector of input coefficient matrix. We define the vector v whose elements are deviations of labor vector from Marx vector p^*.

$$\mathrm{v} = 1 - p^{*} \tag{6}$$

Professor Schefold extends the consideration using these two vectors *m* and *v*. From equation (4), we can derive the equation (7).

$$\mathrm{p} = wl\ [I - (1+\mathrm{r})\ \mathrm{A}]^{-1} = \mathrm{w}\left[\frac{p^{*}}{1 - \frac{1+r}{1+R}} + v\right] \tag{7}$$

Then we normalize production price vector and obtain equation (8).

$$1 = \bar{p}\mathrm{y} = \bar{\mathrm{w}}\left[\frac{p^{*}y^{*}}{1 - \frac{1+r}{1+R}} + vm\right] \tag{8}$$

Because $cov\ (v,\ m) = 0$, the equation below follows.

$$\mathrm{vm} = \mathrm{n}\bar{v}\,\bar{m} \tag{9}$$

Here *n* is the dimension of vectors and bars over letters mean averages. We obtain equation (10) substituting equation (9) for (8).

$$\bar{w} = \frac{1}{\frac{p^{*}y^{*}}{1 - \frac{1+r}{1+R}} + n\bar{v}\,\bar{m}} \tag{10}$$

If we make an assumption the average value of *v* is zero, equation (11) follows.

$$\overline{w} = \frac{1 - \frac{1+r}{1+R}}{p^{*}y^{*}} \qquad (11)$$

When $r = R$, normalized wage rate is zero.

Like wage rate, we can calculate total profit as follows.

$$\Pi = \overline{p}s = \frac{1}{p^{*}y^{*}}\left[p^{*}s + \left(1 - \frac{1+r}{1+R}\right) vs \right] \qquad (12)$$

Because $cov\ (v,\ s) = 0$, the equation below follows.

$$\text{vs} = \text{n}\overline{v}\ \overline{s} \qquad (13)$$

We obtain equation (14) substituting equation (13) for (12).

$$\Pi = \frac{1}{p^{*}y^{*}}\left[p^{*}s + \left(1 - \frac{1+r}{1+R}\right) \text{n}\overline{v}\ \overline{s} \right] \qquad (14)$$

We assume the average value of v is zero and equation (15) follows.

$$\Pi = \frac{p^{*}s}{p^{*}y^{*}} \qquad (15)$$

Even if the average value of v is not zero, equation (15) follows when $r = R$.[1]

3. Differential Calculus in Marx

Schefold [2016] also referred to mathematical thought on differential calculus of G. W. Leibniz, G. W. F. Hegel and Marx. Leibniz is said to be ambiguous on the concept of the infinitesimal. He, however, considered people's antipathy against such a new idea. Because of this consideration, he defined *dx* or *dy* as finite quantities and described them less than any given quantities in the same Latin paper. Leibniz tried to persuade and make people understand the new idea.

Hegel added to this mathematical concept a very philosophical meaning. He treated the infinitesimal something between being and nothing. He called it an intermediate state. Marx's understanding is not so philosophical. He was particular about the fact that $\Delta y/\Delta x = dy/dx$ in the linear case while $\Delta y/\Delta x \neq dy/dx$ in the non-linear case. Marx also picked Leibniz rule up.

$$\frac{dyz}{dx} = z\frac{dy}{dx} + y\frac{dz}{dx} \tag{16}$$

Professor Schefold interprets that Marx took a distance from Hegel by regarding the differentials not as magnitudes of the infinitesimal but as operators. Marx wrote “The equation is thus only a symbolic indication of the operations to be performed”.

[1] The total profit in which $r = 0$ of equation (12) is total surplus value. Even in this case, equation (15) is held if the average value of v is zero.

4. Conclusion

Transformation problem has been treated as gradual recalculation from labor value to production price. The substantial backbone of these formal procedures has been supposed to be confirmed by the three propositions : total value = total production price, total surplus value = total profit and total value product = total income. As well known, we can hold only one proposition of the three. This means that the backbone is also just formal not substantial.

Professor Schafold's approach has a significance in that it can show the proposition of total surplus value = total profit is held on average. It can explore a new aspect of transformation problem. The approach tells not only that value system works in a deeper dimension than production price system but also that the two systems interact quantitatively at the same time.

References

Schefold, B., 'Profits equal surplus value on average and the significance of this result for the Marxian theory of accumulation : Being a new contribution to Engels' Prize Essay Competition, based on random matrices and on manuscripts recently published in the MEGA for the first time', *Cambridge Journal of Economics* 40, 165−199, 2016.