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ACCOUNTING FOR CHANGING MONEY VALUE

— Formularization of GPLA Adjustment for General Ledger Entries
and that of Earned Surplus Adjustment —

by Bunji NAKAI*

Introduction

This paper discusses an approach to formularize accounting for changing money value (or accounting for changes in the purchasing power of money) in order to clarify its accounting structure, to promote its practice by using computers, as well as to elucidate the relationship between such accounting system and nominal capital accounting (or conventional accounting). Therefore we do not intend to consider the real essence or substance of accounting for changing money value itself. And we are not going to compare the accounting for changing money value with so-called anti-inflationary procedures such as last-in last-out method, accelerated depreciation, one-time asset revaluation and the like used in nominal capital accounting, as well as other

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This paper was rewritten using the following articles already published in Japanese, with partial revision as appropriate :

“Kakuh Rieki Haijo to Kaheikachi Hendo Kaikei” (Elimination of Fictitious Income and General Price Level Accounting), *Keizai Ronso*, Vol. 103, No. 2 (Feb. 1969).

“Kaheikachi Hendo Kaikei no Keisan Kozo” (Structure of Computations in General Price Level Accounting), *Kaikei*, Vol. 108, No. 4 and No. 5 (Oct. and Nov., 1975).

“Kaheikachi Hendo Kaikei ni okeru Rieki Joyokin” (Earned Surplus in General Price Level Accounting), *Oikonomika*, Vol. 17, No. 2 (Sept. 1980).

“correct adjustment” here is that the adjustment is correct in computation–structure) was shown for the first time by Mahlberg in his work on “balance sheet adjustment”.²⁾ His adjustment pertains to one period, in which money value is stable at the beginning and deteriorated at the end, on the basis of progressive as well as retrospective method. As for the adjustment of financial statements including profit and loss statement adjustment (which, unlike balance sheet adjustment, indicates profit/loss due to changes in money value or purchasing power profit/loss), it was correctly achieved by Schmalenbach.³⁾

In 1926, Schmalenbach also presented the approach for adjusting ledger balances using retrospective method (progressive method was not used).⁴⁾ His work is not perfect because the adjustment for decrease–transaction (ref. notes to follow) was done using the money value at a particular time when decrease–transaction accrue. Yet, this is an memorable accomplishment in that he seemed to show not more explanatory case but an actual one when hyperinflation was rampant in 1920s in Germany. Following this, the general ledger (all transaction) adjustment method was studied in great detail both for progressive and retrospective method by Sweeney.⁵⁾ Also, Katano’s study of progressive method achieved a systematization of general ledger adjustment method and its adjustment working sheet.⁶⁾ It seems that so far, the Statement⁷⁾ of the Accounting Principle Board of AICPA No. 3 (APBS No. 3) represents the most general (and detailed) general–ledger–adjustment method showing examples based on the progressive method.

It remains to be said, however, that almost all literatures published so far, including those cited on the above, discuss structure of GPLA by means of concrete figures whether actual or hypothetical, and little has been done yet to formularize GPLA itself.

Several examples applying GPLA for the actual case in the United States are shown using a computer,⁸⁾ suggesting that GPLA is formularized in these instances, but none of them shows such formula itself. Ijiri’s paper⁹⁾ which attempts this in conjunction with analysis of APBS No. 3 is a very rare example.

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- 2) Mahlberg, W., *Bilanztechnik und Bewertung bei schwankender Wahrung*, 2. Aufl., 1922, SS. 69–76, 89–93; 3. Aufl., 1923, SS. 99–106, 119–124. The author was not able to see the first edition of 1921, but the Introductions to the First and Second Edition, both contained in the Second, suggest that both editions are basically the same.
 - 3) Schmalenbach, E., “Geldwertausgleich in der bilanzmaigen Erfolgsrechnung”, *Zeitschrift fur handelswissenschaftliche Forschung (Zfhf)*, Jg. 15, 1921, SS. 401–417. Schmalenbach, *Goldmarkbilanz*, 1922, SS. 9–22.
 - 4) Schmalenbach, *Dynamische Bilanz*, 4. Aufl., 1926, SS. 238–260.
 - 5) Sweeney, H. W., “The Technique of Stabilized Accounting”, *Accounting Review*, Vol. 10, 1935, pp. 185–205. Sweeney, H. W., *Stabilized Accounting*, 1936, pp. 54–168.
 - 6) Katano, Ichiro, *Accounting for Changing Money Value*, 1962, pp. 849–896 (in Japanese), pp. 32–89 (in English).
 - 7) Statement of the Accounting Principles Board of the AICPA, No. 3, Financial Statements Restated For General Price–Level Changes, 1969. (APBS No. 3). (APB Accounting Principles, Original Procurements as of February 1, 1971, Volume Two, pp. 9007–9015).
 - 8) Parker, J. E., “Impact of Price–Level Accounting”, *Accounting Review*, Vol. 52, No. 1 (January 1977), pp. 69–96.
 - 9) Ijiri, Y., *Theory of Accounting Measurement*, 1975, pp. 117–127.

so-called inflation accounting (that is, what is often considered as such) like accounting for physical capital maintenance. Also, we are not going to take up the issue of what type of index (wholesale price, consumer price, GNP deflator, etc) should be used to determine general price level (assuming that it constitutes the reciprocal of money value) in accounting for changing money value.

We are planning to conceive a more comprehensive accounting for changing money value which is to be based on the current cost principle in nominal capital accounting and includes the consolidation of financial statements in other inflationary countries.

However, because our purpose is to clarify as the first step the structure of accounting for changing money value, we shall concentrate our discussion to adjusted historical cost accounting (i. e., general price level accounting, or GPLA) as applied to the financial statements pertaining to a single country.

The adjustment practice of GPLA is distinguished alternatively into either "retrospective method" or "progressive method (roll forward method)" depending on timing of determination of the base money value to be used. The retrospective method converts current or past accounting figures to the money value at a certain point of time in the past (not necessarily a stable money value), while in the progressive method, accounting figures in the past or present are adjusted to the money value at a later date—generally as of the end of the current period. Both are same in substance and inter-convertible, although the retrospective method is more adapted to the comparison of accounting results of a same company at different period, and the progressive method is suited to compare accounting results of different companies at a current period. Note that the current financial statements cannot be restated by the retrospective method alone in relation to total economy. They must be restated on the basis of the progressive method.

Be to the adjustment procedure, there are two different approaches. The one is so-called "adjustment of all general ledger entries (all transactions)" in which the entire transactions during the period in question are individually adjusted. The other is "adjustment of financial statements" in which adjustment is made only for the financial statements. The latter is more simple, but it cannot give exact results. The former approach must be used if exactitude is required.

When we see the computation-structure of GPLA from its historical point of view, technique of GPLA was explained for the first time in 1918 by Middleditch,¹⁾ but the examples he gave showed no correct adjustment procedure. The correct adjustment method (as already mentioned, we are not considering the index to be used for money value adjustment (general price level), so it is assumed that an index is selected appropriately; also, no attempt is done to disclose the window-dressing which might have been made in the course of nominal capital accounting, so window-dressing, if any, remains in GPLA, and for this reason, what we call

1) Middleditch, L. J., "Should Accounts Reflect the Changing Value of the Dollar?" *Journal of Accountancy*, Vol. 25, Feb., 1918, pp. 117-120.

I Formularization of Ledger Account (All Transactions) Adjustment Method of GPLA¹⁰⁾.

I. a. Progressive Method

X (with no letter added) : Figures shown on the balance sheet (B/S) as of the end of current year and on the profit/loss statement (P/L) for the current year according to nominal capital accounting

- \bar{X} : Figures shown on the B/S and P/L above according to progressive method
 X_k : Amount of transaction at time point k (for restatement of non-monetary items, increase-transaction is given by Y_{k+} and decrease-transaction by Y_{k-})
 X_m : Transaction amount at the end of the preceding year (the last transaction on the closing day of the preceding year, to be more exact)
 X_n : Transaction amount at the end of the current year (the last transaction on the closing day of the current year, to be more exact)
 p_k : General price level index (reciprocal of money value) at time k
 p_m : General price level index (reciprocal of money value) at the end of the preceding year
 p_n : General price level index (reciprocal of money value) at the end of the current year
 p_{k+} : General price level index (reciprocal of money value) applied to decrease transaction Y_{k-} at the time of occurrence of the corresponding accrue or increase-transaction
 X_{m0} : Figures in (nominal) B/S at the end of the preceding year
 \bar{X}_{m0} : Figures in (as restated according to progressive method) B/S at the end of the preceding year

On the basis of these symbols as defined, the progressive restatement can be formulated as follows :

Balance of non-monetary items at the end of the current year

$$\bar{Y} = \sum_{k=1}^n Y_k + \sum_{k=1}^n \left\{ Y_{k+} \left(\frac{p_n}{p_k} - 1 \right) \right\} + \sum_{k=1}^n \left\{ Y_{k-} \left(\frac{p_n}{p_{k+}} - 1 \right) \right\} \dots\dots\dots (1)$$

$$= \bar{Y}_{m0} \times \frac{p_n}{p_m} + \sum_{k=m+1}^n Y_k + \sum_{k=m-1}^n \left\{ Y_{k+} \left(\frac{p_n}{p_k} - 1 \right) \right\} + \sum_{k=m-1}^n \left\{ Y_{k-} \left(\frac{p_n}{p_{k+}} - 1 \right) \right\} \dots\dots\dots (1a)$$

Balance of monetary items at the end of the current year

$$\bar{Z} = Z = \sum_{k=1}^n Z_k = Z_{m0} + \sum_{k=m+1}^n Z_k \dots\dots\dots (2)$$

Profit/loss arising from change of money value (purchasing power profit/loss, creditor's loss or

10) For simple formularization of adjustment of financial statements, see Nakai, "Kakuh Rieki Haijo to Kaheikachi Hendo Kaikei" (Elimination of Fictitious Profit and Accounting for Changing Money Value) in the *Keizai Ronso*, Vol. 103, No. 2, February, 1969, pp. 98-101.

debtor's profit)

$$\bar{G} = \sum_{k=1}^n \left\{ Z_k \left(\frac{p_n}{p_k} - 1 \right) \right\} - \sum_{k=1}^m \left\{ Z_k \left(\frac{p_m}{p_k} - 1 \right) \times \frac{p_n}{p_m} \right\} \dots\dots\dots (3)$$

$$= Z_{m0} \left(\frac{p_n}{p_m} - 1 \right) + \sum_{k=m+1}^n \left\{ Z_k \left(\frac{p_n}{p_k} - 1 \right) \right\} \dots\dots\dots (3a)$$

Formula (1) shows the restated balance of non-monetary items as of the end of the year, or restatement of all transactions since foundation of the business. Here, profit/loss items (entries to P/L) amount to the total of transactions during the current year (one term). Y_k includes all of increase and decrease transactions (if debit transactions are positive and credit transactions are negative, then each entry item has the balance either on the debit or credit side, expressed by positive or negative figures). $\sum_{k=1}^n Y_k$, the first term in formula (1) pertains to nominal balance at the end of year. $\sum_{k=1}^n \{ Y_k (p_n/p_k - 1) \}$, the second and the third term in formula (1) represents the sum total of (adjusted or restated) difference between the amount of individual transactions adjusted to general price level at the end of year ($Y_k \cdot p_n/p_k$) and the nominal amount (Y_k). Because the total of the adjusted differences of all B/S items except capital account, is adjunct to the capital (-stock) amount (as explained later), they are not indicated separately in case of off-the-book adjustment. However, when books are to be restated, the adjustment difference of each item has to be booked against money value adjustment account which constitutes the linkage between nominal capital accounting and GPLA (ref. in seq.).

In case when GPLA is applied immediately upon the establishment of a company (i. e., starting from the first year), restatement of the balance of each item at the year-end is given by the formula (1), and from the second year and thereafter, restated B/S as of the beginning of the year becomes available (each entry item has been restated). Thus, the formula (1a) can be used in this instance, as it converts into p_n (general price level at the current year-end) each item of B/S as of the beginning of the current year, already restated at GPL of the end of the preceding year, and individual restatement is done only for transactions occurred during the current year. (It may be superfluous to say, but note that diminution during the current year, of the balance at the beginning of year is treated as the transaction in the current year, so it does not affect aggregate roll forward conversion of the total balance at the beginning of the current year.) In the event GPLA is to be applied for a particular year to a company which has been using nominan capital accounting over years, the formula (1) is first used in adjustment accumulation of each item year from foundation of the company (or from the year in which money value began to fall) up to the start of GPLA, and the aggregate adjustments are then used to develop restated B/S as of the start of GPLA. From the following year on, the formula (1a) is to be used. If data to be used for restatement are available but actual computations are too cumbersome to be done (within a company), or when outsiders (e. g. analysts) are called in to conduct business analysis based on published financial statements (which makes exact restatement exercise impossible due to lack of sufficient data), some approximate and imperfect B/S, reflecting money value adjustment at the start of GPLA, is compelled to be used for the purpose.

Note that decrease-transactions of non-monetary items (such as fixed asset write off, depre-

ciation, sale returns, purchase returns, cost of sales, etc.) should be restated not on the basis of GPL at the time of transaction but using GPL at the time of their occurrence (acquisition of the asset to be written off, time of sales for goods returned, and time of acquisition for return of goods purchased and for cost of sales) of the corresponding increase-transaction. If we express an increase-transaction by Y_{k+} and its corresponding decrease-transaction by Y_{k-} , respectively, then :

$$Y_{k+} + Y_{k-} = 0$$

(in some cases like depreciation, a Y_{k-} corresponding to a given Y_{k+} has to be divided in more than one transactions.) There arises no profit or loss from the adjustment of non-monetary item, and for this reason,

$$Y_{k+} \left(\frac{p_n}{p_{k+}} - 1 \right) + Y_{k-} \left(\frac{p_n}{p_{k-}} - 1 \right) = 0, \quad \text{and} \quad p_{k+} = p_{k-}.$$

(Note that restatement for increase-transaction has been done with p_k at the time of occurrence, and restatement of decrease-transaction follows this. That is to say, p_{k-} is to be converted into p_{k+} and not vice versa.) This is the reason why in the formula (1), restatement for a decrease-transaction Y_{k-} has to be done on the basis of p_{k+} (GPL at the occurrence of increase-transaction) and not that of p_k (GPL at the time of decrease-transaction).

In progressive method, the amount of monetary items (assuming that the indexation is not applied in actual business transactions)—index-linked credits and liabilities are non-monetary items—shows no difference between nominal accounting and GPLA (strictly speaking, in case shown at GPL as of the end of current year).

In nominal capital accounting, actual profit/loss arising from money value change with regard to those monetary items are totally disregarded, as against GPLA. As we saw in the formula (2), monetary items have to be indicated in nominal amount from the point of economic calculation. Purchasing power profit/loss is the difference between the nominal amount of monetary item and its amount adjusted (restated) just like non-monetary items (from nominal to real money values). Balance of monetary items at year-end, as in the case of non-monetary items, should be (although no distinction is necessary between increase and decrease-transactions):

$$Z_{m0} \times \frac{p_n}{p_m} + \sum_{k=m-1}^n Z_k + \sum_{k=m+1}^n \left\{ Z_k \left(\frac{p_n}{p_k} - 1 \right) \right\} \dots\dots\dots (2b)$$

However, because economic calculation enforces transaction in nominal figure, it has to be indicated in nominal amount (formula (2)). Thus, the difference between formula (2b) and formula (2) becomes profit/loss arising from change in money value (actual profit/loss, purchasing power profit/loss creditor's loss or debtor's profit), expressed by formula (3a).

The first term in formula (3) indicates all the purchasing power profit/loss which arose since foundation of the company, whereas the second term indicates purchasing power profit/loss

since foundation of the business up to the end of the preceding year (after conversion into GPL at the current year-end). Hence the difference between these two terms show purchasing power profit/loss accrued during the current year. Purchasing power profit/loss in the preceding years are included in the restated earned surplus at the beginning of the current year. The formula (3 a) pertains to a method to make restatement based on balances of the preceding year-end instead of cumulative computations for the entire period since the foundation like in the formula (3). The formula (3a) applied to determine purchasing power profit/loss is also different from (1a) used for restatement of non-monetary items because it can show such profit/loss on the sole basis of accounting data for the current year. (The formula (1a) requires data for the preceding year in conjunction with $\overline{Y_{m0}}$ and p_{k+}). The difference between (1a) and (3a) gives rise to an issue, which will be discussed in the sequel of this paper.

Some scholars¹¹⁾ make distinction between realized and unrealized profit/loss on money value change, but we, the same as in the APBS No. 3, do not adopt their view, (hence its accrual is equal to realization), nor draw distinctions in the formulas above.

Next, using these formulas (1a), (2) and (3a), let us try to indicate the opening and closing B/S and P/L both in nominal and restated (adjusted) values, and to show the money value adjustment account as the linkage of nominal and restated figures. This exercise will allow us to clarify structure of GPLA in regard to nominal capital accounting. For this purpose, a part of the symbols used in the formulas are converted in the following manner :

$$X_{nk} = \sum_{k=m+1}^n X_k, \text{ so } X = X_{m0} + X_{nk}$$

$$\frac{p_n}{p_k} = \alpha_k, \quad \frac{p_n}{p_{k+}} = \alpha_{k+}, \quad \frac{p_n}{p_m} = \alpha_m$$

In order to simplify the model, we use the following assumptions :

Nominal Balance Sheet as of the Beginning of the Year

Inventories	I_{m0}	Capital	K_{m0}
Depreciable assets	F_{m0}	Earned surplus	S_{m0}
Other assets	L_{m0}	Accumulated depreciation	B_{m0}
Monetary assets	D_{m0}	Monetary liabilities	C_{m0}

11) Sweeney, "The Technique of Stabilized Accounting", p. 186; Sweeney, *Stabilized Accounting*, pp. 21-22, 30, 90, 142, etc., Katano, I., "Kaheikachi Shusei Kaikei" (Accounting for Money Value Adjustment), 1941, pp. 72-73, and Katano, I., *Kaheikachi Hendo Kaikei* (Accounting for Changing Money Value), 1962, pp. 881-885.

GPL Restated B/S (progressive adjustment) as of the Beginning of the Year

Inventories	$\overline{I_{m0}}$	Capital	$\overline{K_{m0}}$
Depreciable assets	$\overline{F_{m0}}$	Earned surplus	$\overline{S_{m0}}$
Other assets	$\overline{L_{m0}}$	Accumulated depreciation	$\overline{B_{m0}}$
Monetary assets	$\overline{D_{m0}}$	Monetary liabilities	$\overline{C_{m0}}$

P/L (nominal)

Cost of sales	$I_{m0} + \sum_{k=m+1}^{l-1} U_k$	Revenue	V_{nk}
Depreciation	B_{nk}		
Other expenses	W_{nk}		
Net income	P		

Nominal B/S as of the Year End

Inventories	$\sum_{k=1}^n U_k$	Capital	$K_{m0} + K_{nk}$
Depreciable assets	$F_{m0} + F_{nk}$	Earned surplus	$S_{m0} + S_{nk}$
Other assets	$L_{m0} + L_{nk}$	Accumulated depreciation	$B_{m0} + B_{nk}$
Monetary assets	$D_{m0} + D_{nk}$	Monetary liabilities	$C_{m0} + C_{nk}$
		Net Income	P

Appropriation of income is assumed here to take place at the end of the year. Net income shows the residual of income after distribution and tax. Therefore, the corporate taxes, dividends and bonuses payable are included in the B/S as liabilities, while the corporate taxes, dividends and directors' bonuses (while they pertain to appropriation of income) are indicated as "other expenses" in the P/L. Earned surplus at the beginning of the year includes net income for the preceding year. Conceptually, earned surplus should include net income for the current year, but in this case, earned surplus at the current year-end does not include the net income for the current year, which is to be indicated separately. Since the net income consists of monetary and non-monetary items, it is not possible for earned surplus, including both items, to be expressed in terms of the simple symbols such as Y and Z . This point shall be discussed in detail later on. Accumulated depreciation is a non-monetary item (to be given as Y), while allowance for doubtful accounts pertains to a monetary item (Z). The latter is included in monetary credit D (as a negative item). Liability reserves Z are included in liabilities C . Special reserve (reserves other than liability reserve), to be given as Y , are omitted in the present model (restatement method is same as for Capital K). Index-linked credits and liabilities are considered to be Y , a part of other assets (the present model does not show non-monetary liabilities as such, although adjustment can be made in the same manner as in the case of capital K).

Inventories and cost of sales are computed by the first-in, first out method. Goods purchased are expressed by U , and l denotes the time at which the goods to become year-end inven-

tory are first procured. Depreciation is computed on the straight-line basis and the depreciable assets are assumed to have no salvage value. A full year's depreciation is taken in the year of acquisition, and no depreciation is taken in the year of abandonment (same as in APBS No. 3). If we express depreciation rate as h_k , then :

$$B_{nk} = (F_{m0} + F_{nk}) h_k.$$

(Its cases where LIFO, average cost method, declining-balance method are adopted, formulas used for adjusting cost of sales and depreciation become somewhat different, although this does not have any influence on our study of GPLA structure itself.)

If we undertake the adjustment using progressive method under these assumptions, the year-end B/S, P/L and money value adjustment account will be as those shown in the following page.

Net income for the current year is computed in the B/S by deducting the total balance of credit side (excluding net income) from the total balance of debit side, while in the P/L, it is obtained by deducting the total balance of debit side (excluding net income for the period) from the total balance of credit side. As it is, by comparison of nominal P/L and adjusted P/L as of the year as well as nominal B/S and adjusted B/S both as of the year-end, the relationship between P and \bar{P} is shown as follows :

$$\begin{aligned} \bar{P} = & P + \{V_{nk+}(\alpha_k - 1) + V_{nk-}(\alpha_{k+} - 1)\} \\ & - [\{W_{nk+}(\alpha_k - 1) + W_{nk-}(\alpha_{k+} - 1)\} + \{\bar{I}_{m0} \cdot \alpha_m - I_{m0} + \sum_{k=m+1}^{l-1} \{U_k + (\alpha_k - 1)\}\} \\ & + \sum_{k=m+1}^{l-1} \{U_{k-}(\alpha_{k+} - 1)\}] + \{(\bar{F}_{m0} \cdot \alpha_m - F_{m0}) h_k + F_{nk+}(\alpha_k - 1) h_k \\ & + F_{nk-}(\alpha_{k+} - 1) h_k\} + \{C_{m0}(\alpha_m - 1) + C_{nk}(\alpha_k - 1)\} - \{D_{m0}(\alpha_m - 1) \\ & + D_{nk}(\alpha_k - 1)\} \dots \dots \dots (4) \end{aligned}$$

$$\begin{aligned} \bar{P} = & P + [\{\bar{L}_{m0} \alpha_m - L_{m0} + L_{nk+}(\alpha_k - 1) + L_{nk-}(\alpha_{k+} - 1)\} \\ & + \bar{F}_{m0} \alpha_m - F_{m0} + F_{nk+}(\alpha_k - 1) + F_{nk-}(\alpha_{k+} - 1)\} + \{\sum_{k=1}^n \{U_{k+}(\alpha_k - 1)\}\} \\ & + \sum_{k=1}^n \{U_{k-}(\alpha_{k+} - 1)\}] - [\{\bar{K}_{m0} \alpha_m - K_{m0} + K_{nk+}(\alpha_k - 1) + K_{nk-}(\alpha_{k+} - 1)\} \\ & + \{\bar{S}_{m0} \alpha_m - S_{m0} + S_{nk+}(\alpha_k - 1) + S_{nk-}(\alpha_{k+} - 1)\} + \{\bar{B}_{m0} \alpha_m - B_{m0} \\ & + (\bar{F}_{m0} \alpha_m - F_{m0}) h_k + F_{nk+}(\alpha_k - 1) + F_{nk-}(\alpha_{k+} - 1)\}] \dots \dots \dots (5) \end{aligned}$$

GPLA restated B/S as the end of the year (Progressive adjustment)

Inventories	$\sum_{k=1}^n U_k + \sum_{k=1}^n \{U_k + (\alpha_k - 1)\}$ $+ \sum_{k=1}^n \{U_{k-} (\alpha_{k+} - 1)\}$	Capital	$\overline{K}_{m0} \cdot \alpha_m + K_{nk}$ $+ K_{nk+} (\alpha_k - 1)$ $+ K_{nk-} (\alpha_{k+} - 1)$
Depreciable assets	$\overline{F}_{m0} \cdot \alpha_m + F_{nk}$ $+ F_{nk+} (\alpha_k - 1)$ $+ F_{nk-} (\alpha_{k+} - 1)$	Earned surplus (except for net income)	$\overline{S}_{m0} \cdot \alpha_m + S_{nk}$ $+ S_{nk+} (\alpha_k - 1)$ $+ S_{nk-} (\alpha_{k+} - 1)$
Other assets	$\overline{L}_{m0} \cdot \alpha_m + L_{nk}$ $+ L_{nk+} (\alpha_k - 1)$ $+ L_{nk-} (\alpha_{k+} - 1)$	Accumulated depreciation	$\overline{B}_{m0} \cdot \alpha_m + B_{nk} + (\overline{F}_{m0} \alpha_m$ $- F_{m0}) h_k + F_{nk+} (\alpha_k - 1) h_k$ $+ F_{nk-} (\alpha_{k+} - 1) h_k$
Monetary assets	$D_{m0} + D_{nk}$	Monetary liabilities	$C_{m0} + C_{nk}$
		Net income	\overline{P}

GPLA restated P/L (Progressive adjustment)

Cost of sales	$\overline{I}_{m0} \cdot \alpha_m + \sum_{k=m+1}^{l-1} U_k$ $+ \sum_{k=m+1}^{l-1} \{U_{k+} (\alpha_k - 1)\}$ $+ \sum_{k=m+1}^{l-1} \{U_{k-} (\alpha_{k+} - 1)\}$	Revenue	$V_{nk} + V_{nk+} (\alpha_k - 1)$ $+ V_{nk-} (\alpha_{k+} - 1)$
Depreciation	$B_{nk} + (\overline{F}_{m0} \cdot \alpha_m - F_{m0}) h_k$ $+ F_{nk+} (\alpha_k - 1) h_k$ $+ F_{nk-} (\alpha_{k+} - 1) h_k$	Profit on money value change	$C_{m0} (\alpha_m - 1) + C_{nk} (\alpha_k - 1)$
Loss on money value change	$D_{m0} (\alpha_m - 1)$ $+ D_{nk} (\alpha_k - 1)$	Other expenses	$W_{nk} + W_{nk+} (\alpha_k - 1)$ $+ W_{nk-} (\alpha_{k+} - 1)$
		Net income	\overline{P}

Money Value Adjustment Account (Progressive adjustment)

$\overline{K}_{m0} \cdot \alpha_m - K_{m0} + K_{nk+} (\alpha_k - 1) + K_{nk-} (\alpha_{k+} - 1)$	$\overline{I}_{m0} \cdot \alpha_m - I_{m0} + U_{nk+} (\alpha_k - 1) + U_{nk-} (\alpha_{k+} - 1)$
$\overline{S}_{m0} \cdot \alpha_m - S_{m0} + S_{nk+} (\alpha_k - 1) + S_{nk-} (\alpha_{k+} - 1)$	$\overline{F}_{m0} \cdot \alpha_m - F_{m0} + F_{nk+} (\alpha_k - 1) + F_{nk-} (\alpha_{k+} - 1)$
$\overline{B}_{m0} \cdot \alpha_m - B_{m0}$	$\overline{L}_{m0} \cdot \alpha_m - L_{m0} + L_{nk+} (\alpha_k - 1) + L_{nk-} (\alpha_{k+} - 1)$
$V_{nk+} (\alpha_k - 1) + V_{nk-} (\alpha_{k+} - 1)$	$W_{nk+} (\alpha_k - 1) + W_{nk-} (\alpha_{k+} - 1)$
$C_{m0} (\alpha_m - 1) + C_{nk} (\alpha_k - 1)$	$D_{m0} (\alpha_m - 1) + D_{nk} (\alpha_k - 1)$

The formula (4) and (5) indicates adjustment made by income approach (computation of income using P/L) and adjustment based on "net-worth approach (to income)" (computation of income on B/S), respectively. By transforming the formula (4), we obtain :

$$\begin{aligned}
P(\text{nominal income}) - \bar{P}(\text{real income}) &= \text{fictitious profit(loss)} \\
&= (\text{expense shortage} - \text{revenue shortage}) \\
&\quad - \text{profit on money value change (purchasing power profit)} \\
&\quad + \text{loss on money value change (purchasing power loss)}. \dots\dots\dots (4a)^{12}
\end{aligned}$$

(Detailed explanation is given later on these points.)

From these formulas, we can see that in order to obtain value of \bar{P} (or the adjustment in come difference $\bar{P} - P$), there is no need to prepare the restated adjusted B/S and P/L, as P can be calculated simply by introducing actual (concrete) figures into (4) and (5), or (4') and (5') to be given below. Next, if we use letter x to represent $\bar{X}_{m0}\alpha_m - X_{m0} + X_{nk}(\alpha_k - 1)$, then

$$\begin{aligned}
\bar{P} &= P + (v - w + c - d) \dots\dots\dots (4b) \\
\bar{P} &= P + (l + f + i - k - s - b) \dots\dots\dots (5b)
\end{aligned}$$

and to eliminate P and \bar{P} from these formulas (4b) and (5b), then we get :

$$k = (l + f + i + w + d) - (s + b + v + c) \dots\dots\dots (6)$$

Note that for $Y(L \cdot F \cdot I \cdot K \cdot S)$, we take y to express $\{\bar{Y}_{m0}\alpha_m - Y_{m0} + Y_{nk}(\alpha_k - 1) + Y_{nk} - (\alpha_{k+} - 1)\}$, and for $I \cdot U$, U_k is replaced with I_k . as to $V \cdot W$, $\bar{X}_{m0} = X_{m0} = 0$. As to B , the third term in $\{\bar{B}_{m0}\alpha_m - B_{m0} + B_{nk}(\alpha_k - 1)\}$ becomes zero (because the same amount appears both in B/S and P/L in conjunction with the adjustment of depreciation for the current year. Also note that in (4b), w is assumed to include adjustment difference for cost of sales and depreciation for the sake of simplicity.

This formula (6) shows that money value adjustment account is an adjunct account to capital account. As it is, in case where adjustment is incomplete due to lack of sufficient data, the balance of the money value adjustment account (except for capital adjustment difference) can be compared with the amount of capital adjustment difference (according to the direct and complete adjustment) to discover errors arising from incomplete adjustment (this is true also in retrospective method to be explained later on). In such a case, we assume that the balance of earned surplus have already been fully adjusted by means of cumulative computation. If capital account has been fully adjusted without complete adjustment of earned surplus, then errors arising from imperfect adjustment of other items are absorbed in the amount of earned surplus adjustment and we have no means to determine these errors as such (This point will also be discussed later on).

12) This relationship is also indicated in the simple formulas in the paper already cited (Nakai, 1969, p. 100), as well as in Nakai, B., "Inflationary Profit and Nominal Capital Accounting" (in Japanese), *Keizai Ronso*, Vol. 97, No. 5 (May, 1966), p. 59. It corresponds to formula (3.25) shown by Ijiri (1975).

The preceding formulas (as well as those according to retrospective method shown later on amount to a general approach to make adjustment of all transactions at general price levels at each time of accrual. In actual application, published general price level indexes are usually given as monthly or quarterly are (daily or weekly index are not available except during the extraordinary period of hyper-inflation in post-great war Germany for example), so the most complete adjustment is on monthly basis at best. These monthly adjustments, however, can be compared with the results of quarterly or annual adjustments (on financial statement adjustment) for the purpose of discovering errors due to the latter incomplete adjustments. Under these circumstances, a decision will have to be made as to how far actual adjustment is needed in consideration of the degree of errors which arose from incomplete adjustment, the availability of data, economical efficiency involved and other factors.

I. b. Retrospective Method

$\overline{X'}$ (with no letter added) : Figures shown on the B/S as of the end of current year and P/L as of the current year after retrospective adjustment

$\overline{X'_{m0}}$: Figures on (as restated according to retrospective method) B/S at the end of preceding year

p_s : General price level index (reciprocal of money value) at the base point for retrospective method.

Other than these three above, we use the same symbols employed in the progressive method formulas. Adjustment according to retrospective method is then given in the following formulas :

Balance of non-monetary items at the end of year

$$\overline{Y} = \sum_{k=1}^n Y_k - \sum_{k=1}^n \left\{ Y_{k+} \left(1 - \frac{p_s}{p_k} \right) \right\} - \sum_{k=1}^n \left\{ Y_{k-} \left(1 - \frac{p_s}{p_{k+}} \right) \right\} \dots\dots\dots (1')$$

$$= \overline{Y'_{m0}} + \sum_{k=m+1}^n Y_k - \sum_{k=m+1}^n \left\{ Y_{k+} \left(1 - \frac{p_s}{p_k} \right) \right\} - \sum_{k=m+1}^n \left\{ Y_{k-} \left(1 - \frac{p_s}{p_{k+}} \right) \right\} \dots\dots\dots (1a)$$

Balance of monetary items at the end of year

$$\overline{Z} = \sum_{k=1}^n Z_k - \sum_{k=1}^n \left\{ Z_k \left(1 - \frac{p_s}{p_k} \right) \right\} - \sum_{k=1}^n \left\{ Z_k \left(\frac{p_s}{p_k} - \frac{p_s}{p_n} \right) \right\} \dots\dots\dots (2')$$

$$= \overline{Z'_{m0}} - Z_{m0} \left(\frac{p_s}{p_m} - \frac{p_s}{p_n} \right) + \sum_{k=m+1}^n Z_k - \sum_{k=m+1}^n \left\{ Z_k \left(1 - \frac{p_s}{p_k} \right) \right\} \\ - \sum_{k=m+1}^n \left\{ Z_k \left(\frac{p_s}{p_k} - \frac{p_s}{p_n} \right) \right\} \dots\dots\dots (2a)$$

Profit/loss arising from change of money value (purchasing power profit/loss, creditor's loss or debetor's profit)

$$\overline{G} = \sum_{k=1}^n \left\{ Z_k \left(\frac{p_s}{p_k} - \frac{p_s}{p_n} \right) \right\} - \sum_{k=1}^m \left\{ Z_k \left(\frac{p_s}{p_k} - \frac{p_s}{p_m} \right) \right\} \dots\dots\dots (3')$$

$$= Z_{m0} \left(\frac{p_s}{p_m} - \frac{p_s}{p_n} \right) + \sum_{k=m-1}^n \left\{ Z_k \left(\frac{p_s}{p_k} - \frac{p_s}{p_n} \right) \right\} \dots\dots\dots (3a)$$

These formulas are used to make retrospective adjustment of the current year (–end) figures based on general price level p_s , of a basis year, and not necessarily on the general price level prevailing when money value is stabilized. This is because money value is not always stable for a basis year. In the event the basis year for general price level index to be used is changed (for instance, the published index which has been based on figures in 1960 is going to be changed to the index based on the year from 1965 on), then the index to be used must be converted in a consistent manner. Formulas (1') and (1a) show the balance of non-monetary items at the end of the year adjusted by the retrospective method. It therefore corresponds to (1a) in the progressive method (detailed explanation cannot be given here because of limitation in space—readers are asked to refer to the earlier discussions relative to formulas (1) and (1a)).

Formula (2'), on the other hand, indicates the balance of monetary items after retrospective adjustment. The first and second terms in the formula (2') correspond to formula (1') for non-monetary items (although no distinction is made to diminishing transactions), that is to say, "figures that should be", but it is necessary to subtract by the third term (purchasing power profit/loss) since economic calculation is done on nominal basis. Whereas formula (2') shows cumulative computations of all transactions since the foundation of the company, formula (2a) indicates an approach to make adjustment starting from retrospectively adjusted balance at the end of preceding year (Z'_{m0}). In (2a), the second and fifth terms show purchasing power profit/loss for the balance at the beginning of the current year and for the transactions during the current year, respectively, and the sum total of the two constitutes formula (3a).

Formula (3') pertains to a method of obtaining purchasing power profit/loss by cumulative computation. The first term of the formula amounts to the sum of purchasing profit/loss since the start of enterprise up to the end of current year. The second term shows purchasing power profit/loss from the start of the enterprise till the end of the preceding year. The difference between the two, therefore, represents profit/loss which have arisen from money value change during the current year. Formula (3a) is different from (1a) for adjustment of non-monetary items in that the former is used to determine purchasing power profit/loss by the data pertaining to the current year only, and for this reason they stand in the same relationship as retrospective adjustment of monetary items tends to be misunderstood in practice, it would perhaps be appropriate to show here the journal entry for adjustment.

As to credit (debit side balance items),

(Debit) money value adjustment a/c (Credit) Credit $\sum_{k=m-1}^n \left\{ Z_k \left(1 - \frac{p_s}{p_k} \right) \right\}$

(Debit) purchasing power loss (Credit) Credit

$$Z_{m0} \left(\frac{p_s}{p_m} - \frac{p_s}{p_n} \right) + \sum_{k=m+1}^n \left\{ Z_k \left(\frac{p_s}{p_k} - \frac{p_s}{p_n} \right) \right\}$$

Therefore, balance after adjustment comes up to (2a).

According to the progressive adjustment, the following journal entry for adjustment is recorded, and "credit" (monetary asset) item itself is never adjusted (restated).

(Debit) purchasing power loss (Credit) money value adjustment

$$Z_{m0} \left(\frac{p_n}{p_m} - 1 \right) + \sum_{k=m+1}^n \left\{ Z_k \left(\frac{p_n}{p_k} - 1 \right) \right\}$$

On the other hand, according to the retrospective adjustment, credits are to be adjusted whether or not profit/loss arise due to change of money value. In such "credit" transactions incurred at the end of the current year. Purchasing power profit/loss doesn't occur, but "credit" is restated (adjusted). It is important that the latter adjustment be not mistaken as occurrence of purchasing power profit or loss.

Next, as in the case of the progressive adjustment, we will show B/S at the beginning and the end of the year, P/L and money value adjustment account for the year based on the formulas (1a), (2a) and (3a). Nominal B/S and P/L are identical to those taken in the progressive adjustment explained earlier. Also, except for the following alterations, symbols used are same as those used in the progressive method.

$$1 - \frac{p_s}{p_k} = \beta_k, \quad 1 - \frac{p_s}{p_{k+}} = \beta_{k+}, \quad \frac{p_s}{p_m} - \frac{p_s}{p_n} = \beta_{mn}, \quad \frac{p_s}{p_k} - \frac{p_s}{p_n} = \beta_{kn}$$

B/S at the beginning of the year (retrospective adjustment)

Inventories	$\overline{I'_{m0}}$	Capital	$\overline{K'_{m0}}$
Depreciable assets	$\overline{F'_{m0}}$	Reserve/Earned Surplus	$\overline{S'_{m0}}$
Other assets	$\overline{L'_{m0}}$	Accumulated depreciation	$\overline{B'_{m0}}$
Monetary assets	$\overline{D'_{m0}}$	Monetary liabilities	$\overline{C'_{m0}}$

B/S at the end of the year (retrospective adjustment)

Inventories	$\sum_{k=1}^n U_k - \sum_{k=1}^n U_{k+} \beta_k - \sum_{k=1}^n U_k - \beta_{k-}$	Capital	$\overline{K'_{m0}} + K_{nk} - K_{nk+} \beta_k - K_{nk} - \beta_{k-}$
Depreciable assets	$\overline{F'_{m0}} + F_{nk} - F_{nk+} \beta_k - F_{nk} - \beta_{k-}$	Reserve/Earned Surplus	$\overline{S'_{m0}} + S_{nk} - S_{nk+} \beta_k - S_{nk} - \beta_{k-}$
Other assets	$\overline{L'_{m0}} + L_{nk} - L_{nk+} \beta_k - L_{nk} - \beta_{k+}$	Accumulated depreciation	$\overline{B'_{m0}} + \overline{F'_{m0}} h_k + F_{nk+} h_k - F_{nk+} \beta_k h_k - F_{nk} - \beta_k h_{k-} - F_{nk} - \beta_{k-} h_k$
Monetary assets	$\overline{D'_{m0}} - D_{m0} \beta_{mn} + D_{nk} - D_{nk} \beta_k - D_{nk} \beta_{kn}$	Monetary liabilities	$\overline{C'_{m0}} - C_{m0} \beta_{mn} + C_{nk} - C_{nk} \beta_k - C_{nk} \beta_{kn}$
		Net income for the Current year	$\overline{P'}$

P/L (retrospective adjustment)

Cost of sales $\bar{I}_{m0} + \sum_{k=m+1}^{l-1} U_k - \sum_{k=m+1}^{l-1} U_{k+\beta_k} - \sum_{k=m+1}^{l-1} U_{k-\beta_{k+}}$	Revenue $V_{nk} - V_{nk+\beta_k} - V_{nk-\beta_{k-}}$
Depreciation $\bar{F}'_{m0} h_k + F_{nk-} h_k - F_{nk+\beta_k} h_k - F_{nk-\beta_{k-}} h_k$	Purchasing power profit $C_{m0} \beta_{mn} + C_{nk} \beta_{kn}$
Other expenses $W_{nk} - W_{nk+\beta_k} - W_{nk-\beta_{k+}}$	Purchasing power loss $D_{m0} \beta_{mn} + D_{nk} \beta_{kn}$
Net income for the current year \bar{P}'	

Money Value Adjustment (retrospective)

$I_{m0} - \bar{I}'_{m0} + U_{nk-\beta_k} + U_{nk-\beta_{k+}}$	$K_{m0} - \bar{K}'_{m0} + K_{nk+\beta_k} + K_{nk-\beta_{k-}}$
$F_{m0} - \bar{F}'_{m0} + F_{nk+\beta_k} + F_{nk-\beta_{k+}}$	$S_{m0} - \bar{S}'_{m0} + S_{nk-\beta_k} + S_{nk-\beta_{k-}}$
$L_{m0} - \bar{L}'_{m0} + L_{nk+\beta_k} + L_{nk-\beta_{k+}}$	$B_{m0} - \bar{B}'_{m0}$
$W_{nk+\beta_k} + W_{nk-\beta_{k-}}$	$V_{nk-\beta_k} + V_{nk-\beta_{k-}}$
$D_{m0} - \bar{D}'_{m0} + D_{nk} \beta_k$	$C_{m0} - \bar{C}'_{m0} + C_{nk} \beta_k$

As it was in the relationship between P and \bar{P} according to the progressive adjustment (formulas (4) and (5)), the P to \bar{P}' relationship in the retrospective method can be given as the following formula :

$$\begin{aligned} \bar{P}' = P + & [(I_{m0} - \bar{I}'_{m0} + \sum_{k=m+1}^{l-1} U_{k+\beta_k} + \sum_{k=m+1}^{l-1} U_{k-\beta_{k+}}) + \{(F_{m0} - \bar{F}'_{m0}) h_k \\ & + F_{nk+\beta_k} h_k + F_{nk-\beta_{k+}} h_k\} + (W_{nk+\beta_k} + W_{nk-\beta_{k+}}) - (V_{nk+\beta_k} + V_{nk-\beta_{k+}})] \\ & + \{(C_{m0} \beta_{mn} + C_{nk} \beta_{kn}) - (D_{m0} \beta_{mn} + D_{nk} \beta_{kn})\} \dots\dots\dots (4') \end{aligned}$$

$$\begin{aligned} \bar{P}' = P + & [\{(\bar{L}'_{m0} - L_{m0} - L_{nk+\beta_k} - L_{nk-\beta_{k+}}) + \bar{F}'_{m0} - F_{m0} - F_{nk+\beta_k} \\ & - F_{nk-\beta_{k+}}\} - \sum_{k=1}^n U_{k+\beta_k} - \sum_{k=1}^n U_{k+\beta_{k+}}] - \{(K'_{m0} - K_{m0} - K_{nk+\beta_k} - K_{nk-\beta_{k+}}) \\ & + (S'_{m0} - S_{m0} - S_{nk+\beta_k} - S_{nk-\beta_{k+}}) + (B'_{m0} - B_{m0}) + (\bar{F}'_{m0} - F_{m0}) h_k \\ & - F_{nk+\beta_k} h_k - F_{nk-\beta_{k+}} h_k\} + \{(D'_{m0} - D_{m0} - D_{nk} \beta_k - D_{m0} \beta_{mn} - D_{nk} \beta_{kn}) \\ & - (C'_{m0} - C_{m0} - C_{nk} \beta_k - C_{m0} \beta_{mn} - C_{nk} \beta_{kn})\} \dots\dots\dots (5') \end{aligned}$$

The formula (4') shows adjustment by income approach (computation of income based on P/L), while (5') shows that of net-worth approach (computation of income based on B/S).

Then, we take x' to express $\bar{X}'_{m0} - X_{m0} - X_{nk} \beta_k$ and eliminate $P \cdot \bar{P}'$ and so on from (4') and (5'), we get :

$$k' = (l' + f' + i' + w' + d') - (s' + b' + v' + c') \dots\dots\dots (6')$$

pressed in the past money value. The adjustment differences are booked (debited or credited) as opposite account to Geldwertkonto (money value account). Mahlberg calls this money value account as reines Erfolgskonto (net income account) or Gewinn- und Verlustkonto II (the second profit/loss account) as against nominal profit/loss account, but it can never be considered a "profit/loss" account. It is no more than a summary account (Kollektivkonten) which shows the sum of adjustment difference arising in different accounts. However, when nominal profit/loss are transferred to the account, the balance of the account shows a real net income (income after adjustment), and this means that it has the same structure formularized in (5) already shown, Mahlberg therefore attempts to make income (profit/loss) adjustment by means of the net-worth method. His adjustment computations are correctly done (here, we assume that adjustment for changing money value is based on an appropriate index, and no discussion is made regarding correctness of index itself. "Correct adjustment" therefore means no more than that computations are exact in form.), but the effect is only to obtain real profit, and no distinction (separate presentation is made between profit/loss occurring from change of money value (purchasing power profit/loss) and other ordinary profit/loss itself.

Mahlberg's retrospective method.¹⁴⁾ like his progressive approach, amounts to the adjustment conversion of the balance of each item in the year-end balance sheet, but in contrast to the progressive method, it converts to the money value at the beginning of the year only those items expressed in the current money value among the year-end balances of B/S items. Of those non monetary and capital items, no adjustment is made for the balance carried forward from the preceding year because they are expressed in money value at the beginning of the current year, while adjustment to money value at the beginning of the year is applied to those monetary items as well as to accruals and increments of non monetary and capital account items during the current year, as those are shown at the current value. The adjustment difference (according to his retrospective method) are not transferred to money value account (Geldwertkonto) as it was the case with his progressive method, but added on as loss (Verlust) or profit (Gewinn) to profit/loss statement. In this event, the profit/loss statement shows the real profit as a balance, which means that the approach has the same structure as that of formula (5') earlier. This, we see that the adjustment according to this method is that of "net worth" computation which is correct in itself, but like in the case of his progressive method, there is made no distinction between profit/loss occurring from changing money value (purchasing power profit/loss) and ordinary profit/loss.

Next, it should be pointed out that Mahlberg's description of his retrospective method is extremely misleading. It would be much more appropriate to enter the adjustment difference not in P/L but in money value account as he did so with his progressive method, and this in particular for the sake of consistent understanding of his achievements. Mahlberg says that the adjusted profit/loss statement was made by adding adjustment differences as "profit/loss" to unadjusted P/L, but as stated already, what he did was only to make adjustment using the net worth approach and not by means of computations on the income approach. Adjusted profit/

14) *Ebenda*, SS. 103-106, 119-124.

Note that for $Y(L \cdot F \cdot I \cdot K \cdot S)$, $\overline{Y'_{m0}} - Y_{m0} - Y_{nk+\beta_k} - Y_{nk}\beta_{k+}$ is given as \overline{Y} . For $I \cdot U$, U_k is replaced with I_k . For $V \cdot W$, $X'_{m0} = X_{m0} = O$, and as for B , the third term of $\overline{B'_{m0}} - B_{m0} - B_{nk}B_k$ becomes O (this is because the term is taken up as the same amount in B/S and P/L to make adjustment for depreciation during the current period).

The formula (6') means that the money value adjustment account under the retrospective method is in fact an off-set account of capital account. If capital doesn't increase after the change of money value (after the base year), then $\overline{X'_{m0}}$ is equal to X_{m0} , or $X_{nk} = O$, and $K' = O$, and unlike the progressive adjustment, no balance remains in the money value adjustment account according to retrospective method because its constituent items cancel each other. As in the case of formula (6) for the progressive adjustment, formula (6') can be used to find out errors arising from incomplete exercise due to lack of sufficient information.

I. c. The Relationship Between Progressive Method and Retrospective Method

If we express general price level in a base year as p_s and price levels at the current fiscal year end as p_n , there exists the following relationship arising from the definitions of progressive and retrospective methods. $\overline{Y} : \overline{Y} = \overline{Z} : \overline{Z} = \overline{G} : \overline{G} = \overline{P} : \overline{P} = p_n : p_s$

In consequence, by analogy between (1) and (1'), (2) and (2') (or between (1a)/(1á), (2)/(2á)), we can say that there are following relationships :

For B/S items, (nominal balances at the year-end minus amounts of retrospective adjustment) $\times \frac{p_n}{p_s}$ = (nominal balances at the year-end plus amounts of progressive adjustment)

For P/L items, (nominal figures minus amount of retrospective adjustment) $\times \frac{p_n}{p_s}$ = (nominal figures plus amounts of retrospective adjustment)

II Interpretation of "Some Prior Studies in Accounting for Changing Money Value" Using the Formulas

The preceding formularization of accounting for changing money value serves to clarify its structure and to pinpoint the issues inherent in the actual examples of that accounting given by some scholars. In this paper, we are going to take up three examples below.

II. a. Mahlberg

Mahlberg advocated progressive as well as retrospective method using B/S adjustment method.

His progressive method¹³⁾ is to make adjustment by conversion of only those figures shown in the past money value among various items in the year-end balance sheet. No adjustment is made for non-monetary items which incurred or increased during the current year (as they are assumed to be shown in current money value) nor for monetary items (cash, credits and debts) as they are shown in the current money value. Balance carried forward from the preceding year in non monetary asset and capital account items, however, are adjusted, because they are ex-

13) Mahlberg, *a. a. O.*, 3 Aufl., SS. 99-103.

loss statement is not made in real sense, and because of this, his P/L is no more than money value account, unlike his progressive method. What he calls "loss" or "profit" is mere the adjustment difference and not the real (adjusted) profit or loss, as we saw already. Because this "profit or loss" is addition to profit/loss statement, it may appear as that arising from change in money value.¹⁵⁾ However, it is clear that adjustment difference of non monetary asset items (such as l' , f' , etc. in our earlier formula) is not profit or loss caused by money value change. Also, adjustment to monetary items, in case it applies to transactions incurred after drop of money value, is mere value adjustment and not any indication of profit/loss caused by change of money value (purchasing power profit/loss). The misunderstanding will disappear once we realize that his method is the adjustment based on computations on net-worth approach, i. e., the one expressed by formula (5') already given, but we cannot see if he was well aware of this fact.

II. b. Schmalenbach

Progressive and retrospective adjustment methods based on the conversion of balance sheet were presented by Schmalenbach as well.

His progressive method¹⁶⁾ is different from Mahlberg's in that the conversion target is given to B/S at the beginning of the year rather than that as of the year-end. Schmalenbach's approach is to adjust (convert) all debit and credit items (except for capital) in B/S to money value at the end of year, and the adjustment difference is booked (debited or credited) into "Geldwertausgleichskonto" (monetary stabilization account, which is same as the money value adjustment account which we have already seen). The balance of monetary stabilization account is equal to the adjustment difference to capital account, and we see therefore that the account constitutes the adjustment account for capital. This means the adjustment by the preceding formula (5) at page 9. In Schmalenbach's method, profit/loss arising from money value change is distinct from ordinary profit and is shown separately, and adjustment computation in P/L is done by the income approach (in accordance with the preceding formula (4) at page 9).

Schmalenbach's retrospective method¹⁷⁾ consists in the conversion into gold mark (of which the value in 1914 is taken as the basis in his examples) of B/S at the beginning and end of the year as well as total sum of current transactions of each account item. Contrary to his progressive method, it does not assemble the adjustment difference of each items into money value adjustment account (which he calls "Geldentwertungskonto" for retrospective method). He computes adjustment difference for capital and shows it separately in the Geldentwertungskonto (in the same way as the preceding formula (6')) as a valuation account. This is same in content as the value adjustment account (retrospective method) which we saw previously, and differs from

15) Katano, I., *ibid.*, 1962, pp. 73-80 (in Japanese), explains the example given by Mahlberg by translating "Verlust" and "Gewinn" as "money-value-profit-and -loss" (purchasing power profit/loss).

16) Schmalenbach, E., "Geldwertausgleich in der bilanzmäßigen Erfolgsrechnung", *ZfhF*, Jg. 15, 1921, SS. 401-417.

17) Schmalenbach, E., *Goldmarkbilanz*, 1922, SS. 9-22.

the progressive method only in computation procedures. Yet, his approach is incomplete in that compared to his progressive method, no efforts are done to verify that Geldbewertungskonto equals total of adjustment difference for each item. It should be noted that his approach is to make a collective conversion on the basis of average index for the current year, although every current transaction in assets, liabilities, expense and revenue is adjusted into gold mark. As it is, unlike Mahlberg's method, adjusted profit and loss statement is drawn up in gold mark. This means that adjustment of profit and loss is done by income approach (formula (4')), distinguishing ordinary profit/loss and purchasing power profit/loss.

Thus, Schmalenbach's approach is more advanced compared to Mahlberg's both in progressive and retrospective methods (Mahlberg in fact admitted that Schmalenbach's method is superior to his).¹⁸⁾ Although Schmalenbach does not go beyond the case descriptions and his work shows no attempt for formularization, his method is same in its computational structure as GPLA already mentioned. Although it is not quite perfect (for instance, the lack of consistency and inter-convertibility between retrospective and progressive methods), we may say that from the structural point of view, he succeeded in completing GPLA. From such a viewpoint, it seems difficult to support Sweeney's¹⁹⁾ opinion that Mahlberg is the best authority on inflation accounting in Germany—at least insofar as the computation—structure is concerned.

II. c. AICPA • APB Statement No. 3

The GPLA example shown in AICPA • APBS No. 3 is an off-the-book adjustment (value adjustment account is not shown, and no attempt is made to verify consistency between capital adjustment and the total of adjustments for other items) according to progressive method (retrospective adjustment is not included). Yet diminishing transactions (see the explanation already given) are properly adjusted in the example, and the adjustments according to the ledger entries are applied by using quarterly GNP deflator to the financial statements for two years while inflation is in course (different from Mahlberg and Schmalenbach who suppose the money value at the starting point of adjustment be stable). Therefore, we can perhaps say that this approach is the most perfect among many examples given so far (due to space constraint, the actual method cannot be described in detail here).

Yet, the APBS No. 3 is still not quite free from problems. In the examples given, general price level gain/loss (APBS No. 3 call purchasing power profit/loss as so) prior to the start of adjustment (note that adjustment does not start simultaneously with decline of monetary value) is not indicated at all. General price level gain/loss from the start of adjustment is, however, represented correctly for each year (even if amounts for the preceding years are not explicitly given). That is to say, as we saw in the formula (3a) at page 5, \bar{G} is computed using only those accounting data (including deflator) for each year on and after the start of adjustment. As for

18) Mahlberg, *a. a. O.*, S. 126.

19) "Of the German treatises on the subject, the most logical, clear, complete and practical was, by far, the book entitled *Bilanztechnik und Bewertung bei schwankender Wahrung*," Sweeney, H. W., *Stabilized Accounting*, 1964, p. xxi.

Table 1 Example of transactions

(Example)	(Nominal Accounting)
This refers to a case in which 3-year fixed term deposit at 6% (simple) interest is put in December of the year 0 and with drawn in Dec. of the year 3. Transactions are journalized (debit/credit entry) for each year thereafter ending in December. GPL in December, year 0 =100 GPL, Jan. -Dec., year 1 =150 GPL, Jan. -Dec., year 2 =200 GPL, Jan. -Dec., year 3 =300 Purchasing power loss on fixed term deposit ... DVI Purchasing power loss on accrued interest ... IVI Value adjustment account.....adjustment (suffix shows the year in question.)	Dec. 0 Fixed deposit/cash ... 1000
	Dec. 1 year
	Accrued interest/interest received ... 30
	Dec. 2 year
	Accrued interest/interest received ... 30
	Dec. 3 year
	Accrued interest/interest received ... 30
	Cash/accrued interest ... 900
	Cash/fixed deposit ... 1000
	Total DVI none
	Total IVI none

non-monetary items, the balance at the beginning of the year \overline{Y}_{m0} must be an adjusted figures as required under the formula (1a), while data from the preceding years are also needed for diminishing transactions. Accounting data after the start of adjustment alone are not sufficient to make proper adjustment of financial statements for the years to be adjusted for, in contrast to the above (3a).

Next, the meaning of non-disclosure of purchasing power profit/loss for the preceding years must be clarified, and examples are given for this purpose. In progressive method, the total of adjustment amounts for each year become unmeaning because each adjustment amount is shown at each year-end general price level, and thus, it is necessary to show the converted adjustment amount at the maturity date general price level.

In this example (Table 1), if GPLA is first applied in the fourth year without disclosing purchasing power/loss for the preceding years, then we know that according to progressive method (adjustment on maturity date), total purchasing power loss for the three years were 2000 for the time deposit and 180 for accrued interest, yet disclosure is made only for the 4th year at 500 and 90, respectively, while 1500 and 90 for total of the 2nd and 3rd year are not shown at all.

Yet, although the AICPA. APBS No. 3 example does not indicate general price level profit/loss for past years, it does not mean that computation is not done at all. The APBS approach is that since the adjustment for past years is too cumbersome, it starts from B/S at the beginning of the year when GPLA is introduced (i. e., as of the end of the preceding year). Moreover, earned surplus is not adjusted directly, but indirectly by making the debit and credit totals of the starting B/S tally with each other. No adjustment of profit/loss for past years (which does not mean adjustment under nominal capital accounting, but that by applying GPLA for past years)

on purchasing power profit/loss

(Retrospective adjustment)		(Progressive adjustment)		(adjustment for the GPL as of maturity date)	
DV1 ₁ /time deposit	333	DV1 ₁ /adjustment	500	DVI/adjustment	1000
		IV1 ₁ /adjustment	15	ID1/adjustment	30
IV1 ₁ /acc. interest	10				
Interest rec'd/adjustment	10				
DV1 ₁ /time deposit	167	DV1 ₁ /adjustment	333	DV1 ₁ /adjustment	500
IV1 ₁ /acc. interest	5	IV1 ₁ /adjustment	10	IV1 ₁ /adjustment	15
IV1 ₂ /acc. interest	15	IV1 ₂ /adjustment	30	IV1 ₂ /adjustment	45
Interest rec'd/adjustment	15				
DV1 ₁ /time deposit	167	DV1 ₁ /adjustment	500	DV1 ₁ /adjustment	500
IV1 _{1,2} /acc. interest	10	IV1 _{1,2} /adjustment	30	IV1 _{1,2} /adjustment	30
IV1 ₃ /acc. interest	20	IV1 ₂ /adjustment	60	IV1 ₂ /adjustment	60
Interest received/ money value adjustment	20				
Cash/accrued interest	30				
Cash/time deposit	333				
	667	meaning less			2000
	60	meaning less			180

is done for non-monetary items nor monetary items (purchasing power profit/loss). Although profit/loss adjustment for the past years is not indicated, and no verification is made as to the point mentioned below, it can be said that the AICPA • APBS No. 3 does provide the full adjustment for profit/loss in the past years with regard to B/S at the start of the year when GPLA was first introduced.

By transforming the B/S at the beginning of the year for progressive adjustment already shown in page 8 into an equation, we get :

$$\overline{I}_{m0} + \overline{F}_{m0} + \overline{L}_{m0} + D_{m0} = \overline{K}_{m0} + \overline{S}_{m0} + \overline{B}_{m0} + C_{m0} \dots\dots\dots (7)$$

in which \overline{S}_{m0} represents the earned surplus at the start of preceding year (after adjustment, if any, of variation in the year) adjusted at the year-end plus the adjusted net income for the preceding year (after appropriation of profit). As such, cumulative computations can be made for adjustment of profit/loss in all past years ever since the start of business. On the other hand, if we assume that full adjustment has already been done on \overline{I}_{m0} , \overline{F}_{m0} , \overline{L}_{m0} , and \overline{B}_{m0} on the basis of data for the past years. (\overline{G} corresponding to D_{m0} and C_{m0} is included in \overline{S}_{m0}), we may transform (7) into :

$$\overline{S}_{m0} = \overline{I}_{m0} + \overline{F}_{m0} + \overline{L}_{m0} + D_{m0} - (\overline{K}_{m0} + \overline{B}_{m0} + C_{m0}) \dots\dots\dots (7b)$$

If the right side member of (7b) is already known, then the left side member (\overline{S}_{m0}) can be correctly obtained (without cumulative computations).

In the AICPA • APBS No. 3, \overline{I}_{m0} , \overline{F}_{m0} , \overline{L}_{m0} , \overline{K}_{m0} , and \overline{B}_{m0} (the classification is slightly different in this approach) are more or less fully adjusted by means of past records since the start

of business. As such, we can consider that $\overline{S_{m0}}$ also is completely adjusted, even if cumulative adjustments for past years have not been done). In other words, profit/loss adjustment including those arisen from change of money value in the past years is not indicated as such (this is not verified under the AICPA • APBS No. 3), yet it is fully included in $\overline{S_{m0}}$ (ref. explanation to follow).

We must remember, however, that (1) if adjustment of the right side member of (7b) is incomplete either for voluntary reasons or not, all of adjustment errors will move to $\overline{S_{m0}}$, assuming that $\overline{K_{m0}}$ has been fully adjusted, and (2) GPLA's significance is not only that it converts nominal profit into real (adjusted) one but that it distinguishes profit/loss due to money value change (purchasing power profit/loss) from other profit/loss as adjusted. Thus, if GPLA is introduced not from the start of the business but at a later year, adjusted earned surplus ($\overline{S_{m0}}$) in B/S at the beginning of year when GPLA is applied for the first time should then be shown in two distinct part separately, i. e., purchasing power profit/loss during past years and other profit/loss adjustment.

If, without examination of the meaning of indirect computation of $\overline{S_{m0}}$, AICP • APBS No. 3 approach is used for a typical Japanese company with large long-term debts (such as debentures) and very low equity ratio, the huge purchasing power profit accrued prior to GPLA start will not appear unless computation does not go back to the start of the company. The result will be an incomplete disclosure. Cumulative adjustment computation of all profit/loss items during past years are, to be sure, very cumbersome, but that for purchasing power profit/loss will be quite easy for monetary assets and liabilities by means of (3) and (3a). Once this has been done, (4a) can be used to adjust the other profit/loss (for non-monetary items) indirectly.

Now, let us assume on the APBS No. 3 example that cash, accounts receivable and current liabilities in the starting B/S²⁰⁾ of the first year of GPLA (at the end of 1966) have been acquired fairly evenly throughout the preceding year (1966) and long-term debt in the like manner during 1958. Purchasing power gain/loss on those monetary items is then computed at the dollar value (level) at the end of the starting year of GPLA (1967). We see that purchasing power loss is 10530 for cash (dollar unit omitted) and 247,000 for accounts receivable, while purchasing power profit is 38,350 for current liabilities and 837,400 for long-term debts, resulting therefore in net purchasing power profit of 618,220. Earned surplus (retained earnings) at dollar value in effect in the end of 1967 (indirectly calculated as difference between debit and credit balance) is 6,137,560. Its nominal amount 5,830,000, when converted into the 1967-end dollar value, is then 6,010,730. As it is, the adjustment difference for earned surplus (retained earnings) at the 1967-end dollar value comes up to 126,830(a), consisting of the net purchasing power profit of 618,220(b), already given, and also of profit/loss adjustment to non-monetary items (net amount of expenses shortage) of 441,390 which is obtained by reverse computation (a)-(b) in accordance with the formula (4a). (Because of the lack of data, it is not possible here to indicate purchasing power profit/loss on monetary items which showed up and then disappeared

20) APBS No. 3, p. 9031.

all in the past years and no longer existing at the end of 1966, yet it is included in the earned surplus adjustment difference, which means that profit/loss adjustment to non-monetary items involves an error equal to that amount.)

The fact the amount of adjustment to earned surplus does include the profit/loss adjustment for the previous years can be understood also by delaying the start of GPLA adjustment by one year (from the year 1968 on) on the same APBS No. 3 example, to examine the adjustment to earned surplus at the end of the year 1967.

In the adjusted (restated) B/S at 1967 end²¹⁾, earned surplus of 7,099,506 has been calculated based on the adjusted P/L²²⁾ (restated statement of income and retained earnings). The difference of 1,506 from nominal figure of 7,098,000 is the sum total of 307,506 or the restated difference of earned surplus brought forward at the year start (i. e., the difference between restated amount of 6,137,560 and nominal amount of 5,830,000), -304,054 for the difference on net income during the current year, and -2,000 for the difference on appropriation surplus (dividend paid) for the current year. The difference of adjustment for net income in the current year, on the other hand, in sum total of 137,715 or purchasing power profit (GPL gain) and 441,769 or shortage for net expenses incurred. In order to obtain the amount of adjustment to earned surplus (retained earnings) indirectly only by the restated B/S, liabilities and capital other than earned surplus (all after adjustment) are to be subtracted from total assets, and the amount should be equal to the amount obtained on the basis of restated P/L. This means that the restated earned surplus, indirectly obtained, is equal to the sum total of earned surplus (retained earnings) brought forward at the start of period (with adjustments on variation, if any, during the period) as restated (forward conversion), and net income for the current year (including appropriation of profit) as restated, or the sum of purchasing power profit/loss and shortage of net expenses for income (assuming progression of inflation).

Therefore, amount of adjustment to earned surplus brought forward at the beginning of the year can be broken into the aggregate purchasing power profit/loss since the start of business and the shortage in net expenses/revenue by means of cumulative computation if sufficient data exist. Also, we can see that restated earned surplus according to indirect method also includes all of adjustments for the past years (refer to detailed explanation to be given later on).

III Formularization of Earned Surplus Adjustment (Progressive Restatement)

1.

The formularization explained in Chapter I shows that if necessary data are available, it is possible to make adjustment for financial statements prepared by nominal capital accounting at a given point of time and to obtain financial statements restated on GPLA.

21) APBS No. 3, p. 9031.

22) APBS No. 3, p. 9032.

Earned surplus²³⁾ pertains to a non-monetary item and adjustment can be made using to formula already shown, but it should be remembered that surplus increment in each period includes net income for the same period. The fact that the restatement of net income for the current year consists of adjustment for non-monetary items (nominal profit and loss items) and profit/loss arising from money value change (purchasing power profit/loss) makes the restatement of earned surplus rather complicated, often causing the difference in treatment from the adjustment for other non-monetary items. For example, AICPA, APBS No. 3 does not attempt direct adjustment for earned surplus at the beginning of the year when GPLA is introduced (not from the start of the business) as we have already seen. Its adjustment is indirect, in that this is accomplished by making total of debit side tally with that of credit side on the balance sheet at the beginning of the year to which GPLA is first applied.²⁴⁾ (This approach is same as that specified in a report titled "Structure of Inflation Accounting" made by the Ad Hoc Committee for Inflation Accounting of Japan Accounting Association in 1977. Earlier to this, and following Mahlberg's²⁵⁾ pioneering work on GPLA, almost all examples presented were those of only the first year of the business, and practically hardly any one tried to deal with the restatement of earned surplus other than net income for the current year.)

2.

In consideration of the above, we are now going to study in detail the restatement of earned surplus as well as adjustment to its constituent factors, namely, income for the year and total of the income of the past years. For this purpose, the following symbols are to be used :

N_i = Amounts shown on B/S as of the end of year i and on P/L for the year i , all in nominal capital accounting.

\bar{N}_i = Amounts shown on B/S as of the end of year i and on P/L for the year i , following progressive adjustment according to GPLA. adjustment for amount of each transaction from the start of business up to the end of year i to reflect changes in GPL (which is assumed to be the reciprocal of money value) is assumed to have been adjusted already as per the formula²⁶⁾ given earlier. Note that we are not considering retrospective method in this chapter.

X_i^j = Amount of N_i converted into GPL at the end of year j . N_i^j is assumed to be equal to N_i ,

\bar{X}_i^j = Amount of \bar{N}_i converted into GPL at the end of year j . \bar{N}_i^j is identical to \bar{N}_i . (N_i to \bar{N}_i may more properly be expressed as X_i to \bar{X}_i , but the changes are necessary to avoid

23) In this paper, no distinction is made between unappropriated earned surplus and surplus after appropriation, nor between legal reserve, voluntary reserve and so on. With regard to the latter. The transfer of such Earned Surplus account each other doesn't effect the Earned Surplus adjustment as a whole.

24) APBS No. 3, pp. 9023, 9031.

25) Chapter II . a.

26) Chapter I , pp. 4~9.

confusion with the symbols used in Chapter I.)

- A = Non-monetary asset items (I, F, L, B in Chapter I)
- D = Money and credits (monetary asset items)
- C = Debts (monetary liability items)
- R = Non-monetary liability items
- K = Capital and capital surplus
- S = Earned surplus. Year-end balance includes net income for the current year (which is separately shown in Chapter I).
- P_i = Net income for the year
- Q = Outflow of profit (distribution the company outside or unretained appropriation of earnings)

If we express by T transfer of earned surplus to capital and capital surplus, the following relationships exist between S , P , Q and T :

$$S_i = S_{i-1} + P_i - Q_i - T_i \dots\dots\dots \text{III (1)}$$

P is thought to be income after tax, and unpaid taxes are included in C . (In case P is income before tax, taxes are included in Q for the following year.)

- V = Revenues according to nominal capital accounting. \bar{V} does not include profit arising from change in money value (purchasing power profit).
- W = Expenses according to nominal capital accounting. No distinction is made for cost of sales, depreciation and other items, but \bar{W} is assumed, as per the formula previously given,²⁷⁾ to be the sum total of each restated amount. It does not include loss arising from change in money value (purchasing power loss).
- M = Loss resulting from change in money value. (Purchasing Power loss) (Same as "d" in formula (4b) and (6) given in Chapter I)
- H = Profit resulting from change in money value (Purchasing Power loss) (Same as "c" in formula (4b) and (6) in Chapter I)
- p_i = GPL at the end of year i

Next, we indicate the balance sheet (B/S) at the start of business and as of the end of year i , as well as income statement (P/L) for the year i :

B/S at the start of the business (nominal)			
Non-monetary assets	A_0	monetary liabilities	C_0
Monetary assets	D_0	Non-monetary liabilities	R_0
		Capital • capital surplus	K_0
		Earned surplus	S_0

27) Chapter I, pp. 4~9.

Here, S_0 is normally zero, except sometimes for a new by amalgamation. In this paper, we always assume that $S_0=0$.

B/S at the end of year i (nominal capital accounting)

Expenses	W_i	Revenues	V_i
Net income for the year	P_i		

B/S at the end of year i (GPLA)

Non-monetary assets	\bar{A}_i	Liabilities	C_i
Monetary assets	D_i	Non-monetary liabilities	\bar{R}_i
		Capital • capital surplus	\bar{K}_i
		Earned surplus	\bar{S}_i

P/L for the year i (GPLA)

Expenses	\bar{W}_i	Revenues	\bar{V}_i
Loss on money value change (Purchasing power loss)	M_i	Profit on money value change (Purchasing power profit)	H_i
Net profit for the year	\bar{P}_i		

Based on the preceding B/S and P/L, let us consider the relationship between the net income for each year and the total income (life time net income). Life time net income is the aggregate total of all term income since the start of the business up to the current year (n) end. Whether or not the company is liquidated at that time, does not matter. In case of liquidation, the only difference is that gain on sale of asset is added to net income for the year and payout of liquidation profit is additional to total income payout. Then,

Nominal income for the each year : $P_1, P_2, \dots, P_i \dots P_n$

GPLA adjusted income for each year : $\bar{P}_1, \bar{P}_2, \dots, \bar{P}_i \dots \bar{P}_n$

Nominal life time net income : $\sum_{i=1}^n P_i^n$,

GPLA adjusted life time net income : $\sum_{i=1}^n \bar{P}_i^n$

($\sum_{i=1}^n \bar{P}_i$ is meaningless because it expresses total of adjustment amounts on GPL at the end of each year.)

(a) Net income according to income approach is :

In case of nominal capital accounting : $P_i = V_i - W_i$

In case of GPLA : $\bar{P}_i = \bar{V}_i - \bar{W}_i + H_i - M_i$

From these, life time net income will be as follows :

$$\sum_{i=1}^n P_i = \sum_{i=1}^n (V_i - W_i) \dots \dots \dots \text{III (2)}$$

$$\sum_{i=1}^n \overline{P}_i^n = \sum_{i=1}^n (\overline{V}_i^n - \overline{W}_i^n) + \sum_{i=1}^n (H_i^n - M_i^n) \dots\dots\dots \text{III (3)}$$

If we use v and w to express adjustment difference for nominal revenue and expense, respectively ($v_i = \overline{V}_i - V_i$, $w_i = \overline{W}_i - W_i$), then :

$$\overline{P}_i = P_i + v_i - w_i + H_i - M_i \dots\dots\dots \text{III (4)}$$

As it is,²⁸⁾ the formula (III) can be given as :

$$\sum_{i=1}^n \overline{P}_i^n = \sum_{i=1}^n P_i^n + \sum_{i=1}^n (V_i^n - W_i^n) + \sum_{i=1}^n (H_i^n - M_i^n) \dots\dots\dots \text{III (3)'}$$

From III (2), III (3) and III (3'), we get :

$$\sum_{i=1}^n \overline{P}_i^n = \sum_{i=1}^n P_i + \sum_{i=1}^n (\overline{V}_i^n - \overline{W}_i^n) + \sum_{i=1}^n (H_i^n - M_i^n) - \sum_{i=1}^n (V_i - W_i) \dots\dots\dots \text{III (5)}$$

$$= \sum_{i=1}^n (\overline{v}_i^n - \overline{w}_i^n) + \sum_{i=1}^n (H_i^n - M_i^n) + \sum_{i=1}^n P_i^n - \sum_{i=1}^n P_i \dots\dots\dots \text{III (5)'}$$

By transforming III (5)', we have :

$$\sum_{i=1}^n \overline{P}_i^n - \sum_{i=1}^n P_i^n = \sum_{i=1}^n (\overline{v}_i^n - \overline{w}_i^n) + \sum_{i=1}^n (H_i^n - M_i^n) \dots\dots\dots \text{III (6)}$$

Here, III (6) tells us that if uniform conversion value by GPL at the point of time n , the difference between GPLA life time net income and life time net income according to nominal capital accounting is equal to the difference of adjustment, to nominal revenue/expense (revenue shortage and expense shortage) and profit/loss arising from GPLA, (In the other article,²⁹⁾ this formula is used to determine restatement differences on net income under GPLA for large corporations in Japan, USA, UK and Germany during 30 years, while adjustment to their earned surplus was made by means of III (14) to be shown later.)

III (5)' shows, on the other hand, that the difference between GPLA life time net income (converted at uniform GPL level at time point n) and life time net income on nominal capital accounting (nominal value) is equal to the sum of product of III (6) and the difference between life time net income on nominal capital accounting and that net income converted at GPL value at time point n .

(b) Net income for the current year is, in case of nominal capital accounting :

$$P_i = A_i + D_i - (C_i + R_i + K_i) - (S_{i-1} - Q_i - T_i) \dots\dots\dots \text{III (7)}$$

28) Chapter I, p. 11.

29) Nakai, B., "Comparison of the General Price-Level Adjusted Financial Data of Japanese, American, British and German Large Companies for Recent 30 years" (in Japanese), *Kaikai (Accounting)*, March, June and July, 1983.

in case of GPLA :

$$\bar{P}_i = \bar{A}_i + D_i - (C_i + \bar{R}_i + \bar{K}_i) - (\bar{S}_{i-1}^i - Q_i - T_i) \dots\dots\dots \text{III (8)}$$

Therefore, by comparing net worth at beginning and end of each year, that is to say, for nominal capital accounting, by making the following replacement in III (7) :

$$S_{i-1} = A_{i-1} + D_{i-1} - (C_{i-1} + R_{i-1} + K_{i-1})$$

and the following in III (8) :

$$\bar{S}_{i-1} = \bar{A}_{i-1} + D_{i-1}^i - (C_{i-1}^i + \bar{R}_{i-1}^i + \bar{R}_{i-1}^i + \bar{K}_{i-1}^i),$$

life time net income is given, respectively, as :

$$\sum_{i=1}^n P_i = (A_n - A_0) + (D_n - D_0) - (C_n - C_0) - (R_n - R_0) - (K_n - K_0) + \sum_{i=1}^n Q_i + \sum_{i=1}^n T_i \dots\dots \text{III (9)}$$

$$\sum_{i=1}^n \bar{P}_i = (\bar{A}_n - A_0^n) + (D_n - D_0^n) - (C_n - C_0^n) - (\bar{R}_n - R_0^n) - K_n - K_0^n + \sum_{i=1}^n Q_i^n + \sum_{i=1}^n T_i^n \dots \text{III (10)}$$

III (9) and III (10) show that life time net income is the sum of net worth increase (taking into account the change in capital from founding of the company to the current year n) and outflow of income (surplus) during the life of the company.

From these two formulas, we derive :

$$\begin{aligned} \sum_{i=1}^n \bar{P}_i^n - \sum_{i=1}^n P_i = & \{(\bar{A}_n - A_n) - (A_0^n - A_0) - (D_0^n - D_0) + (C_0^n - C_0) - \{(\bar{R}_n - R_n) \\ & - (R_0^n - R_0)\} - \{(\bar{K}_n - K_n) - (K_0^n - K_0)\} + \sum_{i=1}^n (Q_i^n - Q_i) + \sum_{i=1}^n (T_i^n - T_i) \dots\dots\dots \text{III (11)} \end{aligned}$$

We know, from III (9), III (10) and III (11), that life time net income (nominal) under nominal capital accounting, GPLA adjusted life time income converted at uniform GPL value in the year n , as well as the difference between these two figures can be obtained from the starting B/S, B/S at the year n , and amounts of life time profit outflow • earned surplus transferred to capital and capital surplus.

Also, since

$$P_i^n = \frac{P_n}{p_i} \times \{(A_i - A_{i-1}) + (D_i - D_{i-1}) - (C_i - C_{i-1}) - (R_i - R_{i-1}) - (K_i - K_{i+1})\} + Q_i^n + T_i^n,$$

For $\sum_{i=1}^n P_i^n$, the following formula, same as III (9) and (10) :

$$\sum_{i=1}^n P_i^n = (A_n - A_0^n) + (D_n - D_0^n) - (C_n - C_0^n) - (R_n - R_0^n) - (K_n - K_0^n) + \sum_{i=1}^n Q_i^n + \sum_{i=1}^n T_i^n$$

cannot exist. As it is, according to net-worth approach, it is not possible to express $\sum_{i=1}^n \bar{P}_i^n - \sum_{i=1}^n P_i^n$ in a simple formula like III (11), in contrast to income approach.

Following the GPLA exercise in the preceding section, we are going to take up the case of

earned surplus below :

In case of nominal capital accounting, from III (1), we get :

$$S_n = S_{n-1} + P_n - Q_n - T_n \dots\dots\dots \text{III (1)'}$$

$$= S_0 + \sum_{i=1}^n P_i - \sum_{i=1}^n Q_i - \sum_{i=1}^n T_i \dots\dots\dots \text{III (12)}$$

Similarly, for GPLA,

$$\bar{S}_n = \bar{S}_{n-1} + \bar{P}_n - Q_n - T_n \dots\dots\dots \text{III (1)''}$$

$$= S_0^n + \sum_{i=1}^n \bar{P}_i^n - \sum_{i=1}^n Q_i^n - \sum_{i=1}^n T_i^n \dots\dots\dots \text{III (13)}$$

From III (12) and III (13), we derive :

$$\bar{S}_n = S_n + (S_0^n - S_0) + \sum_{i=1}^n (\bar{P}_i^n - P_i) - \sum_{i=1}^n (Q_i^n - Q_i) - \sum_{i=1}^n (T_i^n - T_i) \dots\dots\dots \text{III (14)}$$

III (14) indicates the fact that amount of adjustment to earned surplus, according to GPLA, is made up by nominal earned surplus, life time net income (both nominal as well as GPLA restated), and life time profit outflow as well as earned surplus transferred into capital • capital surplus account. Also, from III (5)' and III (14), we obtain :

$$\begin{aligned} \bar{S}_n = S_n + (S_0^n - S_0) + \sum_{i=1}^n (v_i^n - w_i^n) + \sum_{i=1}^n (H_i^n - M_i^n) + \sum_{i=1}^n (P_i^n - P_i) \\ - \sum_{i=1}^n (Q_i^n - Q_i) - \sum_{i=1}^n (T_i^n - T_i) \dots\dots\dots \text{III (15)} \end{aligned}$$

then from III (11) and III (14) :

$$\begin{aligned} \bar{S}_n = S_n + (S_0^n - S_0) + \{(\bar{A}_n - A_n) - (A_0^n - A_0)\} - (D_0^n - D_0) + (C_0^n - C_0) \\ - \{(\bar{R}_n - R_n) - (R_0^n - R_0)\} - \{(\bar{K}_n - K_n) - (K_0^n - K_0)\} \dots\dots\dots \text{III (16)} \end{aligned}$$

IV Paradox of General Price Level Accounting

— Relationships between nominal income and real income —

The formularization of GPLA makes more clear the relationships existing between nominal income and real (restated) income. Here, we take up once again formula (4a) which resulted from transformation of (4) relative to progressive adjustment based on income approach :

$$\begin{aligned} P(\text{nominal income}) - \bar{P}(\text{real income}) &= \text{fictitious income (loss)} \\ &= (\text{expense shortage} - \text{revenue shortage}) \\ &\quad - \text{profit on monetary value change} \end{aligned}$$

$$\begin{aligned} & \text{(purchasing power profit)} \\ & + \text{loss on monetary value change (purchasing power loss) } \dots\dots\dots (4a) \end{aligned}$$

When nominal capital accounting is applied to an inflationary period, the balances appearing on B/S and P/L represent the composite amounts at different price levels, and a mixture of heterogeneous figures. This makes it impossible to indicate the exact financial position and results. But this formula (4a) shows that the net income (nominal) reported in nominal B/S and P/L is not always fictitious.

When a company does business during an inflationary period, the adjustment shortage for revenues and expenses such as sales, cost of sales and depreciation by means of progressive method accrues inevitably. Normally, the amount of adjustment shortage is larger as for expenses (as cost of sales and depreciation are diminishing transactions and their substantial part is adjusted (restated) at GPL of the preceding years) than as for revenues (of which most part is restated at GPL in the current period). So it is usual with the net expense adjustment shortage, in this sense, even if there is no debt or credit, fictitious profit does usually occur.

Yet, depending on the relationship between the second and third term of (4a), net purchasing power profit (or less) and the first term, net expense adjustment shortage, "nominal income less real income" could be either in positive or negative figure, or it could be zero. Where net purchasing power loss (net loss on money value change) exists, the fictitious profit tends to increase much more, and if net purchasing power profit is less than net expenses adjustment shortage, the fictitious profit also occur. In case net profit on money value change is equal to such shortage, then nominal and real income became equals to each other, as nominal financial statements happen to show real income and no fictitious profit is included, notwithstanding the nominal financial statements consisting of a mixture of heterogeneous figures. Moreover, when net profit on change of money value (net purchasing power profit) is in excess of expense adjustment shortage, "nominal income less real income" becomes negative, which means that the loss is fictitious and there is hidden reserve.

Thus, with regard to nominal and real income, the difference could either be positive, negative or zero according to the quantitative relation between monetary assets and liabilities, although in general the shortage of net expense adjustment is more frequently shown than the other way.

During the first inflation, in 1920s in German, Schmalenbach³⁰⁾ already pointed out the difference (gap) which resulted between the large companies who hold huge debts and the smaller who had to pay in cash on or in advance, or "the larger companies free from fictitious profit and the smaller ones inflated by fictitious profit." These difference (gap) have never disappeared. Throughout any inflationary period in every country, and particularly in Japan, these difference (gaps), in the practice that large companies always hold huge debts, have been realized quite clearly, and this is the reason why GPLA cannot easily be institutionalized, reflecting the inclination of large companies which will be subjected to demerits of GPLA (since their profits from

30) Schmalenbach, E., *Goldmarkbilanz*, 1922, p. 29.

decline of monetary value will be disclosed and the fact that they are inflationary profiteers will be made clear).

Thus, implementation of GPLA is impeded just because it will disclose the purchasing power profit—debtors' benefit. Inflation paradoxically discourage large companies to adopt GPLA and makes them prefer to continue with nominal capital accounting. Just because value of money declines, GPLA is not implemented but the nominal capital accounting is practiced. This may be a phenomenon which can be called a paradox of the nominal capital accounting.

As accounting methods to cope with an inflation, only last-in first-out method, accelerated depreciation and other methods which do not go beyond the framework of the nominal capital accounting are exclusively institutionalized (not as supplementary information, but on B/S or P/L itself). The assets revaluation not reckoning the valuation profits is generally institutionalized as a temporary expedient. (Except in some countries like the Netherland where companies are free to chose accounting method by virtue of commercial code, and nominal accounting is not excluded in the Netherlands, either.) Where indexation is adopted for economic transaction like in Brazil, for example, GPLA has to be institutionalized at least in part.

It is therefore and clearly a mistake to say that in inflation, nominal capital accounting always produces fictitious income ($\bar{P} < P$) to result in erosion of capital. The fact that inflation, on the contrary, benefits debtors is generally well recognized already.

Moreover, even if fictitious income exists ($\bar{P} < P$), it is evident that this does not necessarily lead to erosion of capital (stated capital, capital surplus). Profit distribution outside the company (dividend and bonus to directors) when there exists fictitious income ($\bar{P} < P$) merely causes real "payout ratio" —broader than that ratio usually used, (either annually or cumulatively) to increase above the level of nominal "payout ratio" (annual or cumulative), and no capital erosion takes place as long as there is real earned surplus \bar{S} , that is, cumulative real "payout ratio" $\Sigma Q / \Sigma \bar{P}$ is below 100.