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Introduction

The aim of this paper is to construct a macroeconomic model along the line which J. M. Keynes proposes in "the General Theory" ([2]). Emphasis is put in two points, one is theoretical, the other empirical.

First, how can we make sense of Keynes' Investment theory? Hicksian *LM-IS* analysis is suggestive, and there seems to be much room for us to advance the Keynesian macroeconomic theory. Second, actual business cycles are examined in relation to Keynes' theory.

I have tried to borrow Keynes' ideas for the theoretical and statistical analysis of the large firms in all industries in Japan in my previous paper [4].

In this paper I intend to consider relations of various macroeconomic variables in the aspect of cyclical fluctuations. The starting point is the model in the paper [4]. The model motivates us to investigate economic data by providing a theoretical viewpoint, but it should not be taken as absolute. In this paper, therefore, the model is revised in the directions the results of statistical researches indicate.

In applying Keynes' ideas to the firms, I focus attention to various *ratios*, by which the growing firms can be abstracted from the exponential trends. E. g., the ratios such as (investment)/(capital assets)$=I/K$ ratio come to be less formidable to analyze qualitatively since most of them show clearer cyclical fluctuations.

1. Shortcomings of Keynes' *General Theory*

No economist would deny that "*the General Theory*" ([2]) is a classic in economics, but it will be at least partly due to Keynes himself that a satisfactory explanation has not yet seemed to be given as to what he means in the book. The book seems to have the following serious limitations.

(1) The foremost misformulation of "*the General Theory*" ([2]) is nothing but the simple 'investment function'

$$I=I(r)$$

where I denotes investment and r the 'rate of interest.' This interpretation brought about the criticisms by the "Oxford Studies in the Price Mechanism," [7] which maintains based on the results of

interviews to businessmen, etc., that neither short-term nor long-term rates of interest do not seem to have direct influences on investment decisions, an alleged denial to one of the apparently main theses of the book of Keynes.

What is unfortunate to the downward sloping 'schedule of investment' $I(r)$ is that it has been closely associated with the symbolical expression

$$M = L_1(Y) + L_2(r),$$

by Keynes himself (P. 199, [2]). For it seems quite legitimate to consider the symbol r as representing in Chapter 15, [2] a 'rate of interest' in the financial sense distinct from the average rate of return on the firms' assets. However, in the interpretation of $I(r)$, the symbol r should have meant an average rate of return on the firms' total assets.

(2) It must be remarked that the so called 'discount-rate policy' is difficult to incorporate in the framework of the "General Theory" ([2]). To cite Keynes' words, "[a] change in M can be assumed to operate by changing r, and a change in r will lead to a new equilibrium partly by changing M_2 and partly by changing Y and therefore M_1." (P. 200—201, [2]) He admits that the discount-rate policy is more than a theoretical possibility. Nevertheless, he summarizes, "[o]ur independent variables are, in the first instances, ... the rate of interest, though, ..., these are capable of further analysis." (P. 245, [2]) Here he recognizes r as an independent variable. we may conclude that his original model is made so as to accommodate the open-market operations, but not the discount-rate policy.

(3) Since he neglects credit transactions among firms, the book has come to neglect liquidity of notes receivable, and limit to a narrower definition of money. The inter-firm credit transactions have a special importance in relation to inventory investment, which reflects the level of commodity transactions among firms which necessarily accompany the inter-firm credit mechanism.

(4) The statical assumption that capital assets are given makes the theory appear less general than it is to be.

2. The Average Rate of Return Instead of the Rate of Interest

It has really been the greatest misfortune to Keynes' readers that he appears to have left it hard to understand what he means

'the rate of interest' in his *"General Theory"* ([2]).

As a clue to solve the enigma, I would like to maintain that what he means by 'the rate of interest' in relation to investment determination is *an average rate of return on assets,* as distinct from long-term or short-term rates of interest. This means that investment should be considered to be determined so as to equalize the marginal efficiency of capital assets and the average rate of return on assets. The firms should be regarded to try to maximize the surplus of the integral of the schedule of the marginal efficiency (which represents the expected additional profit from investment) over and above the additional profit which is *at the least required* to keep the same average rate of return as before. The surplus may be paid as interest on additional loans for monetary assets, may be distributed as additional dividends, or may be saved in liquid forms. They will be free how to dispose this surplus, and this is the reason why it is for them to try to maximize. In my previous papers ([3], [4]) I emphasize the formulation of the firms' motive to maximize liquidity, and I should have meant to the effect that, in a polar case, they may try to maximize the surplus *solely* in order to use it as interest payments on additional liquidity. Usually, however, the firms save a part of it instead of paying it out as interest on loans. The reason why I must think so is because it turned out by the empirical research that the ratio of 'cash' (currency and deposits) to total assets and, correspondingly, the ratio of short-term loans to total assets, fluctuate mostly in the opposite direction to that in which the ratio of monetary assets tototal assets does. This means that those ratios are changed by the monetary policy so as to partly cancel out the fluctuation of the ratio of monetary to total assets. For if the hypothesis of the firms' liquidity-maximization is generally valid those ratios must fluctuate in the same direction as the monetary-asset ratio does, since additional currency and deposits must be a part of what the firms try to maximize.

3. An Outline of the Revised Model

(1) Let us summarize the mathematical structure of the revised model which is a result of the theoretical and statistical researches of this paper. The new model may be regarded to have been constructed in order to overcome the above shortcomings of Keynes' original theory.

First, instead of regarding r in the equation $I=I(r)$ as the 'rate of interest,' I formulate the investment function as

$$I_t=I^{(a)}(r^*(y_{t-1},\ m_{t-2}))K_{t-1}, \quad \text{.....(1*)}$$

where $I^{(a)}(\cdot)$ is inverse function of the schedule of the marginal efficiency of capital assets, r^* is the average rate of return on total assets of the firms, K_{t-1} is capital assets at the end of the last period, and

$$Y_t=y_tK_{t-1}, \quad \text{.....(2*)}$$

$$L_t=m_tK_{t-1}, \quad \text{.....(3*)}$$

where Y_t is total production, and L_t is monetary assets. We assume that

$$\frac{dI^{(a)}}{dr^*}<0, \quad \frac{\partial r^*}{\partial y}>0, \text{ and } \frac{\partial r^*}{\partial m}<0.$$

Second, instead of the equation $M=L_1(Y)+L_2(r)$, there is formulated

$$m_t=L_1(y_t)+L_2(i_t)+\beta_t, \quad \text{.....(4*)}$$

where i_t is the (official) rate of rediscount and β_t is the shift parameter. It is assumed that $dL_1/dy>0$ and $dL_2/di<0$.

Third, instead of the equation $I=S(Y)$, I formulate

$$I_t=S(y_t\ ;\ a_t/K_{t-1})K_{t-1}, \quad \text{.....(5*)}$$

where a_t represents the autonomous factors of aggregate demand. It is assumed that

$$\frac{\partial S}{\partial y_t}>0, \quad \frac{\partial S}{\partial(a/K_{t-1})}<0,$$

and

$$K_t=K_{t-1}+I_t. \quad \text{.....(6*)}$$

Last, we endogenize the determination of the rate of rediscount as

$$i_t=u.(y_{t-1}-y_{t-2})+i_{t-1}, \quad \text{.....(7*)}$$

where u is a positive constant.

(2) *If* it were to happen that

$$r^*(y_{t-1},\ m_{t-2})\equiv i_t, \quad \text{.....(8*)}$$

holds *as an identity,* the system would reduce to a system with

$$I_t=I^{(a)}(r_t)K_{t-1},$$

$$m_t=L_1(y_t)+L_2(r_t),$$

$$I_t=S(y_t\ ;\ a_t/K_{t-1})K_{t-1},$$

where $i_t\equiv r_t$ ($\beta_t=0$ is assumed for simplicity). Now, let us here drop

the equation (7*) from the reduced system and exogenize m_t. Then, the resulting system has four unknowns, K_t, I_t, Y_t, and r_t, and forms a closed difference system with Eq. (6*) added. This is a dynamical version of the original statical model of Keynes developped in *"the General Theory"* ([2]). *The revised model fundamentally differs from Keynes' model in the denial of the presumption* (8*) *that the average rate of return on total assets of the firms is always equal to the rate of interest.*

It is also intended to ameliolate Keynes' Model in the other respects suggested in the subsection 1 above.

Section I Concepts and Functional Relations

In applying the ideas of Keynes' theory to the aggregated firms it is essential to prepare a system of notation and definitions, so that it (1) denotes various theoretical relations in the simplest and most natural fashion, (2) accommodates a logically consistent, closed system of equations to be built on it, and (3) corresponds to the available statistical data.

As the stock data in [6] on which the empirical research is based are measured *at the end of each period* whereas the flow data (e. g., gross profit, net sales, etc.,) in [6] are measured as values *accumulated within each period,* special attentions are required to build the model. (1) The discrete (as against continuous) scheme is adopted. (2) The stock values which are relevant *in* a period are most appropriately considered to be those at the end of the period just before the period in question, whereas the flow values in each period are relevant as they are. (3) The investment program (or schedule) of the firms is assumed to be made at the beginning of each period, so that investment *in* a period is assumed to be decided at the beginning of the period. (4) However, the firms' behavior about monetary assets is not assumed to be determined at the beginning of each period but, so to speak, every month or every day in the year. This means that, as the general business condition (measured by e^*, or the capital-asset turnover ratio) changes through the income-multiplier by the effect of the change in investment rate (I/K'), monetary assets L, especially a part W of L, change accordingly, and in this process, e^* and L are no such varables as to be programmed at the beginning of the year. Moreover, the effect of the policy of changing the official rate of rediscount, i, on

monetary assets, L, especially on the other part M_2 of L, should be assumed to reveal itself quickly, so that Eq. (4*) in Page. 5 does not contain a lagged relation. It is assumed that the firms are more sensitive to changes in the financial conditions such as the short- and long-term rates of interest, in the adjustment of monetary assets relative to total assets, than in the adjustment of investment relative to capital assets.

(1) *Inter-firm Loan Transaction As Liquidity*

If we consider the balance sheet of all the firms in a closed economy, every inter-firm stock (as against flow) transaction will appear on both the debit and credit sides, in an equal amount. Therefore, the same total amount of the inter-firm stock transactions constitutes a part of both the total assets and the total liabilities and net worth of the aggregated firms.

When a measure of liquidity in the total assets of the firms is required, we should not overlook the liquidity of the assets as results of such inter-firm stock transactions.

In this paper, therefore, the ratio of *monetary assets,* which consists of *current assets except inventories,* including the assets corresponding to the outstanding inter-firm stock transactions, to total assets, will be regarded as an average measure of liquidity of the total assets of the firms. On the other hand the ratio of the additional monetary assets (i.e., from the last period to the present period) to the additional total assets will be regarded as the *marginal* measure of liquidity of the firms.

Let us denote by L *the monetary assets,* or current assets other than inventories.

(2) *The Discrete Scheme of Flows and Stocks*

Let K' and L' denote capital assets and monetary assets, resp., *at the end of the last period.* Correspondingly, let K and L denote those at the end of the present period.

Then, it would be natural to assume in the discrete scheme that production *in* the present period is done using K' rather than K, together with work services employed.

Let Y denote production *in* the present period. Then the production scheme will be that the firms use the stock K' and employ work services to produce Y in the present period.

Investment in the present period is denoted by I, and

$$I \equiv K - K'.$$

Total assets *in* the present period is defined to be that at the end of the last period, and equals to

$$K'+L'.$$

(3) *A Formulation of Gross Profit*

The gross profit rate is regarded as the average rate of return on total assets to be compared with the marginal efficiency of capital.

Since (gross profit)=(operating profit)
+(non-operating incomes),

it includes interest receits on the inter-firm lending transactions, which constitutes a considerable part of current assets.

On the other hand,

(gross profit)=(net profit)
+(non-operating charges),

where the second term on the right-hand side includes not only interest payments to banks and individuals but also the firms themselves.

The gross profit is denoted by π, and is assumed to be a function

$$\pi=\pi(Y,\ K'),$$

where Y denotes total value-added, and K' capital assets at the end of the last period. π is assumed to be in such a form as

$$\pi(Y,\ K')=K'\xi(Y/K'),$$

where $d\xi/d(Y/K')>0$.

(4) *A Reformulation of the Marginal Efficiency of Capital Assets*

Let the schedule of the marginal efficiency of capital assets at the beginning of the t-th period, $i_{IS}^{(t)}(I\ ;\ K')$, be a decreasing function of investment I, for each given K'. It is assumed that, to each infinitesimal difference between $I+dI$ and I, there corresponds a value $i_{IS}^{(t)}(I\ ;\ K')$, for the given level of K'. The value $i_{IS}^{(t)}(I\ ;\ K')dI$ denotes the expected potential overtime-average addition to *gross profit* which is expectedly caused by the dI at that I. Its unit is (goods)/(time)^2, since gross profit has the unit of (goods)/(time), and $i_{IS}^{(t)}(I\ ;\ K')dI$ is its expected addition per unit of time. The unit of $i_{IS}^{(t)}(I\ ;\ K')$ is, therefore, (time)$^{-1}$.

It is assumed that the function $i_{IS}^{(t)}(I\ ;\ K')$ takes such a homo-

geneous form as

$$i_{IS}^{(i)}(I\ ;\ K')=i_{IS}^{*(i)}(I/K'),\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

where $i_{IS}^{*(i)}(\cdot)$ is a decreasing function.

(5) *Investment and Profit*

The gross profit rate i_{LM} in the present period is defined as

$$i_{LM}=\frac{K'\xi(Y/K')}{K'+L'}\equiv i_{LM}^{*}(Y/K',\ L'/K').\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Namely the gross profit rate is always equal to gross profit divided by total assets.

The total expected addition to gross profit in the present period, associated with I in the present period equals to

$$\int_0^I i_{IS}^{(i)}(q\ ;\ K')dq.$$

Thus, the gross profit in the next period expected at the beginning of the present period equals to

$$K'\xi(Y^e/K')+\int_0^I i_{IS}^{(i)}(q\ ;\ K')dq,$$

where Y^e denotes the expected value of Y, or net production in the (coming) present period.

(6) *Investment Adjustment*

The cost of investment is defined as investment multiplied by the expected gross profit rate

$$I.i_{LM}^{*}(Y^e/K',\ L'/K').$$

The cost of investment is a proportional function of I, and represents *at least how much amount* of additional gross profit is required to be earned by each level of total investment in order to sustain the expected gross profit rate.

The expected surplus of the expected additional gross profit associated with I over and above the cost of I equals to

$$\int_0^I i_{IS}^{(i)}(q\ ;\ K')dq-I.\,i_{LM}^{*}(Y^e/K',\ L'/K')$$

$$=\int_0^I (i_{IS}^{*(i)}(q/K')-i_{LM}^{*}(Y^e/K',\ L'/K'))dq.$$

It is assumed that the firms try to change I so as to maximize the above expected surplus associated with I.

Since $K'=K_{t-1}$ is given, the expected surplus can be rewritten as

$$K'\left(\int_0^{I/K'}(i_{IS}^{*(t)}(q/K')-i_{LM}^{*}(Y^e/K',\ L'/K'))d(q/K')\right),$$

in view of Identity (1).

It is assumed that I is determined at the beginning of the present period so as to satisfy

$$i_{IS}^{(t)}(I\ ;\ K')=i_{LM}^{*}(Y^e/K',\ L'/K'). \quad \text{.....(3)}$$

At the beginning of the present period, the firms form two kinds of expectations, one on the schedule of the marginal efficiency of capital assets, and the other on the gross profit rate in the present period. Let us assume that the gross profit rate in the present period t is expected to be equal to

$$(i_{LM(t)}^{*})^e=i_{LM(t-1)}^{*}+\Psi(i_{LM(t-1)}^{*}-i_{LM(t-2)}^{*}),$$

where $1>\Psi>0$ and Ψ is a positive constant. In the case where $\Psi=0$, we have

$$i_{LM}^{*}(Y^e/K',\ L'/K')=i_{LM}^{*}(Y'/K'',\ L''/K''), \quad \text{.....(4)}$$

where K'' and L'' denote capital and monetary assets at the end of the period before the last.

(7) *Production Adjustment*

The whole part of Y_t which is not consumed personally, or $S(Y_t)$, is assumed to be always equal to I_t+a_t, where I_t denotes investment and a_t denotes autonomous demand whose change reflects all such factors as changes in government expenditure, export, and shifts of the personal propensity to consume.

The assumption that $I_t+a_t=S(Y_t)$ holds as an identity implies that the income multiplier process is assumed to complete within the period.

Putting $S(Y)=\bar{s}.Y+\bar{b}$, we have

$$\frac{I_t}{K_{t-1}}+\frac{a_t}{K_{t-1}}=\bar{s}\frac{Y_t}{K_{t-1}}+\frac{\bar{b}}{K_{t-1}}. \quad \text{.....(5)}$$

(8) *Effects of the Monetary Policy*

As seen above the expected level of the gross profit rate, $i_{LM}^{*}(Y^e/K',\ L'/K')$, participates in the determination of investment, which in turn much influences the actual change in Y. (See Eqs. (3) and (5).)

The policy of changing the official rate of rediscount, or the *kotei-buai,* affects the gross profit rate through its effect on L/K, since M, or currency and deposits of the firms, is included in L, and since $m=M/(K+L)$ is much (negatively) correlated with the rate of rediscount (Table A6, [4]).

By the firms' liquidity preference, the policy of raising (reducing) the rate of rediscount *ceteris paribus* reduces (raises) the ratio of currency and deposits to total assets, so that the scarcity of monetary assets in total assets will *c. p.* be raised (reduced). This corresponds to the consequence that the average rate of return rises (falls). If there were to be no difference in liquidity between capital assets and monetary assets, then a policy, if any, of directly or indirectly restricting the quantity of the firms' total assets would tend to *raise* the average rate of return on total assets *in the very short run,* since the sales of products, and hence gross profit, won't start to fall so soon as total assets do. In reality fixed assets are not under the immediate influence of economic policy but only current assets are. Nonetheless, the effect of the interest rate policy on total assets is the same in principle as that in the above abstract case in which capital and monetary assets are not distinguished.

E. g. when the rate of rediscount is reduced, total assets are *ceteris paribus* increased relative to in the case without the policy. Then the average rate of return on total assets will *c. p.* fall in the very short run, since its numerator will remain unaffected for the time being. Assume that the firms have the *same* schedule of the marginal efficiency of investment. Now that the average rate has fallen, they will find more such investment opportunities as will earn at higher rates than the present (relatively lower) average rate of return. Then, investment will increase.

Thus, the firms would raise investment *c. p.* when the average rate of return on total assets is lower than before. In the opposite case, they would be more satisfied by a higher average rate of return and would reduce investment, because further investment would bring about less surplus.

Section II Statistical Findings

1. The Relation between the Model and the Data

The Capital-asset Turnover Ratio

Let us assume that Y/K', or production per unit of capital

assets, is an increasing function of

e^*=(net sales, in the present period)/(capital assets, at the end of the last period),

which we will call *"the capital-asset turnover ratio."* Let us write

$$Y/K'=y(e^*), \quad \text{.....(6)}$$

where $dy/de^*>0$ and is assumed constant.

The Gross Profit Rate

Gross profit will be written as

$$\pi=K'\xi(y(e^*)). \quad \text{.....(7)}$$

The gross profit rate is

$$\frac{\pi}{K'+L'}=\frac{\xi(y(e^*))}{1+(L'/K')}. \quad \text{.....(8)}$$

The general business condition measured by the capital-asset turnover ratio, e^*, affects the gross profit rate, $\pi/(K'+L')$ by two channels. One is its effect on the numerator, gross profit : a rise (fall) in the business condition raises (reduces) gross profit. The other is its effect on the denominator, total assets. Total assets can be divided into capital and monetary assets. Given capital assets, monetary assets are influenced by two kinds of effects, one by a change in the short- (or long-) term rate of interest, the other by a change in the general business condition. A rise (fall) in the general business condition *c. p.* tends to raise (reduce) monetary assets relative to capital assets.

The total effect of the general business condition on the average rate of return cannot be decided to be in the positive or negative direction by *a priori* reasonings.

2. Notation

For simplicity let us write

"(economic variable A)/(economic variable B) $\dot{+}(x/y)$, (z %), (economic variale C) /(economic variable D), ...(j)"

to mean

"the direction of half-yearly change in the ratio of economic variables A to B is the same as that in the ratio of C to D for x half-yearly periods out of the y periods in which both A/B and C/D change, and $x/y=z/100$, ...Formula (j)."

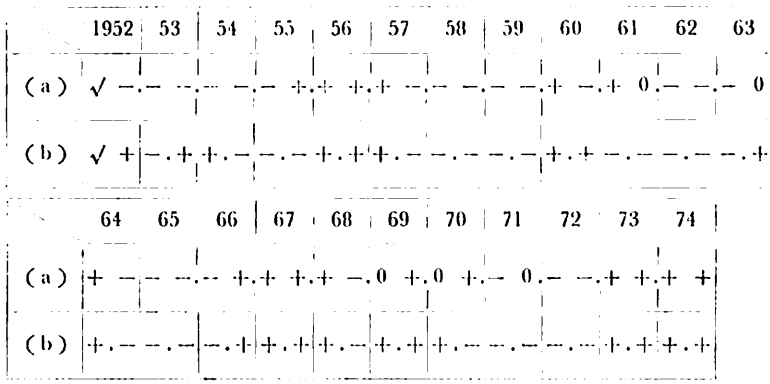
Remarks. (1) Instead of writing (net sales)/(capital assets),

we write simply (capital-asset turnover ratio). (2) In the case of such a pair of ratios one of which lags, the ratio which precedes the other ratio is put a prime.

For example the formula (Formula (3), P. 15, below)

(inventories)/(total assets)
+(32/40), +(80.0%), (capital-asset turnover ratio)′,

has been derived from the table such as



where (a) and (b) denote the ratios on the left- and right-hand sides of the above formula, and the sign of (a) signifies the direction of change *from the last to the present period,* whereas the corresponding sign of (b) signifies that *from the period before last to the last period.* This table describes an aspect of the time series of the ratios and enables us to abstract the factor of cyclical fluctuations in the quantitative time series data.

(3) When minus sign − instead of plus sign + is put just before the ratio (x/y), it means that x equals to the number of periods in which such a table as the above example has the signs of the changes in (a) and (b) to be *opposite.* In the above example we *may* write either +(32/40) or −(8/40), and we write the former simply because the percentage is larger than 50%.

(4) Additional quantities will be written with deltas: e. g., Δ(monetary assets) denotes monetary assets at the end of *the present* period *less* monetary assets at the end of *the last* period.

(5) The denominator y of the ratio (x/y) equals to the number of such periods in which such a table as the above example has non-zero signs for both the ratios. It does not cover such periods

in which the table has zero for one of the lagged or unlagged pair of ratios. Since the half-yearly data is available only for 1951-FH to 74-LH, y cannot be greater than 47. Thus, y equals to 47 *less* the number of periods in which at least one of the ratios in a formula cannot be calculated from the available data, and further, *less* the number of periods in which at least one of the ratios shows zero sign in the table.

(6) The borderline between the case in which the ratio (x/y) is significant and that in which it is not cannot be absolute, but I think that about 70% is a standard rate. Formulas with x/y ratio lower than this will not be presented except for those with special significances.

3. Results

(1) *The Basic Variable*

The gross profit rate, or (gross profit)/(total assets), is theoretically expected to rise (fall) as the capital-asset turnover ratio, or (net sales)/(capital assets), rise (fall), *provided* that (monetary assets)/(capital assets) does not have a *dominant* effect on the fluctuation of the gross profit ratio (Eqs. (2), (8)). If this expectation is proved true, the theoretical relation between $i^*_{L,M}$ and e^* will not be rejected.

(the capital-asset turnover ratio, e^*)

$+(40/46)$, $+(87.0\%)$, (the gross profit rate, $i^*_{L,M}$).

.....(1)

It is convenient for the following analysis to regard e^* as the *basic variable of the business cycle,* for e^* represents Y/K', which is related to employment.

Formula (1) implies that changes in L/K do not have so *dominant* an influence on the fluctuation of $i^*_{L,M}$ as Eq. (2) may suggest. If L/K changed cyclically it would be possible that the influence of e^* on $i^*_{L,M}$ is more than cancelled out by its change in not a few periods. However, the fact is that $L/(K+L)$ rises in most of the periods, and the ratio of the number of periods of its rise to that its fall equals to 33/12.

(2) *The Income-multiplier Relation*

The ratio of (investment)/(capital assets)′ is expected to rise

(fall) as the capital-asset turnover ratio rises (falls), since there is supposed to be the causal ordering $I \rightarrow Y$ by the income-multiplier process. Moreover, the factor of autonomous demand in the aggregate demand, including the shift parameter of the personal propensity to consume, government expenditure, and export demand, will be proved to have only secondary importance, in causing the fluctuation of the turnover ratio, if the numerical ratio (x/y) is significant.

(investment in the present period)
/(capital assets at the end of the last period)
+(37/46), +(80.4%),
(capital-asset turnover ratio). .....(2)

This formula shows that changes in the terms

$$\frac{a_t}{K_{t-1}} \text{ and } \frac{\bar{b}}{K_{t-1}}$$

in Eq. (5) are minor relative to those in I/K' and Y/K' (or, equivalently, I_t/K_{t-1} and Y_t/K_{t-1}) in Eq. (5). Thus the formula (2) is explained by Eqs. (5) and (6).

(3) *Current Assets : Inventories*

Remark that inventories belong not only to capital assets, K, but also to current assets. However, monetary assets, L, does not include inventories.

Inventories should be distinguished from fixed assets. They will be more important as a stock (as against flow) variable than fixed assets, in relation to the fluctuation of the turnover ratio. Moreover, we are interested in how the composition of total assets of the firms are related to the flow measure of the capital-asset turnover ratio, and since inventories are special constituents of total assets, the ratio (inventories)/(total assets) will be worth studying in relation to the fluctuation of e^*.

(inventories)/(total assets)
+(32/40), +(80.0%),
(capital-asset turnover ratio)', ...(3)

where the stock concepts denote values at the end of the present period, and $e^{*\prime}$ denotes the turnover ratio in the *previous* period.

Also, we have

(inventories)/(total assets)

$+(24/41)$, $+(58.5\%)$,
(capital-asset turnover ratio), ...(4)

without a prime on the right-hand side. e^* in the formula (4) denotes the turnover ratio in the *present* period. *A priori,* we may be liable to imagine that the ratio of inventories to total assets will change as a result of a change in the turnover ratio from the last period to the period in consideration. The above facts shows, however, that the change in the inventory ratio reflects the change in the turnover ratio *with the lag of one period.*

Since the ratio (inventories)/(total assets) is proved important in relation to the fluctuation of e^* by Formulas (3) and (4), we are led to study the marginal ratio of Δ(inventories)/Δ(total assets) in relation to the fluctuation of e^*. For, generally, the fluctuation of the marginal ratio $\Delta A/\Delta B$ tends to precede that of the average ratio A/B, so that the fact that A/B reflects the fluctuation of e^* may be explained by finding a relation between the fluctuation of $\Delta A/\Delta B$ and that of e^*.

Δ(inventories)/Δ(total assets)
$+(36/46)$, $+(78.3\%)$
(capital-asset turnover ratio), ...(5)

whereas

Δ(inventories)/Δ(total assets)
$+(29/45)$, $+(64.4\%)$
(capital-asset turnover ratio)′. .....(6)

Formula (5) corresponds to Formula (3).

Though the fluctuation of Δ(inventories)/Δ(total assets) can be explained by the fluctuation of e^*, it can be explained also by the fluctuation of the ratio of (investment)/(capital assets), because since investment includes additional inventories the marginal ratio Δ(inventories)/Δ(total assets) will be expected to rise (fall) as the growth rate of capital assets rises (falls).

Δ(inventories)/Δ(total assets)
$+(35/46)$, $+(76.1\%)$,
(investment in the present period)
/(capital assets at the end of the last period).
.....(7)

This formula indicates that the marginal change of inventories to

total assets can be regarded mostly as intended (as against unexpected), since I/K' is assumed to be an intended value that is always realized.

(4) *Current Assets: Currency and Deposits*

Since we note in my paper [4] that (currency and deposits)/(total assets) ratio is rather negatively correlated with the total-asset turnover ratio, it will be worth examining whether the fluctuation of (currency and deposits)/(total assets) is negatively related to that of the *capital-asset* turnover ratio. Moreover, by the same interest in the asset-composition as noted above in respect of Formulas (3) and (4), and by high liquidity of currency and deposits relative to other current assets, the ratio will deserve paying attention.

(currency and deposits)/(total assets)
$-(33/46)$, $-(71.7\%)$,
(capital-asset turnover ratio), ...(8)

where the sign '$-$' indicates reverse directions of change. Similarly

(currency and deposits)/(total assets)
$-(34/45)$, $-(75.6\%)$,
(capital-asset turnover ratio)'. .....(9)

These two formulas in comparison with Formula (3) suggest that the policy of changing the short rate rediscount (*kotei-buai*) affects the ratio of (current assets)/(total assets) to the counteracting direction, i.e., to cancel out a part of the effect of the fluctuation of investment on the (current assets)/(total assets) ratio, though the effect is apparently dominated by the latter effect.

It has been known in my paper [4] that the rate of rediscount is much positively correlated with the total-asset turnover ratio, and its fluctuation will deserve examining in relation to the fluctuation of e^*.

(the rate of rediscount, the *kotei-buai*)
$+(28/33)$, $+(84.8\%)$,
(capital-asset turnover ratio)', ...(10)

where the denominator 33 covers the periods in which the rate of rediscount is changed from the levels of the last periods.

The negative correlation between (currency and deposits)/(total assets) ratio and the rate of rediscount will have to be reassured in the form of the following formula.

(currency and deposits)/(total assets)

$-(27/33)$, $-(81.8\%)$,
(the rate of rediscount).....(11)

In order to discern the peculiarity of the movement of the (currency and deposits)/(total assets) ratio in contrast to the ratio of other current assets to total assets, we first examine the ratio (current assets other than inventories, currency, and deposits)/(total assets) in relation to the fluctuation of e^*. The exclusion of inventories from current assets will be necessary in order to separate the effect of the fluctuation of (inventories)/(total assets) ratio on the fluctuation of (current assets)/(total assets), since Formulas (3) and (4) show that the former ratio is expected to affect the latter in she direction in conformity with the fluctuation of e^*.

(current assets other than inventories, currency,
and deposits)/(total assets)
$+(35/43)$, $+(81.4\%)$,
(capital-asset turnover ratio). .....(12)

It is expected by Formulas (3) and (4) that (current assets)/(total assets) reflects the fluctuation of e^*, since inventories are substantial constituents of current assets.

(current assets)/(total assets)
$+(34/45)$, $+(75.6\%)$,
(capital-asset turnover ratio). .....(13)

Since Formula (13) shows that the theoretical expectation is verified, it will then be easily expected that (currency and deposits)/(total assets) ratio fluctuates in the opposite direction to that in which (current assets)/(total assets) fluctuates, although currency and deposits are parts of current assets. The expectation deserves investigation. moreover, that the policy of changing the rate of rediscount tends to counteract the fluctuation of (current assets)/(total assets) ratio is clear by the following formula :

(currency and deposits)/(total assets)
$-(32/46)$, $-(69.6\%)$,
(current assets)/(total assets). .....(14)

(5) *Liabilities : Current Liabilities*

Needless to say any form of liability or net worth may finance any kind of asset. If (current liabilities)/(total assets) is proved to be related to the fluctuation of e^*, then it may imply that the fluctuation of the ratio of the finance by current liabilities to the total finance can be explained mainly by the fluctuation of the

ratio of current assets to total assets, since the latter ratio is positively related to the fluctuation of e^*. This does not mean, of course, that fixed investment is not financed by current liabilities.

(current liabilities)/(total assets)
+(33/43), +(76.7%),
(capital-asset turnover ratio). .....(15)

Δ(current liabilities)/Δ(total assets)
+(36/45), +(80.0%),
(capital-asset turnover ratio). .....(16)

(current liabilities)/(total assets)
+(39/43), +(90.7%),
(current assets)/(total assets). .....(17)

Δ(current liabilities)/Δ(total assets)
+(34/44), +(77.3%),
Δ(current assets)/Δ(total assets). .....(18)

If (current liabilities)/(total assets) is positively related to the fluctuation of e^*, then by Formula (8), it will be negatively related to the fluctuation of (currency and deposits)/(total assets) ratio. Thus the pair of the ratios deserve investigation to endorse that reasoning.

(current liabilities)/(total assets)
−(33/44), −(75.0%),
(currency and deposits)/(total assets). .....(19)

Δ(current liabilities)/Δ(total assets)
−(32/44), −(72.7%),
Δ(currency and deposits)/Δ(total assets). .....(20)

Since Formula (20) shows that Δ(currency and deposits)/Δ(total assets) is negatively related to the fluctuation of Δ(current liabilities)/Δ(total assets), how about the marginal ratios of the other current assets to total assets in relation to the fluctuation of Δ(current liabilities)/Δ(total assets)?

Δ(current liabilities)/Δ(total assets)
+(36/45), +(80.0%),
Δ(current assets other than inventories,
currency, and deposits)/Δ(total assets). ...(21)

and

Δ(current liabilities)/Δ(total assets)
+(33/45), +(73.3%),
Δ(inventories)/Δ(total assets). .....(22)

(6) *Current Liabilities: Short-term Loans*

Let us classify current liabilities into (1) short-term loans, (2) accounts payable, (3) notes payable, and (4) the other current liabilities. Is there any relation between (short-term loans)/(total assets) and the fluctuation of e^*?

(short-term loans)/(total assets)
$-(38/46)$, $-(82.6\%)$,
(capital-asset turnover ratio). .....(23)

Since Formula (23) shows the negative relation between the fluctuation of (short-term loans)/(total assets) and that of e^*, how about between the former and the fluctuation of (currency and deposits)/(total assets) ratio which has been shown to be negatively related to the fluctuation of e^*?

(short-term loans)/(total assets)
$+(32/47)$, $+(68.1\%)$,
(currency and deposits)/(total assets). .....(24)

Formula (24) implies that the policy of changing the rate of rediscount affects the ratio of (currency and deposits)/(total assets) mainly through its effect on the ratio of (short-term loans)/(total assets).

(7) *Current Liabilities: Accounts and Notes Payable*

We are motivated by Formula(23) to study the following pairs of ratios.

(accounts payable)/(total assets)
$+(38/43)$, $+(88.4\%)$,
(capital-asset turnover ratio). .....(25)

On the other hand we have

(notes payable)/(total assets)
$+(29/43)$, $+(67.4\%)$,
(capital-asset turnover ratio). .....(26)

In comparing the percentages in Formulas (23), (25), and (26), it is known that, among short-term loans, accounts payable, and notes payable, the current liabilities whose ratio to total assets shows the fluctuation that is the most like that of capital-asset turnover ratio is accounts payable, and that whose ratio to total assets shows the fluctuation that is in the opposite direction to that of the basic variable is short-term loans.

In view of Formulas (8), (10), and (11), we know by Formulas

(23), (25), and (26) that, among the three kinds of current liabilities that whose ratio to total assets shows the fluctuation that seems to be the most influenced by the policy of changing the rate of rediscount is short-term loans, and that whose ratio to total assets shows the fluctuation that seems to be the least influenced by that policy is accounts payable.

(8) *Fixed Liabilities and Net Worth*

The ratio of (net worth)/(total assets) shows an almost monotonely decreasing slope, falling in 40 periods out of 45 periods (1951-LH to 74-LH) in which the ratio changes.

Since total assets consist not only of current and fixed liabilities but also of net worth, the ratio (fixed liabilities)/(total assets) deserves investigation.

(fixed liabilities)/(total assets)
$\doteqdot$(33/46), $\doteqdot$(71.7%),
(currency and deposits)/(total assets). .....(27)

Section III A Feedback to Theory

1. A Remodelling

Let us summarize the results of the last section by reformulating a system of difference equations.

The following system of equations, however, does not mean to be a necessary outcome of the results of the statistical researches but a possible theoretical scheme built so as not to contradict them.

(1) *Investment Adjustment*

The first equation is

$$i^{*(t)}_{IS}(I_t/K_{t-1}) = i^{*}_{LM}(y(e^{*}_{t-1}),\ L_{t-2}/K_{t-2}), \quad \text{.....(9)}$$

by Eqs. (3), (4) and (6). Since $i^{(t)}_{IS}(I\,;K')$ is a function expected by the firms, the above equation should be regarded as purely theoretical, expressing Keynes' idea that the long-term expectations and the 'rate of interest' determine the level of investment. In this system the gross profit rate is assumed to play the role corresponding to that of the rate of interest in Keynes' original scheme.

(2) *The Income-multiplier Equation*

The second equation is

$$I_t/K_{t-1}-I_{t-1}/K_{t-2}=s.\ y'.(e_t^*-e_{t-1}^*)+\nu(t),\quad \text{.....(10)}$$

by Eqs. (5) and (6), based on the first approximation that the terms (a_t/K') and $(\bar{b}/K')$ in Eq. (5) are of secondary importance in our Keynesian context, as mostly verified by Formula (2).

(3) *Adjustment of Monetary Assets*

By definition, monetary assets L consist of (1) currency and deposits, M_2, and (2) current assets except inventories, currency and deposits, W.

$$L\equiv W+M_2. \quad \text{.....(11)}$$

The change in L/K is positively related to the change in $L/(K+L)$, or (monetary assets)/(total assets), which consists of the two parts, the change in $M_2/(K+L)$, or (currency and deposits)/(total assets) and the change in $W/(K+L)$, or (current assets other than inventories, currency, and deposits)/(total assets).

First, the fluctuation of $W/(K+L)$ is positively related to the fluctuation of e^* (Formula (12)). As we write

$$W_t/(K+L)_t-W_{t-1}/(K+L)_{t-1}$$
$$=\theta_1\cdot(e_t^*-e_{t-1}^*)-\theta_2\cdot(i_t-i_{t-1})+\varphi(t),\text{...(12)}$$

where θ_1, $\theta_2>0$, Formula (12) implies that the first term is dominant in the total on the right-hand side.

Second, the fluctuation of $M_2/(K+L)$ is negatively related to the fluctuation of i. (Formula (11)).

Third, the ratio $L/(K+L)$ shows a rather monotonely increassing trend (Page 14), so that the trend factor of the difference $L_t/K_t-L_{t-1}/K_{t-1}$ can be written as a positive function of t, or $\alpha(t)$.

Thus, we have the formulation

$$L_t/K_t-L_{t-1}/K_{t-1}=\rho\cdot(e_t^*-e_{t-1}^*)-\gamma\cdot(i_t-i_{t-1})+\alpha(t),$$
$$\text{.....(13)}$$

where ρ and γ are positive constants, i_t the rate of rediscount in the period t, and $\alpha(t)$ denotes the trend factor which is positive.

(4) *The Rate of Rediscount*

The system of the three equations (9), (10), and (13) has five dependent variables, e^*, I, K, L, and i, with $i_{IS}^{*(\alpha)}(\cdot)$, $t=1,2,...,\infty$, $i_{LM}^*(\cdot,\cdot)$, s, y', ρ, γ, and ν(t)and $\alpha(t)$, $t=1,2,...,\infty$, given. The system

needs two other equations added to be determinate. Thus, we close the system by Eqs. (14) and (15).

$$i_t - i_{t-1} = u.(e^*_{t-1} - e^*_{t-2}) + \eta(t), \quad \text{.....(14)}$$

where u is a positive constant. This lagged relation between the rate of rediscount and the capital-asset turnover ratio is verified to some extent by Formula (10). And

$$K_t = K_{t-1} + I_t. \quad \text{.....(15)}$$

The system of equations (9), (10), (13), (14), and (15) is determinate, given the initial values e^*_0, e^*_1, L_0, K_0, I_1, i_0, and i_1.

2. Consistency between the Facts and the Revised Formulation

(1) Eq. (2) may be rewritten as

$$i^{(t)}_{LM} = i^{*(t)}_{LM}(y(e^*_t),\ (L/K)_{t-1}),$$

by Eq. (6), where $i^{(t)}_{LM}$ denotes the gross profit rate in the t-th period. By the signs of the partial derivatives of the function, we have the following proposition : *$\Delta i^{(t)}_{LM}$ has the same sign as Δe^*_t, if Δe^*_t has the opposite sign to that of $\Delta(L/K)_{t-1}$.* We cannot know *a priori* about the sign of $\Delta i^{(t)}_{LM}$, if Δe^*_t and $\Delta(L/K)_{t-1}$ are of the same sign.

This proposition can be easily proved to be perfectly consistent with the data. In fact there are only 16 periods in which Δe^*_t and $\Delta(L/K)_{t-1}$ are of opposite signs, and $\Delta i^{(t)}_{LM}$ and e^*_t are of the same sign in all of these 16 periods.

(2) By Eq. (12), we have the following proposition : *$\Delta(W/K+L))_t$ has the same sign as Δe^*_t, if Δe^*_t has the opposite sign to that of Δi_t, provided the effect of the shift-parameter $\varphi(t)$ on $\Delta(W/(K+L))_t$ is negligible.* We cannot know *a priori* about the sign of $\Delta(W/(K+L))_t$ if Δe^*_t and Δi_t are of the same sign, provided the effect of $\varphi(t)$ is negligible.

This proposition can be proved to be consistent with the data. There are only 11 periods in which Δe^*_t and Δi_t are of opposite

signs, and $\Delta(W/(K+L))_t$ and Δe_t^* are of the same sign in 10 periods among these 12 periods.

In the remaining three periods, 1961-LH and 64-FH, $\Delta(W/(K+L))_t$ is positive, and this implies that the shift parameter $\varphi(t)$ dominates the negative effects of Δe_t^* and Δi_t to make the total effect positive.

(3) By Eq. (13), we have the proposition : *$\Delta(L/(K+L))_t$ has the same sign as Δe_t^*, if Δe_t^* has the opposite sign to that of Δi_t, provided the effect of the shift-parameter $\alpha(t)$ on $\Delta(L/(K+L))_t$ is negligible.* We cannot know *a priori* about the sign of $\Delta(L/(K+L))_t$ if Δe_t^* and Δi_t are of the same sign, provided the effect of $\alpha(t)$ is negligible.

This proposition can be proved to be consistent with the data. $\Delta(L/(K+L))_t$ and Δe_t^* are of the same sign in the same 10 periods among the 12 periods in which Δe_t^* and Δi_t are of opposite signs. In the remaining three periods, 61-LH and 64-FH, $\Delta(L/(K+L))_t$ is positive, and this implies the conclusion similar to that in (2) of this subsection 2.

(4) Eqs. (10) and (14) can be proved to be consistent with the data as seen above.

Conclusion

It is a matter of course that a higher rate of interest on bank loans will diminish net profit of the firms, but this does not mean that it will diminish gross profit, since gross profit includes interest payments on bank loans. The interest payments will at first rise. They will, however, start to reduce bank loans to alleviate the burden of interest payments at the higher rate. Therefore, net profit may rise or fall as the interest payments fall or rise. Whether the interest payments rise or fall depends on the elasticity of the demand schedule of bank loans in terms of the short rate. It is important to see, however, that gross profit will not be reduced by the rise in the short rate of interest at least in the very short run.

It is the denominator of the gross profit rate, or total assets, that is reduced in the very short run by the rise in the short rate. For

total assets include a considerable part that changes in parallel with a change in bank-loans, mainly in the forms of currency and deposits. The rise in the short rate will, therefore, *ceteris paribus,* reduce the demominator in the very short run, so that the gross profit rate will be raised.

The relative insensitivity of gross profit to a change in the short rate of interest on bank loans is closely related to the relative stickiness of the level of total production to the change in the short rate. The change in the flow of production is mainly governed by the change in investment which is determined by the changes in the average rate of return and in the long-term expectations about profitability of investment. Moreover the long-term expectations are insensitive to any changes in the short-term financial conditions, as the so called "Oxford Study" [7] maintains. As long as the inducement to invest remains in the same state, and the average rate of return on total assets is constant, total production per unit of capital assets will be at the same level, so that net sales, and therefore gross profit, both per unit of capital assets, will be so, too. When the short-term rate of interest rises (falls), total assets will sensitively shrink (expand) although it will be a part of current assets that comes to be affected immediately. Then the gross profit rate will rise (fall) since its numerator (gross profit) does not change in the very short run. Investment per unit of capital assets will fall (rise) since the marginal afficiency of capital assets falls (rises) relative to the average rate of return (the gross profit rate).

It is not accurate to say that the policy of changing the short-term rate of interest tends to lengthen the amplitude of fluctuation of the gross profit rate. The change in the short rate does soon change the denominator (total assets) of the gross profit rate, but it is also true that it changes its numerator (gross profit) sooner or later in the same direction as it changes the former, with a lag. Since the directions of these short-run changes in the numerator and the denominator caused by the change in the short rate are the same, the amplitude of fluctuation of the gross profit rate may or may not be lengthened in the short run by the interest rate policy.

Statistical Tables

Table 1 : List of Statistical Variables[*]*

①	$i^{(1)}_{LM}$	=the gross profit rate (in the t-th period)=gross profit (in the t-th period)/total assets (at the end of the $(t-1)$-th period),
②	e^*_t	=the capital-asset turnover ratio (in the t-th period)=net sales (in the t-th period)/capital assets (at the end of the $(t-1)$-th period),[**]
③	I_t/K_{t-1}	=investment (in the t-th period)/capital assets (at the end of the $(t-1)$-th period),
④	i_t	=the rate of rediscount (in the t-th period)=the half-yearly average level[*3] of the *kotei-buai* (in the t-th period),
⑤	$(L/(K+L))_t$	=the average liquidity of the total assets of the firms (at the end of the t-th period)=monetary assets[*4] (at the end of the t-th period)/total assets (at the end of the t-th period),
⑥	$(M/(K+L))_t$	=the ratio of currency and deposits to total assets (at the end of the t-th period)=currency and deposits (at the end of the t-th period)/total assets (at the end of the t-th period),
⑦	$(W/(K+L))_t$	=the ratio of monetary assets other than currency and deposits to total assets (at the end of the t-th period) =monetary assets except currency and deposits (at the end of the t-th period)/total assets (at the end of the t-th period),
⑧	$(In./T.a.)_t$	=inventories (at the end of the t-th period)/total assets (at the end of the t-th period),
⑨	$(\Delta In/\Delta Ta)_t$	=additional inventories from at the end of the $(t-1)$-th period to at the end of the t-th period/additional total assets from at the of the $(t-1)$-th period to at the end of th $t-$th period,
⑩	$(C.a./T.a.)_t$	=current assets (at the end of the t-th period)/total assets (at the end of the t-th period),
⑪	$(\Delta L/\Delta(K+L))_t$	=additional[*5] monetary assets/additional total assets,
⑫	$(C.l./T.a.)_t$	=current liabilities (at the end of the t-th period)/total assets (at the end of the t-th period),
⑬	$(\Delta Cl/\Delta Ta)_t$	=additional current liabilities/additional total assets,
⑭	$(\Delta Ca/\Delta Ta)_t$	=additional current asssets/additional total assets,
⑮	$(\Delta M/\Delta(K+L))_t$	=additional currency and deposits/additional total assets,
⑯	$(\Delta W/\Delta(K+L))_t$	=additional monetary assets other than currency and deposits/additional total assets,
⑰	$(S.l./T.a.)_t$	=short-term loans (at the end of the t-th period)/total

assets (at the end of the t-th period),

⑱ $(A.p./T.a.)_t$ =accounts payable (at the end of the t-th period)/total assets at the end of the t-th period),

⑲ $(N.p./T.a.)_t$ =notes payable (at the end of the t-th period)/total assets (at the end of the t-th period),

⑳ $(F.l./T.a.)_t$ =fixed liabilities (at the end of the t-th period)/total assets (at the end of the t-th period),

㉑ $(N.w./T.a.)_t$ =net worth (at the end of the t-th period)/total assets (at the end of the t-th period).

*) The statistical variables with which we are concerned in this paper are those of all industries aggregated. **) See Subsection (2) of Section I. *3) This is the average weighted by the length of time for which each raw level of the *kotei-buai* stays. See Statistical Appnedix in [4] for detail. *4) See (3) in Table 2. *5) The 'additional' figure herafter means the additional stock *from at the end of the $(t-1)$-th period to at the end of the t-th period.*

Table 2: List of Identities

(1) (gross profit)=(net profit)+(non-operating charges)
(2) (total assets)=(monetary assets)+(capital assets)+(deferred charges)*)
(3) (monetary assets)=(current assets)−(inventories),
(4) (capital assets)=(fixed assets)+(inventories),
(5) (investment)=(additional capital assets).

*) Since deferred charges occupies only two to four tenth of one per cent of total assets, we approximately have (total assets)=(monetary assets)+(capital assets).

Table 3: The Data for Section II

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	$i_{LM}^{(t)} \times 2$	$e_t^* \times 2$	$\frac{I_t}{K_{t-1}} \times 2$	i_t	$\left(\frac{L}{K+L}\right)_t$	$\left(\frac{M}{K+L}\right)_t$	$\left(\frac{W}{K+L}\right)_t$	$\left(\frac{In.}{T.a.}\right)_t$	$\left(\frac{\Delta In}{\Delta Ta}\right)_t$	$\left(\frac{C.a.}{T.a.}\right)_t$	$\left(\frac{\Delta L}{\Delta(K+L)}\right)_t$
1951-F H	—	—	—	5.84*4)	29.3*5)	7.18	22.1	28.3	—	57.6	—
-L H	16.92*1)	2.279*2)	19.1*3)	45.8 ⁰	29.9 +	8.09 +	21.9 −	26.4 −	8.9	56.3 −	35.6
52-F H	14.23−*6)	2.343 +	34.9 −	5.84 ⁰	30.5 +	8.60 +	21.9 ⁰	25.1 −	5.2 −	55.5 −	46.0 +
-L H	11.99 −	2.040 −	16.1 −	5.84 ⁰	31.8 +	8.83 +	23.0 +	23.0 −	2.7 −	54.8 −	44.8 −
53-F H	12.21 +	2.066 +	18.9 +	5.84 ⁰	31.2 −	8.31 −	22.9 −	21.9 −	9.8 +	53.2 −	24.2 −
-L H	13.46 +	2.201 +	30.5 +	5.84 ⁰	30.9 −	7.82 −	23.0 +	20.6 −	11.1 +	51.4 −	28.3 +
54-F H	11.16 −	1.757 −	25.3 −	5.84 ⁰	27.7 −	7.37 −	20.3 −	19.5 −	5.5 −	47.2 −	−13.5 −
-L H	10.29 −	1.634 −	11.1 −	5.84 ⁰	28.5 +	7.60 +	20.9 +	17.9 −	−5.4 −	46.4 −	40.0 +
55-F H	10.21 −	1.653 +	4.3 −	6.25 +	29.6 +	7.63 +	22.0 +	17.0 −	−8.0 −	46.6 +	−11.3 −
-L H	11.19 +	1.847 +	13.5 +	7.30 +	29.8 +	7.09 −	22.7 +	17.5 +	24.6 +	47.2 +	32.0 +
56-F H	11.15 −	1.899 +	11.1 −	7.30 ⁰	29.4 −	6.50 −	22.9 +	17.9 +	26.9 +	47.3 +	22.7 −
-L H	12.72 +	2.062 +	25.5 +	7.32 +	29.6 +	6.38 −	23.3 +	19.0 +	27.4 +	48.7 +	31.5 +
57-F H	12.20 −	1.989 −	29.0 +	8.24 +	28.6 −	6.09 −	22.5 −	20.8 +	35.1 +	49.4 +	20.4 −
-L H	9.83 −	1.645 −	14.7 −	8.40 +	27.4 −	6.23 +	21.2 −	20.0 −	5.5 −	47.4 −	5.8 −
58-F H	8.48 −	1.480 −	8.6 −	7.93 −	27.4 ⁰	6.73 +	20.7 −	18.3 −	−22.2 −	45.7 −	27.1 +
-L H	8.97 +	1.488 −	8.0 −	7.22 −	27.8 +	6.86 +	20.9 +	16.6 −	−18.9 +	44.4 −	36.8 +
59-F H	10.09 +	1.609 +	12.2 +	6.94 −	29.1 +	6.97 +	22.2 +	16.0 −	7.9 +	45.1 +	45.6 +
-L H	11.68 +	1.768 +	16.3 +	7.18 +	30.7 +	7.53 +	23.2 +	15.6 −	12.4 +	46.3 +	45.5 −
60-F H	11.74 +	1.810 +	18.8 +	7.20 +	30.8 +	7.02 −	23.7 +	15.8 +	17.8 +	46.6 +	31.1 −
-L H	11.79 +	1.846 +	20.5 +	6.82 −	32.7 +	7.80 +	24.9 +	15.0 −	8.7 −	47.7 +	47.1 +
61-F H	10.99 −	1.860 +	23.2 +	6.71 −	33.3 +	7.03 −	26.2 +	15.1 +	16.3 +	48.4 +	37.9 −
-L H	10.66 −	1.804 −	21.7 −	7.30 +	33.8 +	6.82 −	27.0 +	15.1 ⁰	14.9 −	48.9 +	38.4 +
62-F H	9.52 −	1.635 −	14.8 −	7.30 ⁰	34.6 +	6.93 +	27.6 +	14.4 −	6.7 −	49.0 +	43.0 +
-L H	9.01 −	1.605 −	9.4 −	6.73 −	35.7 +	7.76 +	28.0 +	13.3 −	−3.9 −	49.0 ⁰	53.2 +

63-FH	9.31 +	1.677 +	9.0 −	5.88 −	37.0 +	†)8.48 +	28.5 +	12.7 −	3.6 +	49.6 +	55.2 +
-LH	10.68 +	1.967 +	26.1 +	5.88 0	39.1 +	9.16 +	30.0 +	12.7 0	13.0 +	51.8 +	51.9 −
64-FH	9.36 −	1.857 −	12.9 −	6.57 +	40.0 +	8.94 −	31.0 +	12.8 +	14.0 +	52.8 +	50.8 −
-LH	8.88 −	1.834 −	10.8 −	6.41 −	40.2 +	9.20 +	31.0 0	12.7 −	11.0 −	52.9 +	43.3 −
65-FH	8.39 −	1.779 −	7.5 −	5.66 −	40.3 +	9.35 +	30.4 −	12.5 −	6.2 −	52.7 −	42.6 −
-LH	8.27 −	1.770 −	5.6 −	5.48 −	40.5 +	10.33 +	30.1 −	12.1 −	1.8 −	52.6 −	47.5 +
66-FH	8.92 +	1.849 +	4.9 −	5.48 0	41.0 +	10.28 −	30.7 +	11.8 −	2.6 +	52.8 +	55.7 +
-LH	9.56 +	1.978 +	8.7 +	5.48 0	41.0 0	10.11 −	30.9 +	12.1 +	18.9 +	53.1 +	41.9 −
67-FH	9.93 +	2.045 +	12.7 +	5.52 +	41.1 +	10.00 −	31.1 +	12.5 +	18.5 −	53.6 +	42.6 +
-LH	10.07 +	2.103 +	15.1 +	6.00 +	41.8 +	9.83 −	32.0 +	12.9 +	17.3 −	54.7 +	49.7 +
68-FH	9.65 −	2.074 −	14.0 −	6.11 +	41.4 −	9.89 +	31.5 −	13.0 +	14.5 −	54.4 −	36.1 −
-LH	9.91 +	2.099 +	14.2 +	5.94 −	41.8 +	9.70 −	32.1 +	12.9 −	11.1 −	54.7 +	47.2 +
69-FH	10.11 +	2.158 +	15.4 +	5.91 +	42.8 +	9.63 −	33.2 +	12.9 0	12.8 +	55.6 −	52.7 +
-LH	10.60 +	2.263 +	18.4 +	6.25 +	43.4 +	9.42 −	34.0 +	13.1 +	15.5 +	56.6 +	49.9 −
70-FH	10.04 −	2.216 −	12.9 −	6.25 0	43.6 +	9.63 +	34.0 0	13.1 0	13.1 −	56.8 +	46.3 −
-LH	9.39 −	2.201 −	17.8 +	5.94 −	43.3 −	9.83 +	33.5 −	13.3 +	15.4 +	56.7 −	40.0 −
71-FH	8.41 −	2.092 −	14.5 −	5.47 −	43.5 +	10.85 +	32.7 −	12.9 −	7.4 −	56.4 −	45.4 +
-LH	8.29 −	2.003 −	17.2 +	5.00 −	43.1 −	11.38 +	31.7 −	12.9 0	13.7 +	55.9 −	36.5 −
72-FH	7.86 −	1.936 −	7.6 −	4.47 −	43.0 −	11.41 +	31.6 −	12.6 −	5.3 −	55.7 −	44.9 +
-LH	8.98 +	2.119 +	14.4 +	4.25 −	43.8 +	11.60 +	32.2 +	12.5 −	11.2 +	56.3 +	52.0 +
73-FH	9.73 +	2.269 +	16.0 +	5.75 +	44.7 +	10.58 −	34.1 +	13.1 +	19.3 +	57.8 +	54.1 +
-LH	9.72 −	2.518 +	23.8 +	8.11 +	45.1 +	9.44 −	35.7 +	14.5 +	25.3 +	59.7 +	48.7 −
74-FH	9.16 −	2.548 +	18.5 −	9.00 +	43.2 −	8.97 −	34.2 −	17.1 +	63.6 +	60.3 +	7.8 −
-LH	7.84 −	2.356 −	9.6 −	9.00 0	41.9 −	9.22 +	32.7 −	17.5 +	35.4 −	59.5 −	−8.3 −

*) Unit: %/year. *2) Unit: times/year. *3) Unit: %/year. *4) Unit: %/year. *5) The unit of the figures in the columns (5)~(21) is %. *6) 'FH' and 'LH' denote the first half and the last half. *8) The signs +, −, and 0 indicate the directions of change from the last period to the present period.

†) This is the figure to which that in the original table has been corrected.

	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	$\left(\frac{C.l.}{T.a.}\right)_t$	$\left(\frac{\Delta Cl}{\Delta Ta}\right)_t$	$\left(\frac{\Delta Ca}{\Delta Ta}\right)_t$	$\left(\frac{\Delta M}{\Delta(K+L)}\right)_t$	$\left(\frac{\Delta W}{\Delta(K+L)}\right)_t$	$\left(\frac{S.l.}{T.a.}\right)_t$	$\left(\frac{A.p.}{T.a.}\right)_t$	$\left(\frac{N.p.}{T.a.}\right)_t$	$\left(\frac{F.l.}{T.a.}\right)_t$	$\left(\frac{N.w.}{T.a.}\right)_t$
1951-F H	48.2	—	—	—	—	16.0	8.7	10.3	12.9	38.9
-L H	48.0 −	45.7	44.5	16.6	19.0	17.3 +	7.2 −	9.7 −	14.1 +	37.9 −
52-F H	47.6 −	45.7 0	51.2 +	11.4 −	34.6 +	17.8 +	6.9 −	9.7 0	15.7 +	36.7 −
-L H	47.2 −	43.4 −	47.5 −	11.1 −	33.7 −	17.6 −	6.5 −	10.3 +	17.2 +	35.6 −
53-F H	46.2 −	34.4 −	34.0 −	2.2 −	22.0 −	16.5 −	6.7 +	10.3 0	18.6 +	35.2 −
-L H	45.6 −	41.6 +	39.4 +	4.4 +	23.9 +	16.2 −	6.6 −	10.4 +	18.0 −	36.3 +
54-F H	42.3 −	−0.3 −	−8.0 −	1.5 −	−15.0 −	15.6 −	6.0 −	8.7 −	18.7 +	39.0 +
-L H	40.8 −	17.6 +	34.6 +	11.0 +	29.0 +	16.5 +	5.4 −	7.6 −	19.4 +	39.8 +
55-F H	40.4 −	30.5 +	51.2 +	8.4 −	50.8 +	15.2 −	5.7 +	8.6 −	20.6 +	38.9 −
-L H	40.7 +	44.3 +	56.6 +	−0.6 −	32.6 −	14.6 −	5.9 +	8.8 +	21.4 +	38.0 −
56-F H	42.1 +	71.2 +	49.6 −	−5.3 −	28.0 −	13.9 −	6.4 +	8.6 −	20.8 −	37.1 −
-L H	44.0 +	58.1 −	58.9 +	5.4 +	26.1 −	14.7 +	6.7 +	8.6 0	20.2 −	35.8 −
57-F H	46.2 +	63.3 +	55.5 −	3.8 −	16.6 −	15.6 +	6.6 −	8.8 +	20.4 +	33.5 −
-L H	45.4 −	31.0 −	11.3 −	8.6 +	−2.8 −	17.2 +	5.6 −	8.2 −	21.5 +	33.1 −
58-F H	44.1 −	15.0 −	4.9 −	18.7 +	8.4 +	17.8 +	5.1 −	7.4 −	22.8 +	33.1 0
-L H	42.9 −	16.0 +	17.9 +	9.5 −	27.5 +	17.7 −	5.0 −	7.2 −	24.3 +	32.8 +
59-F H	44.3 +	61.9 +	53.5 +	8.4 −	37.2 +	17.5 −	5.4 +	7.7 +	24.5 +	31.2 −
-L H	44.3 0	44.7 −	57.9 +	12.8 +	32.7 −	16.9 −	5.8 +	8.2 +	24.8 +	30.9 −
60-F H	44.7 +	48.4 +	48.9 −	1.6 −	29.5 −	16.7 −	6.0 +	8.8 +	25.3 +	30.0 −
-L H	45.3 +	49.8 +	55.8 +	13.5 +	33.6 +	16.5 −	6.1 +	9.4 +	25.8 +	28.9 −
61-F H	46.7 +	57.6 +	54.2 −	0.9 −	37.0 +	16.2 −	6.4 +	10.3 +	25.4 −	28.0 −
-L H	47.5 +	54.6 −	53.3 −	5.1 +	33.3 −	16.8 +	6.3 −	11.0 +	24.6 −	27.9 −
62-F H	47.8 +	51.9 −	49.7 −	7.9 +	35.1 +	17.0 +	6.2 −	11.2 +	24.2 −	28.0 +
-L H	47.7 −	45.2 −	49.3 −	20.6 +	32.6 −	17.4 +	6.1 −	11.4 +	24.9 +	27.4 −

63-F H	47.7 −	47.3 +	58.8 +	19.1 −	36.1 +	17.3 −	6.1 0	11.3 −	25.5 +	26.8 −
-L H	48.6 0	54.2 +	64.9 +	13.2 −	38.7 +	17.5 +	7.2 +	13.1 +	25.4 −	26.0 −
64-F H	49.4 +	59.9 +	64.8 −	6.2 −	44.6 +	17.8 +	7.2 0	13.3 +	25.2 −	25.3 −
-L H	49.6 +	51.7 −	54.3 −	13.8 +	27.5 −	18.0 +	7.0 −	13.7 +	25.7 +	24.8 −
65-F H	49.3 −	43.9 −	48.8 −	26.5 +	16.1 −	18.6 −	6.7 −	13.1 −	26.5 +	24.1 −
-L H	49.0 −	39.6 −	49.3 +	25.1 −	22.4 +	18.8 0	6.7 −	12.6 −	27.1 +	23.8 −
66-F H	49.2 +	52.8 +	58.3 +	8.8 −	46.9 +	18.4 −	6.9 +	12.5 −	27.2 +	23.6 −
-L H	50.0 +	68.7 +	60.8 +	7.5 −	34.4 +	18.1 −	7.3 +	12.9 +	26.8 −	23.3 −
67-F H	50.4 +	57.4 −	61.1 +	8.3 +	33.9 −	17.5 −	7.4 +	13.2 +	26.9 +	22.7 −
-L H	51.3 +	60.8 +	67.0 +	7.9 −	40.2 −	17.4 −	7.7 +	14.3 +	27.1 +	21.7 −
68-F H	50.5 −	38.5 −	50.6 −	10.9 +	25.2 −	17.2 −	7.4 −	13.8 −	28.1 +	21.4 −
-L H	50.5 0	50.4 +	58.3 +	7.3 −	39.9 +	16.9 +	7.7 +	13.7 −	28.7 +	20.8 −
69-F H	51.0 +	56.7 +	65.5 +	8.9 +	43.8 +	16.5 −	8.0 +	14.1 +	28.6 −	20.3 −
-L H	51.9 +	59.7 +	65.4 −	7.4 −	42.5 −	16.2 −	8.2 +	14.9 +	28.6 0	19.6 −
70-F H	51.8 −	51.0 −	59.4 −	12.8 +	33.5 −	15.9 −	8.3 +	15.5 +	28.9 +	19.3 −
-L H	51.4 −	46.9 −	55.4 −	12.2 −	27.8 −	16.0 +	8.2 −	15.4 −	29.9 +	18.6 −
71-F H	50.8 −	41.9 −	52.8 −	24.3 +	21.1 −	16.1 +	7.8 −	14.1 −	31.3 +	18.0 −
-L H	50.1 −	41.6 −	50.2 −	18.4 −	18.1 −	16.4 +	7.3 −	13.0 −	32.3 +	17.6 −
72-F H	50.5 −	60.2 +	50.2 0	12.5 −	32.4 +	16.9 +	7.4 +	12.6 −	32.1 −	17.5 −
-L H	51.3 −	60.3 +	63.2 +	13.8 +	38.2 +	16.8 −	7.7 +	13.2 +	31.2 −	17.5 0
73-F H	52.6 +	66.7 +	73.4 +	0.2 −	53.9 +	16.1 −	8.0 +	14.9 +	30.4 −	17.0 −
-L H	55.3 +	76.1 +	74.0 +	0.5 +	48.2 −	15.8 −	9.2 +	16.4 +	28.9 −	15.8 −
74-F H	55.9 +	66.6 −	71.4 −	0.5 0	7.3 −	16.9 +	9.3 +	15.6 −	28.7 −	15.4 −
-L H	55.0 −	22.0 −	27.1 −	19.4 +	−27.7 −	17.7 +	8.6 −	14.7 −	29.7 +	15.2 −

[Sourses : the sourse of the figures of i_t (in the column (4)) is Table A 7 in [4]. The sourse of all the other figures in this Table 3 is the data of 'all industries' in [6]. Also, see Tables 1 and 2 above.]

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