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Theoretical Problems of Investment Planning.

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Contents :

This topic deals with a partial problem of the main review in which we intend to ensure a stable development of national economy.

Investment is an important factor for safegarding the stability of economy, since investment helps to establish in a large extent new proportions both between the groups of products and between the various branches of national economy. Therefore, the investment policy is undoubtedly an important factor for the development of any national economy.

1. Kinds of investment

At first, we have to distinguish:

investment

1- replacing investment and 2- new investment

Replacing investment represents investment measures to maintain available fixed capitals.

The special forms are:

a- capital repairs which are restructing the ability of use or the efficiency of already used fixed capital, and

b- the virtual replacing of finally retired machines.

In both of the cases the replacement is not only or shall not only be a simple replacement; but when replacing machines, when executing general repairs or capital repairs the new level of the technical progress and the progress reached from the technological point of view must be taken into consideration.

That means, older machines used up and now to be replaced should not be replaced by the same kind but by modern machines according to the level of technic development.

The same must be stated concerning capital repairs which should not be a simple reconstruction of the former efficiency; but it should be a reconstruction considering the technical progress, too. That means, the productivity of the machine repaired shall be higher than in former times.

Thus, we can state:

> Investment means, to use part of the national productive labour, represented by goods, in order to create new and to renew available productive (and as well non-productive!) capacities.

The word "use" indicates that investment is a process implying measures to supply investment goods and to set up a new capacity (or to renew an existing one!) in a certain space of time.

This process starts with the supply of these goods and is completed at the moment when the new capacity comes into action.

In other words:

> Investment is a process which begins, when the output of investment goods has finished, and will end, when the newly built up capacity became part of the fixed assets of the national economy.

2. Maintenance of fixed assets

As know, the value composition of our gross national product has been

$$v = c + w + p$$

w+p = value added or
new value or
net product, able to be redistributed

c = compensation fund or
fund for replacing used
fixed assets

As known, furthermore, c is containing

a- used materials and
b- used instruments of production
(machines etc.)

The utilization of these two kinds of c within the production process is a different one.

The material is used within one production process; that means, certain materials are bought for producing a certain product. After producing this certain product the materials will be used entirely.

The machines, however, forming the equipment of an enterprise, are bought to produce a lot of products. That means, their value will not fully be used after finishing one production period. That means again, after finishing one production period only a certain part of the value of the equipment will be used. This part of value is transmitted or given up to the produced products. Now, it is forming one value component of the new product, it is contained within the value and, therefore, this transmitted part of value of the machines forms one part or ingredient of the price of the new product. When selling the product, this part of value will be realized, and now it will be forming the fund of amortisation or depreciation.

That means, the realized value parts of the machines are accumulated or collected, and thus, they are forming the fund of depreciation.

The determination and calculation of the transmitted parts of value can be realized by several methods:

a- the so-called time-proportional method. In this case, a certain time of useful life is assumed. Yearly an adequate part of the original value is transmitted to the produced production.

For instance:

- Value (price) of the bought machine.	1.000,-	£.E.
- time of useful life,	10	years
- to transmit per annum	100,-	£.E.

Accordingly, the value expression of the produced production will be (for instance again)

- costs of material	300,-,-	£.E.
- wages and salaries	200,-,-	£.E.
- value transmission of used machines .	100,-,-	£.E.
prime cost	600,-,-	£.E.
profit	200,-,-	£.E.
Industrial delivery price	800,-,-	£.E.

After selling the products, the transmitted part of value of the used machines will be released, and after 10 years the depreciations will amount to 1000,-,- £.E. (10x100,-,- £.E.). After 10 years the time of useful life will be over and the old machine can be replaced by the 1.000,-,- £.E. realized in the course of 10 years.

But the problem is more complicated than just treated.

This so, because the yearly amount of depreciation is not only determined by the time of useful life, physically considered, but it also depends on the influences of the moral wear and tear.

Furthermore, the value to be amortized is not equal to the initial cost of the certain machine.

The value to be amortized contains:

	1- initial cost	= IC
+	2- expenditures for capital repairs	= CR
+	3- scrap cost	= SC
-	4- scrap value	= SV
	value to be amortized	= D

The used formula is like:

$$D = \frac{(IC + CR + SC - SV) \times 100}{IC \times t}$$

(t = time of useful life)

Let us explain this by an example:

1- initial cost	= 1.000,-,-	£.E.
2- capital repairs		
a- at the end of the 9th year	= 400,-,-	£.E.
b- at the end of the 14th year	= 500,-,-	£.E.
3- scrap cost	= 40,-,-	£.E.
4- scrap value	= 140,-,-	£.E.
5- time of useful life	= 20	years

inserted into our formula:

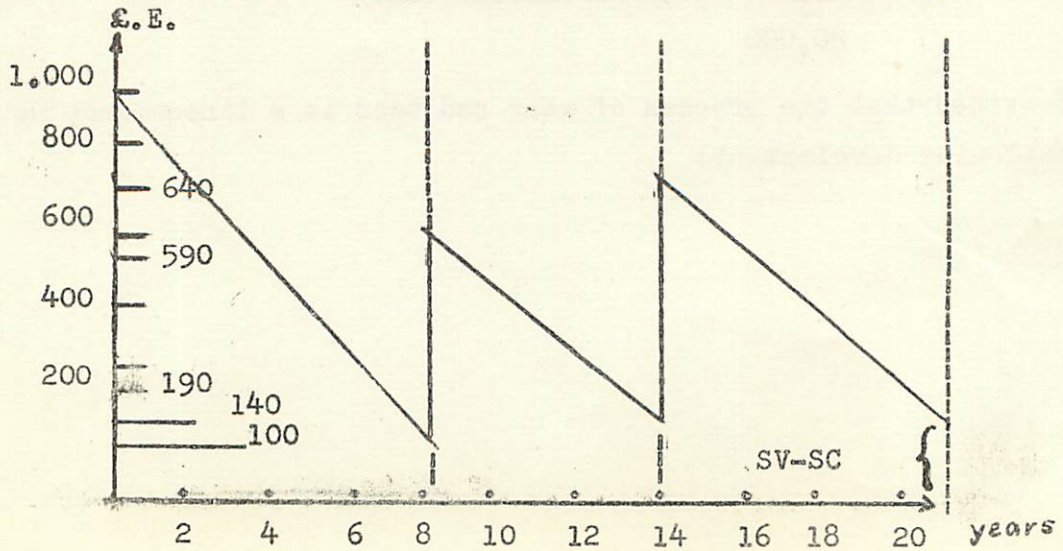
$$D = \frac{(1.000 + 100 + 40 - 140) \times 100}{1.000 \times 20}$$

$$= \frac{180.000}{20,000} = 9\% \text{ of initial cost}$$

Provided that the process of wear and tear is a linear one, we receive the following development:

time	accumulated amortization	capital repairs	remaining value
1. year	90,-,-	-	910,-,-
2. year	180,-,-	-	820,-,-
.			
.			
8. year	720,-,-	-	280,-,-
9. year	410,-,-	400,-,-	590,-,-
.			
.			
13. year	770,-,-	-	230,-,-
14. year	360,-,-	500,-,-	640,-,-
.			
.			
19. year	810,-,-	-	190,-,-
20. year	900,-,-	-	100,-,-
SV- SC	1.000,-,-	-	- ,-,-

The same illustrated by a diagram would look like the following:



That means, at the end of the 20th year

there are available

a- amortizations of	900,-,-	£.E.
b- amount realized when selling the scrap)	100,-,-	£.E.
equal to initial cost	1.000,-,-	£.E.

Thus, the sustaining reproduction of the used machine would be ensured.

But our calculation is not yet quite exact. Up to now we only have considered the so-called physical wear and tear. The time of useful life, however, is essentially determined by the so-called moral wear and tear, too.

Here we have to distinguish between two causes:

1- moral wear and tear caused by producing the same instruments of production (with the same output!) with less socially necessary working-time. By this fact the instruments of production produced under previous conditions are suffering from loss of value.

2- moral wear and tear caused by producing these instuments with the same socially necessary working-time, but the instruments now produced are signed by a higher output-capacity.

Especially, by the last fact the depreciations are influenced. But the moral wear and tear, caused by the technical progress, cannot be calculated in advance and exactly. Therefore, after some years it will be necessary to fix a new time of useful life by considering the technical progress happened during the passed years.

This can be done by a coefficient, calculated as follows; let us explain this fact by an example:

- initial cost of a machine (IC)	2.000,-,-	£.E.
- time of sueful life (t) according to the present wear and tear	20	years
- rate of depreciation (D) (valid hitherto)	5%	
- yearly amount of amortization	100,-,-	£.E.
- new time of useful life calculated by considering technical progress	15	years
- time of use until now	12	years
- remaining time of useful life (t_{ro})	8	years
- actually remaining time of useful life (t_{rl})	3	years

Now, the coefficient C_D can be calculated as:

$$C_D = \frac{8}{3} = 2{,}67$$

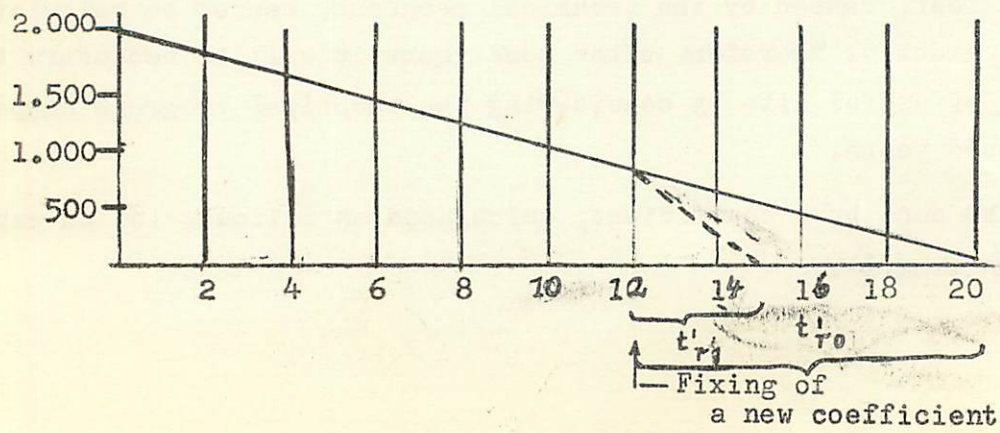
$$= C'_D = 13{,}33\% = 5 \times 2.67$$

(older rate of depeciation multiplied with the coefficient)

Accordingly, the new yearly amount of depreciation well be:

= 266,70,- £.E.

In form of a diagram the running off of depreciations will look as follows:



This has been the so-called time-proportional method of the calculation of depreciations, a method only considering the time of useful life which depends on the physical and the moral wear and tear as well. But I spoke about several methods for measuring depreciations. Another method is still known:

b- the so-called production-proportional method

We should not go deeper into this problem for this method is not used; it is existing only theoretically. But, on the other hand, it is marked by some remarkable advantages. In the case of the time-proportional method the quotes of depreciations are fixed without considering the quantity of production. The higher the quantity of production, the lower quote of depreciations regarding one unit of production and vice versa. But the quantity of production will doubtlessly be influencing the time of useful life.

From this point of view it would be more advantageous to use the production proportional method, and to say:

It is possible to produce by this machine a certain number of products, let us say X. The value (or the price) of this machine has been, let us say again, 1.000,-,- £.E. Then the depreciation per unit of production would be

$$D = \frac{1.000}{x}$$

But how to consider in such a case the moral wear and tear? How to consider the physical wear and tear caused by some natural conditions?- These are the questions coming into existence and making the production-proportional method useless, at least for the time being!.

And now let us return to our problem: financing of investment. As stated, the separate amounts of depreciation are accumulated or collected and as a total they are forming the fund of depreciation.

In the GDR this fund is formed by the nationally-owned enterprises. It is to be used in accordance with lawful determinations for financing investments; that means, of course, replacing investment or capital repairs.

In the first stage of our development capital repairs were predominating. Now, however, the center is changing to replacing investment more and more. The reason for this changing is the technical development and, especially, the speed of technical development by which the moral wear and tear happens earlier than the physical wear and tear.

3. Extension of fixed assets

As known, any social reproduction must be an expanding one. Therefore, it will not be enough only to ensure the maintenance of fixed assets.

3.1. Planning of investment

Proceeding from that fact that the value expression of our gross national product is:

$$GNP = c + w + p$$

and by:

$$w + p$$

the net product or the national income is represented, we now have to state that this simple equation is containing the basic foundation for planning investment.

Where can we find the needed figures?

i - in the case that interlacing balances are used we find the national gross product as well as the net product there.

ii- otherwise, we have to establish
a- the balance of the gross national product, and
b- the balance of the national income.

And that, in the following way:

Balance of Gross National Product

BRANCH	COMPENSATION FUND		NET PRODUCT
	DEPRECIATIONS	PRODUCTION REQUIREMENTS	
	used up fixed capital	used up materials	paid wages and salaries as well as earned profits
I. Industry			
1. Basic industry			
11. Power			
12. Mining			
.			
.			
2. Metal-working ind.			
21. Heavy engin.			
22. General engin.			
.			
.			
3. Light industry			
31. Woodware			
32. Textile			
4. Sundry ind.			
41. Foodstuffs			
42. Construction.			
II . Handicraft			
III. Agricutlture			
IV . Traffic and Transp.			
V . Trade			
VI . Sundry (productive establishm.)			
TOTAL			

The column "Net product" of this balance must be transferred to another balance, to the so-called "balance of national income."

Balance of National Income

I Active-Formation

1. National income produced		
2. Losses	-	
3. Damage of productive fixed and floating capital	-	
4. Balance of foreign trade	±	
5. National income available		

II Passive-Distribution

A. Accumulation		
1. Investment for the productive sphere	+	
2. Increase of floating capital	+	
3. Increase of state reserves	+	
B. Consumption	+	
1. Consumption of the individual producers	+	
2. Expenditures for social consumption.	+	
3. Expenditures for persons unfit for work	+	
4. Expenditures for workers temporary out of work	+	
5. Expenditures of persons receiving capital income	+	

(Con't ....

6. Expenditures for tasks of the state(incl. defence)	+	
7. Expenditures of social organizations .	+	
8. Expenditures of the banking system.	+	
TOTAL		

When planning investment, we have to take into consideration that investment in not only represented by the expenditures out of the national income.

As said above, we have to distinguish between

i- replacing investment and

ii- new or expanding investment.

Regarding financing there are some differences, too. Replacing investment, that means, the replacement of used up machines, has to be financed by means of depreciations as part of the compansation fund. There are no problems. This part is fixed. Regardless, of course, those problems resulting from the applied method for calculating the use of machines as mentioned above.- Thus, this amount of investment means can be taken out of the accounting of the single enterprises. By a mere addition the amount of the associations, and so forth, can be ascertained.

Finally, we come to the result that planning of means of investment so as to expand the reproduction process is rather a problem of planning that part of the national income which sall be used for these purposes. Planning of investment, therefore, is a problem of distributing national income.

If you have a look at the balance of national income, you will find this distribution.

On principle, national income is used for the sake of accumulation ((Balance of National Income, II. Passive, Distribution, item A) and for the sake of consumption (Balance of National Income, II. Passive, Distribution, item B). Is it can be seen furthermore, both accumulation and consumption a forther subdivided into single elements of the reproduction process.

Accumulation, for instance, is subdivided into:

i - investment for the productive sphere;
that means, new investment expected to extend existing capacities or to shape absolutely new capacities;

ii- increase of floating or working capital;
that means, capital used on a larger scale by using the newly shaped capacities; in other words, increase in stocks of raw materials, fuel, semi-finished or intermediate goods etc. needed for the growth of output,

iii- increase of state and other reserves (physical stocks as well as monetary reserves) for encountering possibly occuring disturbances (resulting from, for instance, natural catastrophes, hold-ups within foreign trade relations etc.). This item, in other words, contains those goods and means not allocated for the current production of the planned period. This part of national income will be an increasing one in accordance with an increasing production.

The other part of the national income, used for the sake of consumption, is divided with respect to the separate parts of consumption; that means, with respect to social and individual consumption. But in connection with the submitted problem it is non of our business now to talk about consumption and their subdivision or distribution.

Thus, we can state and express by mathematic equations:

$$GNP = C + N$$

C = compensation fund, needed for compensating or replacing used up fixed capital and parts of the working capital (raw materials etc.).

N = net product

$N = A + C$

C_o = consumption ($C_o = C_{os} + C_{oi}$)

A = Accumulation

$A = I_n + I_s + R$

I_n = new investment of fixed capital

I_s = increasing stocks of production requirements

R = reserves

Finally we can say:

$$N = (I_n + I_s + R) + (C_{os} + C_{oi})$$

Let us look at the concrete development of these figures in the case of the GDR. According to out Statistical Yearbook we can observe the following development:

Distribution of the National Income (in milliards)

year	total	thereof								
		Accumulation					Consumption			
		total	%	thereof			total	%	thereof	
				I_p	I_{np}	R			C_{os}	C_{oi}
1950	30.30	2.54	8.4	0.94	0.64	0.96	28.06	91.6	2.18	25.88
1955	52.50	6.46	12.3	3.94	1.73	0.79	46.04	87.7	4.25	41.79
1960	73.60	14.06	19.1	9.49	3.09	1.48	59.54	80.9	5.52	54.02
1963	79.70	15.61	19.6	10.52	3.03	2.06	64.09	80.4	6.61	57.48

At it can be seen the development of the distribution of our national income proceeds in favour of the accumulation. Its percentage could be increased from 8.4% to 19.6% from 1950 up to 1963.

But we have to take into consideration that used prices are actual prices and that, conditioned by this fact, the appearance is a deceptive one. Why that?- We have to think of the fact that the movement of prices is a different one regarding the separate markets. In socialist countries we usually find dropping prices on the market of consumer goods. On the market of investment goods, however, conditioned by the fact that the quality of produced investment goods is a steadily increasing one, that the producted machines are perfected more and more, the prices will be increasing, too.

For all these reasons we have, when appraising the development of the national income and especially the development of the distribution of the national income, to distinguish between the physical distribution on the one hand, and the value distribution on the other.

Let us take for granted the following assumption. Proceeding from our GDR-example we have to state (as a mere assumption, of course!) a decrease of prices by 5% on consumer goods market (from 1950 up to 1963); that means, the purchasing power of money regarding consumer goods had been increased by 5.2% while the purchasing power of money on the market of investment goods decreased at the same time by 21.1% conditioned by increasing prices from 100 to 126.7 .

Proceeding from this assumed facts there are some differences between physical distribution of national income and the distribution expressed in value terms.

According to our example the distribution in value terms is like 19.6 to 80.4; i.e., 19.6% of the produced national income is being accumulated and 80.4% can be consumed. When looking at the physical distribution, however, we have to state a distribution like 15.42% to 84.58%; that means only 15.42% of the produced and physical national income can be accumulated, whilst 84.58% is destined to be consumed.

This is essentially to be considered when planning the relative distribution of national income. And in my oppionion, it is the relation of the physical distribution which is bound to be brought to a level like 25 to 75. Otherwise we would let us be deceived regarding the pace of technical development and technical progress.

But back to our main probleum

By ascertaining the national income and especially when ascertaining that part of national income available for the accumulation we ascertain at the same moment the total of means available for investment financing. Of course, not the whole amount can be used for investment. Out of the accumulation, as known, the formation of reserves must be financed, too.

But, anyhow, when ascertaining the national income, that part will be determined available so as to finance investment within the national economy as a whole. This total amount now must be distributed among the single branches of national economy in accordance with the development program erected by prospective plans and bound to be reached by annual plans.

3.2. The distribution of investment funds.

Starting point of any investment planning must be the production program; that means, what should be produced in future and what technical equipment will be necessary for doing so. In other words, the productive capacities available and necessary must be ascertained.

You know that productive capacity means the highest possible volume of production, possible to be reached by a fullfledged expolitation of all the available machines etc. The productive capacity is bigger than the possible and the actual production. This so, because the fullfledged expolitation of all means of production usually in confronted with a range of objective difficulties and appearances. So, among others, the degree of physical wear and tear of the means of production, the difference between optimum and average norms (standards) a.s.o.

In spite of this, the ascertainment of the productive capacity is a necessary one so as to disclose existing reserves of capacities which can be made usefull within the following periods.

The volume of production really reachable within the planning period is called possible capacity utilization. In many cases even this will be higher than the actual production or the actual capacity utilization. This so, for instance, when caused by missing manpower or by difficulties regarding the supply of materials the given productive possibilities cannot be used in a full measure, Since by these differences, between possible utilization and actual capacity, reserves are represented which must without fail be mobilized within the planning period we have to take for granted, when planning the development of fixed assets and production that actual production and possible production are coinciding.

These connexions can be made discernible by the following equations:

C = productive capacity

C_p = possible capacity utilization

c_p = degree of the possible capacity utilization

(measured on the basis of the productive capacity).

P = physical volume of production

from

$$C \; C_p = P$$

and

$$C_p = \frac{C_p}{C} = \frac{P}{C} \quad 1$$

can be derived:

$$P = C \cdot c_p$$

or

$$C = P \cdot \frac{1}{c_p}$$

That means,

the voluem of the necessary capacity depends directly proportional on the volume of the required production and indirectly proportional on the degree of the possible capacity utilization; the higher the degree of the possible capacity utilization (maximum = 1) the lower the atsolute difference between production and productive capacity.

Furthermore, there is resulting from this:

the necessary development of the productive capacity in the course of the planning period depends as well on the projected increase of production as on the increase of the degree of capacity utilisation.

Every increase of the degree of capacity utilization makes possible a slow-down development of the productive capacity as against the production.

Which are now the connections between the development of productive capacities and the development of the equipment of the enterprises?

This question will become perspicious, when splitting up roductive capacity as well as utilization of productive capacity into the single components.

i- working time fund of machines (F) being the basis for calculating the productive capacity, or the actually available working time fund (F_p) .

ii- the shortest possible working time for producing one unit on the strengthen of optimum performances (T), or the possible working time of the basis of standards of used living and dead labour possibly to be attained during the forthcoming year (T_p)

The productive capacity, therefore, can be calculated:

$$C = \frac{F}{T};$$

The possible utilization of capacity:

$$C_a = \frac{F_p}{T_p};$$

and the degree of the possible utilization of capacity will be:

$$C_a = \frac{\frac{F_p}{T_p}}{\frac{F}{T}} \quad ; \text{ or } c_p = \frac{F_p \cdot T}{T_p \cdot F}$$

F as well as T are immediately related to the productive equipments.

a- The working time fund of machines is compossed by the number of useful hours of the equipment; its volume therefore, primarily depends on the volume of available machines:

> The higher the supply of machines, the higher the working time fund, and the higher the capacity.

b- The shortest possible working times for producing one unit of production finally depend on the technical level of the means of production; those workers, attaining optimum performances, make best use of the technical level of the instruments of production. The development of optimum performances, on the other hand, is limited by the instruments of production and by their technical level, if no modernizing measures are carried through.

> The higher the technical level and its utilization, the shorter the working time for producing one unit of production, and the larger the productive capacity.

On the basis of these connections and proceeding from

$$C = \frac{F}{T} = P_o \cdot \frac{1}{c_p}$$

or:

$$F = P \cdot \frac{1}{c_p} \cdot T$$

the necessary working time fund of machines can be ascertained as:

$$F = P\left(\frac{F \cdot TP}{F_p \; T}\right) T; \text{ or after simplifying:}$$

$$F = P \cdot TP \cdot \frac{F}{F_P}$$

4. Concluding Remarks

Summarizing we can state:

The voluem of production, possible to be attained by means of a certain equipment, is destined

- by the size of the working time fund of machines,
- by its utilization, and
- by the technical level of the equipment.

From that there can be inferred that the starting point for planning investment must be an analysis concerning the hitherto reached degree of utilization of the productive equipment and the possible development of this degree.

The better utilization of productive equipments is resulting from

- further improvements of technological procedures, possible to be carried through by means of the available equipment,
- the appropriation of new materials or from a better adaptation of already known materials to the requisites of their working up.

- and that especially- the increase of the productivity of living labour and the improvement of the organization of production.

The real development of the GDR's economic development just is showing that considerable increases in production and productivity as well are possible in many branches without undertaking bigger qualitative or quantitative variations regarding the productive equipments, but only be a better utilization of these equipment.

This analysis of available capacities is-so we can say-the first step or the first stage of investment planning. We have-and that's understood, I think-to look at first: what capacities are available and what capacities are needed for fulfilling our planned production program.

After adjusting capacities and production program-for the prospective, of course-investment planning can be started.

And here, we have to distinguish between:

- preparation of investment and,
- implementation of investment.

Regarding these problems we would like to draw your attention to memorandum No. 295, Dr. M. Engert, Investment Planning Part I and II, and to our forthcoming Memorandum: Practical Problems of Investment Planning and Financing.