JUGOSLAV INSTITUTE OF ECONOMIC RESEARCH

THE OPTIMUM RATE OF INVESTMENT RECONSIDERED

by Branko Horvat

REPRINT № 33
from THE ECONOMIC JOURNAL
September 1965

JUGOSLAV INSTITUTE OF ECONOMIC RESEARCH

THE OPTIMUM RATE OF INVESTMENT RECONSIDERED

by Branko Horvat
senior research associate

REPRINT № 33
from THE ECONOMIC JOURNAL
September 1965

THE OPTIMUM RATE OF INVESTMENT RECONSIDERED

Introduction

A paper on the optimum investment rate is always likely to provoke an animated discussion. My original paper on that subject [1] has been followed by a number of comments, criticisms and further developments,[2] oral and written, in the six years that have passed since it was published in this Journal. It does not seem necessary to take up all the major points made in that discussion, but it may be useful to mention some of them. Besides, in my original argument there was a flaw in reasoning concerning the optimum rate of saving. It was corrected in my later book,[3] but the solution did not yet sound completely satisfactory. In the meantime I believe I have found the correct solution, and it is the purpose of the present paper to describe it.

The Traditional Approach

The traditional approach, still in vogue, makes use of the utility discount by which future consumption is made comparable with present consumption and the solution is derived in terms of finite values. The utility discount may be concerned either with "rational" discounting (due to the falling marginal utility of consumption) or with the former plus "irrational" discounting (due to the deficient telescopic faculty of human beings, to use the Pigovian phrase). The trouble is that in either case the rate of discount cannot be measured.

There is a lot of naïve reasoning around the attempts to derive the rate of utility discount from the rate of interest. The argument presented has been fallacious on two scores:

1. As Keynes—and many before and after him—have shown, the market rate of interest has nothing to do with the social time preference discount rate.[4]

[1] "The Optimum Rate of Investment," Economic Journal, December 1958, 747–67.

[2] I quote some of the more important texts, interesting also because of their different national colours: O. Eckstein, "Capital Theory and Some Theoretical Problems in Development Planning," *American Economic Review*, 1961, pp. 94–5. A. K. Sen, "On Optimising the Rate of Saving," Economic Journal, September 1961, pp. 484–6. A. A. Lazaris, *Οικονομετρική διερεύνησις της σχέσεως μεταξύ αποταμιεύσεως και καταναλώσεως.* (Athens, 1961), pp. 65–71. P. Sulmicki, *Proporcje gospodarcze*, Warsaw, 1962, pp. 110–12. A. Heertje, "On the Optimum Rate of Savings," *Weltwirtschaftliches Archiv*, Band 90/1, 1963, pp. 18–23.

[3] B. Horvat, *Towards an Economic Theory of the Planned Economy* (Jugoslav Institute of Economic Research, Belgrade), Chapter 10.

[4] Cf., *e.g.*, M. S. Feldstein, "The Social Time Preference Discount Rate in Cost Benefit Analysis," Economic Journal, June 1964, pp. 360–79.

2. Even if we had an ideal economic system with no market imperfections and with other obstacles (such as the lack of knowledge of individual intentions) removed, the observable rate of interest could not determine the correct amount of new investment in a dynamic economy. With such a positive interest rate, investment could still be too large. This follows from the fact that: (*a*) the marginal efficiency of investment (in a fixed time period) is falling; (*b*) the interest rate is determined by *mei* of *new* investment which is economically superior; and (*c*) *mei* of the entire economy may be negative, while *mei* of the investing firms is large and positive and the average efficiency of investment of all firms is large and positive.[1]

The traditional utility approach implies that we choose what we prefer to choose, which is patently incorrect, since the circumstances in which choices are being made, and which are beyond the control of individual consumers and producers, are not taken into account. However, even if this objection were neglected, there is in principle no possibility of measuring time preferences. Thus, the traditional approach ends with the conclusion that we *should* choose what we prefer, which is a normative tautology that gives us no clue for the economic policy.

The Criticism of the Solution Suggested in the 1958 Paper

In my paper the optimum rate of investment was determined by zero social marginal efficiency of investment. This suggestion had been criticised in two ways. First, it was said that this is an authoritarian approach imposing great hardships on the population, since *mei* is zero only when investment is very high—and consequently consumption is very low. It is frequently implied that consumption is not only low, but is remaining stagnant or is declining so as to enable investment to grow. This belief is derived from the observation that even in periods of unusually high investment rates the returns to *individual* investing firms were still positive and quite large.

The criticism is theoretically invalid because it confuses individual and social *mei*, which was explained above. It is also empirically invalid. One may quote at least some countries—*e.g.*, Jugoslavia, Japan, the Soviet Union —whose economies operate close to the point of social *mei* = 0, and at some time seem even to have surpassed that point, but where the share of investment in national income is not at all close to 100%; it lies rather between 25 and 35%. As far as consumption or real wages are concerned, they are rising in Jugoslavia and Japan faster than anywhere else in the world.

The second criticism has been more subtle. It has been understood that the limited absorptive capacity of the economy drives social *mei* very soon to zero. But, it has been argued, *mei* = 0 means that at that point investing

[1] For a more detailed discussion of the "allocation rate of interest" and "the investment determination rate of interest" see my *Towards an Economic Theory of the Planned Economy*, Chapter 4.

individuals get no rewards in increments of production—*a fortiori* no increments in consumption, which is always smaller than total output. Thus investment should be stopped some time before *mei* = 0. However, it is not known at which point, and we are back to the agnosticism of the utility approach.

If we may assume that the production function of the economy resembles that of an individual firm, then close to the point of full-capacity operation the *mei* curve will be falling steeply. In this case the points *mei* = 0 and "*mei* close to zero" are so near to each other that empirically they cannot be distinguished. If empirical distinction is impossible theoretical distinction has no sense either. That was briefly the essence of the corrected solution. However, it can be further improved.

The Assumptions of an Empirically Relevant Solution

If one wishes to derive a solution relevant for economic policy one has to start from some more or less realistic assumptions. The more realistic the assumptions are, the more valuable is the solution likely to be. But just because it is empirically relevant, the solution cannot be logically necessary (*i.e.*, it does not eliminate the possibility of other solutions), which is a property of tautologies only. This warning seems necessary in order to avoid the frequent confusion between an empirically relevant economic theory and a theory which consists of a set of tautologies. Our assumptions are as follows:

1. With respect to which period of time does an individual maximise the utility of his consumption? The answer to this question may be a twofold one: (*a*) with respect to whichever period it pleases him, or (*b*) with respect to his life-span. The former answer does not help us very much; the latter is quantitatively determined and seems to describe a rational choice. For any other choice would imply a lesser total amount of consumption, and therefore a lesser total amount of utility. Now in reality some periods of life may be more demanding than others (and, of course, we do not know exactly how long we shall be living). We may admit all that and only assume that deviations in the needs of various individuals compensate each other, so that, on the average, the society behaves so as to maximise the consumption of each generation.

2. We assume a democratic community of consumers which implies that each consumer has one vote. In modern communities the average expectancy of life of individuals alive at any particular moment of time will be somewhere between thirty and fifty years. That is at the same time the generation's life-span with respect to which consumption has to be maximised.

3. It is a fact that the investment absorptive capacity of any economy is limited. Therefore, the marginal efficiency of investment falls as investment per unit of time increases. It falls less rapidly if the rate of technological progress is higher, but it falls in any case.

4. It is a fact that the uncertainty of the outcomes of investment decisions increases with the length of the planning horizon. The long-term programmes of development worked out so far rarely go beyond the horizon of twenty years, and practically never beyond twenty-five years. This practice implies a belief that future events become so uncertain after twenty to twenty-five years that the programming or forecasting of these events cannot possibly improve present-day investment decisions.

5. It follows that the relevant time horizon for output maximisation is twenty to twenty-five years. Consequently, the marginal efficiency of investment must be driven to zero with respect to this time period.

6. Since the life-span of every generation is considerably longer than its planning horizon, every generation maximises not only output but, very likely, consumption also. Within twenty to twenty-five years consumption is not maximised, because a part of output is used for investment which is not brought to fruition within that period. With investment maturation period short enough, that investment will generate consumer goods—either directly or indirectly through further investment—within the remaining years of the generation's life-span. Thus, every generation will maximise its total consumption, if it is taken into account that every new-born baby pushes the end point of the generation's life-span further ahead.

Conclusion

The characteristics of the real world are such that output maximisation decisions coincide with consumption maximisation decisions if we agree that each generation's consumption maximisation is the proper target of a national investment policy. Of course, there is no logical necessity that we agree on that. But the target and the assumptions involved seem to be rather realistic, certainly considerably more realistic than the assumptions generally found in economic theorising.

It follows that the optimum rate of investment is determined by the point on the investment line where social marginal efficiency of investment with respect to the period of twenty to twenty-five years becomes zero. Such an investment policy in normal circumstances cannot imply a reduction of consumption, not even temporarily.[1] Once put into full operation, it produces a share of investment in national income of about 35% and an annual rate of growth of output and consumption of about 10%, if recent experience and national income statistics may be trusted.

[1] Economic Journal, 1958, pp. 764–6.

The point *mei* = 0 cannot be determined directly and with the rigour of natural sciences, since repeated experiments under unchanged conditions cannot be performed in economics. However, this point can be pretty closely approximated by indirect methods, *i.e.*, by observing changes in gestation periods of individual investment projects, by examining changes in the average and marginal capital coefficients of total and new investment, by comparing the national performance with those of other countries, etc. One might not be particularly satisfied with the precision of such methods, but are measuring errors in natural sciences substantially different?

BRANKO HORVAT

Jugoslav Institute of Economic Research,
Belgrade

5. B. Horvat and V. Rašković, "Workers' Management in Yugoslavia: A Comment", *The Journal of Political Economy*, April 1959, 194–198.

6. B. Horvat, "Drei Definitionen des Sozialprodukts", *Konjukturpolitik*, Erstes Heft, 1960. 27–40.

7. B. Horvat, "A Restatement of a Simple Planning Model with some Examples from Yugoslav Economy", *Sankhya*, Series B, Vol. 23, Parts 1, 2, 3, 29–48.

8. B. Horvat, "The Characteristics of Yugoslav Economic Development", *Socialist Thought and Practice*, 1/1961, 1–15.

9. B. Horvat, "Caractéristiques du developpement de l' économie Yougoslave", Questions actuelles du socialisme, 60/1961, 89–105.

10. B. Horvat, "The Conceptual Background of Social Product, *Income and Wealth*, Series IX (1961) 234–252.

11. B. Horvat, "Radna vrijednost proizvodnje jugoslavenske poljoprivrede i industrije", *Ekonomist*, 4/1961, 512–523.

12. B. Horvat, "Raspodjela prema radu medju kolektivima", *Naša stvarnost*, 1/1962, 52–66.

13. B. Ivanović, "Primena metoda I–odstupanja u problemima odredjivanja stepena ekonomske razvijenosti", *Statistička revija*, 2/1957, 125–154, 1–2/1959. 26–42, 1/1962. 1–14, *Ekonomist*, 2/1961, 182–205.

14. B. Horvat, "Methodological Problems in Long–Term Economic Development Programming", *Industrialization and Productivity*, UN. Bulletin, 5/1962, 37–51.

15. B. Horvat, "Ekonomska nauka i narodna privreda", *Naša stvarnost*, 7–8/1962, 48–67.

16. B. Ivanović, "The estimation of the two dimensional distributions of a statistical set, based on the marginal distributions of its strata", *Statistica Neerlandica*, 1/1963, 13–23.

17. B. Horvat, "Naftni kartel u predratnoj Jugoslaviji", *Ekonomski anali*, 12–13 (1962), 205–222.

18. B. Savić, "Problemi regionalne lične potrošnje u Jugoslaviji", *Ekonomski anali*, 12–13 (1962) 97–116.

19. D. Nikolić, "Konstrukcija jednog ekonometrijskog modela za razvoj industrije", *Ekonomist*, 2/1963, 388–419.

20. M. Živković, "Matematika u sovjetskoj ekonomiji", *Naša stvarnost*, 7–8/1963. 126–135.

21. V. Tričković, "Lična potrošnja kao kriterij proizvodne politike", *Ekonomist*, 1–2/1958.

22. V. Tričković, "Tendencije potrošnje hrane u svetlosti savremenih izučavanja", *Ekonomist*, 1/1960, 41–71.

23. V. Matejić, "Suština i metode operacionih istraživanja", *Statistička revija*, 1/1963, 1–18.

24. B. Horvat, "Quelques aspects de la planification economique nationale" *Les Annales de l'economie collective*, 2–3/1963.

25. B. Savić, "Nivo ishrane seoskog stanovništva Srbije po poljoprivrednim rejonima", *Hrana i ishrana*, IV 1963.

26. B. Horvat, "Metodološki problemi dugoročnog programiranja privrednog–razvoja", *Ekonomski pregled*, 10–11/1962.

27. V. Medenica i V. Tričković, "Materijalni i novčani tokovi i njihov uticaj na cene i tržište", *Ekonomski pregled*, 10–12/1963.

28. B. Marendić, "Financiranje djelatnosti visokog školstva SRH u periodu 1960–63. godine", *Ekonomski pregled*, 10–12/1963.

29. B. Horvat, "Samoupravljanje, centralizam i planiranje", *Pregled*, 5/1964. 413–444.

30. B. Horvat, "Dva modela efekata formiranja zaliha na kretanje društvenog proizvoda", *Ekonomski pregled*, 7/1964., 407–415.

31. B. Horvat, "Ekonomski smisao indeksa proizvodnje i cijena", *Statistička revija*, 1/1964., 7–14.

32. B. Ivanović, "Statistički rasporedi sa aleatornim parametrima", *Statistička revija, 1/1964*, 1–6.

IV Posebna izdanja

1. Branko Horvat, Towards a Theory of Planned Economy.

2. Olga Tomić, Priprema rukopisa naučnih i stručnih radova, priručnik za autore.