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TIBOR SCITOVSKY

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PAPERS ON WELFARE AND GROWTH

Tibor Scitovsky

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PREFACE

Of the papers assembled in this volume, fifteen have been published before, two have been given as lectures but not previously printed. They range in time over a period of more than twenty years; but all of them exemplify the approach of exploring the logical implications of a few simple and plausible postulates. Rereading them with a view to their inclusion in this volume, I was pleased with my progress towards shorter and simpler ways of saying what I had to say and struck by the recurrence of a relatively few ideas. The latter is a sobering thought for an author but also the main justification for publishing this volume.

After all, an economist is not a man of letters, with devotees who want to read all he has written, because they like his style, or his psychological insight, or the world he creates. People who read economics do so for the subject's not the author's sake. If there is a reason, nevertheless, for assembling in one volume the writings of a single economist, it is that they complement each other, carry further the same thought, explore different implications of the same postulate, or round out the treatment of the same subject. The essays in this volume deal with two subjects; but these are broad and broadly interpreted. There are much closer ties between the essays of the kind just mentioned. The first and second are of a piece, both try to reconcile Keynes's employment and interest theory with the classical theory of interest and capital accumulation. Essays three to six also form a group; three and four deal with different subjects but these are pulled together in five and developed a little further in six. Eleven and twelve again belong together, since both deal with the economic implications of imperfect knowledge; but this to some extent is the subject also of the third and fourteenth essays. Again, fourteen and fifteen continue the argument first stated in thirteen; but it is thirteen, sixteen and to some extent five that explore different implications of the same event: uneven economic progress. Seven, eight and nine form a group only as exercises in economic geometry; a more important common feature, which also ties them together with most of the other essays in this volume, is that they all deal with exceptions, flaws and difficulties in that

best of all possible worlds, the competitive system.

Apart from the correction of minor printer's and author's errors, the essays previously published have been reprinted unchanged, with two exceptions. The thirteenth essay was originally published in the *Yale Review* whose editorial policy precludes footnotes and limits length. In the present volume the footnotes and omitted passages have been restored. In the original version of the eighth essay, the main argument was qualified and weakened in a way that has since been shown to have been unnecessary. The argument has been simplified and the qualifications omitted in the present version. Also, in this and the preceeding paper, footnotes have been added to draw the reader's attention to subsequent modifications or corrections of my original argument.

Thanks for letting me reprint these essays are due to my wife, with whom I wrote and published the thirteenth paper, and to Macmillan & Co., the Stanford University Press, and the editors of the *American Economic Review*, *Economica*, the *Journal of Political Economy*, the *Quarterly Journal of Economics*, the *Review of Economic Studies*, and the *Yale Review*. I am indebted to Miss Ruth Westheimer for preparing the index.

TIBOR SCITOVSKY

Berkeley, California

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A

ECONOMIC GROWTH AND
RELATED PROBLEMS

Chapter I

A STUDY OF INTEREST AND CAPITAL¹

1940

The aim of this paper is to study the determination and interdependence of the rates of interest yielded by different kinds of securities. The complexity of the subject makes it necessary to divide it into three parts. In Part I we make an attempt to determine the price and rate of output of securities in a general way; and as securities are a commodity of which large stocks are always extant, we shall begin with a short discussion on the general theory of supply and demand of commodities of which large stocks are usually held, and so derive the price of securities in analogy with ordinary supply and demand analysis. It will be seen that in this way we arrive at a theory of interest rates which is fundamentally a generalization of Mr Keynes's liquidity preference theory for any number of securities. In Part II we shall analyse the several criteria according to which securities differ from each other. This will lead us to a more complete understanding of the interdependence of different rates of interest and to a new explanation of the relative movements of long- and short-term rates. In Part III we shall restate the theory in a slightly different form and compare it with the 'real' theory of interest and capital.

It is possible to conceive of the rate of interest as being determined by the supply and demand either of capital goods, or of securities, or of money. In this paper we shall always think of it as being determined in the market for securities, and to make the analogy with the supply and demand analysis of

¹ The writing of this paper was made possible by a special grant from the Leon Bequest Fund. I am very much indebted to Professor O. Lange and Mr G. Jászi for reading the manuscript and making valuable suggestions.

consumers' commodities easier, we shall have to think in terms of security prices as well as in terms of yields. This may be a little inconvenient at first because of the inverse relationship between the price and yield of a security, but I hope that the advantage of this approach will outweigh the additional trouble. The 'physical' quantity of securities will be measured by their nominal value.

In Parts I and II we shall deal generally with any number of different kinds of securities. Money is just one of these. Securities differ from each other not because the capital goods they represent are physically heterogeneous, but according to their promised yield, life-time and risk of default. For goods must always be differentiated from the buyers' point of view, and yield, life-time and riskiness are the only characteristics of a security that matter to the investor. For example, beet and cane sugar, or natural and artificial rubber, are identical commodities if consumers do not or cannot distinguish between them; similarly, two securities are homogeneous whatever the nature of the capital goods they stand for *if* they are equally safe and offer the same income for the same period.¹ The meaning of these characteristics will be discussed in detail in Part II. Until then we shall simply have to accept the fact that securities differ from each other in several ways, just as consumers' goods differ in taste, colour, consistency and a hundred other respects.

We shall have to make two simplifying assumptions, to be retained throughout this article. The first is the exclusion of ordinary shares and all other non-fixed-interest-bearing securities. This is admittedly a limitation. I believe that the co-existence of stocks and shares has some very important and interesting consequences, but I also think that this problem is additional to ours, in the sense that its solution would supplement rather than distort our results, so that its discussion may be reserved for some future date. For the time being our analysis will be considerably simplified by the absence of all non-fixed-interest-bearing securities.

Our second assumption is rigid money wages within the short period, in the sense that money wages in any short period are independent of changes *in the same* short period. Dropping

¹ We abstract from the problem of shifts in consumers' demand from the services of one capital good to that of another.

this assumption would lead to interesting and rather unexpected results,¹ but the discussion of such problems is beyond the scope of this paper. Besides, I believe the assumption to be a realistic one.

I

In the supply and demand analysis of an ordinary consumers' good, supply is represented by the flow of production, demand by the flow of consumers' demand—both functions of price—and the quality of these two is said to determine the equilibrium price and flow of output. This is a legitimate approach to reality in the case of many commodities which cannot be stored or the stocks of which are small and independent of price—depending only on storage costs and the rate of turnover. When, however, the volume of stocks is a function of price and is large relatively to current production,² then supply will no longer be equivalent to production, but will—at certain prices—be temporarily augmented by a reduction, or temporarily reduced by an accumulation, of stocks; and this factor may become so important relatively to current production as to render the above picture of the determination of short-period equilibrium incorrect and misleading.

The reason for a general theory of stocks being as yet non-existent seems to lie in the fact that the desire to hold stocks is usually a very complicated function of price, involving derivatives with respect to time and relative prices at different dates.³ For the following argument, however, we shall make the simple assumption that the form of this function is exactly similar to an ordinary demand function, i.e. that the desire to hold stocks is a diminishing function of price. This will be

¹ These will be discussed in the next essay.

² The *volume* of stocks and the *flow* of production have different dimensions and are therefore incomparable quantities. We can, however, compare the volume of stocks with the volume of production per unit of time. The choice of this unit is not entirely arbitrary. To be useful it must correspond to the Marshallian short period to which most economic analysis refers. While few economists have assigned a definite length to the short period, the order of magnitude we think of when talking about short-period adjustment and short-period equilibrium seems to be about half a year. This assumption will be made use of at a later stage.

³ Since the writing of this paper, however, there has appeared a very important article on the subject by Mr N. Kaldor, 'Speculation and Economic Stability', in the October 1939 number of *The Review of Economic Studies*.

shown to be true of the demand for holding securities, and in the short run it also represents—at any rate approximately—speculative demand for commodity stocks whenever speculation is based on the notion of normality.

Let us consider an equilibrium situation where price is such that current production equals current consumption and the volume of stocks corresponds to the volume demanded by 'stockholders' at that price. Then assume a shift in consumers' demand. In the absence of stocks there would be an immediate change in price, followed by the adjustment of production, and a new equilibrium would be established at the new point of intersection of the two curves. In the presence of stocks, however, the situation will be different, because the establishment of the new equilibrium will be retarded by the adjustment of the volume of stocks to the new price. So a diminished consumption demand (leftward or downward shift of the consumption curve) will be temporarily supplemented by the demand of stockholders who want to increase their stocks as price falls¹—thereby checking the fall in price and the consequent adjustment of production.² Similarly, an increased consumption demand will be temporarily satisfied—and the rise in price and production checked—by the dishoarding of stocks. The nature of this retardation can best be described by saying that the existence of stocks sets a limit to the time-rate at which price can change, the limit depending on the size of stocks and the price-elasticity of stockholding. For to each price change there corresponds a certain quantity of stocks which must be released (if price rises) or accumulated (if it falls) before the new equilibrium price can be established; and given the price change, this will be the greater the more elastic the demand for stockholding and the greater the total quantity of stocks. The time needed for the adjustment—and for the new equilibrium to be established—will be the longer the greater is this quantity in relation to the gap between current production and consumption opened up by the initial change in data (and not immediately closed by the requisite

¹ We have assumed above (see end of previous paragraph) that speculation in commodity stocks is based on the notion of a normal and 'just' price which is expected to return and deviations from which are believed to be temporary. In other words, we have assumed the elasticity of expectations to be zero.

² Throughout this paper we shall assume production to be price-determined.

change in price), since—to put it crudely—stocks can only be released or accumulated through this gap. If this ratio is very large, because, for example, stocks are very large, then the adjustment of price will proceed so slowly that we can say the influence on price of primary changes in production or consumption is negligible in the short run, and it will be more correct to say that price depends on the quantity of stocks than that it is determined by the intersection of the production and consumption curves.

If the existence of stocks keeps the price of a commodity temporarily at a level where current production and consumption are not equal, this disparity will cause a change in the level of income which may—if the commodity is important and its stocks large—equate its production and consumption before price has had time to equate them. The way in which this happens has often been described and is known as the theory of the multiplier. A disparity in any particular industry between receipts and income paid out causes a similar but opposite disparity in the rest of the economy. This will disappoint (favourably or unfavourably) the expectations of entrepreneurs in those industries and induce them to change their rate of production and with it the rate at which they pay out income to the owners of the factors of production. This process is cumulative and will continue while the disequilibrium in the first industry subsists, i.e. until current demand is equated to current production, partly by the change in incomes causing a change in demand, partly—to the extent that stocks have adjusted themselves in the meantime—by the change in price.

For a further elucidation of the above argument let us take a specific example. Imagine a community which always spends all its income and has a margin of unemployed resources.¹ We further assume that there is speculation in one of the staple commodities consumed by this society—let us call it wheat—and that the average value of speculative wheat stocks is large relatively to the value of all other speculative stocks taken together. Now imagine a shift in consumers' demand away from wheat. The prices of all the goods which now are demanded more urgently will rise, causing an increased production and a higher level of employment in the industries

¹ The compatibility of these two assumptions will appear presently.

affected. The price of wheat would fall and cause an offsetting diminution of production and employment in the wheat industry *if it were not for the existence of speculation*. But when the price of wheat begins to fall, people, who believe that the former price of wheat was 'normal' and therefore expect it to return after a while, will find it profitable to hoard wheat, thereby checking the fall in its price and production. So we get a net increase in employment in the community, and corresponding to it a rise in the level of incomes. This will increase consumers' demand for most commodities. The increased demand for goods other than wheat will cause employment and incomes to rise yet further; the increased demand for wheat will check and ultimately stop the accumulation of wheat stocks. Short-period equilibrium will be re-established when incomes have risen sufficiently to make the consumption of wheat again equal to its production *in spite of the change in tastes*. This will probably happen at a wheat price somewhat below the original, corresponding to the now greater wheat stocks. It should be obvious that the argument for a shift in demand towards wheat is perfectly symmetrical.

All this, of course, will happen only if prices in those other industries are flexible. If they were as rigid as the price of wheat (e.g. because of the existence of equally large stocks), then the disequilibrium between receipts and outgoings in the wheat industry caused by the adjustment of its stocks would merely cause an exactly offsetting adjustment of stocks in all the other industries, without inducing entrepreneurs to any action. Thus the degree to which the equality between the current demand and current production of any particular commodity is brought about by a change in the level of income rather than by a change in its price, depends on the value of its stocks relatively to the value of all other stocks taken together. The greater the relative value of its stocks, the more sticky will be its price, and the more quickly will the level of income adjust itself through changes in the activity of other industries.

The reader may object here that speculators will not keep stocks at their unnaturally high (or low) level indefinitely; in fact, that speculators' demand for stocks cannot be represented by a simple diminishing function of price. He will be perfectly right. The change in the level of income described above is

only a temporary effect of the shift in consumers' tastes, and the whole argument may be taken as an illustration of the harmful destabilizing nature of speculation. But it is also an illustration by analogy of the *permanent* effect on the level of income of changes in the propensity to consume. For it will be shown on p. 20 that unlike commodity stocks, the stocks of securities *are* simple decreasing functions of price, so that as regards the latter it will be true to say that they determine security prices while the level of income equates the flow of saving ('current consumption') to the flow of investment. This is the more true because securities are the commodity with large stocks *par excellence*. Another respect in which securities differ from other goods is that the current demand for them represents not consumption, but what may be called *normal* additions to stock. It will become apparent that this fact cannot affect the argument, but it will make the exposition easier if we assume for the moment that new securities are bought out of new savings for an entirely different purpose from that which induces people to hold the stock of 'secondhand' securities. (In Part III the same argument will be repeated without this analytical dodge.) In this way we can split up the individual's economic problem into two parts: firstly he has to decide in what forms to hold his already accumulated stock of wealth, secondly he has to allocate his flow of income between the flows of different kinds of consumers' goods and securities.

The second of these, to be dealt with later, is the familiar problem of the subjective theory of demand and is generally considered to be solved. The first is exactly analogous to the second. Each security promises a certain yield, distributed over time in a certain way, and each promise inspires a certain degree of confidence.¹ The individual aims at the highest possible average yield, subject to the limitations of his wealth and preference for safety and liquidity. At each constellation of market prices, which to him are given, there exists an optimum selection of securities which, in his opinion, involves the exact amount of risk and illiquidity he is willing to bear and at the same time maximizes his average yield.

From the community's point of view the quantity and not

¹ While the yield is an objective quantity, the degree of confidence depends on subjective valuation.

the price of each security is given in the short period, and these, together with the individuals' preference scales and the level of income determine security prices.¹ Just as in the general theory of demand for consumers' goods, it can be shown that, neglecting capital-gain and capital-loss effects (these correspond to the income effects of the theory of consumers' demand), the price of each security is a diminishing function of its quantity, while an increase in the quantity of another security will lower or raise its price according as the securities are substitutes or complements.

The effects of variations in the quantity of money need special consideration. They can be analysed most easily if we think of the price of a security as the ratio of its marginal utility to the marginal utility of money, the *numéraire*. Then an increase in the quantity of money will lower the marginal utility of money, i.e. lower the value of the denominator in the expression for price, and raise or lower the value of the numerator according as the security in question is a complement or substitute of money. So an increase in the quantity of money will cause *all* security prices to rise, those of complements most and those of substitutes least. In the limiting case the price of a perfect substitute for money would remain unchanged, because both the denominator and numerator of the expression for its price would fall in the same proportion.

This is little more than a generalization of Mr Keynes's liquidity preference theory of the rate of interest. In the special case when there are only securities of one kind besides money, *the* rate of interest is an index of their relative prices which is a function of their relative quantities. The rate of interest, therefore, will rise equally whether the quantity of securities is increased relatively to that of money, or the quantity of money is diminished relatively to that of securities. For short-period analysis it is better to think of the rate of interest as a function of the quantity of money, simply because a change in the quantity of money is easily conceivable within

¹ The level of income must be given because money not only satisfies preference for safety and liquidity, it is also demanded for transaction purposes, and this demand is an increasing function of income and the level of employment. Hence an increase in employment is equivalent to a diminution of the quantity of money—available to the investor.

the short period while a significant change in the quantity of other securities is impossible by definition.¹

When we distinguish between different kinds of securities, the crude picture of *the* rate of interest as the demand price of money breaks down because of the multiplicity of interest rates. But it still remains true that the quantity of each kind of capital and hence each kind of security is practically fixed within the short period—securities not representing physical capital (war loans), however, form an important exception—and only the quantity of money is variable. We can say, therefore, that while the prices of different kinds of securities are determined by their quantities and individuals' preference scales, in the short run the quantity of securities representing 'real' capital is fixed by the technical limitations of the rate at which they can be consumed, added to or converted into other kinds of capital; so that changes in their prices and yields can only be accounted for by changes in preference scales and in the quantity of money and incomes.²

The above argument contains an explanation of the exact relationship between Mr Keynes's theory of interest and the so-called classical theory. The classical theory never distinguished between the stock of capital and the flow of saving

¹ The concept of the short period originally arose in connection with partial equilibrium analysis. As the equipment of an individual firm can only be changed discontinuously, partial adjustment with constant equipment can be analysed in the intervals between two discontinuous changes in equipment. This was called short-period analysis, and the minimum length of this interval: that period of time which is too short for the entrepreneur to adjust his equipment in response to changes in price, was defined by Marshall as the short period. Its length, therefore, was determined by the gestation period of equipment, which we have assumed above (footnote 2, p. 15) to be of the order of magnitude of half a year in industry. When we use the concept of the short period in total analysis we tacitly redefine it to mean a period sufficiently short to make changes in total equipment (which are continuous!) negligible. Statistics of the stock of capital and of current investment suggest that we may legitimately retain the order of length of the short period of partial analysis also when dealing with total quantities. The national capital in England and the USA has been estimated at about six times the annual national income, i.e. twelve times the national income of our short period; while net investment and depreciation of equipment are both about (a maximum of) 12 per cent of the national income. So the maximum increase and the maximum possible decrease of the stock of capital is not more than approximately 1 per cent during a short period of six months.

² For the problem arising from the fact that securities are not issued *pari passu* with the progress of the investment they represent, see J. M. Keynes: 'The "ex ante" theory of investment', *Economic Journal*, vol. 47, pp. 663-4.

in this context. If, therefore, we interpret it as meaning that the rate of interest is a function of the stock of securities, it is identical with Mr Keynes's theory, though for precision's sake one should say 'stock of securities relatively to the quantity of money'.¹ If, on the other hand, it meant that the rate of interest is determined—analogueously with the price of a non-storable commodity—by the equality of current production (investment) and consumption (saving), then it is not identical with the liquidity preference theory; moreover it is also wrong, being based on a false analogy.² We have seen so far how security prices are determined in the market where capitalists choose the form in which to hold their wealth—the quantity of securities and the level of income being given. With the exception of money and other securities representing non-tangible capital, the quantity of securities is technically fixed in the short period, but there remains the determination of the level of income by (current) supply conditions and the allocation of the flow of income between different uses. We are not here concerned with the determination of the relative prices of consumers' goods, nor with the effect on income of a shift in demand from one consumers' good to another. As to the relative rates at which different securities and different kinds of capital goods are produced, they, as we know, do not affect security prices directly in the short run,³ while for the determination of income and employment only total investment (i.e. the horizontal sum of all security production curves) and total saving are of importance. So we can concentrate on the relation between investment and saving.

We shall assume that the rate of supply of securities, or, shortly, investment activity, is an increasing function of the level of security prices (diminishing function of the structure

¹ At the same time Mr Keynes cannot be charged with a lack of precision when he does not mention the stock of securities. For he is primarily concerned with the short period within which that stock is constant.

² We do not propose to criticize here all those writers who have asserted that the Keynesian theory of interest is identical with the classical theory. But the reader's attention may be drawn to an article by Mr Peter Bauer, 'Die allgemeine Theorie von Keynes und ihre Kritiker', *Zeitschr. für National-ökonomie*, vol. 9, p. 99, who criticizes Professor Hicks for not noticing that in the liquidity preference theory the rate of interest equates the supply and demand of a *stock*, while in the classical theory it equates the supply and demand of a *flow*.

³ In the long run they do affect relative prices by determining the relative quantity of the stocks of different securities.

of interest rates). This seems plausible enough, but is by no means obvious, nor always true, and will be justified in part three. Until then it must be regarded as an arbitrary assumption. Saving is an increasing function of employment and income. Whether it also depends on the rate of interest is an open question, but makes little difference to our argument. For simplicity's sake we shall assume that it does not.

We have seen that the secondhand market links the structure of security prices to the level of income.¹ Hence the level of income determines, *via* the secondhand market, the level of investment activity; and it also determines directly (and indirectly if saving is also a function of interest rates) the flow of saving. When the level of income is such that these two are equal we have short-period equilibrium. What happens if they are unequal, if, for example, investment exceeds saving?² This, as we know from page 17, causes receipts in consumption-good industries to exceed expected receipts (costs), which will induce entrepreneurs to increase current production and with it the level of employment and income. The rise in incomes increases the flow of savings, but—by increasing the transaction demand for money—it also lowers the level of security prices. This latter will have the effect of checking investment activity, and with investment falling and saving rising equilibrium will be established.

So we see that an excess of investment over saving will not only raise the level of income until savings have caught up with investment; it will also lower security prices. This latter effect, however, is brought about not directly by the supply of securities exceeding the demand for them, but indirectly, through increasing employment, raising the transaction demand for money and thereby diminishing the quantity of money available for purposes of investment. Whether changes in the rate of saving or in the level of security prices are more important in bringing about short-period equilibrium is a

¹ Because the level of income determines the quantity of money available for purposes of investment.

² It must be borne in mind that while saving may be unequal to investment the supply and demand of securities will always be equal—even in an 'ex ante' sense—because the gap between saving and investment is filled in either by holders of secondhand securities who at that price find it profitable to go into money, or by holders of money who find it profitable to swap money for securities, as the case may be.

question of fact. But the great fluctuations in employment and the surprising stability of the gilt-edged rate suggest an answer to it.

II

It has been shown on pp. 19-20 how, given the quantity of different kinds of securities, the price of each of them is determined by the individuals' preference scales. We now proceed to investigate more closely the factors that account for the differences between different securities and cause their prices and yields to be different, and to move differently. It has already been mentioned that from the investor's point of view—which alone is relevant for the determination of price and yield—securities differ according to nominal yield, life-time and risk of default. Nominal yield and life-time are both characteristics of the time-shape of a security and will, therefore, be treated together. In fact, it is often said that a lower nominal yield (coupon rate) is equivalent to a longer life-time.¹ While this is only true approximately, it is a convenient simplification which we propose to adopt, thereby reducing the number of our criteria to two: currency and risk of default. Differences in currency cause differences in yield and price again for two reasons: first, because expected future interest rates vary over time, and secondly, because these expectations are not certain. We shall consider variations in expected future rates first, and assume for the moment that all securities are equally risky both as regards the danger of default and that of changing market valuations.

Having thus excluded the problems of riskiness and of the uncertainty of expectations, it is clear that the demand for different kinds of securities will always be such as to equalize their true yields over any given period of time. In other words, security prices must so adjust themselves as to make investment in all types of securities equally profitable (yield the same interest) whatever length of time one invests for. It should also be obvious that this does not necessarily imply that the market rate of interest on every security must always be equal. For the market rate of a security expresses the rate of interest it

¹ Cf. F. R. Macaulay: *Some Theoretical Problems suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856*, 1938, p. 45.

will yield on its present value if held to maturity.¹ Its yield for a shorter period of time depends on the relation between its market value at the beginning and at the end of that period, and may be greater or smaller than its market rate. If then, given the quantities of different securities, demand conditions are such as to make the yield of a given security (say) 4 per cent, and the yield of another security with a longer currency 5 per cent, this implies that the market expects the yield of the more durable security to rise by the date of maturity of the first security to such a level as to make its true yield over the life-time of the first security also 4 per cent. It follows from this argument that the present market rates of securities of different currency express the expected future course of the market rate of any given security, and that differences in the amplitude of the fluctuations of different market rates can be accounted for by the expected future course of security yields.² In the following we shall try to explain the divergence of present market rates from the gilt-edged rate in terms of the future course of gilt-edged rates. Theoretically we could have chosen the future yields of any type of security, but in practice the horizon of expectations is likely to stretch farthest in relation to gilt-edged securities.

The way in which future expectations are based on past experience can be conveniently expressed in terms of Professor Hicks's elasticity of expectations. The simplest and most important case is that of unit elasticity, when people expect present rates to continue unchanged in the future. It is easy to see without further explanation that if the quantity of securities and demand conditions are such as to make the present gilt-edged rate 4 per cent, and people expect it to remain 4 per cent also in the future, then the true yield of gilt-edged securities will be 4 per cent over any period of time. Consequently the market rate of *all* securities (i.e. securities of all life-times) must also be 4 per cent. So we can establish our first rule: if the elasticity of yield expectations is unity, security prices must be such and must move in such a way as to make

¹ We define the market rate as that rate of discount which will make the discounted sum of all future payments promised by a security equal to its present market value.

² A somewhat similar argument can be found in Chapter 11 of Professor J. R. Hicks' *Value and Capital*, 1939, where it is also proved that this kind of argument is not circular.

the *market rate* of all securities always equal. We next consider the case of an elasticity of expectations smaller than one. Assume as an example that a change in data causes the gilt-edged rate to rise from 4 per cent to 5 per cent, but people expect it to return in the near future to either 4 per cent or to some intermediate level between 4 per cent and 5 per cent. In other words, people expect an appreciation in the value of gilt-edged securities, and if anybody buys them now and sells after their yield has again fallen, he will make a capital gain, and will have earned interest over that period at a rate higher than the gilt-edged rate of the date of purchase by the capital appreciation. So if the yield on shorter-term securities is to be the same as the true yield on gilt-edged over the life-time of the short-term securities, their market rates must rise more than the gilt-edged rate has risen, and when the latter falls their rate will fall by more. In the limiting case of zero elasticity of expectations the market rates of securities with a shorter duration will fluctuate so much more violently as to make their *prices* move proportionately with the prices of gilt-edged securities.¹ We shall not discuss elasticities greater than unity, but the reader ought to be able to work it out for himself that in such a case it is the market rates of the longer-term securities that would fluctuate more violently in consequence of a change in data.

So far we have not considered speculation. But whenever the elasticity of expectations is greater than zero, the prices of securities with a shorter currency will be more stable than the prices of those with a longer duration, and this will induce people to go into long when they expect a general price rise, and into short (and money) when they anticipate a fall. This will further accentuate the disparity between price movements, while it will stabilize relative market rate movements when the elasticity of expectations is less than one and destabilize them when it is unity or above it.

The outcome of this rather involved argument is that it depends entirely on the elasticity of yield expectations whether—and to what extent—it is the differences in life-time that account for the different amplitudes in the fluctuations of different market yields. We shall see presently that our other

¹ This is strictly correct only if the gilt-edged securities are non-redeemable. Otherwise it is only approximately true.

criterion, risk of default, can account equally well for the observed fact that short-term rates are more volatile than long-term rates; and personally I also believe that this factor is the more important. For it seems unlikely that the elasticity of yield expectations should so consistently be always below unity. But a true assessment of the relative importance of the two factors could only be made on the basis of statistical investigation.

Hitherto we have excluded the problem of riskiness by assuming all securities to be equally risky. Henceforth we shall exclude the problem of different durations, not by adopting a uniform life-time for all securities, but by assuming the elasticity of yield expectations to be unity. In this way we can let differences in the amplitude of price variations to be taken care of by differences in currency, while we leave differences in yields to be explained by varying degrees of riskiness. We do not regard this as a correct representation of reality (although we suspect it to be fairly near), only as a convenient method of separating the discussion of the two criteria.¹

Before we can go on to the discussion of risk of default, we shall have to consider another kind of risk: the risk of future changes in capital values. Liquidity preference proper is an insurance against this risk only. We have seen above how the expectation of falling security prices will lead speculators to buy money and short-term bills for long-term securities. In addition to this speculative demand there will also be a more permanent demand for money and bills arising from the uncertainty of expectations, and coming from people who cannot be compensated for a danger of capital loss by the chance of capital gain. Much has been written recently on this motive for the preference of money and low-income-yielding bills over high-income-yielding securities, and we have nothing to add to it. Two things, however, may be pointed out. Firstly that arguments showing an equally strong preference for long-term securities (e.g. by investors who want to stabilize the yield of their investment rather than its capital value) do not affect the liquidity preference theory.² Secondly that *in*

¹ To be quite correct, if we admit speculation, the elasticity of expectations must be slightly below unity to equalize yields.

² For even if there are people who prefer the cinema to the theatre and do not regard it merely as an imperfect substitute for it, their relative prices will still depend on their relative quantities.

a purely formal sense the propositions of this paper do not depend on the validity of the liquidity preference theory. This will appear below.

Risk of default is the next criterion of differentiation between securities. It is obvious that securities do differ according to the confidence attached to the fulfilment of their promises and that such differences can and do account for differences in their yields. The problem is, in what order does this risk range the different types of securities? Since all securities promise the future payment of money sums, money itself must occupy the first place as the completely riskless security. Gilt-edged securities come next. Their 'nearness' to money seems to be the most satisfactory explanation of the great stability of the gilt-edged rate: we have seen on page 20 that it is the yield of the closest substitutes to money which is least affected by changes in the quantity of money and in the level of employment. We have not yet explained, however, the relatively high level of the gilt-edged rate. One reason must be liquidity preference, another, perhaps equally important one, seems to be the high transaction costs (brokerage charges, stamp duties, commissions, etc.) on long-term securities. Assuming a certain stability in the frequency of transactions, this would be an element in long-term rates which is independent of tastes and relative quantities.

In what exact order the stocks, bills and overdraft facilities of all the different private companies and foreign governments and municipalities range on our list would be difficult to decide. Nor is this necessary for our purposes, as we are only interested here in the relation between long- and short-term rates, and that is explained by the special position of short-term securities. It is an important feature of short-term capital that it is mainly held by the banking system. In particular, all bank advances are 'held' by the banks and the greater part of bills is also held by them. Now it is well known that banks usually tend to keep a fixed proportion between their cash reserves, advances to industry, commercial bill holdings and security holdings; and we also know that such 'joint demand' establishes a relation of complementarity between the goods jointly demanded. This will not affect long-term securities, of which banks only hold a very small proportion, but it will make all forms of short-term capital complementary with money. On