concerned and would help to redress the international monetary system.

(a) It would do away with one of the main sources of Great Britain's balance-of-payments instability and with speculative attacks on the pound.

(b) It would offer new outlets for the savings of the Continent by associating them with the reconstruction of a vast European international finance market which could be harnessed to the service of a common policy.

(c) It would contribute to the improvement of the international monetary system by organising in a concerted and less precarious manner, the use of the Community reserves, formerly excessively absorbed by the hoarding of sterile gold, and nowadays, by direct or indirect — through the Eurodollar market — credits to the richest and most highly capitalised country in the world.

Every policy certainly has its risks, but those which might flow from the reforms proposed above would certainly be less than those boldly faced, with a success which is now unanimously recognised, by the signatory countries of the European Payments Union in a Europe and in a world whose monetary, economic, social and political equilibrium had been profoundly shaken by the sequel of the Second World War and the opening of the Cold War. As to the risks involved by the refusal or inability of Europe to choose a policy, they are clearly highlighted by the events of recent years and recent months; the accelerated rush to a Dollar Area, itself weakened by the monetary, financial, economic and social chaos of a chain reaction of restrictions and devaluations, and towards a monetary system which the former Governor of the Bank of Greece characterised, in a recent book, as the system of “speculocracy”.

ROBERT TRiffin


PART I  GENERAL INTRODUCTION TO THE ITALIAN BOND MARKET AND MAIN RESULTS (**) 

Introduction

Economists quite often work on “heroic assumptions”. On these lines it is mostly common to speak of “the rate of interest”. Unfortunately, when we are confronted with actual market rates, we realize how difficult it is to select a “representative” rate of interest. The structure of interest rates appears to be widely spread and differentiated; moreover, it is not invariant with respect to time.

Many differentiating factors determine the observable variety of yields from different obligations: risk of default in promised payments, marketability, coupon rates, call provisions, tax advantages, eligibility as collateral for special purposes, and so forth. However, especially from a theoretical point of view, the most important determinant of the observed yield differentials seems to be the term to maturity of the considered obligations. To analyze this determinant a special substructure must be examined: the term structure of interest rates, where we are concerned with differences in yields from obligations being equal, except for their term to maturity.

In order to study this substructure it is therefore necessary to consider the yields to maturity of a group of homogeneous bonds.

(*) I wish to express my gratitude to Professor Sir John Hicks for his continuous help and encouragement, and to Mr. Robert Barou for helpful advice. Responsibility for all remaining errors is of course entirely mine. Computations were performed at the Computing Laboratory of Oxford University.

(**) The second part of this paper, which is technically an Appendix to the first one, is specifically devoted to a description of the statistical procedure followed and reports the numerical data obtained. It will be published in the next issue of this Review.
Conventionally, the "yield to maturity" (or "internal rate of return") of a bond maturing in n years, at a given time t (Y_n), is that (annual) interest rate which equates the present values of the stream of payments (coupons C to be received as interest and principal F to be repaid at maturity) from the bond to its market price P:

\[ P = \frac{C}{1 + Y_n} + \frac{C}{(1 + Y_n)^2} + \ldots + \frac{C + F}{(1 + Y_n)^n} \]

However, this conventionally calculated n-year yield is not in general equal to the true n-year-holding-period yield at the same time t. It would be equal only if the intermediate coupon receipts could actually be reinvested at the rate Y_n, which clearly need not be true. Hence, the internal rate of return is not a completely unambiguous criterion to evaluate different bond investment opportunities (1). It should in fact be pointed out that if there is a flow of intermediate coupon payments from a bond with n years to maturity, the true redemption yield (i.e. the true n-year-holding-period yield) cannot in principle be defined ex-ante, as it will depend on the future spot rates, which are unknown at time t: the intermediate coupon payments will be invested at rates unknown at t.

A related but logically separate difficulty is due to the fact that the concept itself of maturity is not unambiguous once coupon payments are allowed for: the same date of final payment may imply different patterns of intermediate payments. Thus, especially in the case of long-term bonds, the average term-to-maturity of the payments stream is only very loosely related to the final redemption date. These problems have been raised by Macaulay, who proposed to indicate as "duration" the true length of a loan. As he put it: "a duration is a reality of which 'maturity' is only one factor" (2).

He proposed as a measure of duration a weighted average of the maturities of the individual loans that correspond to each future payment. This, of course, brings us back to the problem of how to weight future loans to discount them back to their present values (3). Using, in a simple example, as discount rate the rate corresponding to the redemption yield of the bond, which admittedly seems the best procedure, Macaulay shows the strikingly different results obtained considering duration instead of maturity. From his results (4) it can easily be seen that, while for short-term bonds the two concepts are closely connected, especially for very-long-term bonds, the importance of the maturity date on duration may be as small as to be almost negligible (5).

To avoid these difficulties the theoretical analysis of the term structure is often made on the assumption that the coupon rate is equal to zero (i.e. on the Hickian assumption that there are no payments prior to redemption). In this case in fact the concepts of "internal rate of return" and "true n-year-holding-period yield" and those of "maturity" and "duration" clearly coincide.

Once we have adjusted the observed interest rates so as to make them alike in every respect except term to maturity, we can construct a curve describing the relationship between these yields and term to maturity: the yield curve. Along the abscissa we measure years to maturity and along the ordinate annual yield to maturity. Empirically we shall observe only a certain number of yields from issues of different maturities; however, a smooth and continuous yield curve is normally constructed (6). The method of construction and smoothing of a yield curve is subjectively chosen. This must be taken into account when interpreting differences obtained in empirical investigations on the term structure of interest rates: different results possibly depending only on the different methods employed to fit the curve (7). The curves actually observed show a great

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(1) Macaulay makes the point that a priori it would also be possible to use future (instead of present) value weighting, although this approach leads in general to absurd results. For a stimulating analysis of the problems and difficulties involved in the two concepts of maturity and duration, see ibid., Chapter 2.
(2) Ibid., p. 51.
(3) Ibid., p. 46.
(4) A continuous curve obviously permits a better appraisal of the term structure, in comparison to that which might be obtained by means of a finite number of points: but the main reason for the construction of continuous yield curves is due to the necessity for many investigations of having a series of data on yields at different periods (months) to maturity.
(5) I shall return in greater detail to this point, and in general to the technical problems connected with the construction of yield curves, in the second part of this paper.
variety of shapes; however, four general forms can be selected, as shown in Chart 1.

The curves empirically obtained are normally based on yearly, quarterly, or monthly market observations. They can be represented over a span of time by means of a three-dimensional chart following S. Homer’s suggestions (8). For each term to maturity, average yields can be computed for the considered time span, thus obtaining a composite yield curve which, in the absence of secular trends, and

![Chart 1 - Common Types of Yield Curves.](image)

with cycles approximately balancing, should represent more or less “normal” conditions.

This study is precisely devoted to the construction of yield curves by means of least-squares interpolation analysis in relation to the Italian experience. As we have seen, in order to study a meaningful way the term structure of interest rates, it is essential to construct reliable yield curves for a group of homogeneous securities. It is also evident that any quantitative analysis of the term structure requires the availability of statistical series of data on redemption yields derived from the actual construction of yield curves. Unfortunately, no such data are available in relation to the Italian experience. This study appears to be the first attempt in this direction: it should therefore be taken as a first step. However,


the features of the Government securities selected and the theoretical procedure followed might perhaps be of some general interest.

In order to make this paper easier to read I left a detailed analysis of the technical problems connected with yield-curve-construction, together with a brief survey of the relevant literature on the subject and a description of the particular procedure followed in the second part of this paper. It is, however, immediately clear that the set of securities considered should represent a relevant share of the market, so as to avoid the difficulties of transactions in “thin” markets; next, the chosen securities must be actively traded, i.e. they should be highly “marketable” assets, to avoid as far as possible confusions between “liquidity premia” and transactions costs; thirdly, they should not present large gaps in the maturity continuum, which would obviously imply extremely serious difficulties for the construction of reliable yield curves; finally, and more generally, the securities selected should not differ with respect to important properties, which would make it difficult to obtain comparable redemption yields.

Section I of this paper aims therefore not only at giving a very brief introductory outline of the Italian financial system, and, in particular, of the Italian bond market (9) — so as to give the reader a brief knowledge of the institutional system in Italy — but should also provide an explanation of the reasons which led me to select a certain group of Treasury securities — the B.T.P. (Buoni del Tesoro Poliennali) — for the construction of the yield curves and the quantitative analysis of the term structure in relation to the Italian experience.

1. Some Notes on the Bond Market in Italy

1.1. A Brief Outline of the Italian Financial System

An attempt to give a comprehensive survey of Italy’s financial system and its recent developments would certainly be too lengthy and probably out of place here (10). In this section I shall therefore


(10) The best general references are the annual *Relazioni* of the Bank of Italy (abridged versions of the Reports are available in English). In particular, for an illuminating analysis of the post-war evolution of the Italian monetary system and of the general impacts of Italian
confine myself to elucidate the main points which are essentially peculiar to the Italian system and to underline the most important recent developments.

The Italian financial system is apparently characterized by its simplicity and by the rigidity of the banking sector. Thus, one reads that essential non-bank financial intermediaries, like building societies and hire-purchase finance companies, do not exist in Italy, while insurance institutions are rather backward and do not have a real impact on the financial market. When we come to the banking sector we find that by law there is a clear distinction between the deposit banks and investment banks. Deposit banks are restricted to short-term lending. Direct banking portfolio investment in equities is not allowed. Moreover, one single customer may not borrow from any one bank more than 20 per cent of that bank's capital and general reserves. Industrial long-term lending should therefore be confined to investment banks (11) which derive their resources mainly through bond issues. A cartel agreement among the banks, which is officially recognized by the monetary authorities, regulates minimum lending rates and maximum rates on deposits, all rates being linked to the official discount rate.

On the basis of the above elements one is clearly tempted to draw the conclusion that the links between long- and short-term markets are rather loose and that institutional segmentations should therefore play an essential role to explain the term structure of interest rates in Italy. This conclusion, however, does not appear to be correct. If we compare yields from securities differing only with respect to term to maturity, it is clear that the links between short and long rates have been fairly close; moreover, they can be shown to be consistent with an expectation approach to the explanation of the term structure, independently of market segmentations. In doing this, we must clearly compare yields from securities as far as possible identical in all respects, except term to maturity, which, in turn, implies the construction of yield curves for bonds with different redemption dates and their quantitative analysis. One must not jump, for example, to the conclusion that short-term rates in

monetary policy, see P. Bassi, "Monetary Developments in Italy from 1961 to 1975", in this Review, Vol 26, March 1976, and Studi sulla Moneta, Milano, Giuffrè, 1978 (many essays are available in English).

(10) They are called istituti speciali di credito: special credit institutions, and are subdivided in: (i) istituti speciali di credito mobiliare and (ii) istituti speciali di credito immobiliare.

Italy fluctuate less than long-term ones from the fact that the official discount rate (or the yield on 12-month Treasury bills) was practically the same during the 11 years considered in this study (1967-1978) (12), while yields on long-term government bonds showed remarkable fluctuations.

To avoid any possible misunderstanding I should like to make it clear that I am certainly not contending that market segmentations are always irrelevant. This would clearly be absurd. All I want to say is that segmentations in relation to the Italian domestic market have been essentially formal for the recent period considered in this study and did not prevent close links between long and short rates, at least with respect to the maturity range which will be explicitly examined, and to the important group of securities considered.

The reason why the stringent institutional ties mentioned above did not prevent close connections between long- and short-term rates in Italy is that they were not effectively implemented. Borrowers, for example, have commonly used nominally short-term loans to finance long-term investment, due to the practical facility of renewal. In fact, as we shall see, the share of private outstanding bonds with respect to government and government-backed bonds is relatively small. This reflects the common practice of firms to rely essentially for external financing either on continually renewed deposit-banks' credit or on the loans of the above mentioned special credit institutions, instead of issuing their own bonds. The reason for this behaviour is partly due to the fact that fiscal inducements (13) tend to bias towards this indirect form of financing, but is clearly also due to the general ease with which it is possible to obtain these loans, even for quite substantial amounts.

(12) For an analysis of the movements of the official discount rate and the yield on 12-month Treasury bills see below footnotes (13) to (15). It should be pointed out, from a general point of view, that in this paper I will not consider explicitly the important experiences and shifts in monetary policy which have taken place in 1967 and 1969, because of their importance a meaningful and detailed analysis would certainly be too long to be included in this paper.

(13) Borrowers must pay as direct taxes on their interest payments to lenders a share which progressively increased from 11.34 per cent in 1966 to 33.75 per cent in 1969. They have, in principle, the right of repayment (diretto di riscatto) for these taxes from income receipts, but in practice, in order to give lenders a tax-free income, this right is not exercised. Since 1961, however, special credit institutions have been essentially exempted from payments of these taxes (they pay a subscription rate approximately equal to 1 per cent of their interest payments). If one takes into account that capital taxes on the funds borrowed are, moreover, slightly favourable to the special credit institutions, it becomes clear that it is often cheaper to raise funds through the intermediation of these institutions.
Coming to the reasons why the formal distinction between deposit banks and special credit institutions is in practice blurred, the most important one is perhaps that the latter are in many cases just a "special section" of the former. The bills are also reinforced by the fact that commercial banks can freely invest in bonds, i.e. they always have the choice between direct commercial credit (which, as we have seen, can be successively renewed to finance long-term investment) and portfolio investment in bonds. In general they can therefore either face default risk on commercial and industrial credit or face risks associated with changes in interest rates with respect to their bond portfolios (14).

The actual flexibility of the Italian banking system (15) is clearly shown by the fact that the cartel agreement has been in practice often infringed, with substantial fluctuations from the official rates. In particular, Anglo-Saxon readers should not interpret official statistics reporting that the discount rate has not been changed from 1958 to 1969 as an indication of a remarkable stability in the Italian money market during this period (16). The reason for this constancy is simply that credit from the central bank is not an automatic right; unlike the Bank of England, the Bank of Italy is no unlimited lender of last resort. Credit from the central bank is supplied to the banking system in the normal ways, i.e., through rediscounts and advances, but there is no automatic granting of credit. This is of course a most powerful weapon in the hands of the central bank, which makes policy decisions felt by varying the availability of credit and not its official cost. In other words, the official discount rate is clearly a non-market-clearing rate. The impacts of policy directives are enhanced because: (a) there is not a well-developed money market, and (b) these controls can be used in a selective way.

Special emphasis should be laid on the lack of an institutional and well-developed short-term market, like those for 3-month Treasury bills in the U.K. and in the U.S. There is in fact a market for Treasury bills in Italy (banconomi ordinari del tesoro, or B.O.T.) but their yield is fixed by monetary authorities, the one on 13-month bills (17) being equal to the discount rate (18). These B.O.T. have been almost exclusively bought by banks to satisfy compulsory reserve requirements (19) and their yields did not have a significant con-

(17) Until November 1965, bills, with terms to maturity ranging from 3 to 10-12 months were issued. From then onwards there have been mostly issues (for given amounts of funds) with only maturities of 12 months.

(18) It should be pointed out that while the stated yield is the same: 5.50 per cent, Treasury bills are quoted on a discount rather than a yield-to-maturity basis; thus a one-year bill is priced at 95-50 (per cent of par), which implies that the true yield to maturity is 5.43 (and not 5.50) per cent. To bring the picture up to date it should be pointed out that from May 1966 the stated yield has been raised to 3.75 per cent (the true yield being thus 3.50 per cent).

(19) In Italy compulsory reserves are not uncleared assets. To satisfy reserve requirements banks can either cash or short-term (14-month) bills (or from September 1965, subject to certain restrictions, some government and government-guaranteed issues. The rate paid on compulsory currency reserves deposited by the central bank is practically equal to the rate on short-term bills (for an extensive analysis of required reserves in the Italian system see F. Massa, La riserva obbligativa nel sistema istituzionale italiano, mimeographed note, Bank of Italy, Rome, August 26, 1965).

Attention should be directed to the fact that since November 1965 a distinction has been introduced between bills immediately used to satisfy reserve requirements (which from June 1956 up to May 1965 have always been issued at the fixed price of 356) and bills which banks intended to use as free investment, the price for those bills being determined by monthly auctions. This attempt to influence short-term rates directly has, however, always failed. This is due to different reasons. The main one is probably that, while free rates determined in the secondary market for securities of the same maturity have always been higher than the 3.50 yield on fixed-price B.O.T., the Bank of Italy has, however, always prevented the effective auction rate on B.O.T. going above the 3.50 ceiling (when the auction price was approaching the 3.50 floor, the central bank stepped in to buy any remaining bids). The auction rate, therefore, has always remained close to the 3.50 ceiling (some banks have invested in B.O.T. even at lower yields than those obtainable buying other securities of the same term to maturity, because the B.O.T. may be sold to the central bank at will, at prices equal to the ones realized at the last auction; in other words, the B.O.T. are essentially considered to have the same degree of liquidity as cash by the banking system). The differences between the rates on the B.O.T. and those on secondary-market securities of the same term to maturity will be clearly shown in the following section (see below pp. 191, 192 and Chart 4).

To bring the picture up to date also in this case it should be pointed out that starting from May 1965 the Bank of Italy abandoned the policy of preventing the auction rate from going above the rate on bills bought to satisfy reserve requirements. Thus in May and June 1965 we found that the auction rate is 4.44 per cent, and in July-August it reaches 4.99 per cent, while, as we have seen, the rate on bills used to satisfy reserve requirements is...
1.2. The Bond Market: Structure and Recent Developments

For the reasons already pointed out, one of the most relevant features of the Italian bond market is the clear predominance of public and semi-public bonds and bonds issued by special credit institutions with respect to private corporate bonds. This is shown by Tables 1 and 2, where it is possible to find a breakdown of fixed-interest securities (outstanding amounts and net new issues) according to issuers from 1950 to 1967. In 1950 the outstanding amount of bonds issued by private industrial corporations was L. 161,9 md., i.e. 14.7 per cent of the total amount of fixed-interest securities; while in 1967 the absolute figure is L. 954.0 md., i.e. only 5.4 per cent of the total (20). The growing importance of special credit institutions is clearly shown by the fact that in 1950 the Istituti di Credito Mobiliere and those of the Credito Immobiliare, taken together, accounted for 18.3 per cent of the market for fixed-interest securities, while in 1967 their share is 41.7 per cent. Another important feature of the recent evolution of the Italian bond market is the increasing weight of public holding companies (IRI, ENI, and ENEL). This is due to two main reasons. First of all, IRI and ENI have been rapidly expanding and their main source of finance is through bond issues; on top of this, in 1962 the Italian electricity industry was nationalized; the compensations for the expropriation were paid through successive bond issues, which essentially explain the very relevant share in net new issues of public holding companies especially in 1963, 1964 and 1965 (see Table 2). For all these causes we find that in 1960 the outstanding amount of bonds issued by public holding companies was L. 553 md. (4.8 per cent of total), while

From May 1969 3.00 per cent (on these points see also A. Fazio, "Monetary Base and the Control of Credit in Italy", this Review, June 1969, pp. 150-154).

From a general point of view it should be underlined that the recent increase in the discount rate and in the rates of Treasury bills are not an expression of a restrictive monetary policy. These measures are part of a package intended to stem the recent serious capital outflow from Italy.

(20) See Table 1, under the heading "Industrial Corporations (Other)." The Autostrade Spa (Motorways Company), which has very recently become an important bond issuer is in fact a member of the IRI Group, which is one of the three big Public Holding Companies (together with ENEL, the national electric energy agency, and ENI, the petrochemical group).

in 1967 the amount is Lit. 2,799,4 md. (15.1 per cent of total); if we add the bonds issued by the Azienda Spa, the 1967 figure becomes Lit. 3,159,4 md. (17.0 per cent of total).

The increasing relative shares of special credit institutions and public holding companies are matched by a relative decline not only of private corporate bonds, but also of Government securities: these last are issued either directly — titoli di stato (state bonds) — or through a public special credit institution — the Consorzio di credito per le opere pubbliche or, for short, CREDIOP (Credit Consortium for Public Works). Thus, although the outstanding amount of all Government securities was Lit. 683.4 md. in 1950 and increased to Lit. 6,396.8 md. in 1967, in relative terms there is a decline from 62.0 per cent of total to 34.8 per cent of total. This relative decline is, however, the result of two opposite tendencies: a strong decline in direct Government issues which more than outweighs the relative increase of issues through the Credit Consortium for Public Works. In particular, there is a sharp relative decline in Government bonds other than B.T.P.: these securities accounted for 28.2 per cent of total fixed-interest securities in 1950, while their share in 1967 is only 5.8 per cent of total.

When we come to B.T.P., while it is clear that their relative importance has also decreased from 1950 (39.4 per cent of total outstanding amount) to 1967 (13.3 per cent of total), it is also evident that they represent the most relevant set of homogeneous securities in the Italian market. These bonds have a maximum maturity of 9 years, and all outstanding issues have practically identical features, apart from term to maturity; in particular, same coupon payments, same tax exemptions, same special privileges, no call provisions and they are, of course, perfectly homogeneous with respect to credit-worthiness and safety. If we take into account that, on the contrary, bonds issued by the Credit Consortium for Public Works differ with respect to many important features, this being also true for bonds issued by Special Credit Institutions and by Public Holding Companies, which may also be considered by buyers as different with respect to credit risk, we can conclude that the B.T.P. have been the only important set of homogeneous securities in recent years in relation to the Italian bond market.

Another important factor which makes the B.T.P. suitable for the construction of reliable yield curves is that these bonds have been widely traded, i.e. they enjoyed a high and uniform marketability during the whole postwar period. In particular, they have been a common portfolio investment of firms, households and deposit banks, while the share held by institutional investors is very small, as is clearly shown in Tables 3 and 4. Thus, from Table 3 we can observe that while the B.T.P. held by the personal sector, companies and by deposit banks, altogether, accounted for approximately 85 per cent of total for the whole period considered, the percentage share of B.T.P. held by Insurance and Social Security Institutions was 5.8 in 1950 and since then has been declining, to reach an approximately constant 3 per cent in the 1960's. The other main investors in B.T.P., apart from special credit institutions which have always accounted for less than 1 per cent of total (1 per cent in 1967), have been the Bank of Italy and the "Cassa Depositi e Prestiti" (22), with a declining weight of the latter, which in 1964 completely sold out its B.T.P. investments.

The above distribution by the type of investor of the B.T.P. appears to point out that a relevant share of these bonds is held for temporary investment purposes (22): the B.T.P. should therefore constitute a highly sensitive and rather sophisticated market (23).

The maximum term to maturity of only nine years of the B.T.P. may be considered a disadvantage for studies of the term structure of interest rates. It would of course be desirable to consider also longer-term bonds; however, it should be observed that for many econometric investigations on the term structure (for example for all Meiselman-type models (24)) aimed at explaining the process of

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(22) The "Cassa Depositi e Prestiti" (or Cassa DD. PP.) is a credit institution directly run by the Treasury. It derives its resources through the Post Office System (either postal savings, or payments to the State made by means of postal current accounts). These funds are either lent to Local Authorities at special privileged rates, or invested in Government and Government-guaranteed bonds, or, finally, deposited in special current accounts with the Treasury, to finance current expenditures.

(23) By means of the "Cassa DD. PP.", the Treasury can have a direct impact on the Italian monetary system (for a general analysis of these problems see G. Sossai, Linee di politica economica, Roma, De Sisti, 1955, part. Chap. 2).

(24) In order to have more reliable evidence on this point, it would be desirable to have at least some knowledge of the further breakdown of the B.T.P. held by the personal sector and by companies, respectively.

(25) In particular, this appears to be a necessary condition to hypothesise the validity of any specification of the term structure. In other words, a necessary condition for an unexplicative model to hold is that the marginal investor must be potentially interested in portfolio speculations (reinvestments) during the lifetime of the securities he owns (on this point see, for example, J. Flood, "The Yield on Consol", in his Critical Essays in Monetary Theory, Oxford, Oxford University Press, 1967, pp. 52-90).

revision of expectations, and not explicitly the level of interest rates) the maximum term to maturity of nine years does not represent a serious limitation. In fact, other securities (CREDIOP, Special Credit Institutions, Public Holding Companies) which have longer terms to maturity, in addition to the difficulties already pointed out, present large gaps in the maturity continuum, while the B.T.P. from 1950 onwards have been issued rather regularly (see Table 2), which implies that approximately from 1957-58 they have presented a fairly well-distributed maturity composition (25).

To conclude this very brief analysis of the composition of the Italian bond market we should mention the Local Authorities and Foreign Bonds issues. The former are in fact municipal obligations, which occupy a relatively unimportant and practically constant position during the whole period examined: in 1950 they represent 0.2 per cent of the total market, while in 1957 their share is 0.3 per cent of total. With respect to Foreign Bonds issues, it should be pointed out that the data reported do not refer to portfolio investments abroad of Italian residents: we have to do with bonds issued by international institutions directly in Lire and floated in the Italian market.

As a final remark on the composition of the market for fixed-interest securities in Italy, it is necessary to observe that, unfortunately, there are no data available on the maturity distribution of outstanding bonds on an aggregate basis. This is certainly a serious disadvantage, which, in particular, prevents any attempt to test the effects of changes in the maturity composition of the outstanding debt. With reference to this point, it should be made clear that the available data on the composition of the public debt, which may be found even in semi-official publications, are completely misleading, in that they do not take into account the true term to maturity of outstanding issues: bonds are classified as long-term if they were long-term at the date of issue, irrespective of their true term to maturity when the classification of the public debt is prepared.

Given that all the original data which are needed for the construction of a true term-to-maturity breakdown of the outstanding debt are available to the Italian central bank, and considering their

(25) For a more detailed and specific analysis of the problems connected with the construction of yield curves based on B.T.P. data, the reader is referred to the second part of this study.
growing interest in open-market operations across the whole maturity continuum, one would certainly like the Bank of Italy to consider the opportunity of adding this set of data to their Bollino.

Finally, Tables 5 and 6 give us a rough idea of the relative importance of fixed-interest securities in the Italian stock exchange market and, more generally, of the orders of magnitude involved. Table 5 shows that after an all-time peak in 1961 when shares were valued (market-prices) at 20.772.4 mld., share prices fell heavily, and in 1967 they still totalled only 17.289.0 mld. Fixed-interest securities figures of Table 6 are not strictly comparable as they represent nominal values (25), but they provide a fairly accurate indication of the very recent extraordinary expansion of this sector of the stock exchange market. Thus, for example, from 1963 to 1967 the outstanding amount of bonds leapt from Lit. 9.717.6 mld. to Lit. 18.626.4 mld., with a more than 100 per cent increase. The recent increase in the propensity towards credit-capital with respect to risk-capital is also emphasized by Table 6, which reports the net new issues of bonds and shares at market prices (27).

2. Main Features of the Estimated Yield Curves

On the basis of the analysis developed in Section I, I decided to use the B.T.P. yield-data as starting point for the construction of yield curves in relation to the Italian experience. A description of the least-squares interpolating procedure followed, and the estimated annual redemption yields obtained for the maturity range from 1 to 9 years are reported in the second part of this paper, which, for

(25) Data on fixed-interest securities at market prices are not available; on the other hand, data of nominal values of shares are practically meaningless. According to the definitions of the Bank of Italy bills data are not reported together with other fixed-interest securities; this, however, does not make any relevant difference since, as we have seen, the market for Treasury bills is relatively unimportant and "segmented" from the bond market.

For a general introduction to the technical procedures and definitions used in the construction of all the tables of this section the reader is referred to the two mentioned articles by G. Bianchi and E. Perotti (Bollino, Sept.-Oct. 1965 and Sept.-Dec. 1965). In particular, it should be pointed out that, in relation to fixed-interest securities, the differences between end-of-period stocks are not identical with the net new issues during the period, as the latter are valued according to their prices at issue, while the former are based on nominal values.

(27) The trend is still continuing: the figures for 1968 and 1969 alone, show fixed-interest securities Lit. 30,022.2 mld. (48.7 per cent) and shares Lit. 60,157.7 mld. (13.3 per cent).
brevity, I will hereafter call "Appendix" (28). In this section I shall therefore confine myself to outlining the main features of the curves obtained.

It is, first of all, evident from the data of Appendix A.7 that the interpolating curves may have a great freedom of shape, and, in particular, are often "humped", although, by construction, they are "smooth", i.e. continuous and continuously differentiable. This, of course, underlines the need of adopting a reliable estimating procedure and, more specifically, a theoretically justified rule by which it is decided whether to accept humps or reject them as spurious or random (29). In fact, as has been shown, oversmoothed yield curves tend to generate "well behaved" forward rates (30), and are therefore implicitly biased in favour of expectational models of the term structure (in particular in favour of the Meiselman model of revision of expectations).

From a general point of view, the yield curves obtained are consistent with the normal patterns which have been observed both for the U.S. and the U.K.:

1. Descending yield curves (or at least yield curves with negatively sloped segments) are typical of periods when both long and short rates are relatively high, while ascending curves characterize periods when interest rates are relatively low. This is most easily seen by means of Chart 2. In the upper part we have the difference between R₀ and R₁; in the lower R₁ and its mean value over the whole period. As we can easily see, when R₁ is above its mean value, which may roughly be interpreted as an indication of high interest rates, R₀ tends to lie below R₁; conversely, when R₁ is below its mean value, the interest rate spread is usually positive, with a remarkable similarity in the opposite movements of the two curves (31).

(28) The numerical data obtained are reported in Appendix A.7, the time series of estimated redemption yields on bonds of the same maturities have been plotted on graphs in Appendix A.8, together with the average yields, for each term to maturity, during the 11 years considered: 1957-1967 (53 monthly observations).

(29) See A. Buss, "Interest Rates, the Meiselman model and Random Numbers ".

(30) See Chart 2 - By - By₁, and By₁ : 1957-1967

(31) This is quantitatively confirmed by the fact that the correlation coefficient between (B₀ - By₁) and (B₁ - By₁) is equal to -0.37. This, incidentally, should serve as a warning of the need of great caution in interpreting high correlations in equations which explain the interest rate spread in terms of present and past values of short-term interest rates. On this point see also below pp. 367-370.

2. As is clear from the charts of Appendix A.8, long rates have shown much lower fluctuations than short rates. This is quantified in cols. 1 and 2 of Table 7, where I reported the standard deviation and the coefficient of variation for the B.T.P. yields by maturity. It is, in particular, evident that the observed interest-rate-
variability is a monotonically decreasing function of term to maturity (see also Chart 3), with a substantial drop from the figures for the one-year rate (st. dev. = 1.215, coeff. of var. = 23.28%) to those of the nine-year rate (st. dev. = 0.490, coeff. of var. = 8.78%).

In particular, with reference to these data, it is interesting to show explicitly the differences between the one-year rate on the B.O.T. (32) and the one-year rate on the B.T.P. (see Chart 4). It is clear from this chart that the B.O.T. rate has a limited economic significance with respect to free market short-term interest rates; this being also true from November 1962 onwards (33).

3. Finally, when we come to analyze the average yield curve, we find (see Chart 3) that this curve after a steep increase, especially in the maturity range from 1 to 2 years, reaches a maximum at 4 years to maturity, then is gently downward sloping until 8 years to maturity, with the average nine-year rate slightly above the eight-year one (the figures are reported in col. 3 of Table 7). The lack of any significant trend in interest rates during the period considered (34), and the approximate balance of cycles should, therefore,

<table>
<thead>
<tr>
<th>Years to Maturity</th>
<th>Standard Deviation (1)</th>
<th>Coefficient of Variation (2)</th>
<th>Mean (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.215</td>
<td>23.28%</td>
<td>2.99</td>
</tr>
<tr>
<td>2</td>
<td>0.952</td>
<td>16.03%</td>
<td>2.94</td>
</tr>
<tr>
<td>3</td>
<td>0.789</td>
<td>14.24%</td>
<td>2.99</td>
</tr>
<tr>
<td>4</td>
<td>0.638</td>
<td>12.03%</td>
<td>2.88</td>
</tr>
<tr>
<td>5</td>
<td>0.558</td>
<td>11.03%</td>
<td>2.76</td>
</tr>
<tr>
<td>6</td>
<td>0.498</td>
<td>10.79%</td>
<td>2.66</td>
</tr>
<tr>
<td>7</td>
<td>0.438</td>
<td>9.95%</td>
<td>2.58</td>
</tr>
<tr>
<td>8</td>
<td>0.396</td>
<td>9.06%</td>
<td>2.56</td>
</tr>
<tr>
<td>9</td>
<td>0.359</td>
<td>8.19%</td>
<td>2.57</td>
</tr>
</tbody>
</table>

Table 7: Standard Deviation, Coefficient of Variation, and Mean of B.T.P. Interest Rates for the One to Nine-Year Maturity Range. Monthly Observations, 1972-1987

(32) See above pp. 334-335.
(33) As will be recalled, since November 1962 monthly auctions for free-investment Treasury bills have taken place; the B.O.T. rate of Chart 4 is, from this date, the auction rate. For reasons already pointed out this rate has never differed in any significant way from the fixed 3.65% rate paid on bills used to meet reserve requirements.

3. Finally, when we come to analyze the average yield curve, we find (see Chart 3) that this curve after a steep increase, especially in the maturity range from 1 to 2 years, reaches a maximum at 4 years to maturity, then is gently downward sloping until 8 years to maturity, with the average nine-year rate slightly above the eight-year one (the figures are reported in col. 3 of Table 7). The lack of any significant trend in interest rates during the period considered (34), and the approximate balance of cycles should, therefore, tend to show the existence of "liquidity" or "risk" premium in the determination of the term structure in Italy, at least in relation to the period considered.

Conclusions

The relative imperfections of the secondary market for short-term securities in Italy, together with the fact that this market has been on the whole free from official controls during the period considered (35) makes one expect on a priori grounds: (a) strong fluctuations in market-clearing short-term rates and (b) a great sensitivity not only to general economic conditions but also to policy

(34) I have tried many different trend and trend-seasonal models to the time series of interest rates for the same maturities, but they all gave very poor results.

(35) The policy followed by the Bank of Italy has concentrated mainly on the control of the money supply and on dampening fluctuations of long-term interest rates, while leaving essentially free the market-clearing short-term interest rates (according to the Italian official definitions short-term interest rates refer to loans maturing within 12 months; intermediate-term rates refer to loans with between 12 and 60 months to maturity; long-term rates refer to the yields on securities maturing in 60 months or more). However, starting from the second quarter of 1966 the Bank of Italy has been increasingly engaged in a policy of active control of all interest rates, with continuous interventions across the whole maturity spectrum.
measures taken by monetary authorities. These points appear in fact to be confirmed by the short-term rates obtained from the yield curves constructed in this study.

The lack of a well-developed short-term market may, however, imply some more general and important differences in the explanation of the term structure of interest rates in Italy with respect to, say, the U.K. or the U.S., which are perhaps worth pointing out. On the basis of purely theoretical considerations the analysis of the term structure seems to lead to the conclusion of a simultaneous determination of long and short rates (36). This, however, does not necessarily imply that actual term structures are in fact to be explained by means of highly sophisticated simultaneous models. Two opposite views have been proposed: according to the first one the long rate is mainly determined by real forces and sets the level around which the short rate can fluctuate (37). The second approach views, on the contrary, the short rate as essentially determined by monetary forces, and, in particular, by the level of the official discount rate and, say, some banking service variable, while the long rate is determined by expectations on future short rates (38). The two different approaches would imply in terms of an econometric model of the term structure that: (a) in the first case we tend to take the long rate as exogenously determined and therefore we try to explain the current level of the short rate essentially in terms of present and past values of the long rate (39); while (b) in the second case we proceed in the opposite way: we explain the current level of the long rate in terms of present and past values of the short rates.

The second approach has clearly been the most widely adopted in literature. The rationale for this approach lies essentially in the fact that we may assume a close and quick connection between the official discount rate and free money-market rates, either due to direct market links, or simply because of immediate expectations announcement effects. Although one would like all this to be effectively shown, and not only implicitly assumed, there are sound a priori reasons supporting the validity of this approach in relation to the U.S. or the U.K. These reasons, however, do not seem to apply to the Italian market, where the thin market is essentially the short one, and where open-market operations during the period considered in this study have been mainly focused on intermediate- and long-term securities (40).

A priori, it would therefore seem impossible to escape the complications of a simultaneous approach to the explanation of the term structure, i.e. to explain the level of short- and long-term rates, in relation to the Italian experience. But clearly, an essential prerequisite for the construction of a sophisticated simultaneous model is the understanding of how the links between short and long rates are formed, and more specifically, if crude supply and demand models essentially based on the market segmentation hypothesis can be adopted to depict the actual market behaviour.

A full answer to this problem is beyond the scope of this paper. However, it may be relevant to point out that the data presented in this study are consistent with a model of revisions of expectations based on the assumption of short-term forecasts of all future rates (41), thus supporting the arguments in favour of a simultaneous explanation.

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(36) The theoretical arguments in favour of a simultaneous determination of short- and long rates appear more clearly in the case of speculative models of the term structure which assume explicitly short-term expectations of all future rates. On these points see, for example, M. The Term Structure of Interest Rates in Italy, (mimeographed), Ph.D. dissertation, University of Oxford, 1969, Chapter 2.

(37) This point of view is usually associated with Marshall (see A. Marshall, Money, Credit and Commerce, London, MacMillan, 1923, p. 253) and, more recently, with followers of the so-called segmentation approach to the term structure (see, for example, S. Okunishi, "The Interest Rate Structure: Towards Completion of the Classical System", Chapter 10 in F. Mayer and F. Massola (eds.), The Theory of Interest Rates, London, MacMillan, 1965).

(38) Normally this approach is taken to be implied by the expectations approach to the term structure, and in fact the first who expressed it explicitly seems to be R. Koester (see N. Kaleko, "Speculation and Economic Stability", Review of Economic Studies, October 1959, reprinted in Ed., Essays on Economic Stability and Growth, London, Duckworth, 1960, PP. 33 ff.).

(39) It should be pointed out that this approach may be consistent with an expectational approach to the explanation of the term structure; in other words, it should not be necessarily identified with the one proposed by supporters of the segmentation hypothesis. On this point see my paper, La struttura dei tassi di interesse secondo la modellizzazione teorica e implicazioni di politica economica, Banca degli Stati, December 1980, pp. 1559-1588.

(40) All this casts some doubts on the feasibility of adopting, e.g., an approach à la Medigianii and Stich to explain the spread between long and short rates in Italy. (See, for example, F. Medigianii and R. Sorci, "L'Indice di Mercato e la Struttura delle Quote di Interesse: Una Applicazione al Mercato Italiano", Rassen, December 1968, pp. 1559-1588.)
tion of long and short rates in the context of an expectational approach.

Finally, a few words might perhaps be spent considering very briefly the implications of the data presented in this study with regard to the recent attempts of the monetary authorities in Italy to prevent interest rates reaching the present high international levels (42). The sensitivity to economic incentives of free-market rates which is shown by the yield curves obtained in this study points out the very serious difficulties of this policy. These difficulties are enhanced in view of the increasing obstacles which are encountered in achieving effective exchange controls of capital movements when yield differentials are very high, owing to the progressive financial integration of the E.E.C. countries. On the other hand, there are important factors which militate against a policy of letting rates float to higher levels, one of the major ones perhaps being that many banks in Italy have been heavily investing in fixed-income securities during the past two or three years. A heavy and uncontrolled rise in interest rates might therefore have dangerous consequences on their balance sheets, and, hence, on the whole financial system.

The prospects of the present policy of the Italian monetary authorities will of course largely depend on the international situation, and, in particular, on the effectiveness of the attempts to curb inflation in the U.S. Anyhow, taking into account the recent policy experiences of both the U.S. and the U.K., it is quite clear that the policy of control of interest rates in Italy must not be achieved at the expense of losing control of the monetary base, and, more generally, of the money supply. The arguments against the policy of central banks to "lean against rising interest rates" are by now well known, and there is no need of dwelling upon them here (43). A policy of injecting money into the system to relieve temporarily upward pressures in interest rates is particularly exposed to the risk of implying Pyrrhic victories in the Italian situation, where, given the large proportion of international transactions, inflationary pressures may have serious consequences on the balance of payments, and more generally on aggregate demand, even without substantial increases in price levels (44).

Thus, if the Italian monetary authorities decide that the actual level of domestic interest rates is to be essentially maintained, even in a background of continuing very high international rates, the only possible solution appears to be a recourse to adequate fiscal measures to finance the growing needs of the public sector. On the one hand, this would relieve the pressures of the huge demand for new funds in the bond market; on the other hand, a more favourable attitude towards the share market might provide a channel for the funds which are now being illegally exported (45). The Italian postwar experiences have shown the remarkable powers of monetary policy, thus offering strong support to the view that "money matters," precisely because of this lesson, the time might have come to use in this difficult situation more sophisticated "policy mixes," without neglecting the support of fiscal measures (46).

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(40) The dangers of this policy are also enhanced in view of the pressures for wage increases which are now under discussion for a large part of the Italian labour force.

(43) See, for example, with reference to the British experience, A. Walker, Money inBoom andTherapy, Board Paper 44, Institute of Economic Affairs, 1959 and for the American experience, D. Finer, "A Monetary Interpretation of the Post-1945 Inflation in the United States", this Review, June 1959. The general theoretical background of these arguments is essentially to be found on the lines of Friedman's work; however, the basic tenet that price expectations have a powerful influence on (nominal) interest rates is one that is by no means accepted by all economists. Thus, e.g., for John Hicks has recently observed that "The high rates of interest, to which we are becoming accustomed in the nineteen-fifties, are the most obvious adjustment to monetary inflation." See J. Hicks, A Theory of Wages, London, Oxford University Press, 1950, p. 97, n. 9.