

RELATIVE YIELD VARIABILITY
IN THE EUROBOND MARKET

-A PILOT STUDY-

BY GUNTER DUFEY

Document de travail CRIDE 4/69

REPRINT

The author is Ass. Professor of International Business at the University of Michigan. His study has been presented at a seminar organized in January 1969 by the Center for Interdisciplinary Research in Law and Economics (CRIDE) of the University of Louvain (Belgium).

Introduction

During the last decade functions, trends, and problems both of domestic and international capital markets have increasingly attracted the attention of public policy makers, businessmen, and academicians. The extensive studies commissioned by the U. S. Treasury, the EEC, and the OECD attest to this.¹ Among the many changes and trends which can be observed within broader framework of international capital markets, the development of the "Eurobond market" is probably the most interesting. Its rate of growth and its size alone are most remarkable. From small beginnings in 1963, public institutions and private concerns from many countries raised the equivalent of over 450 billion Belgian francs during the last five years in this market.

The concept of the Eurobond market and, consequently, the measurement of the magnitudes involved have sometimes caused difficulties. Therefore, it may be useful to briefly look at capital markets in general from the realistic viewpoint of a borrower and an investor, alternatively. Taking the perspective of a borrower first, it is possible to distinguish three alternative markets in which a new issue can be placed. First, there is the borrower's domestic market. The vast majority of all capital formation and

¹Ira O. Scott, Jr. European Capital Markets, A publication of the Office of the Comptroller of the Currency, U.S. Treasury Department, Washington, D.C., 1968.

EEC Commission, The Development of a European Capital Market, Report of a Group of Experts under Claudio Segre, Brussels, November, 1966.

OECD Committee for Invisible Transactions. Capital Market Study-General Report, Organization for Economic Cooperation and Development, Paris March, 1967.

security transactions take place within that framework. However, cost availability, and balance of payments considerations may induce a borrower to raise funds in the capital market of a country other than his own. Traditionally, this is done through the issue of securities in the foreign bond market which is attached to the domestic bond market of another country. The New York foreign bond market and Switzerland's market for foreign issues are the best known examples of what can be called "national markets for foreign bonds."

The access of foreign borrowers to these national markets, however, is frequently restricted by direct government control or effective underwriter cartels. Deferring the question as to the motivation of this action, it is essential to recognize that the Eurobond market offers borrowers a third alternative. In this market debt and convertible securities are issued to managing consortia and selling groups made up of banks and financial institutions from several different countries. These institutions place the securities for the investors who are frequently foreign account holders from the standpoint of the individual bank.² The Eurobond market can therefore be defined as a market which is both foreign to borrowers and to most investors.

Similarly, from the investor's standpoint, the differentiation of capital markets along these lines is less clear, particularly the distinction between foreign securities sold in a national market on one hand and Eurobonds on the other. Investors are generally subject only to foreign exchange controls, which are often quite liberal, always

²A typical example for a Eurobond transaction would be the issue of dollar denominated bonds by a Norwegian municipality, managed by a consortium of London issuing houses and a large Dutch bank, whereby a portion of the issue would be placed, say, with French investors who maintain investment accounts with Swiss banks.

difficult to enforce, and regularly not discriminatory as far as their application to different kinds of foreign securities is concerned. Otherwise, investor's actions are guided by yield, perceived risk, and tax considerations. However, a point can be made that, inherently, each market has certain distinguishing features for the investor too. To illustrate, the present and potential tax status of securities issued in the Eurobond market is different from those issued in national markets for foreign bonds. Also, the development of security prices is subject to factors different from those which exert their influence in national markets. An elaboration of these examples must wait for analysis until later; for now they serve well enough the purpose of conceptually clarifying the subject of this study, the Eurobond market.

For practical purposes Eurobonds can be defined as follows: First, all U. S. dollar issues subject to the IET. Second, all DM issues floated for non-German borrowers after April 1, 1964 to 1967; DM issues by such borrowers in 1968 are classified as Eurobonds only when they were launched by multinational consortia. Three, multi-currency issues--particularly DM/\$ and DM/£ issues--and EUA issues. The following tables reflect these definitions.

The growth of this market has created a host of problems and questions which have remained largely unanswered. Among these questions are those which refer to the probable effect of this market on the international monetary system. Others concern the problem of integration of national markets within regional blocks, such as the European Economic Community. Another pressing issue related to the

Eurobond market is whether this market can be used as a significant source of development funds for underdeveloped countries. Furthermore, there is the question as to the effects of these markets on independent national policies in capital markets.

However, before one attempts to answer these and other questions with such far-reaching implications, more basic issues have to be solved such as those relating to the structure and functioning of the market. By now, both the volume of issues and the availability of data over a longer time span make some quantitative analysis feasible and necessary. As for descriptive analyses, the literature has grown considerably and the functioning of the market has been analyzed quite well.³ This author attempted a modest contribution in providing for a comprehensive presentation of the market and in making some tentative predictions about its future.⁴

This paper is specifically concerned with the problem of variability of yields and prices in the Eurobond market.

From a theoretical standpoint, the analysis and measurement of price and yield variability in a capital market has both macro- and micro-economic implications. As far as the first aspect is concerned, a comparison of yield fluctuations in different but comparable markets, i.e. the measurement of its relative variability, is most useful to quantitatively support hypotheses about differences in the structure

³For example see: Paul Einzig, Foreign Dollar Loans in Europe. (New York: Macmillan 1965); David Williams, "Foreign Currency Issue on European Security Markets," IMF Staff Papers, March 1967; Robert L. Genill "The Eurobond Market," Financial Analysts Journal, March-April, 1967.

⁴Gunter Dufey, The Eurobond Market--Function and Future, University of Washington, Bureau of Business Research, 1969.

of these markets. The micro-economic aspects are involved because price and yield variability has been widely accepted as the most useful proxy variable for risk which the investor encounters in a market.

These two implications, however, are much more related than it appears at first sight. Risk is one of the crucial variables which determined investor's preferences both for individual securities and capital markets. This in turn affects the pattern of supply of capital which is, together with the pattern of demand, the most important determinant of the structure of a capital market. At the same time, this demand supply relationship is, of course, decisive for the competitiveness of one market against others, and consequently it has important consequences for a market's future.

In the following sections of this paper a brief summary of market characteristics of the Eurobond market will be presented and a hypothesis will be derived therefrom. The subsequent sections deal with the method of testing this hypothesis. Then, the results and the analysis of these results will be presented. A final section is concerned with conclusions and future outlook.

Summary of Market Characteristics

From an historical perspective, the Eurobond market evolved at a relatively late stage in the development of the post-war international financial system, the beginning of which dates back to the Bretton Woods Agreement, Capital flows largely limited to intergovernmental transfers in the late 1940's, and it was not until the beginning of the next decade that a slow revival of private international long-term lending and borrowing took place; the final breakthrough occurred

with the return to at least partial convertibility of major European currencies. Currency convertibility, however, was not a sufficient condition for complete freedom of international capital market transactions in Europe. European markets remained fragmented, even after attempts to integrate other areas of economic activity were successful. The lack of integration, structural weaknesses, and the use of capital markets as a major tool in achieving the objectives of national planning schemes resulted in relatively tight controls on security issues by foreign borrowers. These controls stood in contrast to the relative freedom enjoyed by investors who intended to purchase foreign securities. This asymmetry of controls is the fundamental reason for the birth of the Eurobond market.

The major reason why this asymmetry did not lead to a strong parallel market before 1963 was the vigorous competition provided by the New York foreign bond market. This market's major advantage was that it relied on foreign investors as well as the United States domestic market with its--by international standards--seemingly unlimited supply of funds, channelled through strong institutional investors. The Interest Equalization Tax, announced in the United States during 1963 in order to combat the persistent balance of payments deficits, effectively closed the New York foreign bond market to borrowers from developed countries, thus diverting them into the fledgling Eurobond market. This market was then the only effective alternative for many borrowers who, for one reason or another, were unable to obtain long-term capital at acceptable conditions in their domestic markets.

A third incident aided in the growth of the market: The "Voluntary Restraint Program" announced in the beginning of 1965, which was periodically tightened and made mandatory in early 1968, forced United States corporations with international operations to go outside the country for funds to expand abroad. From then on, corporations issued a heavy volume of securities, attracting new investible funds by offering opportunity for diversification and by issuing securities which were convertible into the common stock of the parent company. The appearance of new borrowers and more speculative types of securities broadened the market, which was formerly monopolized by governments and other public borrowers. Private European corporations entered the Eurobond market soon after United States corporate bonds had become popular with investors.

German balance of payment measures, finally, explain the developments in the DM denominated part of the Eurobond market. From 1958 through 1963, foreigners had purchased large quantities of high yielding German fixed interest securities. To prevent the ever-increasing inflows of foreign funds, a 25 percent yield tax was levied on interest payments on German domestic bonds to foreign bondholders. This tax led foreign investors to sell-off German bonds and purchase DM bonds issued by foreign borrowers which were, of course, exempted from the tax. The result was that yields of domestic and foreign DM bonds moved in opposite directions, whereby those for DM bonds by foreign borrowers fell in line with other Eurobonds. This decrease of interest cost, in turn, led to strong issue activity of

DM denominated bonds in the Eurobond market. Even German companies found it advantageous, at times, to issue DM bonds through Luxembourg financial subsidiaries.

The aforementioned factors which brought the Eurobond market into existence are, however, by no means the only ones which have influenced its subsequent development. With the growth of the market, others evolved which will determine the future of the market. The first of these "dynamic" factors is a characteristic of the institutional framework. The fact that the Eurobond market can rely on the issuing banks and financial institutions of many countries assures that the largest and most efficient institutions of each national market compete for these issues. One of the effects of this enlarged framework of competition has been the lowering of issuing costs, which now appear to be less or at least equal to those prevailing in the most competitive national markets for foreign bonds. Also, the wide choice of banks for the selling groups permits inclusion of those with the highest placement ability at the time of an issue and contributes to its success; by the same token, a wide geographical area is tapped for low cost funds.

The second of these factors concerns the demand for funds. The Eurobond market attracts a very wide variety of both public and private borrowers, from very different countries. No one group of borrowers has had a dominating share of the market for very long, which attests to the strong competition for funds. The market has accepted only borrowers of high quality by the standard of past defaults. The demand determinants are varied, but always contain one or more of the following three considerations: availability, cost, and foreign exchange.

The particular institutional structure of the Eurobond market allows the adjustment of issue techniques in such a way as to obtain the most propitious tax status for the securities. This applies not only to withholding (or source) taxes which are levied by almost all countries on interest payments, but it permits investors also to either defer or avoid the payment of income taxes.

In the Eurocurrency money market, which essentially owes its existence to imperfections in national money markets, the Eurobond issuing banks find a ready and relatively inexpensive source of short-term financing facility to carry temporarily portions of new issues until they can be placed with final investors. At the same time, the Eurodollar market, as it is called most frequently, serves Eurobond issuers as an investment medium for the temporary use of proceeds from security issues. Furthermore, the existence of this Eurocurrency market has strengthened international foreign exchange market facilities. These are essential for the functioning of the Eurobond market because the capital flows involve usually the conversion of currencies by both borrowers and investors.

Theoretically, the Eurobond market has complete freedom in the choice of the currency or artificial currency construct in which the securities can be denominated. In practice, economic factors and the opposition of some central banks limit the choice somewhat. Still, the Eurobond market owes to this unique feature much of its flexibility and competitive advantage.

Many of the above factors relate to the virtually complete freedom from the usual restrictions and controls which are present in national capital markets. For one, governments are basically not

interested in the transactions of third country residents, which is typical for the Eurobond market. On the contrary, most welcome such business as a source of foreign exchange earnings from the services performed by its institutions. Even if an individual government attempted to interfere unilaterally, all market activities would simply shift elsewhere since they do not depend on the institutions of one particular country. Further, if a government intends to maintain convertibility of its currency, it is virtually impossible to prevent investors from purchasing these securities. In preventing its companies to borrow, a government would effectively deprive them of the advantage of low-cost capital and/or foreign exchange, which may simply hurt this borrower's competitive position in world markets. Third country accounts by investors and multinational operations of corporations very much limit the effectiveness of such controls anyway.

The secondary market for Eurobonds, finally, has been relatively the weakest aspect of the market. Trading takes place on a geographically dispersed, over-the-counter basis; in the past turnover has been relatively small, arbitrage not very effective and price fluctuations without apparent reason have been frequent. However, with the increased volume of new issues, improved trading facilities by groups of brokerage houses that cooperate internationally, and the establishment of central clearing facilities, the after-market has been improving rapidly as time progressed.

The interrelationship between the Eurobond market and alternative money and capital markets in respect to the supply of funds is especially important. The sensitivity with which funds

flows react to differential conditions between these markets and the Eurobond market determines--together with the elasticity of the demand for funds--the stability of yields in this market.

Theoretically, an investor who seeks to purchase long term debt securities has three alternatives. He can purchase securities issued in his domestic market by either domestic or foreign borrowers. Second, he can purchase securities which have been issued in a capital market of another country. Third, he can purchase Eurobonds.

In general terms the flow of funds from national markets to the Eurobond market or any other foreign market for that matter, is determined by the following factors. First, the amount of investible savings; second, interest rate differentials, to be adjusted for different tax assessments; third, anticipated changes in exchange rates; fourth, the desire of investors to reduce risk through diversification as to currencies, interest rate movements, and as to the jurisdiction in which he holds his wealth. Finally, there is the influence of present and expected administrative measures such as foreign exchange regulation and specific restrictions on portfolio decisions of institutional investors.

Given these general supply considerations, it is possible to state that the Eurobond market is a closer alternative to investment in domestic securities than securities issued in a capital market of another country. The reasons for such an assumption are based on the characteristics of the Eurobond market, especially the freedom from present and future taxation the unmatched possibility for diversification as to borrowers and currencies and a greater degree and assurance of freedom from interference by national governments. To illustrate,

investors have not forgotten the disastrous results which nationally oriented measures such as the IET and the German coupon tax had on their holdings in the U. S. and German bond markets.

A detailed analysis of the interrelationship in the flow of funds between individual national markets and the Eurobond market would go beyond the scope of this working paper.⁵ However, studies of possible connections between the market under study and the Eurodollar--, the North American--, the Swiss--, and certain other European markets show that the flow of funds between the Eurobond market and these alternative markets responds to changes in yield differentials. The flow of funds during 1965 from the Italian market into the Eurobond market and the similar phenomenon which involved the flow of German funds to the Eurobond market from the end of 1967 on are the best and most prominent examples for this tendency. Of course, the intensity of these flows varies greatly from case to case. Factors which render the relationship between those markets less than perfect include among other things deliberate government policies ranging from discouraging financial institutions to advertise Eurobonds over various tax measure, to stringent currency controls. Also, imperfect information of investors and fear of parity changes of currencies constitute possible causes for remaining yield differences.

Development of a Hypothesis

From the institutional analysis found in the literature cited above and the sketchy material of the previous section it is possible to make some tentative deductions about the structure of the Eurobond

⁵For details see Gunter Dufey, op. cit. Chapter IV.

market. It was shown for example, that domestic capital markets in Europe have certain connections with each other, but essentially are not integrated. These domestic markets have attached to them foreign bond markets, where foreign borrowers issue securities; they represent part of the weak link between the individual markets. However, it is characteristic to these national markets for foreign bonds that they are subject to national regulations; they are also largely dependent on the same market forces, investor habits, and institutional arrangements, which govern the domestic portion of these markets. Most important of all, they reflect the monetary policies of authorities who are guided by nationally oriented objectives. Other types of government interference can cause abrupt alterations in these markets.

All this does not hold true for the Eurobond market, which is not, and cannot be, effectively controlled by national governments. As such, it constitutes a real alternative for borrowers, whose demands for funds can be satisfied neither in their own domestic market nor in other national markets. Indeed, it was shown that for many borrowers the Eurobond market offers better conditions in terms of availability, cost, and currency choice than their own domestic market.

For the investor who wishes to employ funds outside his own domestic market, the Eurobond market is the preferred alternative. This situation is evidenced by shifts in the supply of funds as yield differentials change between the various domestic markets and national markets for foreign bonds on one hand and the Eurobond market on the other hand. Although the relationship between changes of interest rate differentials and the flow of funds is an imperfect one, the tendency of such a linkage can be shown empirically.

Thus, in view of the fact that interest rates in national markets are determined largely by endogenous variables; given that investible funds flow from many different capital markets into the Eurobond market in response to interest rate changes; given further an ever-present demand in this market from a widely varied group of borrowers, it can be expected that yields in the Eurobond market are more stable than those in national markets for foreign bonds. It is interesting to note that a similar phenomenon was observed in the New York foreign bond market,⁶ where yields were found to be less volatile than in the U. S. domestic market. This effect should be even more pronounced in the Eurobond market, where funds from no single national market exert overwhelming influence. In New York the developments in the domestic United States market were, after all, of tantamount importance.

If one prefers a pictorial simile, one can say that, because of its structure, the Eurobond market is like the center of a four-wheeled vehicle, whose vertical motion is less pronounced in the middle than at each of the wheels.

Admittedly, this basic model of the structure of the Eurobond market is simplified. Practitioners will point out that there are a number of countervailing forces in operation. For one, it is sometimes maintained that the relatively sophisticated and mobile investors who operate in this market react far more sensitively to any political or, what is perhaps more important, monetary

⁶Robert F. Gemill, "New Foreign Bond Issues in the U. S. Market," Federal Reserve Bulletin, May, 1963.

disturbances anywhere in the world. Another argument is that a sudden influx of borrowers, whose demand functions exhibit less elasticity within a certain time period than the supply of funds, would make for higher volatility of the market.

Further, there is the alledged weakness of the secondary market for Eurobonds, which may increase volatility. Since the market for new issues is a placement market--i.e. other than in the United States, for example, there is no competitive public selling of an issue--the securities are either firmly placed with the members of the selling group and their clientele, or there is no issue at all. These subscribers, however, will commit themselves to an issue much more readily if they know that there is a well functioning secondary market in which they can liquidate their holdings whenever they wish to do so. If the secondary market, on the other hand, is thin and individual prices fluctuate widely, investors will require special inducements in order to compensate them for the risk of having to sell in an unreliable aftermarket.

This raises the fundamental question whether the market as a whole is volatile or whether it is only the prices of individual securities which fluctuate widely but randomly due to a narrow market for individual securities. In a nutshell, these issues can be summarized as follows: if the basic model which is suggested by the structure of the Eurobond market works effectively, yields in this market can be expected to exhibit less variability than those in alternative markets; if on the other hand, yields in the Eurobond

market are at least as volatile as in alternative markets, then disturbing factors are more powerful. This, then, is the basis of the following hypothesis:

For the market as a whole, yields in the Eurobond market are more stable than those in major alternative markets for foreign bonds.⁷

Method

The conceptual problems and those of method center on possible measurement techniques. The solutions found rely primarily on methods which have been used in studies of common stock prices; some of these findings are applied to bond markets and the specific problems at hand.

It may be helpful to subdivide the whole problem into two parts. The first is concerned with the difficulty of finding a proper yardstick which represents as accurately as possible what is going on in a securities market, which is made up of a large and varying number of individual securities, each having its own properties and price behavior. The second part of the problem refers to the proper measurement of "stability" or its converse, "variability" of these markets.⁸

⁷The particular view, which is expressed in the hypothesis on the basis of the institutional analysis of the Eurobond market, has also been stated by a European investment banker in the draft of a paper which appeared when the results of this research were already submitted for review: "...this possibility to be able to switch easily in the new issues from one currency to another certainly constitutes a positive attribute of the market, adding lastly to its aggregate stability. An international financial center, by contrast, depends on the monetary and fiscal policy of the "guest" country and, consequently, on considerably more unilateral influences." Quoted from Kurt Richebacher, "The Problems and Prospects of Integrating European Capital Markets." Preliminary draft prepared for the 1968 Conference of University Professors of the American Bankers Association, Ditchley Park, Oxfordshire, England, September 10-13, 1968.

⁸Of course, to a certain extent this separation is artificial because the two problems are related.

The first part is related to the problem of developing a representative indicator of overall market price changes. Security markets pose a particularly difficult problem with respect to the application of standard statistical sampling techniques, which are generally relied on to solve problems of this nature. Some of the vexing difficulties connected with the use of conventionally constructed indices are based on the fact that the sampled population changes over time in terms of both the absolute numbers involved and the behavior of the individual security. Further, there is the question of proper weighting, i.e., transactions in the market may be concentrated on a relative small number of securities. This concentration may change constantly from one group of securities to another. These difficulties are particularly apparent in stock markets, and the existence of at least three widely used indices of the New York Stock Exchange attests to the fact that no completely satisfactory solution has been found.⁹

In view of the statistical deficiency of conventionally constructed indices, another avenue of research efforts, generally known under the term "portfolio approach" has found to be very useful for this study.¹⁰ This approach has shown that realistically, i.e. from

⁹For a detailed analysis of the problems of constructing such an index see Robert Richardson Petit, An Index of Pacific Northwest Security Stock Prices, Unpublished MBA Research Paper, Graduate School of Business Administration, University of Washington, 1965, pp. 3-12.

¹⁰It must be pointed out that the objective of the portfolio differs markedly from that which is the basis for the development of an index. There is no intention of finding a yardstick for a market but on the contrary, the objective is to find the efficient set of securities which maximizes an investor's utility function in terms of return and risk.

the standpoint of the investor, the property and behavior of a security is only relevant in terms of its influence on the behavior of the whole portfolio. Because of this relationship, portfolio theory obviates the weighting problem since additions to and deletions from the portfolio in varying amount will be determined by the impact on the behavior of the total portfolio.

The portfolio school has made important contributions to the measurement of "variability" which is regarded as proxy variables for risk. The basic concepts and techniques used in this working paper are taken from the vast body of theoretical and empirical literature in this field.¹¹ Variability of either a security or a portfolio is generally expressed by some statistical measurement of dispersion of the random variable around a mean. The random variable may be a series of prices, value relatives, or yields, depending on the problem at hand. For bond markets it is yields since, in addition to risk, they are the decision criterion for the investor. The specific central value to be chosen depends on the form of the underlying

¹¹Particularly the following: Paul H. Cootner (ed.), The Random Character of Stock Market Prices (Cambridge, Mass.: The M.I.T. Press, 1964); Harry M. Markowitz, Portfolio Selection (New York: John Wiley & Sons, Inc., 1959); Stephen H. Archer and Charles D'Ambrosio, Business Finance: Theory and Management (New York: The Macmillan Co., 1966); William F. Sharpe, "Risk-Aversion in the Stock Market: Some Empirical Evidence," Journal of Finance, September 1965, pp. 416-422; William F. Sharpe, "Security Prices, Risk, and Maximal Gains from Diversification: Reply," Journal of Finance, December 1966, pp. 743-744. In addition, the following empirical studies should be mentioned: Charles Griffiths Ferreira, Quantification and Measurement of Risk: An Empirical Study of Selected Common Stocks, Unpublished DBA Dissertation, Graduate School of Business Administration, University of Washington, 1966; John Leslie Evans, Diversification and the Reduction of Dispersion: An Empirical Analysis, Unpublished DBA Dissertation, Graduate School of Business Administration, University of Washington, 1968.

frequency distribution. Research on the nature of the underlying distribution of value relatives of common stocks has not shown any conclusive results.¹² In the absence of evidence to the contrary, it is assumed that yields of bond portfolios are normally distributed around the arithmetic mean of the series. Of the statistical measures of dispersion, two were considered for this study.¹³ One is the variance, which is a generally accepted measure of absolute dispersion of the random variable around the mean. Mathematically, it is defined as

$$s_x^2 = \frac{(x - \bar{x})^2}{n - 1}$$

whereby x denotes the random variable, $\bar{x}$ the mean, and n the number of observations.

The coefficient of variation is an alternative statistic used to measure variability of securities which is normally defined as

$$CV(X) = \frac{s_x}{\bar{x}} \cdot 100$$

Other than the variance, the coefficient of variation is a measure of the relative dispersion around the mean. Thus, its use as a measurement of stability or risk in security markets has the appealing feature of taking into consideration the magnitude of returns. To illustrate, if two securities equal in every other

¹²Evans, op. cit., p. 40.

¹³For a comprehensive summary and evaluation of such statistical measurements see Charles Griffiths Ferreira, op. cit., pp. 17-27.

respect have the same absolute dispersion of yields, the investor will clearly prefer the one with the higher mean, i.e. average return, and the coefficient of variation should lead to this conclusion.

In spite of this advantage, the coefficient of variation has conceptually and arithmetically certain drawbacks. When the mean value approaches 0, for example, results become distorted; also, it does not yield a unique solution when applied to the analytical framework of the capital market curve.¹⁴ These particular difficulties do not apply here since the mean values of the yield series are quite "well behaved."¹⁵ However, to test the statistical significance of the coefficient of variation of sample portfolios in order to make inferences with respect to the underlying sampling population is virtually impossible because of the form of the resulting distribution. Therefore, the test of the hypothesis is performed in terms of the variance, while the coefficient of variation is used to illustrate the relative variability of the specific portfolios, only.

Consequently, the following specific steps were followed:

(1) A choice of the relevant markets for comparison with the Eurobond market had to be made. In the previous chapters, it was pointed out that among the national foreign bond markets, those of New York and Switzerland are the most likely alternatives to the Eurobond market. A continental European market, that of Germany, was

¹⁴For a detailed discussion see Stephen H. Archer and Charles D'Ambrosio, op. cit., Instructors Manual, pp. vii-xii.

¹⁵See the Appendix.

chosen for two reasons: (a) it is a relatively large market both in terms of domestic and foreign issues, (b) government interference there is less than in others, especially there is virtually no control on new private issues, (c) it constitutes another important alternative for foreign borrowers. The Eurodollar market, finally, was selected because of its close connections with the Eurobond market. The time period under study extends from the beginning of July 1964 to the end of June 1968. Before July 1964 the Eurobond market was not large enough to provide meaningful data.

(2) Portfolios of 18 representative securities were chosen from each market, whereby representative means that a set of securities which reflect the composition of the market in terms of types of borrowers and, in the case of the Eurobond market, the currencies used at the time the portfolios were taken. In order to take account of the rapidly changing composition of the Eurobond market, the portfolio was partially changed to reflect the entry of new borrowers and the use of different currency combinations as of June, 1965. This second portfolio, subsequently called Eurobond 2, was used for control purposes, although the time span of this part of the analysis has to be shortened by one year, of course. Other selection criteria for the inclusion of securities in these portfolios were (1) a reasonably long time to redemption--normally between 1970-1980--and (2) uninterrupted trading over the period under study. Tables contain a list of the securities in the various portfolios.

(3) In taking 18 bonds for each portfolio, the problem of unsystematic risk, i.e. fluctuation of portfolio yields due to the

price behavior of an individual security was considered to be eliminated. In a recent empirical study¹⁶ it was shown that, in the case of common stocks, as soon as a portfolio size of 10 or 11 securities has been reached, the remaining variation of the portfolio is due to the underlying market forces, i.e. the systematic variation. This effect is particularly important in a comparison of markets where market structures, trading volumes, etc., are so different as is the case with the markets in this study. There is no a priori reason against the application of these findings to bond markets.

(4) Weekly price data for each security in the portfolio were collected from the various sources abroad.¹⁷ The prices in each case either reflect actual transactions or the arithmetic mean between bid and ask prices. If a bond was neither traded nor quoted during a week the price was assumed to be the mean value between the previous price and that of the following week.

(5) These weekly prices were used to compute the yield to maturity for each bond, taking into account the coupon rate, and the average remaining time to maturity of the issue. The redemption price

¹⁶John Leslie Evans, op. cit., pp. 38, 55-61.

¹⁷(1) Eurobonds - DM issues from Blick durch die Wirtschaft, special supplement to Frankfurter Allgemeine Zeitung, Frankfurt, Monday editions; (2) Eurobonds quoted in London from The Stock Exchange Daily Official List, London, Friday edition; (3) Eurobonds--others from the private weekly Quotation List, Strauss Turnbull & Co., London; (4) 3 Month Eurodollar Rates from The Financial Times, London, Friday editions; (5) German bonds from Frankfurter Allgemeine Zeitung, Saturday editions; (6) Swiss foreign bonds from Neue Züricher Zeitung, Zurich, Saturday edition, (7) New York foreign bonds from the Commercial and Financial Chronicle, New York, Monday editions.

assumed to be 100 in each case.¹⁸ Finally, the number of interest periods was taken into account.¹⁹ From these yields, a series of average weekly yields was computed for each portfolio, assuming that the portfolio included an equal amount of each security.

(6) Each of these yield series constitutes the basic distribution from which the variance S_x^2 is computed.

(7) To infer from the behavior of the portfolio yields to the behavior of the underlying markets, it is necessary to show that the variances of the markets compared are not equal, i.e. that each observed difference in variation is statistically significant. This can be done by using a standard, two-sided f-test.²⁰ Since f is a robust statistic, it is neither necessary to assume that the populations have equal means, nor must the requirement of strict statistical randomness be fulfilled. Formally, the test can be set up as follows:

$$H_0 : \sigma^2 = \sigma^2$$

$$H_1 : \sigma^2 \neq \sigma^2$$

$$F = S_1^2 / S_2^2$$

Level of significance: = .05

Degrees of freedom: N-1, M-1 = 17

Accept H if $F = F_{.975}$ (2.710) or if $F_{.025}$ (.372)²¹

¹⁸This assumption holds unless the borrower exercises a call option, which cannot be foreseen in advance. Usually, however, a call premium partially compensates for the shortening of the maturity.

¹⁹The actuarial yield formula used was $P = Cv^n + \frac{g}{i} (1 - v^n)$ whereby P = current price; C = redemption value; n = time to redemption; g = coupon rate, i = yield; $v^n = \frac{1}{(1+i)^n}$.

²⁰Wilfrid J. Dixon and Frank W. Massey, Introduction to Statistical Analysis (New York: McGraw-Hill, 2nd edition, 1957), p. 106.

²¹Ibid., Table A-7c.

TABLE 1
VARIABILITY ANALYSIS
(Variance)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 1	Swiss Foreign Market	New York Foreign Market
7/64-6/68	.661	.298*	.821	.371	.211*
7/64-6/66	.251	.296	.228	.236	.099
7/66-6/68	.523	.270	.373	.100*	.094*
7/64-6/65	.084	.048*	.015	.013	.007
7/65-6/66	.190	.104	.144	.244	.023*
7/66-6/67	.605	.227	.127	.108	.043*
7/67-6/68	.430	.024*	.437	.077*	.099*
7/64-12/64	.062	.001	.002	.010*	.001
1/65-6/65	.052	.048	.024	.016	.010
7/65-12/65	.094	.021	.040	.127*	.019*
1/66-6/66	.047	.091	.053	.067	.004*
7/66-12/66	.091	.028	.016	.014	.031
1/67-6/67	.281	.059	.036	.044	.022
7/67-12/67	.315	.001*	.110	.113	.036*
1/68-6/68	.296	.026	.021	.042	.061*

*Difference significant at the .05 level.

TABLE 2
VARIABILITY ANALYSIS
(Variance)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 2	Swiss Foreign Market	New York Foreign Market
7/65-6/68	.536	.228	.457	.220	.106*
7/65-6/66	.191	.104	.140	.244	.023*
7/66-6/67	.605	.227	.175	.108	.043*
7/67-6/68	.432	.024*	.306	.077*	.099*
7/65-12/65	.094	.021	.031	.127*	.019*
1/66-6/66	.047	.091	.049	.067	.004*
7/66-12/66	.091	.028	.027	.014	.031
1/67-6/67	.281	.059	.051	.044	.022
7/67-12/67	.315	.001*	.097	.113	.036
1/68-6/68	.296	.026	.012	.042*	.061*

*Difference significant at the .05 level.

TABLE 3
 VARIABILITY ANALYSIS
 (Coefficient of Variation)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 1	Swiss Foreign Market	New York Foreign Market
7/64-6/68	148	78	130	121	66
7/64-6/66	101	79	76	107	50
7/66-6/68	120	73	79	58	44
7/64-6/65	63	34	21	27	14
7/65-6/66	83	44	57	101	23
7/66-6/67	128	63	48	59	31
7/67-6/68	110	23	83	52	45
7/64-12/64	56	5	8	24	5
1/65-6/65	48	33	26	30	17
7/65-12/65	62	20	32	79	21
1/66-6/66	39	40	33	49	9
7/66-12/66	45	21	16	20	26
1/67-6/67	97	34	27	40	22
7/67-12/67	100	14	45	63	22
1/68-6/68	86	24	17	38	34

TABLE 4
VARIABILITY ANALYSIS
(Coefficient of Variation)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 1	Swiss Foreign Market	New York Foreign Market
7/65-6/68	127	66	93	89	48
7/65-6/67	83	44	56	101	23
7/66-6/67	128	63	57	59	31
7/67-6/68	110	23	69	52	45
7/65-12/65	62	20	28	79	21
1/66-6/66	39	40	32	49	9
7/66-12/66	45	21	21	20	26
1/67-6/67	97	34	32	40	22
7/67-12/67	100	4	42	63	28
1/68-6/68	86	24	13	32	34

In the summary tables, those values which are accepted, i.e., where the variance is found to be significantly different from that of the Eurobond portfolios, are marked by an asterisk.

(8) Formally, the hypothesis can now be stated.

$$H_0 : \sigma_{X_E}^2 \geq \sigma_{X_A}^2$$

$$H_1 : \sigma_{X_E}^2 < \sigma_{X_A}^2$$

(9) In order to take account of different time horizons of investors, the hypothesis is tested for a total period of 4 and 2 years for Eurobond portfolio 1, and 2 years for Eurobond portfolio 2; further, it is tested for each individual year and all half-year periods for both portfolios.

(10) The comparisons of relative portfolio yield variability, expressed by the coefficient of variation $CV(X)$, is also performed on the basis of these periods.

Results

The data are presented in Tables 1 through 4; supplementary data can be found in the appendix.

Analysis of Results and Conclusions

The numerical results for the test of the hypothesis are summarized in Table 1 for Eurobond portfolio 1 and Table 2 for Eurobond portfolio 2. In both cases, the pattern which evolves from these data is clear in some respects and somewhat less than conclusive in others, and consequently raises at least as many questions as it answers. Furthermore, since the observed differences of the portfolio variances are mostly not significant enough to allow precise statistical inference, the interpretation of the results must remain largely conjectural.

On one account, the results of the test of the hypothesis are very unambiguous. For most of the time periods tested, yields in the New York foreign bond market are significantly more stable than in the Eurobond market. This holds true particularly for the relatively longer time spans of one year and more. Even during 1964-66 and 1964-65, periods for which the data were found to be not statistically significant, is the variance of Eurobond portfolio 1 smaller than the variance of the New York foreign bond portfolio.

The only notable exception can be found for the first six months of 1968, a time when the dollar and gold crisis reached a climax. For this particular period yields in the Eurobond market are significantly less volatile than those in the New York foreign bond market.

The above results are confirmed when the test is performed with data for Eurobond portfolio 2. They are particularly remarkable in respect to the relatively longer time period studied, taking into account the rapid rise in long-term interest rates in the United States during these periods. Here, only some tentative explanations can be offered for this phenomenon of relative high stability of foreign bond yields. One factor may be found in the scarcity of new foreign bond issues of high quality after the announcement of the IET. This scarcity may have induced investors to value these securities, which bring a high return compared to domestic bonds, irrespective of the behavior of domestic yields. The predominance of large, institutional investors in the New York market who make decisions on a long-term basis may have further contributed to the

results found. Also, these data tend to confirm the Federal Reserve Study cited in Chapter III which explains the observed stability by the interaction between American and foreign investors in this market.

These speculations clearly point out the need for further research, such as a comparison of yield stability in the New York foreign bond market before and after the announcement of the IET.

As to the Swiss foreign bond market, the differences of the portfolio variances are statistically significant during four periods, only. For the shorter time spans, i.e. for the second half of 1964 and 1965 the data confirms the hypothesis. The null hypothesis, on the other hand, is sustained by the data for 1966-68 and 1967-68. The relative stability of the Swiss franc during the international monetary crisis since 1966 may partially explain the relatively lower volatility of yields in the Swiss foreign bond market during these particular time periods.

In respect to the German market, the results are similar. Again, the data are statistically significant for four periods, only. Three variances support the null hypothesis; the variability of yields in the German bond market is significantly greater than the Eurobond market during 1964-65. The evidence is not conclusive enough to even tentatively guess what specific reasons may account for the particular results during different periods.

Looking at all the results from the perspective of the different time spans, it becomes apparent that the hypothesis tends to receive relatively more support from the short-term data, as compared to the data for the two-, three-, or four-year periods. This would indicate that over the longer time spans studied, the

Eurobond market was relatively more volatile in comparison to the other foreign bond markets. This leads to some interesting speculation as to the length and effectiveness of international arbitrage operations on long-term interest rates.

However, hasty conclusions should be tempered by certain methodological considerations. Part of the relatively high long-term variability of yields in the Eurobond market could be caused by changes in the perceived strength of different currencies. To amplify this point: in order to make yields comparable over time, the same securities must be used for a sample portfolio. In the Eurobond market one of the most distinguishing features is the relative freedom in the choice of currencies or currency constructs. The portfolios, however, reflect a certain currency preference which may change over time in the market for new issues, while the portfolio itself is static in this respect. This factor is, of course, absent in national markets for foreign bonds where the currency is always that of the particular country. To a lesser extent, similar considerations apply to changes in the types of borrowers in a market. Unfortunately, there is no way of avoiding these difficulties without sacrificing comparability of yields over time which is essential for variability analysis.

It must be pointed out that these methodological difficulties do not carry enough weight to render the results of this study meaningless. This is borne out by the very small differences of the data for the two Eurobond portfolios which differ considerably, among other things, in terms of currency composition. The conclusion following

from these considerations is that in the interpretation of the results for relatively longer periods increased possibilities of errors must be taken into account.

The supplementary analysis in the form of a comparison of the variability of the specific sample portfolios, for which the data is expressed in terms of coefficients of variation, essentially confirms the pattern found in the previous part of the study which used the variance as a measurement of absolute variability.

For one, the relative stability of yield for the New York foreign bond portfolio is clearly borne out by the data. Only during two six months periods, namely the second half of 1966 and the first half of 1968 is the relative yield variability of this portfolio greater than that of Eurobond portfolio 1. Again, the data for the second portfolio from this market is very similar. On the other side, yields of 3 month Eurodollar deposits show consistently a higher value for the coefficient of variation than those of both Eurobond portfolios. This holds true for virtually all periods tested. Such a result is not surprising since it merely reflects the greater variability of short-term interest rates where a small change in price causes a relatively large change in yield.

As far as the Swiss foreign bond portfolio is concerned, the lower mean values make for a higher relative variability. Especially during the six months periods, this portfolio exhibits a higher relative variability than the Eurobond portfolios.

Data of the German market portfolio, on the other hand, shows the same inconclusive pattern found in the test of the hypothesis;

i.e. the relative variability of yields of that particular port is as often larger than smaller, depending on the time periods

In lieu of conclusion it must be pointed out that the attention of the critical reviewer should not concentrate on the results as such. Interesting as they might be, some of the statistical difficulties mentioned above give them tentative character best. However, the author solicits comment and advice on two aspects considered essential; one is the logical basis of the hypothesis as such, the other aspect concerns the adequacy of the measurement method used in the study.

APPENDIX

TABLE A-1
VARIABILITY ANALYSIS
(Standard Deviation)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 1	Swiss Foreign Market	New York Foreign Market
7/64-6/68	.813	.546	.906	.609	.459
7/64-6/66	.501	.544	.477	.486	.314
7/66-6/68	.723	.520	.611	.316	.306
7/64-6/65	.289	.219	.122	.115	.084
7/65-6/66	.436	.322	.380	.494	.151
7/66-6/67	.778	.476	.357	.328	.207
7/67-6/68	.656	.156	.661	.278	.315
7/64-12/64	.249	.033	.048	.010	.031
1/65-12/65	.229	.219	.155	.125	.101
7/65-12/65	.306	.145	.199	.356	.137
1/66-6/66	.217	.302	.230	.258	.060
7/66-12/66	.301	.166	.126	.117	.176
1/67-6/67	.530	.242	.190	.209	.149
7/67-12/67	.561	.028	.331	.336	.190
1/68-6/68	.544	.162	.144	.205	.246

TABLE A-2
VARIABILITY ANALYSIS
(Mean Values)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 1	Swiss Foreign Market	New York Foreign Market
7/64-6/68	5.482	7.020	6.963	5.013	6.950
7/64-6/66	4.959	6.891	6.240	4.563	6.223
7/66-6/68	6.017	7.149	7.694	5.466	6.917
7/64-6/65	4.624	6.414	5.857	4.235	5.935
7/65-6/66	5.256	7.356	6.623	4.892	6.512
7/66-6/67	6.074	7.545	7.389	5.557	6.765
7/67-6/68	5.960	6.766	7.994	5.377	7.067
7/64-12/64	4.467	6.262	5.812	4.258	5.895
1/65-6/65	4.793	6.597	5.907	4.213	5.975
7/65-12/65	4.934	7.138	6.312	4.509	6.404
1/66-6/66	5.622	7.513	6.935	5.275	6.620
7/66-12/66	6.760	7.970	7.705	5.837	6.831
1/67-6/67	5.445	7.120	7.072	5.278	6.637
7/67-12/67	5.603	6.873	7.377	5.326	6.837
1/68-6/68	6.304	6.664	8.589	5.425	7.288

TABLE A-3

VARIABILITY ANALYSIS
(Standard Deviation)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 2	Swiss Foreign Market	New York Foreign Market
7/65-6/68	.732	.477	.676	.469	.326
7/65-6/66	.437	.322	.374	.494	.151
7/66-6/67	.778	.476	.418	.328	.207
7/67-6/68	.657	.156	.553	.278	.315
7/65-12/65	.306	.145	.177	.356	.137
1/66-6/66	.217	.302	.221	.258	.060
7/66-12/66	.301	.166	.164	.117	.176
1/67-6/67	.530	.242	.225	.210	.149
7/67-12/67	.561	.028	.311	.336	.190
1/68-6/68	.544	.162	.111	.205	.246

TABLE A-4
 VARIABILITY ANALYSIS
 (Mean Values)

Time Period	Eurodollar Market	German Domestic Market	Eurobond Market 2	Swiss Foreign Market	New York Foreign Market
7/65-6/68	5.766	7.220	7.288	5.276	6.783
7/65-6/66	5.256	7.356	6.623	4.892	6.512
7/66-6/67	6.074	7.545	7.401	5.557	6.765
7/67-6/68	5.960	6.766	7.830	5.377	7.067
7/65-12/65	4.934	7.138	6.309	4.509	6.404
1/66-6/66	5.622	7.573	6.937	5.275	6.620
7/66-12/66	6.760	7.970	7.766	5.837	6.831
1/67-6/67	5.445	7.120	7.035	5.278	6.637
7/67-12/67	5.603	6.873	7.322	5.326	6.837
1/68-6/68	6.304	6.664	8.320	5.425	7.288

TABLE A-5
VARIABILITY ANALYSIS
(f - Values)

Time Period	German Domestic Market	Eurobond Market 1	Swiss Foreign Market	New York Foreign Market
7/64-6/68	2.753*		2.213	3.896*
7/64-6/66	.769		.963	2.308
7/66-6/68	1.381		3.738*	3.987*
7/64-6/65	.310*		1.125	2.109
7/65-6/66	1.393		.592	6.330*
7/66-6/67	.563		1.185	2.974*
7/67-6/68	17.954*		5.653*	4.403*
7/64-12/64	2.116		.226*	2.397
1/65-6/65	.501		1.538	2.355
7/65-12/65	1.884		.312*	.211*
1/66-6/66	.580		.795	14.694*
7/66-12/66	.576		1.160	.512
1/67-6/67	.616		.826	1.626
7/67-12/67	139.746*		.970	3.035*
1/68-6/68	.790		.493	.343*

TABLE A-6
 VARIABILITY ANALYSIS
 (f - Values)

Time Period	German Domestic Market	Eurobond Market 2	Swiss Foreign Market	New York Foreign Market
7/65-6/68	2.008		2.077	4.300*
7/65-6/66	1.349		.573	6.135*
7/66-6/67	.771		1.624	4.078*
7/67-6/68	12.566*		3.956*	3.082*
7/65-12/65	1.490		.247*	1.669
1/66-6/66	.535		.734	13.566*
7/66-12/66	.976		1.965	.868
1/67-6/67	.864		1.148	2.678
7/67-12/67	123.368*		.857	2.678
1/68-6/68	.469		.293*	.203*

TABLE 7

EUROBOND MARKET - 18 SELECTED SECURITIES (1)

1	DM	European Investment Bank '64	5-1/2 %	June 1, 1974
2	DM	Osaka '63	6-1/2 %	March 1, 1969-78
3	DM	Osaka '64	6-1/2 %	Jan. 2, 1970-79
4	DM	Oslo '64	6 %	April 1, 1970-79
5	DM	Eurofima '64	5-1/2 %	Aug. 1, 1967-79
6	DM	Montanunion '64	5-1/2 %	June 1, 1968-79
7	DM	Autostrade	5-1/2 %	July 15, 1969-78
8	\$	Denmark (Kingdom of) '64	5-1/2 %	April 8, 1970-84
9	\$	Denmark (Municipalities) '64	5-3/4 %	June 30, 1975-79
10	\$	I.R.I. (without warrants)	5-3/4 %	June 30, 1975-79
11	\$	Jutland Telephone Co.	5-3/4 %	May 1, 1970-84
12	\$	Midkraft Electricity '64	5-3/4 %	June 30, 1970-79
13	\$	Mortgage Bank Denmark '64	5-5/8 %	March 15, 1970-84
14	\$	Norges Kommunalbank	5-3/4 %	Jan. 15, 1973-84
15	\$	Norway (Kingdom of)	5-1/2 %	May 13, 1975-84
16	\$	Oslo '64	5-3/4 %	Febr. 15, 1969-79
17	\$	Portugal '64	5-3/4 %	June 1, 1970-79
18	\$	Rautaruukki Oy	6-1/4 %	June 23, 1969-79

TABLE 8

EUROBOND MARKET - 18 SELECTED SECURITIES (2)

1	DM	European Investment Bank '64	5-1/2 %	June 1, 1974
2	DM	Osaka '63	6-1/2 %	March 1, 1969-78
3	DM	Osaka '64	6-1/2 %	Jan. 2, 1970-79
4	DM	Oslo '64	6 %	April 1, 1970-79
5	DM	Eurofima '64	5-1/2 %	Aug. 1, 1967-79
6	\$	Autostrade	5-1/2 %	July 15, 1969-79
7	\$	Denmark (Kingdom of) '64	5-1/2 %	April 8, 1970-84
8	\$	Denmark (Municipalities) '64	5-3/4 %	June 30, 1970-84
9	\$	I.R.I. (without warrants)	5-3/4 %	June 30, 1975-79
10	\$	Jutland Telephone Co.	5-3/4 %	May 1, 1970-84
11	\$	Midkraft Electricity '64	5-3/4 %	June 30, 1970-79
12	\$	Austria	6 %	Jan. 31, 1970-84
13	sfr.	Copenhagen	5 %	Nov. 15, 1969-83
14	\$	Copenhagen Tel. (Febr.)	5-3/4 %	Febr. 12, 1970-84
15	£/DM	Enso-Gutzeit	6-1/2 %	Febr. 1, 1971-80
16	\$	Metropolis of Tokyo	5-3/4 %	Oct. 15, 1969-79
17	£/DM	Swedish Lamco	5-3/4 %	June 1, 1970-80
18	£/DM	Mobil Oil	5-3/4 %	June 15, 1971-80

TABLE 9

GERMAN BOND MARKET - 18 SELECTED SECURITIES

1	DM	Kloeckner Werke '63 I	6 %	Febr. 1, 1969-84
2	DM	Bundesbahn '64	5-1/2 %	Febr. 1, 1975
3	DM	Bundesanleihe '62 I	6 %	July 1, 1968-82
4	DM	Bundesanleihe '63 I	6 %	July 1, 1969-78
5	DM	Bundespost '64	5-1/2 %	March 1, 1965-74
6	DM	Bremem '64	6 %	April 1, 1970-79
7	DM	Deutsche Landesrenten Bank R36	5 %	April 1, 1960-85
8	DM	Deutsche Landesrenten Bank R38	5-1/2 %	Oct. 1, 1960-85
9	DM	Deutsche Landesrenten Bank R42	6-1/2 %	April 1, 1971-75
10	DM	A.E.G. '63	6 %	Aug. 1, 1967-76
11	DM	Aral '58	7 %	March 1, 1964-78
12	DM	British Petroleum '63	6 %	March 1, 1969-78
13	DM	Deutsche Shell	5-1/2 %	Jan. 1, 1970-79
14	DM	H.E.W. '64	6 %	Aug. 1, 1969-83
15	DM	Hoechster Farben '63	6 %	June 1, 1969-83
16	DM	Hoechster Farben '64	6 %	Dec. 1, 1970-84
17	DM	R.W.E. '63	6 %	July 1, 1969-88
18	DM	Thyssen '63	6 %	April 1, 1969-83

TABLE 10

SWISS FOREIGN BOND MARKET - 18 SELECTED SECURITIES

1	sfrs	Australien '60	4-1/2 %	April 1, 1970-75
2	sfrs	Danemark '60	4-1/2 %	Dec. 15, 1970-75
3	sfrs	Norwegen '60	4-1/2 %	Nov. 30, 1968-75
4	sfrs	Norwegen '63	4-1/2 %	March 3, 1975-81
5	sfrs	Anglo American Corp. S.A. '62 (ex	5 %	July 15, 1971-74
6	sfrs	Caltex '60 options)	4-1/2 %	Oct. 15, 1966-75
7	sfrs	Cassa per il Mezzogiorno '61	4-1/2 %	April 4, 1971-74
8	sfrs	Intl. Standard Electric '62	4-1/2 %	June 1, 1966-80
9	sfrs	Montanunion '62	4-1/2 %	Dec. 15, 1976-81
10	sfrs	Robert Bosch '61	4-1/2 %	July 31, 1968-76
11	sfrs	British Petroleum '61	4-1/2 %	March 15, 1971-76
12	sfrs	Farben Bayer '63	4-1/2 %	Dec. 15, 1976-81
13	sfrs	IBM '61	4-1/2 %	Febr. 1, 1971-76
14	sfrs	Mannesman '62	4-1/2 %	April 15, 1967-77
15	sfrs	Philips Lamp '61	4-1/2 %	March 15, 1973-79
16	sfrs	Siemens '63	4-1/2 %	June 15, 1973-78
17	sfrs	Thyssen '62	4-1/2 %	Oct. 31, 1971-79
18	sfrs	Weltbank '61	4-1/2 %	April 15, 1971-79

TABLE 11

NEW YORK FOREIGN BOND MARKET - 18 SELECTED SECURITIES

1	\$	Canada	2-3/4 %	Sept., 1974
2	\$	Canada	2-3/4 %	Sept., 1975
3	\$	Cauca Valley (Dept. of)	3 %	July, 1978
4	\$	Costa Rica (Republic of)	3 %	Oct., 1972
5	\$	El Salvador	3 %	Jan. 1, 1976
6	\$	El Salvador	3-1/2 %	Jan. 1, 1976
7	\$	Intl. Tel. & Tel. - Sud America	7 %	Aug., 1977
8	\$	Jamaica (Government of)	5-3/4 %	Sept., 1974
9	\$	Japan	5-1/2 %	Jan., 1974
10	\$	Japan	5-1/2 %	May, 1980
11	\$	The Japan Development Bank	6 %	Sept., 1976
12	\$	The Japan Development Bank	6 %	May, 1977
13	\$	Mexico (U.S.)	6-3/4 %	July, 1978
14	\$	Mexico	6-1/2 %	April, 1976
15	\$	Nippon Tel. & Tel.	6 %	April, 1976
16	\$	Nippon Tel. & Tel.	6 %	Sept., 1977
17	\$	Nippon Tel. & Tel.	5-3/4 %	July, 1978
18	\$	Federation of Rhodesia and Nyasaland	5-3/4 %	May, 1973