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ABSTRACT

The purpose of this research is to investigate the relationship

between corporate interest rates in the $Eurobond market and those of

equally risky corporate bonds in the domestic U.S. market.

As expected, the $Eurobond yield spreads are significantly less

than yield spreads on comparable bonds issued in the U.S. domestic

market. Hence, equally risky securities, denominated in the same cur-

rency, have been shown to trade at different prices in competing

markets.

Such factors as taxes, anonymity, risk preferences and differing

regulations are presented as the major causes of the market segmenta-

tion. The findings support the belief that the $Euromarket is seg-

mented from the U.S. bond market.

COMPARATIVE YIELD SPREADS ON U.S. AND $EUROBONDS

The purpose of this research is to investigate the relationship between corporate interest rates in the $Eurobond[1] market and those of equally risky corporate bonds in the U.S. market. Prior work by Finnerty, Schneeweis and Hegde [4] examined the <u>movement</u> of $Eurobond rates relative to U.S. bond indices. However, since Park's study [9], completed in 1974, little research effort has been directed at examining or explaining the relative structure of $Eurobond and U.S. bond rates.

The $Euromarket is by definition a long and a short term market, which resides outside of the control or influence of any national monetary authority. The $Eurocurrency market is the short-term segment of the $Euromarket and the $Eurobond market is the long term fixed income segment. $Eurobonds are those issued without restriction, outside the jurisdiction of any single national authority, denominated in one of the major vehicle currencies, and underwritten by an international syndicate. The major issuers of $Eurobonds are multinational corporations, governments and international organizations. A detailed discussion of the workings of the $Eurobond market can be found in Fisher [5], Mendelsohn [7], and Park [9].

The presence of governmental policies and controls facilitated the birth of the $Euromarket. However, once the market had become established, the abolition or lifting of controls did not bring about the market's demise. In Table 1, the growth of the $Eurobond and U.S. corporate bond markets is compared. The relative growth of the $Eurobond market has, in large part, occurred since January 1974 when the Foreign Direct Investment Regulations were abolished. Our study examines $Eurobonds issued during the "post controls" period, i.e., after January 1974.

Table 1

$Eurobonds and U.S. Corporate Bonds Issued During 1970-1983

Year	$Eurobond Billions of $	U.S. Bonds Billions of $	$Eurobond - Percent of Total Debt Issues
1970	$2.0	$29	6.5%
1971	3.3	37	8.2
1972	4.9	30	14.0
1973	3.0	24	11.1
1974	1.1	38	2.8
1975	4.8	50	8.8
1976	9.6	52	15.7
1977	11.2	48	18.9
1978	8.3	41	16.8
1979	10.4	49	17.5
1980	13.6	58	19.0
1981	21.5	49	30.5
1982	39.0	74	34.5
1983	34.9	68	33.9

This study is organized as follows. Section I contains a discussion of differing market characteristics and their expected impact, and also outlines the hypotheses to be examined. Section II provides a description of the data and an explanation of the methodology. In Section III, (1) yield spreads and (2) underwriting commissions for matched pairs of $Euro and U.S. corporate bonds are analyzed. Section IV concludes with an overview of the findings.

Section I Yield Spread Relationships

Differing Market Characteristics and Their Expected Impact

"Free" markets are those in which there are no restraints on international capital movements. Given free markets, the yields on Eurobonds and domestic bonds denominated in the same currency and of equivalent risk

should be identical. If this were not the case, borrowers would seek to issue their bonds in the market with lower yields and investors would shift their funds to the market with higher yields. Eventually, this shifting by issuers and investors would cause the rates in both markets to be the same. Hence, arbitrage would cause full integration of the two markets. Under this pure arbitrage argument, equally risky securities, denominated in the same currency, cannot be sold or traded at different prices in competing markets. However, if effective arbitrage is hindered by differing risk perceptions, tax-related barriers, liquidity differences, or regulatory "red tape," the two markets would be segmented, and yields on equally risky domestic bonds and Eurobonds would differ.

One potential inefficiency involves possible differences in the way U.S. and $Eurobond investors evaluate default risk. Investors in the U.S. corporate bond market rely on detailed analyses of financial information to measure default risk. In fact, investment bankers in the U.S. market generally require an issue to be rated as a condition of the offering. Alternatively, in the $Eurobond market, the general (as distinct from the financial) reputation of the borrowing corporation has been the primary risk proxy [3, 5] and very few $Eurobond issues have been rated by Moody's or Standard and Poor's. If $Eurobond investors evaluate default risk differently than U.S. investors, yields on equally risky bonds may vary.

Tax-related barriers may also cause yields to differ between the two markets. U.S. corporate bonds are typically registered and are subject to as much as a 30% withholding tax when coupons are cashed by nonresident investors.[2] By contrast, interest and principal payments on $Eurobonds are exempt from withholding tax at the source. This does not exempt investors from reporting income to their national authorities, but tax avoidance by

legal means and tax evasion by illegal means are extremely widespread

(particularly outside the U.S.). While a large proportion of investment in

$Eurobonds is by non-U.S. central banks and government agencies and by

international financial institutions such as pension funds, insurance com-

panies, and investment banking firms [5, 7], estimates suggest that approx-

imately one-half of all $Eurobonds are held by individuals. The bulk of

these individual holdings are acquired anonymously through external

accounts, such as those administered by Swiss banks. [5, 7, 10] Tax eva-

sion is further facilitated by the fact that nearly all $Eurobonds are sold

in bearer form, providing no clue to the holder's identity. Hence,

$Eurobonds appear to have been "designed" for the tax evader, in marked

contrast to U.S. corporate bonds. For a non-resident tax evader,

$Eurobonds present advantages similar to those provided by tax-free munici-

pal bonds in the U.S. market. Just as municipal bond investors accept

lower yields than those available on taxable bonds of equal risk, non-resi-

dent tax evaders may accept lower yields on effectively "tax-free"

$Eurobonds.[3]

Relative market liquidity may also impact yields on equally risky U.S.

and $Eurobond issues. The $Eurobond market is thought to be considerably

less active and less liquid than the U.S. bond market. [5, 7] This may be

due, in part, to the mix of individual versus institutional investors in

each market. Individual investors are known to trade much less frequently

than their institutional counterparts. With individuals accounting for

approximately half of the trading volume in $Eurobonds [5, 7, 10] and less

than 10% in the U.S. bond market [6], the lesser liquidity of the $Eurobond

market is not surprising. Based on liquidity considerations, investors

would be expected to require higher yields on $Eurobonds than on equally

risky U.S. bonds.

Another factor that may impact relative yields is the degree of regulation in each market. The $Eurobond market is unregulated while the U.S. market is highly regulated. Hence, $Eurobond issues can be floated without satisfying any S.E.C. requirements. The absence of S.E.C. restrictions and requirements greatly reduces the time necessary to bring an issue to market, to say nothing of the legal, accounting, and administrative costs that are avoided.[4] U.S. borrowers may be willing to pay a yield premium to avoid such regulatory constraints.

Test Procedure

The first step is to calculate yield spreads for both U.S. new issues and $Eurobond new issues. The term "yield spread" is defined as the difference between the risk-free rate and the yield to maturity of a risky security. The null hypothesis is that there is no difference between yield spreads on bonds issued by U.S. corporations in the U.S. bond market and yield spreads on equally risky corporate bonds issued by the offshore financing subsidiaries of U.S. parent corporations in the $Eurobond market. Yields are calculated using the issue price before deducting underwriting costs and also using the price after deducting underwriting costs. The null hypothesis is tested using yield to maturity calculated before underwriting costs as well as after underwriting costs. The hypothesis is tested before deduction of underwriting costs using equation (1).

$$YTM_D - R_f = YTM_E - R_f = YS \qquad (1)$$

where,

YTM_D is the yield to maturity of a bond issued by a U.S. corporation in the U.S. bond market, calculated before deduction of underwriting

costs.

R_f is the risk free rate

YTM_E is the yield to maturity of an equally risky corporate bond issued by

the offshore financing subsidiary of a U.S. parent corporation in the

$Eurobond market, calculated before deduction of underwriting costs.

YS is the yield spread

Equation (2) is used to test the null hypothesis after deduction of under-

writing costs, with the asterisk, "*", indicating this deduction.

$$YTM_D^* - R_f = YTM_E^* - R_f = YS^* \tag{2}$$

If the hypothesis is supported both before and after deduction of

underwriting costs, then we can conclude that the U.S. bond market and the

$Eurobond market are well integrated and that effective arbitrage causes

yield differences between markets to be insignificant. On the other hand

if the results do not support the hypothesis, this would suggest that tax

effects, liquidity differences, or regulatory barriers exist, or that

investor risk perceptions differ between the two markets.

Another area of interest involves the magnitude of underwriting costs

in the $Eurobond market relative to those in the U.S. market. In each mar-

ket, the investment banker forms a syndicate which helps in marketing the

bonds. The spread or underwriting commission directly affects the cost to

the issuer and indirectly influences the return to the investor. The sec-

ond hypothesis is that the underwriting costs are the same in each market.

Section II Data and Methodology

An initial sample of over 500 newly issued $Eurobonds (issued by the offshore financing subsidiaries of U.S. parent corporations) was collected for the 1972-82 period using World Bank [11] data. From the initial sample, 173 $Eurobonds were matched with new issues floated by U.S. corporations in the U.S. market. Matched pairs had the same rating, were issued at essentially the same time, and had like S.I.C. classifications. In addition, each matched pair had similar call protection, and maturity. The matched data set included the following variables for each bond: issuer, rating, coupon, size of issue, maturity, date of issue, yield to maturity, underwriting commission and risk free rate on the day of issue. The risk free rate equals the 3-month T-Bill rate as reported in Barron's [1].

For each matched pair, the yield spread was calculated by subtracting the appropriate risk free rate from the yield to maturity on the day of issue for both bonds.[5] Yield spreads were then grouped by rating category[6] (Aaa, Aa, A, Baa, etc.), and statistical measures of mean and standard deviation were calculated. Equality of means tests were used to evaluate whether the mean $Eurobond yield spread was equal to the mean U.S. bond yield spread, for issues of the same rating category. This evaluation was performed using equation (3) for each rating category.

$$YS_E - YS_D \pm Z \sqrt{\frac{\sigma_e^2 + \sigma_d^2}{N}} \qquad (3)$$

where

YS_E and YS_D are the mean yield spreads, before deduction of underwriting costs, for $Eurobonds and U.S. bonds, respectively.

Z   the critical value for the indicated level of confidence.

σ_e^2, σ_d^2 the variance of the \$Eurobond and U.S. bond yield spread

distributions, respectively.

For those intervals which do not include the null value of zero, the differences in means will be statistically significant at the indicated level of confidence. Hence, the test results will indicate whether yield spreads on \$Eurobonds and matched U.S. bonds were significantly different over the 1972-82 period. While Equation (3) refers to yield spreads calculated before deduction of underwriting costs, the same equality of means approach was used for testing yield spreads calculated after deduction of underwriting costs.

The equality of means test was also utilized in comparing underwriting costs for \$Eurobond new issues with those for matched U.S. bonds. Using equation (4), the \$Eurobond and matched U.S. bond samples were tested in their entirety, i.e., not subdivided by rating category.

$$C_E - C_D \pm Z \sqrt{\frac{\sigma_e^2 + \sigma_d^2}{N}} \tag{4}$$

where

C_E and C_D equal the mean underwriting costs for \$Eurobonds and U.S.
bonds, respectively.

Z is the critical value for the indicated level of confidence.

σ_e^2, σ_d^2 equal the variance of \$Eurobond and U.S. bond underwriting costs,
respectively.

For those intervals which do not include the null value of zero, the difference in means will be statistically significant at the indicated level of confidence. The test results will indicate whether underwriting

costs are statistically greater in one market than in the other.

Section III Empirical Results

A summary of the equality of means tests is reported in Table II, parts A and B. The findings are categorized by rating category and maturity. Also shown, are sample size (number of matched pairs), t value, significance level, mean $Eurobond yield spread, and mean U.S. bond yield spread.

The results in Section A of Table II, using yield spreads calculated before deduction of underwriting costs, indicate that for eleven out of twelve rating-maturity categories, $Eurobond yield spreads were significantly less than those of matched U.S. bonds. The only exception was the 6-10 year Aaa category for which $Eurobond and U.S. bond yield spreads were statistically equal. The findings in Section B of Table II, utilizing yield spreads calculated after deduction of underwriting costs, are basically the same as those for yield spreads calculated before deduction of underwriting costs.[7] The best explanation for such significant yield differentials is the existence of tax-related barriers. As discussed earlier, $Eurobonds differ from U.S. corporate bonds in that $Eurobonds are free from withholding tax at the source and are issued in bearer form. Those investors seeking to avoid or evade taxes, respectively, are expected to pay a premium for such tax-related benefits.

Table II

Summary of t-Tests by Rating and Maturity

A. Yield Spreads Calculated Before Deduction of Underwriting Costs

	Rating	Aaa	Aa	A	Less Than A
Maturity					
	Sample Size	13	9	16	11
	t-value	-2.33	-1.88	-1.72	-4.51
1-5 years	Significance	NE	NE	NE	NE
	Mean $Eurobond Y.S.	.87	1.22	1.26	1.46
	Mean U.S. Bond Y.S.	1.65	2.15	2.08	2.81
	Sample Size	23	20	37	15
	t value	-.18	-2.02	-2.13	-2.27
6-10 years	Significance	EQ	NE	NE	NE
	Mean $Eurobond Y.S.	1.18	.98	2.17	1.37
	Mean U.S. Bond Y.S.	1.24	2.08	3.66	2.76
	Sample Size	8	8	7	6
	t-value	-1.81	-2.84	-2.45	-2.72
11-15 years	Significance	NE	NE	NE	NE
	Mean $Eurobond Y.S.	.54	.71	.95	1.18
	Mean U.S. Bond Y.S.	1.50	1.81	2.03	2.61

NE = Not equal, i.e., $Eurobond yield spread minus U.S. bond yield spread
difference falls outside the 90% confidence interval.

EQ = Equal, i.e., yield spread difference falls within the 90% confidence
interval.

Y.S. = Yield spread calculated before deduction of underwriting costs.

B. Yield Spreads Calculated After Deduction of Underwriting Costs

	Rating	Aaa	Aa	A	Less Than A
Maturity					
	Sample Size	7	7	9	2
	t-value	-2.27	-1.83	-1.69	
1-5 years	Significance	NE	NE	NE	Sample Size Too Small
	Mean $Eurobond Y.S.*	1.01	1.42	1.37	
	Mean U.S. Bond Y.S.*	1.72	2.25	2.14	
	Sample Size	16	18	23	2
	t value	-.04	-2.00	-2.21	
6-10 years	Significance	EQ	NE	NE	Sample Size Too Small
	Mean $Eurobond Y.S.*	1.23	1.01	2.19	
	Mean U.S. Bond Y.S.*	1.25	2.09	3.70	
	Sample Size	8	8	7	6
	t-value	-1.81	-2.84	-2.45	-2.72
11-15 years	Significance	NE	NE	NE	NE
	Mean $Eurobond Y.S.*	.54	.71	.95	1.18
	Mean U.S. Bond Y.S.*	1.50	1.81	2.03	2.61

NE = Not equal, i.e., $Eurobond yield spread minus U.S. bond yield spread
    difference falls outside the 90% confidence interval.

EQ = Equal, i.e., yield spread difference falls within the 90% confidence
    interval.

Y.S.* = Yield spread calculated after deduction of underwriting costs.

The yield spread data was also useful in analyzing how $Eurobond and U.S. bond risk premiums were affected by increasing levels of default risk. In this connection, the graphs shown in Figure 1 depict yield spread relationships, prior to deduction of underwriting costs, for both $Eurobonds and U.S. bonds by rating category. An evaluation of yield spreads by rating level reveals that U.S. bond investors required a substantial increase in yield for accepting greater default risk. In contrast, $Eurobond investors demanded only a relatively modest, at times imperceptible, increase in yield for accepting the same incremental default risk. If rating is used as a proxy for default risk, $Eurobond investors appear far less sensitive to increases in default risk than U.S. bond investors. Alternatively, $Eurobond investors may be equally sensitive to increases in default risk but may measure it differently than U.S. bond investors. As mentioned earlier, relatively few Eurobond issues are rated and investors are thought [3, 5] to depend on a borrower's general, as opposed to financial, reputation. Hence, observed differences in the responsiveness of $Eurobond and U.S. bond investors to changes in default risk may be caused by markedly different approaches to measuring default risk.

The equality of means test for differences in $Eurobond and U.S. bond underwriting costs indicated that underwriting spreads were not the same in both markets. The average underwriting spread for $Eurobonds was 1.7% and the average underwriting spread for matched U.S. issues was .82% with the difference falling outside the 99% confidence interval. Hence, during the sample period, bond flotation costs in the U.S. market were significantly less than those in the $Eurobond market. This result is probably due to differences in issuing technique. $Eurobonds are placed throughout the

FIGURE 1

YIELD SPREADS FOR $EUROBONDS AND MATCHED DOMESTIC BONDS
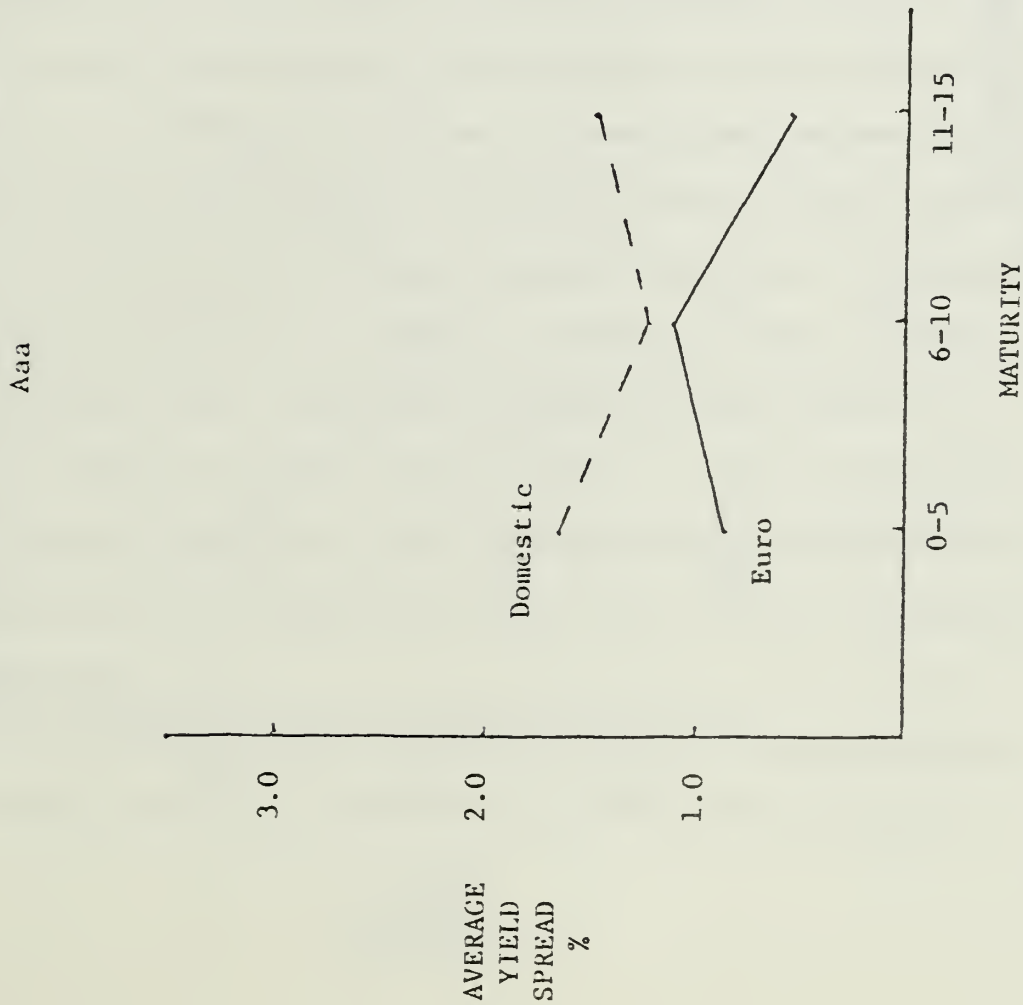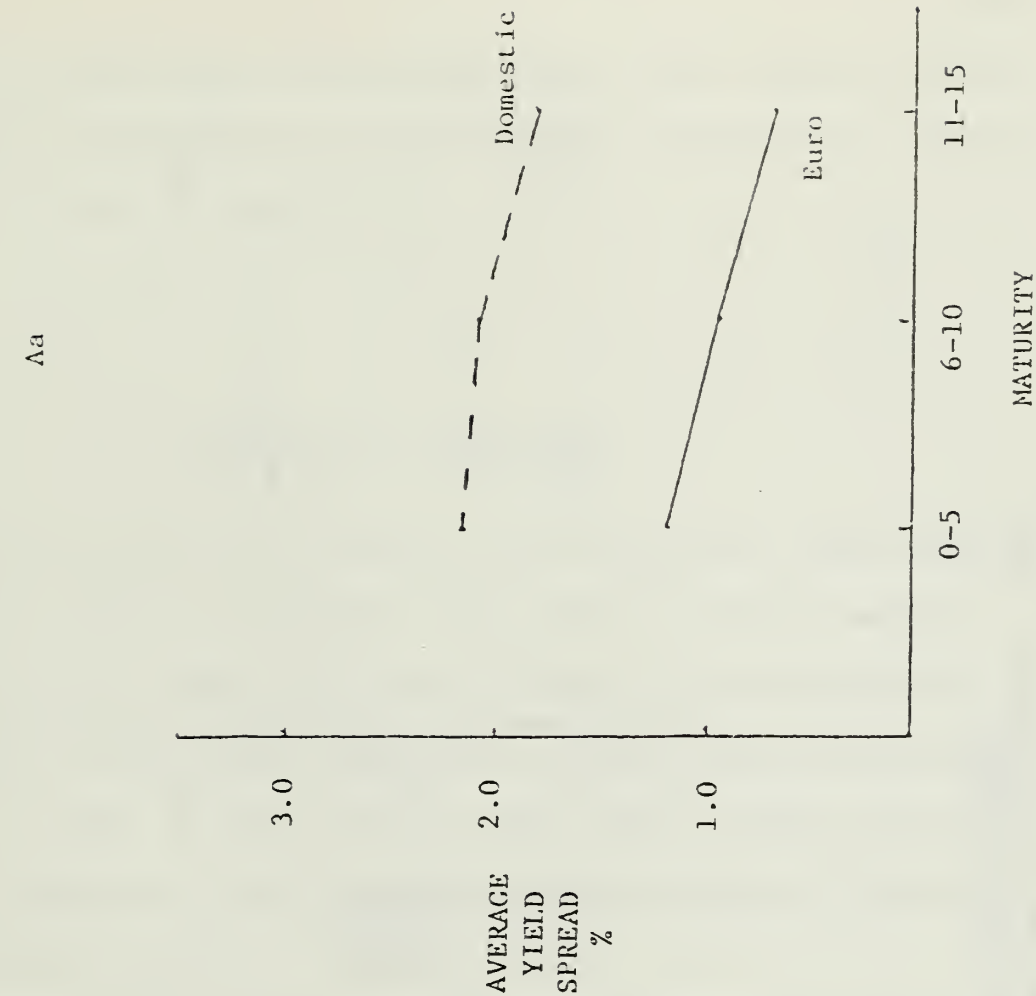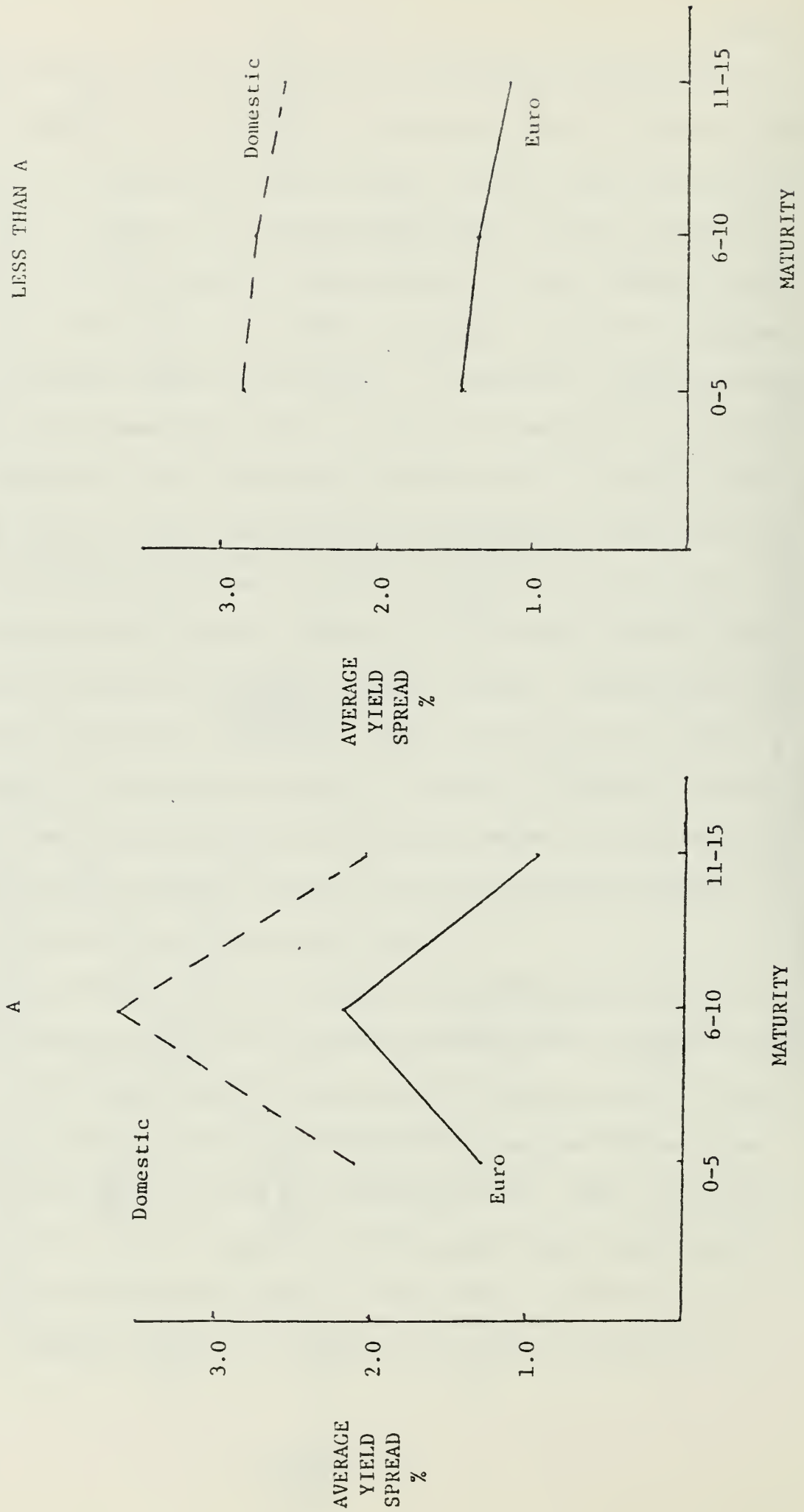BY MATURITY AND RATING CATEGORY

FIGURE I CONTINUED

YIELD SPREADS FOR ŞEUROBONDS AND MATCHED DOMESTIC BONDS
BY MATURITY AND RATING CATEGORY

world by multinational syndicates of underwriting banks, while U.S. bonds
are underwritten and distributed to institutional and individual investors
predominantly in the U.S. market.

Section IV - Conclusions

The findings indicate that $Eurobond yield spreads are significantly
less than yield spreads on comparable bonds issued in the U.S. market.
This result holds both before and after adjusting for flotation costs.
Investors appear willing to pay a substantial price premium for $Eurobonds
relative to U.S. bonds of similar risk. Hence, equally risky securities,
denominated in the same currency, have been shown to trade at different
prices in competing markets.

Of the arguments that can be made for such differential pricing, the
tax argument is the most persuasive. Characteristics, such as absence of
withholding tax at the source and issuance in bearer form, increase the
relative value of $Eurobonds for those who wish to avoid or evade taxes.
In addition, a substantial portion of all Eurobond investment is thought to
be made anonymously by individual investors through Swiss Bank accounts.
For a non-resident tax evader, $Eurobonds present advantages similar to
those provided by tax-free municipal bonds in the U.S. Just as municipal
bond investors accept lower yields than those available on taxable bonds of
equal risk, non-resident tax evaders may accept lower yields on effectively
"tax free" $Eurobonds.

In comparing the responsiveness of $Eurobond and U.S. bond investors
to changes in default risk, U.S. bond investors were found to require a

substantial increase in yield for accepting greater default risk. Alternatively, $Eurobond investors demanded only a relatively modest increase in yield for accepting the same incremental default risk. This result supports the contention that $Eurobond investors may evaluate default risk differently than U.S. investors.

The evidence suggests that for taxpaying individuals and corporations $Eurobonds would have been an inferior investment over the study period because significantly greater yields (for the same risk) were available in the U.S. domestic corporate bond market. Yet, from the perspective of a corporate borrower, $Eurobonds could have been issued at significantly lower yields (after deduction of underwriting costs) and would have been a superior source of funds.

On balance, this study has been a first attempt at identifying and explaining differences in $Eurobond and U.S. bond yield spreads. The findings are consistent with the belief that there are barriers which segment the two markets, frustrating or at least delaying arbitrage attempts and preventing equality between rates.

FOOTNOTES

[1] Each $Eurobond examined in this study was issued by the offshore financing subsidiary of a U.S. parent corporation and was denominated in U.S. dollars.

[2] Congress is currently (1984) considering the repeal of the 30% withholding tax. If the tax is repealed, a major tax-related barrier would be eliminated. Clearly, future repeal of the withholding tax will have no effect on our results for the period of interest, 1974 to 1982.

[3] For some foreigners, tax evasion is a necessary but not a sufficient condition for purchasing $Eurobonds. Their primary motive is to avoid the insecurity of investing funds in politically unstable regions (Latin America, for example). Wealthy investors residing in such politically unstable environments and desiring anonymity have long been known (unofficially) to deposit their funds, i.e., "flight capital", in Swiss banks for investment in $Eurobonds among other investments [7].

[4] Beginning in March 1982, the SEC began allowing companies to file one initial registration statement, a "shelf registration." The initial shelf registration gives a company the freedom to issue securities at any time within the ensuing two years. After the initial "shelf registration," the securities specified in the registration can be issued quickly with only minimal paperwork. This speed and flexibility stands in marked contrast to the long delays and "red tape" that were characteristic of the pre-March 1982 registration requirements. By late 1982 it was estimated that 20 percent of the funds raised in the U.S. since March 1982 involved shelf registrations. (Wall Street Journal, November 2, 1982, page 42.)

[5] It should be noted that interest on $Eurobonds is typically paid annually while semiannual payments are the norm for U.S. bond issues. The yield to maturity utilized in calculating yield spread is an effective annual rate, hence yield differences attributable to frequency of interest payment have been eliminated.

[6] Very few $Eurobond issues have been rated by Moody's or Standard and Poor's and none of the $Eurobonds used in this study were rated. However, $Eurobonds issued by the offshore financing subsidiary of a U.S. parent corporation are thought to bear the same level of default risk as similar issues floated domestically [5]. Hence, the "rating" assigned by the authors to each $Eurobond represents the U.S. parent corporation's rating on similar domestic debt outstanding as of the date of the $Eurobond issue.

[7] The sample size was reduced due to the lack of underwriting cost data for a subset of our $Eurobond group.

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Appendix A

Criteria Used for Matching:

1. Each member of a matched pair had the same Moody's rating.

2. Members of a matched pair were issued within ± 2 weeks of one another. To verify that market, conditions remained reasonably constant between the two issue dates, the yields on bond indices of the same maturity were examined for each date. The bond index yields on each issue date were required to be within ± 25 basis points of one another.

3. Matched pairs were divided into one of three groups by maturity, 1-5 years, 6-10 years or 11-15 years. The following matching criteria were used within each maturity group:

    1-5 years   members of a matched pair were required to mature within ± 1 year of one another.

    6-10 years   members of a matched pair were required to mature within ± 1 1/2 years of one another.

    11-15 years   members of a matched pair were required to mature within ± 2 years of one another.

4. Callability

    $Eurobonds were consistently callable sooner than U.S. corporate bonds of the same maturity and rating, with the period of call protection averaging approximately 4 years for $Eurobonds and approximately 6 years for their U.S. corporate bond matches. Hence, while the period of call protection was similar, it was consistently shorter for $Eurobonds.

    The shorter the period of call protection, the higher the expected yield demanded, ceteris paribus. Hence, based on period of call protection alone, $Eurobonds would be expected to exhibit marginally larger yield spreads than U.S. corporate bonds. As will be shown, our results show significantly smaller yield spreads for $Eurobonds than for matched U.S. corporate bonds.