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Table 3

Consistency of Bank Loss Reserve Decisions
for the years 1982-1985

		Number of Banks	Percentage of Sample
Consistently Conservative	1 > K0/K1	19	23.2%
Consistently Aggressive	0 < K0/K1 < 1	18	22.0%
Not Consistent		45	54.9%

Sample size = 82

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FACULTY WORKING
PAPER NO. 1480

Bid Offer Spreads for Interest Rate Swaps and U.S. Treasury Yields

H. Peter Holzer
Joseph E. Finnerty

College of Commerce and Business Administration
Bureau of Economic and Business Research
University of Illinois, Urbana-Champaign

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August 1988

Bid Offer Spreads for Interest Rate Swaps and U.S. Treasury Yields

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Abstract

The secondary market for trading Interest Rate Swaps has grown considerably over the last few years. The purpose of this study is to investigate the relationship between the pricing of interest rates as well as changes in the rate of interest.

The results of this research indicate that the level of interest rates are significant in determining the Bid and Ask spread in the secondary swap market. Further downward movements in interest rates have an inverse relationship with the Bid and Ask spread, as interest rates fall the spread widens.

BID OFFER SPREADS FOR INTEREST RATE SWAPS AND U.S. TREASURY YIELDS

Interest rate swaps are agreements between two parties to exchange cash flows on assets or liabilities. For example, Company A may prefer to service fixed rate debt whereas Company B prefers floating rate debt. The raison de etre for swaps is that borrowers can get their desired form of debt more cheaply by swapping than they could on their own because of either market imperfections in the debt market or comparative advantage between borrowers. Bicksler and Chen (1986) present two reasons for the existence of a market for swaps; 1) capital market imperfections; and, 2) comparative advantage among different borrowers in the market place. Smith, Smithson, and Wakeman (1986) present four reasons for the swap market; 1) financial arbitrage opportunities, 2) profit opportunities from regulatory and tax arbitrage, 3) lower transaction costs for some types of financial risk exposure management; and, 4) financial market integration.

Regardless of the reason for the evolution of the swap market it is probably safe to say that the market for swaps is well established and will continue growing in the foreseeable future. As with most primary financial markets, there comes a time when continued growth and vitality requires the existence of a secondary market. The growth of the secondary market for swaps will make possible the future growth of the primary market for swaps.

Financial institutions act as matchmakers in the swaps market, looking for parties which have different types of funding needs. Since it is not always possible to exactly match the needs of both parties, these financial institutions often take swaps on to their own books, for later matching or sale. The positioning of the financial institution as one of the parties in the primary swap market has led to an increase in the amount of swapping activity. However, it has also led to a need for a secondary market where the financial institution can find liquidity or a mechanism for adjusting their risk exposure.

This article examines the secondary market for swaps and empirically investigates the relationships between the level of interest rate, changes in interest rates, and the pricing of swaps in the secondary market.

Trading in Swaps

As interest rates change, a swap position develops an intrinsic value, which can be either positive or negative depending on whether interest rates have moved in a particular counterparty's favor or not. In the secondary swap market, those who have positions in a swap with a positive value can sell their swaps for cash and those which have swap contracts with a negative value can get out of their position by buying or paying cash to another party to assume their position. Financial institutions, corporations, and other parties can buy and sell swaps in the secondary market in order to make trading profits and/or to adjust their risk profiles.

An alternative pricing model using option pricing is presented by Whittaker (1987) and a more complete coverage of the pricing of swaps is in Felgran (1987). However for this study we choose to take a simple NPV approach using intrinsic value. The term intrinsic value needs further amplification. It can be defined as the change in present value of the future interest payments discounted at the current level of interest rates. In Figure 1, we show the relationship between the intrinsic value of swap for a firm paying a floating rate and receiving a fixed rate and changes in interest rates.

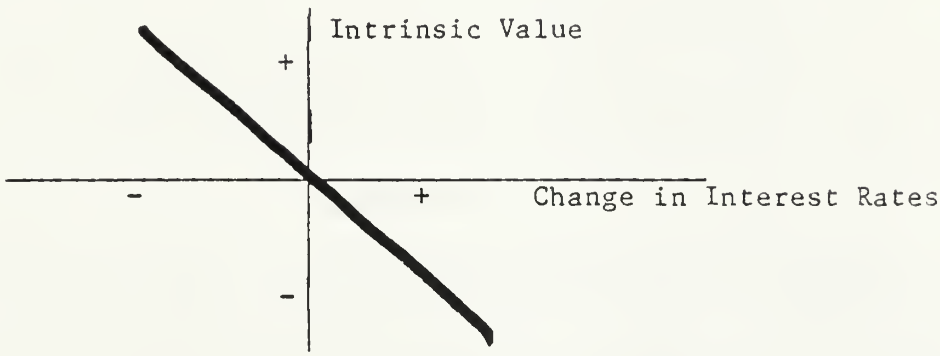

Figure 1. Intrinsic Value of a Swap

For example today, July 1, 19XX, we assume that a firm has borrowed $1m for two years with a floating interest rate of LIBOR + 1 percent due on July 1, 19X1 and 19X2 and enters into a swap for a fixed interest rate of 10 percent for two years. One year later (July 1, 19X1) interest rates have risen to 12 percent for a one year fixed loan. The intrinsic value of the swap will be the present value of the 2 percent additional interest for one year or

$$\text{Intrinsic Value} = P \times \frac{I_N - I_0}{100} \times \frac{1}{(1+I_N)^t} \qquad (1)$$

where

P is the principal amount of the loan;

I_N is the current rate of interest when pricing the swap;

I_0 is the fixed rate of interest for the swap;

t is the maturity of the swap.

In this case we have

$$\text{Intrinsic Value} = \$1\text{m} \times \frac{12 - 10}{100} \times \frac{1}{(1.12)^1}$$

$$= \$17,857.14.$$

Hence, on July 1, 19X1, the swap can be sold in the secondary market for the amount. The actual price that the firm receives for its swap position is affected by two additional factors; 1) the credit risk of the swap position and 2) transaction costs as evidenced by the Bid and Ask Spread in the secondary market. Wall and Fung (1987) discuss a way to evaluate the credit exposure risk of interest rate swaps. The remainder of this paper is focused on the second of these factors, namely the relationship between the Bid and Ask Spread and the underlying interest rate.

Bid Ask Spreads and Interest Rates

As in any dealer based market, prices are quoted in terms of a bid and ask spread. In the secondary swap market, prices are quoted according to standardized procedures. The fixed interest rates paid (offer) or received (bid) are quoted as spreads over the Treasury yield or other index for a specific maturity. For example, a dealer might quote a bid price of 76 basis points and an offer price of 82 basis points over a 5-year Treasury yield of 7.63, which would give a fixed rate to be paid of 8.45 and a fixed rate to be received of 8.39 for 5 years. The spread, Bid-Ask, of 6 basis points is quite common for this market. Normally this Bid-Ask spread is in the range of 6 to 10 basis points. Hence, one round trip transaction for a dealer on a $10m swap would provide between $6,000 to $10,000 in revenue.

The swap dealer assesses many factors in setting the bid-ask spread. Among these are hedging costs, fees and commissions, credit risk, the level of competition among swap dealers, the supply and demand for fixed rate funds, and the level and direction of interest rates.

The growth of the swap market has changed the structure of costs, competition, and the way the dealers price swap transactions. When the market first began, Bid and Ask spreads of 40 to 50 basis points were not uncommon. These relatively high spreads compensated the dealers for R&D costs and the attendant risk of participating in a new market. The lack of extensive competition allowed the mispricing to occur. However, as the swap market has grown and matured a fall in costs as well as increased competition has lead to a Bid-Ask spread of 5 to 10 basis points for swaps in the 2- to 5-year maturity range.

The relationship between the level of interest rates and the Bid-Ask spread is hypothesized to be positive. For example, if interest rates are expected to be high over the life of the swap, it becomes relatively more risky for the financial institution (dealer) to be the fixed rate receiver than the fixed rate payer. Therefore, we would expect the Bid-Ask spread quoted to the market place to increase. Likewise, if interest rates are relatively low over the life of the swap it is more risky to be a fixed rate payer than a fixed rate receiver; therefore, low levels of interest rates should be associated with narrow Bid-Ask spreads. Hence, we posit the following relationship between the Bid-Ask Spread and the level of interest rates

$$\text{Spread} = \overset{+}{f}(\text{T Bill Rate}) \qquad (2)$$

Given the foregoing discussion, not only are we interested in the level of interest rates but also in the changes in interest rates. Hence as interest rates rise we would expect the bid-ask spread to widen and as interest rates fall we would expect the bid-ask spread to narrow. The second hypothesis is

$$\%\Delta\ \text{Spread}_{up} = f(\%\overset{+}{\Delta}\ \text{T Bill Rates}_{up}) \qquad (3a)$$

$$\%\Delta\ \text{Spread}_{down} = \delta(\%\overset{-}{\Delta}\ \text{T Bill Rates}_{down}) \qquad (3b)$$

Given these three hypotheses as shown by Equations 2, 3a, and 3b, we now present a discussion of the data and methodology used in this study.

Data and Methodology

In order to avoid the problems associated with a new and growing market, our study is limited to the period of February 1987 to February 1988. Two hundred forty-one daily quotes of bid and ask prices for 2- and 5-year spreads were provided by Noonan, Astley and Pearce, Inc., a foreign exchange and money market broker in New York

City. Yields on 2-year U.S. T Bills and 5-year U.S. T-Notes were taken from the daily issues of the Financial Times of London.

The relationship between the level of interest rates and the Bid and Ask spread was tested by the following regression equations.

$$(A-B_{2YR,t}) = \alpha + \beta_1 \, TBILL_{2YR,t} + e_t \tag{4a}$$

$$(A-B_{5YR,t}) = \alpha + \beta_1' \, TNOTE_{5YR,t} + e_t \tag{4b}$$

where

B is the Bid price on a 2-year or 5-year swap on day t;

A is the Ask price on a 2-year or 5-year swap on day t;

$TBILL_{2YR,t}$ is the rate on 2-year T Bills on day t;

$TNOTE_{5YR,t}$ is the rate on 5-year T-Notes on day t.

The positive relationship between the size of the Bid-Ask spread and the level of interest rates implies that β_1 and β_1' are positive.

The daily percentage change of the Bid-Ask Spread and Interest Rates was calculated by Equations 5a and 5b.

$$\%\Delta \text{ Spread} = \frac{(A-B)_{t+1} - (A-B)_t}{(A-B)_t} \tag{5a}$$

$$\%\Delta \text{ T Bill Rates} = \frac{(\text{T Bill Rate})_{t+1} - (\text{T Bill Rate})_t}{(\text{T Bill Rate})_t} \tag{5b}$$

If the result of Equation 5b was greater than zero, that day was classified as an up day for interest rates as well as for %Δ Spread, if the results were less than or equal to zero, that day was classified as a down day. Looking at the data for down days revealed that during the crash of October 1987 (October 19 to November 4) not only did the T Bill and T-Note rate fall as a result of the flight to quality, but the Bid-Ask spread more than doubled as a result of the uncertainties in the market place. Hence the regressions run to test the down change relationships (6b and 6d) were run two ways. First, all down days were included and then those down days associated with the October 1987 crash were omitted for the data set. The regression equations run to test the change relationships are:

$$\%\Delta \text{ Spread}_{2YR,t,up} = \alpha + \beta_2 \ \%\Delta \text{ T Bill}_{t,up} + e_t \tag{6a}$$

$$\%\Delta \text{ Spread}_{2YR,t,down} = \alpha + \beta_2' \ \%\Delta \text{ T Bill}_{t,down} + e_t \tag{6b}$$

$$\%\Delta \text{ Spread}_{5YR,t,up} = \alpha + \beta_3 \ \%\Delta \text{ T Note}_{t,down} = e_t \tag{6c}$$

$$\%\Delta \text{ Spread}_{5YR,t,down} = \alpha + \beta_3' \ \%\Delta \text{ T Note}_{t,down} + e_t \tag{6d}$$

For 6a and 6c, the expected sign of the beta is positive. And for 6b and 6d, the hypothesized sign for the beta is negative indicating an inverse relationship between a downward change in the interest rate and a widening of the spread.

Results

Table 1 gives the results of the regression for Equations 4a and 4b. As expected, the significantly positive beta indicates that as the level of interest rates is high, the Bid-Ask spread is wider than when the level of interest rates is low. This is true for both the 2-year T Bill and the 5-year T-Note.

Table 1

Regression Results for Interest Rate Levels and Spreads

$$(A-B)_{2YR,t} = \alpha + \beta_1 \, TBILL_{2YR,t} + e_i$$

β_1 = 1.41

Standard Error = .45

R^2 = .16

n = 241

$$(A-B)_{5YR,t} = \alpha + \beta_1' \, TNOTE_{5YR,t} + e_i$$

β_1' = 1.23

Standard Error = .26

R^2 = .19

n = 241

Table 2 contains the results of the regressions for Equations 6a, 6b, 6c, and 6d. For positive changes in the T Bill and T-Note rate of interest there is no statistically significant relationship between increases in the Bid Ask Spread and increases in the interest rate. However, for downward changes in the T Bill and T-Note rates there is a significantly positive relationship between interest rate decreases and a narrowing spread. As can be seen from a comparison of the two regressions with or without the impact of the October 87 Crash, there is a statistically negative relationship between downward changes in the interest rate and a widening spread. However, for the entire sample (October Crash included) the relationship is much more significant.

Table 2

Regression Results for Percentage Changes in Interest Rates and Spreads

$$\%\Delta\ \text{Spread}_{2YR,t,up} = \alpha + \beta_2\ \%\Delta\ \text{TBILL}_{t,up} + e_t$$

<u>All Data</u>

β_2 = 5.48

Standard error = 16.07

R^2 = 0

n = 144

$$\%\Delta\ \text{Spread}_{5YR,t,up} = \alpha + \beta_3\ \%\Delta\ \text{TNOTE}_{t,up} + e_t$$

<u>All Data</u>

β_3 = 18.24

Standard error = 12.74

R^2 = .03

n = 136

Table 2 (continued)

$$\%\Delta\ \text{Spread}_{2YR,t,down} = \alpha + \beta_2' \ \%\Delta\ \text{TBILL}_{t,down} + e_t$$

All Data		Crash Data Excluded	
β_2' =	- 77.86	β_2' =	-21.68
Standard error =	19.65	Standard error =	8.91
R^2 =	.18	R^2 =	.12
m =	96	m =	88

$$\%\Delta\ \text{Spread}_{5YR,t,down} = \alpha + \beta_3' \ \%\Delta\ \text{TNOTE}_{t,down} + e_t$$

All Data		Crash Data Excluded	
β_3' =	-114.53	β_3' =	-39.53
Standard error =	16.49	Standard error =	19.27
R^2 =	.41	R^2 =	.16
m =	104	m =	96

Conclusions

In pricing interest rate swaps of a given maturity, the market participants consider many factors such as credit risk of the counter-parties, transaction costs, the level of interest rates, changes in interest rates, and the supply and demand for interest rate swaps. The results of this research indicate that the level of interest rates are significant in determining the Bid and Ask spread in the swap market. Further, downward movement in interest rates has an inverse relationship with the Bid and Ask spread, as interest rates fall the

Bid Ask spread widens. In a period of extreme interest rate movements, for example the October 87 Crash, this relationship is intensified.

For upward movements in the interest rates, there does not seem to be a statistically identifiable relationship between increases in the interest rates and the Bid and Ask spread. This would imply that some of the other factors as mentioned above play a more important role in spread determination when rates are rising. Further work is needed in quantifying and gathering data on the other factors so that a more complete explanation can be offered for the pricing of interest rate swaps.

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