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An Empirical Analysis of Yen-Dollar Currency Swap Market Efficiency

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ABSRACT

This study investigates pricing efficiency in the yen-dollar currency swap dealer market. Swap mid-rate adjustments are examined to determine how prices adjust to changes in supply and demand. Bid-ask spreads are investigated to find evidence of term premiums. Swap rates are compared to yields on equal maturity bonds to measure default premiums. Results indicate market efficiency as to adjustments to changes in supply and demand and as to term premiums in prices. Default risk premiums in swap rates are inappropriate. Therefore, the market is not completely efficient and dealer swap rates may not relate directly to risks taken.

JEL: F31, G13, G15

Keywords: Currency swaps; Bid-ask rates; Interest rate swaps

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I. INTRODUCTION

The purpose of this study is to determine whether pricing efficiency exists in the yen-dollar *currency swap* dealer market. For this purpose, we examine currency swap price adjustments to changes in supply and demand. We also investigate whether currency swap prices include maturity risk premiums and default risk premiums. We have three motivations for this study. The first arises from the fact that earlier studies of international swap spreads and default risk premiums only concern *interest rate swaps*. We extend the findings to *currency swaps*. The second motivating factor is the growth and size of the currency swap market. The first swap contract in its present form was in 1981 between IBM and the World Bank. The Bank for International Settlements reports foreign exchange swap market turnover of $656 billion for 2001. Our third motive is to provide information to market participants. Participants in the yen-dollar currency swap market should be interested in knowing if the dealer route for arranging swaps is efficient since efficiency will affect currency swap pricing.

This study utilizes the methodology of Sun, Sundaresan, and Wang (1993) to investigate variation in yen-dollar swap mid-rates, term premiums, and risk premiums. The Sun, Sundaresan, and Wang study only concerns interest rate swaps. Their methodology involves comparing swap pricing rates to yields on equal maturity par bonds and noting any differences as being default risk premiums.

This paper has seven sections. Section II provides information about the currency swap market. Section III is a review of pertinent literature on swaps. Section IV gives our data sources. Section V describes our methodology. Section VI presents our empirical analysis of swap mid-rates, term premiums, and default risk premiums. Section VII summarizes the study and gives our conclusions.

II. THE CURRENCY SWAP MARKET

Increasing international trade and instability of exchange rates in the late 1970s and early 1980s made it desirable to hedge against unfavorable changes in currency exchange rates. In addition, firms want to benefit from more favorable interest rates that can be found in other parts of the world. Receipt of interest payments based on foreign rates may more closely match a firm's interest payment obligations. These needs led to accelerated development of financial services products for international transactions. Currency swaps are among the most important of these products for hedging against exchange rate risk and interest rate risk.

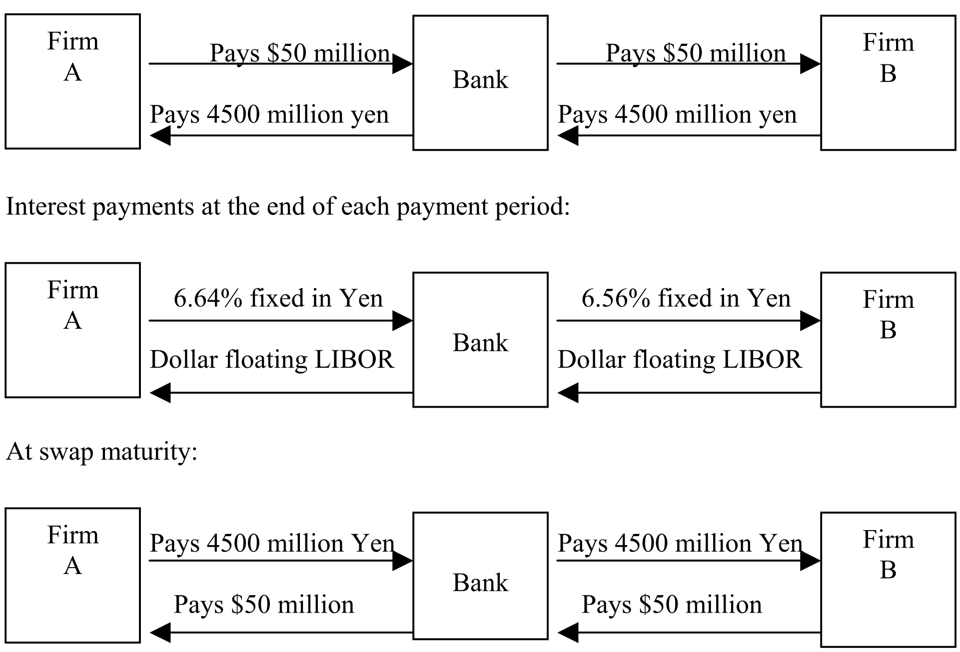
An example of a typical currency swap is the "plain vanilla swap." In this type of swap, the counterparties initially exchange principal amounts in different currencies. Usually the exchange is made at the current spot exchange rate and later reversed at the same exchange rate. After the initial exchange of principal amounts, the counterparties exchange interest payments based on those amounts. Each party pays interest in the currency that it received at the swap's outset. Commonly, but not always, one party pays a floating interest rate and the other pays a fixed rate.[1]

Swap dealers act as intermediaries in arranging swaps. They quote the yen denominated interest rates at which they stand ready to take either side of yen-dollar swaps with simple structures and standard maturities (typically between two to ten years with semiannual interest payments). Dealers find the two parties needed for a swap, exchange currencies with both parties, and funnel interest payments between the counterparties for a fee. Their objective is to profit from this fee, called a bid-ask spread, which is generated when interest payment streams are exchanged. The bid-ask spread is partly compensation for assuming the credit risk of the counterparties in the swap.

In a fixed-for-floating currency swap, a swap dealer's international capital markets team will estimate the appropriate pay and receive fixed rates for all of the currencies in which the dealer makes a market. These pay and receive fixed rates are called indicative prices in a swap contract. In the case of currency swaps, indicative prices are often stated as mid-rates to which some number of basis points is added or subtracted depending on whether the swap dealer is the receiver or payer of the fixed rate. The swap dealer profits from the difference between the pay and receive fixed rates, which is the bid-ask spread.

Figure 1
Cash flows for a simple cross–currency swap contract

At the swap's outset:



To illustrate the cash flows and rates of a currency swap, assume that a bank acting as a swap dealer enters into a 5-year currency swap with Firm A. Figure 1 depicts this transaction and subsequent transactions for the swap. Firm A gives the bank \$50 million for the equivalent amount of Japanese yen at the current spot rate of \$1= 90 yen. Suppose the swap mid-rate for a five-year yen-dollar currency swap is 6.6 percent. To this mid-rate, the swap dealer adds 4 basis points if the swap dealer will receive a fixed rate and deducts 4 basis points if the swap dealer will pay a fixed rate in exchange for the London Interbank Offer Rate (LIBOR), which is the floating rate of interest. Thus, Firm A agrees to pay the bank a fixed rate interest of 6.64 percent in Japanese yen in exchange for receiving interest in dollars at the six month LIBOR in effect at the beginning of each reset period. Simultaneously with the agreement with Firm A, the bank enters into a currency swap agreement with Firm B for five years in which the bank initially exchanges \$50 million for the equivalent amount of Japanese yen at the above current spot rate. The bank agrees to pay 6.56 percent interest in Japanese yen to Firm B at the end of every six months in exchange for receiving interest in dollars at the six-month LIBOR in effect at the beginning of each year. The bid-ask spread of 8 basis points between the pay and receive yen fixed interest rate is the profit for the swap dealer. At the end of the swap contract, Firm A pays 450 million yen back to bank and the bank pays \$50 million to Firm A. Similarly, Firm B receives 450 million Japanese yen from the bank and pays \$50 million to the bank.

III. PREVIOUS RESEARCH

Four studies on the pricing of *interest rate swaps* have been published in recent years. Whitaker (1987) makes a theoretical argument for pricing interest rate swaps using option pricing. McNulty (1990) models interest rate swaps as a package of forward contracts. In this study, he includes an empirical investigation into the pricing and credit risk of interest rate swaps. He finds little evidence of default risk premiums in this swap market. Sun, Sundaresan, and Wang (1993) examine the effect of swap dealer credit ratings on bid-ask rates. They find that the asked rates of an AAA-rated swap dealer are significantly higher than those of an A-rated dealer and bid-ask rates of the AAA dealer bracket those of the A-rated dealer. In the same study, evidence is presented that the spread between swap rates and Treasury yields increases significantly with longer maturities. This increase is much smaller when the Treasury yield curve is inverted. Minton (1997) examines the empirical implications of modeling interest rate swaps as a portfolio of forward contracts and a portfolio of noncallable corporate bonds. She shows that interest rate swap pricing is closely related to the pricing of these instruments.

Default risk premiums included in swap prices have been investigated in a number of studies. Most of this literature concerns interest rate swaps. Arak, Estrella, and Silver (1988) argue that swaps allow firms to stabilize the risk-free rate paid or received in international transactions and, therefore, firms pay the appropriate risk premium associated with their risk position. Abken (1991) analyzes default risk in interest rate swaps in a partial equilibrium framework by modeling swaps as exchanges of caps and floors. Cooper and Mello (1991) discuss default risk in a partial equilibrium framework by modeling interest rate swaps as exchanges of fixed-rate and floating-rate debt. Giberti, Mentini, and Scabellone (1993) discuss standardized valuation criteria proposed by regulatory authorities. They develop a methodology that can be used to quantify credit exposure involved in various types of currency swaps, interest rate swaps, and from off-balance-sheet operations. Brown and Smith (1993) explore the structuring of a swap agreement in ways that can reduce default risk that accumulates as a swap position ages. Malhotra (1997) examines bid-ask rates in interest rate swaps and confirms that default risk premiums are included in these rates. Brown, Harlow, and Smith (1994) examine the interest rate swap spreads for five different swap maturities. They find that the difference in the levels of the Treasury yield curves for zero-coupon and coupon bearing securities, forecasts of the spread between 3-month LIBOR and Treasury bill yields, the overnight rate on repurchase agreements, and a proxy for default risk in the corporate bond market explain the swap spreads. Malhotra (1998) analyzes the impact of interest rate reset period on the bid-offer rates in interest rate swaps. He reports that the bid-offer rates in a one-year LIBOR indexed interest rate swap bracketed the bid-offer rates in a six-month LIBOR indexed interest rate swap contract. Duffie and Singleton (1997) indicate that both credit and liquidity factors have been important sources of variations in swap spreads over the past ten years. Gupta and Subrahmanyam (2000) report evidence of mispricing of swap contracts in the early years, because swaps were being first priced off the futures curve and without any convexity adjustment. Hubner (2001) presents a reduced-form model to price swaps where the event of default is related to structural characteristics of each party. These studies are restricted primarily to fixed-for-floating interest rate swaps.

Our study extends the literature by applying the methodology of Sun, Sundaresan, and Wang (1993) to bid-ask prices and default risk premiums for *currency* swaps.

IV. METHODOLOGY

The first application of the Sun, Sundaresan, and Wang (1993) methodology is an investigation of variation in swap mid-rates. This is done to determine whether swap prices adjust quickly to changes in supply and demand for swaps. Variation in mid-rates for various swap maturities is indicated by standard deviations of mid-rates over time.

Term premiums for swaps of various maturities are examined to find whether swap dealers require greater return for the risk taken in longer-term swap contracts. Swap spreads are used to isolate term premiums. A spread for a particular maturity is the difference between the bid or ask rate and the quoted mid-rate. A term premium is found as the difference in the spread for the short-term two-year swap and the spread for a longer maturity swap.[2] Statistical significance of spreads is tested with Hotelling's T^2. Our null hypothesis is that all term premiums are zero.

The existence of default risk premiums in swap prices is investigated by comparing par bond yields of counterparties in an exchange of bonds with swap bid and asks rates available to them for accomplishing the same objective.[3] The reasoning for doing this is as follows.

A par swap (with beginning value of zero) can be replicated by a portfolio of noncallable bonds with the same par value and maturity as the swap. For example, the net cash flows of a fixed-rate payer in a par yen-dollar swap can be replicated by a *long* position in a variable noncallable LIBOR bond that sells at par on reset dates and a simultaneous *short* position in a noncallable bond of equal par value that makes fixed-rate yen interest rate payments on the same reset dates. When we replicate a swap position this way, the yen fixed rate on a swap should equal the yield on a yen par bond if there is no risk of default, no possibility of arbitrage, no transaction costs exist, and no taxes exist (as argued by Sun, Sundaresan, and Wang).[4] If the yield on the yen par bond is less than the all-in swap yen fixed rate, arbitrage is possible. In a swap contract in which the market maker is paying a dollar LIBOR floating-rate in exchange for a yen fixed-rate, arbitrageurs will short a yen fixed-rate bond with a principal amount equal to the amount of the swap contract, and invest the same amount in dollar LIBOR maturing on the next settlement date.

If default risk exists, a swap contract can be modeled as an exchange of a default-risky fixed-rate bond for a default-risky floating-rate bond. However, there are three inherent differences between the default risk in a swap contract and the default risk for a bond. First, in the case of a bond, only the party long in the bond is subject to default risk. In a swap contract both parties are exposed to default risk. Second, in a swap contract default risk will be lower because the parties net the difference between the fixed interest payment and the floating interest payment on the settlement date. Although interest is received in a currency that is different from the one in which interest is paid, the net loss due to default would be the difference between the two interest payment streams. This loss will be considerably lower than the loss from a bond default even after considering foreign exchange risk. Third, swap contracts carry a provision whereby a party to the swap is relieved of its obligations under the swap contract if the counterparty defaults. Thus, the impact of default risk is reduced compared to the impact with a bond. With these differences in swap and bond default risks, swap-pricing theory implies that the yield on a par bond of equivalent maturity will be greater than or equal to swap bid-ask rates due to the existence of greater default risk.

According to Sun, Sundaresan, and Wang (1993), transactions costs will further increase the difference between bond yields and swap rates. The yield for counterparties in an exchange of par bonds should be higher than the swap rates for an equivalent currency swap to reflect higher transactions costs as well as higher default risk.

With the above reasoning in mind, our null hypothesis in testing for default premiums in bid-ask spreads for yen-dollar currency swaps is that par bond yields exceed swap rates. If this is true, swap dealers appropriately take default risk into account while quoting bid-ask rates. The alternate hypothesis is that par bond yields are equal to or lower than currency swap rates and swap dealers do not appropriately take default risk into consideration. Our hypotheses can be stated as follows:

H_0: Par bond yields exceed swap rates.
H_1: Par bond yields are less than or equal to swap rates.

To test these hypotheses, we compare yen-dollar swap bid-ask rates with par bond yields of equivalent maturity. The maturities we use are two and ten years. For the ten-year maturity, we use par bond yields on 10-year Japanese government bonds. Two-year bond yields are not available. As a substitute we use implied yields for a euroyen time deposit.[5] Assuming that the expectations hypothesis of the term structure of interest rates holds, these implied yields can be computed as a geometric average of the current short-term interest rate and a series of expected three-month forward rates.[6] The yield calculation as shown in Kidwell, Peterson, and Blackwell (1997) is as follows:

$$\left(1+{}_tR_n\right)=\left[\left(1+{}_tR_1\right)\left(1+{}_{t+1}f_1\right)\left(1+{}_{t+2}f_1\right)\cdots\left(1+{}_{t+n-1}f_1\right)\right]^{\frac{1}{n}} \quad (1)$$

where: R = the actual market interest rate; f = the forward interest rate; t = time period for which the rate is applicable; and n = maturity of the bond.

Postscripts identify maturities and prescripts represent the time period in which the security originates. For our study, ${}_tR_n$ is the forecasted yield on a euroyen time deposit, ${}_tR_1$ is the current euroyen spot rate for a six-month deposit, and the forward rates are for successive three-month intervals after the period for which the spot rate is available.

V. DATA

Our euroyen spot rate sample for use as ${}_tR_1$ in equation (2) includes 89 biweekly observations for 1995 through 1998. These rates are not available for years before 1995. The rates in our sample are middle rates, i.e., averages of bid and ask rates.

To analyze the behavior of the bid-ask spread in yen-dollar swap rates, we use biweekly yen-dollar swap quotations from the *Swaps Monitor* for the period October 1, 1987 to June 25, 1998.[1] These rates are for yen-dollar currency swaps in which fixed yen interest rates are exchanged for the six-month LIBOR floating interest rate. The swap maturities that we use are two, three, four, five, seven, and ten years.

VI. EMPIRICAL ANALYSIS

A. Variation in Yen-Dollar Swap Mid-Rates

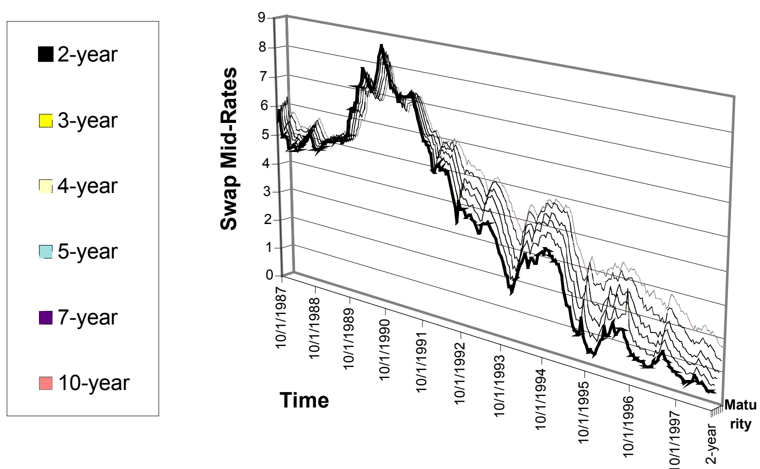
Table 1 summarizes characteristics of yen-dollar swap *mid-rates* quoted from October 1987 through June 1998 for all of the maturities mentioned in Section V. Standard deviations show that on average, swap rates fluctuated in a range of 2 percent from their mean for all maturities.

Figure 2 illustrates the behavior of these same swap mid-rates. It can be seen that for the group of maturities, mid-rates fluctuated between 0.49 percent and 8.72 percent during this period.

Table 1
Summary statistics for yen-dollar currency swap rates for the period October 1987 to June 1998. Mid-rates are stated in percentages.

	Swap Maturity					
Statistics	2-year	3-year	4-year	5-year	7-year	10-year
Mean	3.77	3.99	4.19	4.35	4.57	4.73
Maximum	8.72	8.61	8.49	8.38	8.12	8.01
Minimum	0.49	0.66	0.84	1.04	1.36	1.72
Std. Dev.	2.32	2.17	2.03	1.91	1.70	1.55

Figure 2
Behaviors of Yen-Dollar currency swap mid-rates for the period between October 1987 to June 1998.



Fluctuations in mid-rates can be explained as being the result of adjustments to swap prices made by swap dealers when demand and supply do not match. For example, suppose a swap dealer experiences a surge in demand for currency swaps by clients who want to pay the 5-year fixed-rate in Japanese yen and receive the floating interest rate in dollars. With this surge, demand exceeds supply. To profit from this imbalance, a swap dealer will raise its 5-year mid-rate. By making successive adjustments to this swap price, an equilibrium price will eventually be reached such that demand equals supply for these swaps. The process of reaching equilibrium prices causes swap rates to vary over time. The behavior of swap mid-rates as shown in Figure 2 indicates that dealers are adjusting swap rates in response to changes in supply and demand for swaps of all maturities. In Table 1, it can be seen that swap mid-rates at lower maturities are more volatile than those for longer maturities. This may be due to greater swap market activity for shorter maturities, which in turn would cause more frequent adjustments to mid-rates when supply and demand is mismatched.

B. Term Premiums

Table 2 summarizes characteristics of the bid-ask spread around the mid-rate for the yen-dollar swap market for our sample period. Spreads over time for the various swap maturities are graphed in Figure 3.

Table 2
Summary statistics for bid and ask quotations in the yen-dollar currency swap market from October 1987 to June 1998. Spreads are in basis points.

	Swap Maturity					
Statistics	2-year	3-year	4-year	5-year	7-year	10-year
Part A: Term Premiums in Swap Spreads						
Mean		22.0	42.0	58.0	81.0	96.0
Std. Dev.		0.21	0.38	0.51	0.73	0.86
t-statistics		17.37	18.33	18.86	18.40	18.51
Hotelling's T^2			407.59			
Part B: Spread between bid and ask rates						
Mean	7.39	7.28	7.25	7.38	7.54	7.89
Std. Dev.	1.69	1.71	1.53	1.64	1.89	2.18
t-statistics	72.51	70.60	78.58	80.00	76.24	60.02

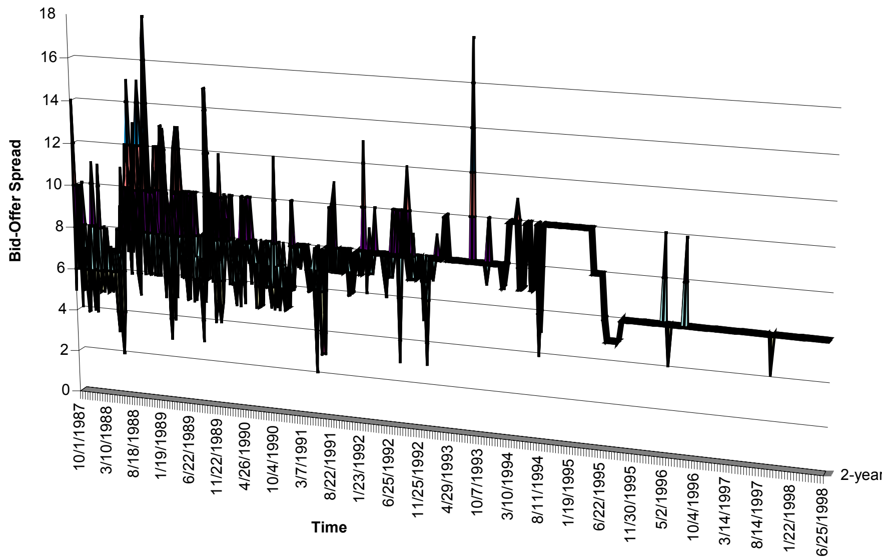
t-statistics are computed as follows:
$\{\mu/(\sigma^2/n)\}^{1/2}$, where μ is the sample mean, σ is the sample standard deviation, and n is the number of observations in the sample. All t-statistics are significant at the one-percent level.

Part A of Table 2 gives term premiums in basis points for swap spreads for the different maturities. On average, yen-dollar swap rate quotations for the period incorporated small but statistically significant positive term premiums. Statistical significance is tested with Hotelling's T^2. The null hypothesis that all risk premiums are zero is rejected. Term premiums rise with maturity indicating that dealers require greater return for maturity risk taken. An upward sloping yield curve exists during our sample period.

Part B of Table 2 shows summary statistics describing the spread between swap bid and ask rates. Spreads are low in that they vary between 7.25 and 7.89 basis points. However, they are statistically significant. These findings indicate the existence of a highly active and liquid yen-dollar currency swap market.

Figure 3

Behavior of the bid-ask spread in yen-dollar currency swap market for the period between October 1987 to June 1998. The spread is in basic points.



C. Default Risk Premiums

As described in Section IV, our empirical analysis of default risk in the yen-dollar swap market involves comparing bid and ask rates for swaps to the yields of equal maturity bonds. For two-year maturity bond yields, we use implied middle rates for euroyen deposits.

Before evaluating the presence of default risk in the yen-dollar currency swap quotations, we test the times series for two-year euroyen rates, two-year swap mid rates, ten-year Japanese government bond yields, and ten-year swap rates for cointegration. A time series that lacks integration with the other time series may imply segmentation of these markets. Lack of cointegration between two-year euroyen and two-year swap rates will imply that the two markets move differently and a comparison will not shed any light on the presence of default risk premium. Similarly, if there is not cointegration between ten-year government bond yields and ten-year swap rates, it will imply that the two markets are segmented and a comparison will not provide any insight into the default risk premium in the yen-dollar currency swap markets. We test for cointegration by using the methodology developed by Johansen (1989). This methodology enables testing for the presence of more than one cointegrating vector. The explanation provided below with respect to this methodology draws heavily from Johansen (1988, 1989, and 1991) and Johansen and Juselius (1990, 1994). The purpose of this analysis is to check for stationarity arising from a linear combination of variables. The analysis begins with the following AR representation for a vector Y made up of n variables:

$$Y_t = c + \sum_{i=1}^{s-1} \phi_i Q_{it} + \sum_{i=1}^{k} \pi_i Y_{t-i} + \varepsilon_t \tag{2}$$

where each series that makes up Y is I (0), Q_{it} are seasonal dummies, and c is a constant.

This equation can be rewritten in error correction form as:

$$\Delta Y_t = c + \sum_{i=1}^{s-1} \phi_i Q_{it} + \sum_{i=1}^{k-1} \Gamma_I \Delta Y_{t-i} + \Pi Y_{t-k} + \varepsilon_t \tag{3}$$

which is basically a vector representation of equation (1) with seasonal dummies added. All long-run information is contained in the levels term ΠY_{t-k}. The above equation would have the same degree of integration on both sides only if $\Pi=0$ (the series are not cointegrated) or ΠY_{t-k} is *I(0),* which implies cointegration. The number of cointegrating vectors can be found based on the number of significant eigenvalues. In addition, the trace test provides another estimation method to identify the number of cointegrating vectors. Table 3 summarizes the results of cointegration tests.

Table 3

Long-term relationship between implied euroyen spot rates, two-year yen-dollar cross currency swap mid-rates, and between ten-year Japanese government bond yields and ten-year yen-dollar cross currency swap mid-rates using bivariate Johansen's cointegration methodology.

Group	Eigen Value	r	Trace	L-Max.
Two-year Euroyen Spot Rates and Two-year Swap Rates				
2-year	0.1748	0	23.55	16.14**
	0.0845	1	7.41	7.41**
Ten-year Japanese Government Bond Yields and Ten-year Swap Rates				
10-year	0.0929	0	15.06	14.63*
	0.0029	1	0.436	0.436

The results are reported for a model with intercept and trend for all series, which was chosen based on the Akaike information criteria. Critical values for Johansen Tests are taken from Tables in Johansen and Juselius (1990) paper. **(*) Denotes a significance level of 1-percent (5-percent).

As shown in Table 3, trace test indicates that 2-year implied euroyen spot rates and 2-year yen-dollar swap rates are cointegrated at both 5% and 1% levels. Max-eigenvalue test also indicates cointegration at the 5% level. For ten-year Japanese government bonds yields and ten-year swap rates, max-eigenvalue test indicates cointegration at the 5% level.

Using 2-year implied euroyen rates and 10-year Japanese government bond rates, we now test for the presence of default risk premium in the yen-dollar currency swap market. Table 4 shows our comparisons for two-year and ten-year maturities for evaluating the presence of default risk in yen-dollar swap quotations.

Table 4

Summary statistics for the difference in par bond yields and swap mid-rates.

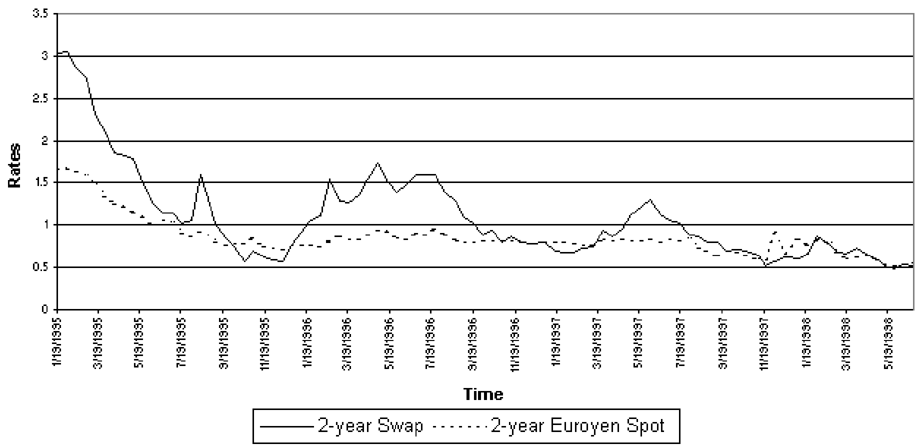
Swap mid-rates are subtracted from bond yields and differences are expressed in basis points. For 2-year swaps, par bond yields are constructed by taking a geometric average of the 6-month euro-yen spot rate and euro-yen forward rates for subsequent 3-month intervals. This comparison is done with 89 bi-weekly observations for the period 1995 through 1998. For 10-year swaps, par bond yields are for 10-year Japanese government bonds. These bond yields are recalculated bi-weekly from October 1987 through June 1998 to produce 276 observations.

2-Year Maturity	
Midpoint euro-yen deposit yields minus swap mid-rate:	
Number of Observations	89
Mean Difference	-23
Std. Dev.	0.36
t-statistics	-6.23*
10-Year Maturity	
Par bond yields for Japanese government bonds minus swap mid-rate:	
Number of Observations	276
Mean Difference	-7
Std. Dev.	0.43
t-statistics	-0.037

t-statistics are computed as follows:
$\{\mu/(\sigma^2/n)\}^{1/2}$, where μ is the sample mean, σ is the sample standard deviation, and n is the number of observations in the sample. *indicates statistically significant at the one-percent level.

For both maturities, mean par bond yields are less than swap mid-rates and the differences are statistically significant. Figure 4 is a graph of two-year swap rates and two-year euroyen rates, which reinforces the findings in Table 3. Two-year euroyen rates are usually lower than swap mid-rates. Therefore, we reject the null hypothesis stated previously that par bond yields exceed swap rates. In contrast to the findings of Sun, Sundaresan, and Wang (1993) for the interest rate swap market; the yen-dollar currency swap market does not appear to incorporate appropriate default risk premiums in swap rate quotes. Rather, default risk premiums are higher than default risk warrants.

Figure 4
Behavior of 2−year yen−dollar currency swap mid rates and 2−year implies European spot rates for the period between October 1987 to June 1998



For the 10-year swap rate, evidence regarding incorporation of default risk is inconclusive, because the par bond yields exceed 10-year swap rates by only 7 basis points and the difference is not statistically significant. Moreover, we do not have any information on the credit rating of Japanese government bonds from 1987 to 1998 to make any conclusive statement on the incorporation of default risk premium in the ten-year swap rates.

VII. SUMMARY AND CONCLUSIONS

Instability of currency exchange rates in the late 1970s and early 1980s initiated the process of financial innovations in international financial markets. Among the new hedging instruments, currency swaps are the most striking product. Volume of currency swap transactions has grown tremendously since 1981.

This study investigates efficiency in the yen-dollar currency swap market in three areas. First, we examine swap price adjustments in the period from October 1987 to June 1998 to determine how quickly prices adjust to changes in supply and demand for currency swaps. Second, we investigate whether bid-ask spreads include term premiums that compensate swap dealers for maturity risk. Third, we investigate whether appropriate default risk premiums are included in swap rates. This is accomplished by comparing yen-dollar currency swap rates to the yields of equal maturity par bonds.

Two of our three areas of investigation indicate efficiency in the yen-dollar currency swap market. Analysis of variation in swap mid-rates shows that the yen-dollar currency swap market is highly liquid and active because spreads over mid-rates are low and the spread between the bid and ask rates is low. These spreads do not vary significantly over time. Increased market activity is found for shorter maturity currency swaps as reflected in high volatility of the swap mid-rate for two-year maturity swap contracts. The yen-dollar swap market appears to quickly adjust to changes in supply and demand. In our second area of investigation, we find small but statistically significant term premiums in swap rate quotations during our sample period. In the assessment of default risk for this market, we evidence of inappropriate default risk premiums that are usually too high. This is in contrast to the findings of Sun, Sundaresan, and Wang (1993) for U.S. dollar interest rate swaps where appropriate default risk premiums are found.

We conclude from the above findings that the yen-dollar currency swap market is efficient in adjusting prices for changes in supply and demand and in incorporating term premiums in prices.

NOTES

1. A fixed-for-floating currency swap is only one of several variants of currency swaps. Other types include fixed-for-fixed rate currency swap, floating-for-floating rate currency swaps, circus swaps, and amortizing swaps.
2. For example, suppose the bid rate for a two-year maturity swap is 3 basis points higher than its mid-rate while the bid rate for a seven-year maturity swap is 5 basis points higher than its bid rate. The term premium is 2 basis points (5 basis points - 3 basis points).
3. To estimate par bond yields in the interbank market, the SSW study uses the LIBOR and LIBID from the interbank market. However, the swap and interbank markets differ in liquidity. Therefore, SSW examine the extent to which par bond yields estimated from the interbank market fluctuate with the change in swap quotes by regressing changes in the par bond yields with the changes in swap quotes. A very low degree of correlation exists between daily changes in swap rates and daily changes in LIBOR par bond yields. SSW also finds that regressions based on weekly changes in swap rates and par bond yields perform better than daily changes. This may be due to the fact that LIBOR data do not correspond to rates at which actual transactions occur. Therefore, their results regarding the tracking of swap offer rates with par bond yields constructed from LIBOR must be interpreted with caution. The SSW study also suggests that actual transactions data is critical in examining the implications of swap pricing theory.
4. This suggests that the fixed swap bid rate should equal the yield on a par bond of equivalent maturity issued by the swap dealer if there are not transaction costs and default risk does not exist.
5. The swap market and the interbank market differ in liquidity. Furthermore, we have data on six-month euro-yen mid-rates only. Therefore, conclusions regarding default risk premium in swap rate quotations should be viewed within the framework of this constraint.
6. Studies by Bansal, Ellis, and Marshall, 1994; Minton, 1997 show that short-dated swaps are priced relative to the Euro currency market.

7. Swaps Monitor is a biweekly publication of the Swaps Monitor, New York, NY 10276.

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