

Hedging Transaction Exposure Through Options and Money Markets: Empirical Findings

Kashi Khazeh, Salisbury University
Robert C. Winder, Christopher Newport University

ABSTRACT: This study compares the effectiveness of money market hedges and options hedges for both payables and receivables denominated in British pounds, German marks, Japanese yen and the Swiss franc. Data on interest rates, exchange rates, and options contracts were obtained from public sources for two recent time periods. This information was used to determine, for each currency: 1) the lowest rate of exchange for payables, and 2) the highest rate of exchange for receivables for each hedging technique. Unique "money market hedge exchange rate factors" and "options hedge exchange rate factors" were developed to facilitate comparisons between the two hedging techniques.

BACKGROUND

The decisions that multinational corporations (MNCs) must make regarding whether to hedge, or leave open, transactions denominated in foreign currencies can have a critical impact on both their expected returns and the riskiness of their cash flows. Even if MNCs believe they will profit from an unhedged position, they may decide, nonetheless, to hedge their positions to lock in the home-currency values of their future payables and receivables. If MNCs make a judgement to hedge these transactions, they must then

determine which type of hedge to utilize.

A variety of hedging techniques are available, including the money market hedge and the option hedge. The money market hedge for payables requires the MNC to borrow home currency, convert this to foreign currency, and invest this foreign currency in a money market instrument denominated in that currency. For receivables, the MNC would borrow foreign currency from the (foreign) money market, convert this to the home currency, and invest this in the (home) money market.

Kashi Khazeh is a Professor of Finance with the Franklin P. Perdue School of Business at Salisbury University. His research interests include international financial management and financial institutions and markets. Email: kxkhazeh@salisbury.edu. Web page: <http://khazeh.com>.

Robert C. Winder is a Professor of Economics and Finance with the Joseph W. Luter, III School of Business at Christopher Newport University. His research interests include money and capital markets and international finance. Email: rwinder@cnu.edu.

The authors wish to recognize and thank Mr. Valentine C. Moscaliuc for his assistance with this research project. An early version of this research was presented to the Academy of International Business, Northeast Conference, Salisbury, Maryland, September 26-28, 2002.

Utilizing call or put options to hedge transactions, alternatively, is somewhat less complicated. To hedge payables using options, the MNC can obtain an option to buy a specific currency at a specific time at a specific price. To hedge receivables, MNCs can obtain an option to sell a specific currency at a specific time at a specific price. Notwithstanding the premium paid, hedging transaction exposure using options (as opposed to the money market) provides MNCs increased flexibility because the corporation can either exercise, or not exercise, an option contract.

The globalization of the world economy and increasingly volatile exchange rates have magnified the foreign exchange exposure of multinational corporations. In this environment of increased risk, more businesses are employing techniques to hedge their foreign transaction exposure. However, multinational and other firms may be better served by employing one hedging technique as opposed to another. This study provides critical information from a recent time period which may assist these firms in developing an optimal hedging strategy. For both managers and shareholders, any increase in return or reduction in risk resulting from such a strategy will create value and enhance stock price.

OVERVIEW OF THE LITERATURE

While derivatives have existed for some time, it is only within the last decade that their use has become widespread. Today, it is not

uncommon for financial managers of multinational and international firms to use a variety of derivative instruments to hedge risk associated with transactions (both receivables and payables) denominated in foreign currencies. These instruments include the use of forward and futures markets, money markets, options, and currency swaps. Haight and Morrell (1996) provide a good overview of the use of derivatives to manage foreign exchange rate risk.

A number of key decisions must be made by firms (i.e., managers) facing foreign exchange rate risk. First, they must make a determination as to whether or not the foreign exchange rate risk should be hedged, or left unhedged. Kawaller and Zabal (2001) list the key questions that managers should ask when assessing risk:

1. If the value of the foreign currency changes (over the relevant time frame) in a way which increases production costs, will the company have the pricing power to pass these costs along to consumers without losing market share?
2. Are the firm's competitors subject to the same foreign exchange rate risk, or have they hedged this risk?
3. Does the firm expect the foreign currency to appreciate, depreciate, or not change in value (over the relevant time frame)?
4. If foreign exchange positions are not hedged, will the possible increase

in the volatility of net income lead to a reduction in the market value of the company's stock?

After answering these questions, if a decision is made to hedge foreign exchange rate risk, then the firm must decide what instrument to use for this purpose. Articles by Atfield, Glod and James (2001) and Kawaller and Zabal (cited above) both present frameworks for determining what the optimal technique is likely to be. Articles by Redhead (2001) and by Baril, Benke, and Buetow (1996) provide a good general discussion of the advantages and disadvantages of the various hedging techniques.

Coy, Weimer and Barrett (1998) note that a number of major companies have concluded that hedging foreign currency risk is just as likely to reduce, as well as increase, profitability. Dunkin and Gutner (1996) make a similar point. On the other hand, Khazeh and Winder (2001) find evidence that MNCs may enhance profits by utilizing forward or money market hedges for both receivables and payables denominated in the same currency. Regardless of the impact on profitability, many firms hedge their foreign exchange rate risk to "smooth out cash flows" so they can manage working capital with more confidence. Coy, Weimer and Barrett consider the hedging strategies of a number of major companies. Additional studies which consider the hedging strategies of specific firms are Brown (2001) and Murphy (1999).

An article by Wallace (1998)

summarizes the best practices (for hedging foreign exchange rate risk) employed by a majority of the companies studied. The best practices include having a written policy identifying the specific foreign exchange risks the firm will hedge against, centralizing the management of foreign exchange risk, and developing adequate information systems to track and manage the derivatives employed. Interestingly, the study by Aabo (2001) finds little commonality in the actual hedging strategies used by firms. It suggests that many firms have not yet developed a systematic strategy for use on a consistent basis.

A number of articles note that the introduction of the Euro may change how firms will manage their foreign exchange rate risk in the future. For some firms, the introduction of this common currency may make it easier for multinationals doing business in these twelve countries to manage their foreign exchange rate risk. Such articles include Kawaller (1998a), Kawaller (1998b), and McMurray (2000). On the other hand, articles by Wilson (1998), Ogden (1997), and Aggarwal and Demaskey (1997) note how instability in the Asian currency markets has increased the risk associated with transactions in emerging markets and, accordingly, increased the benefits of hedging such risks.

Despite the growing body of articles and studies regarding the use of derivatives to hedge foreign exchange rate risk (as noted above), there are still relatively few studies

which directly test the merits of the different hedging techniques using real data for a specific time period. The authors hope the present article will begin to fill this gap.

CONCEPTUAL FRAMEWORK

The general approaches for comparing the effectiveness of the money market hedge and the option hedge are described below.

Elements of the Money Market Hedge

If interest rate parity holds and there are no transaction costs, a forward hedge and a money market hedge will yield identical results. According to interest rate parity theory, the forward premium/discount on a currency reflects the interest rate differential of the currencies. Therefore, if interest rate parity holds, the hedging of both payables and receivables with a forward hedge will result in the same outcome as payables and receivables with a money market hedge. (See Al-Loughani and Moosa (2000) for an empirical test of this hypothesis.)

Money market hedges involve taking a money market position to cover a future payable or receivable position. This type of hedging technique, unlike the forward hedge, requires the firm to simultaneously lend and borrow two different currencies (i.e., the home currency and the foreign currency). As noted above, MNCs often hedge their positions. This may be true even if the real cost of hedging is expected to be positive. As Madura (2003)

has shown, Equations (1) and (2) below indicate the real cost of hedging for payables and receivables, respectively:

$$RCH_p = NCH_p - NCWH_p \text{ Equation 1}$$

Where the real cost of hedging payables (RCH_p) is equal to the nominal cost of hedging payables (NCH_p) minus the nominal cost without hedging payables ($NCWH_p$).

$$RCH_r = NRWH_r - NRH_r \text{ Equation 2}$$

Where the real cost of hedging receivables (RCH_r) is equal to the nominal home currency received without hedging ($NRWH_r$) minus the nominal home currency received with hedging (NRH_r).

The sections below describe, through Exhibit 1 and Exhibit 2, the actual process for hedging payables and receivables, respectively, using a money market hedge and how a unique “money market hedge exchange rate factor” (MMHXF) can be derived in order to make the comparison easier (i.e., rate-base rather than value-based).

Exhibit 1: Hedging Payables Utilizing a Money Market Hedge

To hedge payables with a money market hedge, the corporation borrows home currency at the present time, converts it to foreign currency, invests

the foreign currency in a money market instrument denominated in the foreign currency, and repays the loan denominated in the home currency at the end of the period. In practice, firms must take the following actions:

- i) Determine the present value of the payables denominated in the foreign currency;
- ii) Determine the amount of home currency which must be borrowed (today) to purchase the amount of the foreign currency identified in (i), above;
- iii) Invest the value determined in (i), above, in a money market instrument in the specified foreign currency to pay for the payables at maturity; and
- iv) Determine the future amount of home currency plus interest borrowed in (i), above.

Exhibit 2: Hedging Receivables Utilizing a Money Market Hedge

To hedge receivables with a money market hedge, the corporation borrows foreign currency from the money market, converts it to the home currency, invests the home currency in a money market instrument, and uses the receivables to pay off the loan at the end of the period. More specifically, firms must take the following actions:

- i) Determine the present value of

the receivables denominated in the foreign currency;

- ii) Borrow the amount of foreign currency determined in (i), above, against the receivables;
- iii) Convert the amount borrowed in (ii), above, to home currency and invest it in the domestic money market; and
- iv) Determine the future amount of interest earned and home currency to be received from (iii), above.

The Money Market Hedge Exchange Rate Factor

Assuming the spreads on the money market rates and options are comparable, Exhibits 1 and 2, above, can be transformed into a single rate (factor) which can easily be compared to the option rate to determine which hedging technique would have yielded superior results. This unique rate (factor), which the authors referred to in their recent article (Khazeh and Winder, 2001) as the money market hedge exchange rate factor (MMHXF), is derived below for a single unit of foreign currency:

$$MMHXF = [1/(1 + i_f)] (S_0) (1 + i_h)$$

Equation 3

Where MMHXF=the money market hedge exchange rate factor; i_f = the money market rate for foreign currency; S_0 = the spot rate in dollars at the present time; i_h = the money



market rate for the home currency.

Elements of the Option Hedge

As an alternative to the money market hedge, MNCs may also utilize options contracts to hedge foreign currency positions. While a money market hedge involves simultaneous borrowing and lending in two different currencies to lock in the dollar (or home currency) value of future foreign currency cash flows, the option hedge involves a right, but not an obligation, to buy or sell any future foreign currency cash flow. In this case, corporations are not only able to offset their payables and/or receivables denominated in foreign currencies, they are also able to maintain important flexibility inasmuch as option contracts do not have to be exercised.

With option contracts, corporations can lock in (today) a maximum exchange rate for a future transaction involving payables and a minimum exchange rate for their receivables. Specifically, they either obtain a foreign currency call option contract in which their payables are denominated, or, alternatively, they obtain a currency put option contract if they have receivables denominated in a foreign currency. In either case, the corporation shifts the exchange rate risk to a different entity.

However, one must note that while option contracts provide flexibility, they are not costless. The corporation must pay a premium for the option contract regardless of whether or not it is exercised. Nonetheless, many corporations are

willing to pay these premiums. In effect, they are able to hedge against exchange rate risk while maintaining the flexibility to buy or sell foreign currency at the spot rate if that rate is more favorable at the time the payables or receivables are due.

The sections below describe, through Exhibit 3 and Exhibit 4, the actual process for hedging payables and receivables, respectively, using an option hedge and how a unique "option hedge exchange rate factor" (OHXF) can be derived for comparison with the money market hedge exchange rate factor (MMHXF).

Exhibit 3: Hedging Payables Utilizing an Option Hedge

To hedge payables with an option, the corporation can obtain a contract to have an option to buy a specific currency at a specific time at a specific price. Specifically, the corporation takes the following actions:

- i) Determine the amount of the payables denominated in the foreign currency;
- ii) Obtain a call option contract to cover the amount determined in (i), above, in the specified foreign currency (to be paid at maturity);
- iii) If the spot rate at the time the payables are due is more than the option's strike/exercise price, then utilize the option. If not, let the option expire and obtain the needed currency in the spot market;
- iv) Determine the effective value

of the exchange rate for the currency by adding the option premium to either the exercise price or to the spot rate depending on whether the option is exercised, or not exercised, respectively.

Exhibit 4: Hedging Receivables Utilizing an Option Hedge

To hedge receivables with an option, corporations can obtain a contract to have an option to sell a specific currency at a specific time at a specific price. The specific steps involved are:

- i) Determine the amount of the receivables denominated in the foreign currency;
- ii) Obtain a put option to sell the amount determined in (i), above, in the specified foreign currency to be received at maturity;
- iii) If the spot rate at the time the receivables are due is less than the option's strike/exercise price, then utilize the option. Otherwise, let the option expire and convert the currency received in the spot market;
- iv) Determine the effective value of the exchange rate for the currency by subtracting the option premium from either the exercise price or to the spot rate depending on whether the option is exercised, or not exercised, respectively.

The Option Hedge Exchange Rate Factor

Assuming the spreads on the money market rates and options are comparable, Exhibits 3 and 4, above, can be transformed into a single rate (factor) which can be compared to the money market hedge exchange rate factor (MMHXF) to determine which hedging technique would have yielded superior results. The unique rate (factor) is derived below for a single unit of foreign currency.

For payables:

$$OHXF = [E_p + P_{pu}] \text{ if the option contract is exercised}$$

Equation 4

or

$$OHXF = [S_p + P_{pu}] \text{ if the option contract is not exercised}$$

Equation 5

Where OHXF = the option hedge exchange rate factor; E_p = the exercise price for foreign currency; S_p = the spot rate in dollars at the exercise time; P_{pu} = the per unit premium

For receivables:

$$OHXF = [E_p - P_{pu}] \text{ if the option contract is exercised}$$

Equation 6

or

$$OHXF = [S_p - P_{pu}] \text{ if the option contract is not exercised}$$

Equation 7

Where OHXF = the option hedge exchange rate factor; E_p = the exercise price for foreign currency; S_p = the spot rate in dollars at the exercise time; P_{pu} = the per unit premium



DATA

The specific currencies included in this study were the British pound, the German mark (euro zone currency), the Japanese yen, and the Swiss franc. The specific time periods considered were May/June, 1999. Data for the relevant market rates were obtained from *The Wall Street Journal*, *The Economist*, and the *Philadelphia Exchange*. There were samples of four call (for payables) and two put (for receivables) options for the British pound; three call and five put options for the German mark; six call and five put options for the Japanese yen; and three call and six put on the Swiss franc. All options were European-style currency options (exercisable only on the expiration date). To insure consistency in contract duration, in each case, the 3-month (annualized) money market rates were de-annualized based on the number of days until the expiration date.

RESULTS AND ANALYSIS

The results, shown in Tables 1 and 2 below, reveal that the money market and option hedges were not entirely equivalent in their impact on profitability for both payables and receivables for the time periods and the currencies considered. For payables (see Table 1, Column 13), a comparison of the money market hedge and option hedge exchange rate factors (i.e., $MMHXF - OHXF$, both defined in Section III above) indicate that, for both time periods considered, the money market hedge was generally superior to the option

hedge for all currencies (a positive number in Column 13 indicates a higher rate for the $MMHXF$ while a negative number indicates a higher $OHXF$). Specifically, of the sixteen call option contracts identified during the time periods considered (i.e., used to hedge payables denominated in the specific foreign currency), money market hedges yielded superior results eleven times ($MMHXF - OHXF < 0$). In five cases, the use of the option hedge proved to be superior ($MMHXF - OHXF > 0$).

However, it is critical to point out that the results noted above are composite (consolidated) results including all currencies. For the four call contracts for the British pound, the option hedge was superior in two cases. For the German mark, the money market hedge was superior in all three comparisons to the option hedge. For the Japanese yen, the money market hedge was superior to the option hedge in four out of six comparisons to a hedge utilizing a call option. For the Swiss franc, the money market hedge was superior in two out of three cases identified. At the same time, it is worth noting that for each individual currency, the aggregate results (i.e., the summation of the values in Column 13 for that currency) indicate the superiority of the money market hedge over the option hedge.

With respect to receivables (see Table 2, Column 13), the composite results were equally split between the money market hedge and the option hedge. Specifically, across all currencies, the money market

TABLE 1
Money Market vs. Call Option
LEFT COLUMNS

	1	2	3	4	5	6	7	8
line 1	Date	Currency	Expiration date	Exercise ?	Home Rate I	Foreign Rate I	Strike Price \$	Premium \$
line 2	3-May	£	25-Jun	n	0.6832%	0.7497%	1.65000	0.0023
line 3	18-May	£	25-Jun	n	0.4923%	0.5396%	1.62000	0.0084
line 4	2-Jun	£	24-Sep	y	1.4778%	1.6333%	1.62000	0.0193
line 5	3-Jun	£	30-Jul	y	0.7521%	0.8313%	1.62000	0.0115
line 6								
line 7	3-Jun	DM	30-Jul	y	0.7521%	0.4117%	0.53500	0.0062
line 8	4-Jun	DM	24-Sep	y	1.4514%	0.7944%	0.53000	0.0132
line 9	4-Jun	DM	24-Sep	n	1.4514%	0.7944%	0.55000	0.0044
line 10								
line 11	4-May	¥	25-Jun	n	0.6701%	0.0113%	0.01000	0.000003
line 12	3-May	¥	28-May	n	0.3285%	0.0056%	0.00855	0.000058
line 13	4-Jun	¥	25-Jun	y	0.2771%	0.0018%	0.00760	0.000643
line 14	4-Jun	¥	24-Sep	y	1.4514%	0.0092%	0.00770	0.000665
line 15	4-Jun	¥	25-Jun	y	0.2771%	0.0018%	0.00780	0.000445
line 16	4-Jun	¥	24-Sep	y	1.4514%	0.0092%	0.00790	0.000497
line 17								
line 18	18-May	SF	30-Jul	y	0.9580%	0.2060%	0.67000	0.0096
line 19	18-May	SF	25-Jun	n	0.4923%	0.1059%	0.67000	0.005
line 20	4-Jun	SF	30-Jul	y	0.7389%	0.1649%	0.65000	0.0128

TABLE 1
Money Market vs. Call Option
RIGHT COLUMNS

	9	10	11	12	13
line 1	Spot on expiration \$	Spot rate \$	MMHXF	OHXF	MMHXF - OHXF
line 2	1.586800	1.6094	1.6083386	1.5891	0.019239
line 3	1.586800	1.6205	1.619737975	1.5952	0.024538
line 4	1.642200	1.6041	1.601644834	1.6393	-0.037655
line 5	1.622700	1.6062	1.604938908	1.6315	-0.026561
line 6					
line 7	0.547580	0.52801	0.529800065	0.5412	-0.011400
line 8	0.534100	0.530475	0.533932458	0.5432	-0.009268
line 9	0.534100	0.530475	0.533932458	0.5385	-0.004568
line 10					
line 11	0.008237	0.008267	0.008321453	0.00824023	0.000081
line 12	0.008229	0.008318	0.008344939	0.0082871	0.000058
line 13	0.008237	0.008188	0.008210544	0.008243	-0.000032
line 14	0.009594	0.008188	0.008306078	0.008365	-0.000059
line 15	0.008237	0.008188	0.008210544	0.008245	-0.000034
line 16	0.009594	0.008188	0.008306078	0.008397	-0.000091
line 17					
line 18	0.671270	0.666444	0.671445356	0.6796	-0.008155
line 19	0.652740	0.666444	0.669016712	0.65774	0.011277
line 20	0.671270	0.652656	0.656396078	0.6628	-0.006404



TABLE 2
Money Market vs. Put Option
LEFT COLUMNS

	1	2	3	4	5	6	7	8
line	Date	Currency	Expiration date	Exercise ?	Home Rate i	Foreign Rate i	Strike Price \$	Premium \$
line 2	18-May	£	25-Jun	y	0.4923%	0.5396%	1.61000	0.0084
line 3	3-May	£	28-May	y	0.3285%	0.3604%	1.61000	0.009
line 4								
line 5	3-May	DM	25-Jun	n	0.6832%	0.3741%	0.52000	0.0009
line 6	4-May	DM	24-Sep	y	1.8394%	1.0072%	0.54000	0.0096
line 7	3-Jun	DM	30-Jul	n	0.7521%	0.4117%	0.52000	0.0008
line 8	3-Jun	DM	24-Sep	n	1.4646%	0.8017%	0.53000	0.0039
line 9	4-Jun	DM	30-Jul	n	0.7389%	0.4044%	0.52500	0.0053
line 10								
line 11	18-May	¥	25-Jun	n	0.4923%	0.0103%	0.00810	0.000014
line 12	3-May	¥	28-May	y	0.3285%	0.0056%	0.00830	0.000068
line 13	2-Jun	¥	25-Jun	n	0.3035%	0.0019%	0.00790	0.000024
line 14	2-Jun	¥	24-Sep	n	1.4778%	0.0093%	0.00820	0.000147
line 15	3-Jun	¥	30-Jul	n	0.7521%	0.0048%	0.00825	0.000124
line 16								
line 17	3-May	SF	25-Jun	y	0.6832%	0.1473%	0.67000	0.012
line 18	3-May	SF	25-Jun	y	0.6832%	0.1473%	0.69000	0.028
line 19	3-May	SF	28-May	y	0.3285%	0.0708%	0.71000	0.049
line 20	3-Jun	SF	30-Jul	n	0.7521%	0.1678%	0.65000	0.0075
line 21	3-Jun	SF	30-Jul	n	0.7521%	0.1678%	0.64000	0.0031
line 22	3-Jun	SF	25-Jun	n	0.2903%	0.0648%	0.65000	0.0025

TABLE 2
Money Market vs. Put Option
RIGHT COLUMNS

	9	10	11	12	13
line	Spot on expiration \$	Spot rate \$	MMHXF	OHXF	MMHXF - OHXF
line 2	1.586800	1.6205	1.619737975	1.6016	0.018138
line 3	1.601300	1.6094	1.608887732	1.601	0.007888
line 4					
line 5	0.533300	0.5406	0.542292913	0.5324	0.009893
line 6	0.534100	0.5432	0.547658412	0.5304	0.017258
line 7	0.547580	0.528	0.529800065	0.54678	-0.016980
line 8	0.534100	0.528	0.531482429	0.5302	0.001282
line 9	0.547580	0.5305	0.532241998	0.54228	-0.010038
line 10					
line 11	0.008237	0.0081	0.008154012	0.00822323	-0.000069
line 12	0.008229	0.0083	0.008344939	0.008232	0.000113
line 13	0.008237	0.0082	0.008263443	0.00821323	0.000050
line 14	0.009594	0.0082	0.008359568	0.0094467	-0.001087
line 15	0.008734	0.0082	0.008289891	0.0086096	-0.000320
line 16					
line 17	0.652740	0.6563	0.659808849	0.658	0.001809
line 18	0.652740	0.6563	0.659808849	0.662	-0.002191
line 19	0.654660	0.6563	0.657986679	0.661	-0.003013
line 20	0.671270	0.6492	0.653010736	0.66377	-0.010759
line 21	0.671270	0.6492	0.653010736	0.66817	-0.015159
line 22	0.652740	0.6492	0.650687052	0.65024	0.000447

hedge was superior to the option hedge in nine instances involving a put contract ($MMHXF - OHXF > 0$) while the option hedge was superior to the money market hedge in the remaining nine instances ($MMHXF - OHXF < 0$).

Once again, disaggregating these composite results is revealing. For receivables, the results show that the money market hedge was preferable only for the British pound and the German mark ($MMHXF - OHXF > 0$). Specifically, for the British pound, the money market hedge was superior in each instance (i.e., in two instances). For the German mark, the money market hedge yielded superior results in three of five instances as well as in the aggregate (i.e., summing the values in Column 13 for the mark).

The option hedge was superior for receivables for both the Japanese yen and the Swiss franc in most instances ($MMHXF - OHXF < 0$). Specifically, of the five comparisons involving the Japanese yen, the option hedge was superior in three instances. For the Swiss franc, the option hedge was superior in four of six instances. For both the Japanese yen and the Swiss franc, the option hedge was also superior on an aggregate basis (i.e., summing the values in Column 13 for each currency).

SUMMARY AND LIMITATIONS

Overall, MNCs would have benefited by employing a money market hedge for payables. The money market hedge was also superior for receivables denominated in British

pounds and German marks. However, the option hedge was preferable for receivables denominated in Japanese yen and Swiss francs.

These results suggest that the decisions firms make as to how foreign currency risk should be hedged may have an important impact on their bottom lines as well as on the predictability (riskiness) of future cash flows. Moreover, because the option hedge exchange rate factors employed in this study included the relevant premium (whether or not the contract was exercised), these comparisons could provide realistic guidance for making hedging decisions.

However, it must be noted that these findings apply only to a specific time period and for specific currencies considered. Future studies may shed light as to whether the findings in this study hold up for other time periods and currencies. This study focused on four of the world's major currencies. For currencies that are not as actively traded, or for countries with less efficient money and capital markets or significant sovereign (country) risk, the relationships between interest rates, exchange rates, and forward premiums will be more complicated and less predictable. For these latter currencies, reliance on stable or predictable relationships between key economic and financial variables is problematic. Because the underlying economic factors which would cause one type of hedge (e.g., the money market hedge) to be superior to another type of hedge are both complicated and interrelated

(e.g., inflation differentials, interest rate differentials, and income differentials), these factors should be explored in a longer-term study.

It should also be noted that, notwithstanding the premium involved, for some MNCs the option hedge may be the strategy of choice because of the flexibility it affords the firm. Specifically, the option hedge allows the MNC to: a) insulate its position against adverse currency movements without eliminating the potential benefits of favorable movements, and, b) bid on potential acquisitions of existing plant and/or equipment denominated in the currency.

For the future, it will be interesting to compare money market hedges, option hedges, and forward hedges involving the Euro. Presumably, MNCs will be able to minimize risk and improve efficiency by denominating foreign currency transactions in this common currency.

REFERENCES

- Aabo, T. 2001. Exchange rate exposures and strategies of industrial companies: An empirical study. *Thunderbird International Business Review*, 43 (3): 379.
- Aggarwal, R., & Demaskey, A. L. 1997. Using derivatives in major currencies for cross-hedging currency risks in Asian emerging markets. *Journal of Futures Markets*, 17(7): 781-796.
- Al-Loughani, N. E., & Moosa, I. A. 2000. Covered interest parity and the relative effectiveness of forward and money market hedging. *Applied Economic Letters*, 7(10): 673-675.
- Attfield, C., Glod, M., & James, J. 2001. Options and forwards compete for best hedge. *Quantitative Finance*, Issue 1: 9-11.
- Baril, C. P., Benke, R. L., & Buetow, G. W. 1996. Managing risk with derivatives. *Management Accounting*, 78 (5): 20-27.
- Brown, G. W. 2001. Managing foreign exchange risk with derivatives. *Journal of Financial Economics*, 60 (2): 401.
- Coy, P., Weimer, D., & Barrett, A. 1998. Perils of the hedge highwire. *Business Week*, October 26: 74-77.
- Dunkin, A., & Gutner, T. 1996. The guessing game called hedging. *Business Week*, May 20: 108.
- Haight, T. G. & Morrell, S. O. 1996. Using derivatives to manage foreign exchange risk. *Bankers Magazine*, 179 (6): 23-28.
- Kawaller, I. G. (a). 1998. Capitalizing on change: Preparing for the euro. *TMA Journal*, 18 (5): 32-35.
- Kawaller, I. G. (b). 1998. Hedging the currency exposure of a non-dollar portfolio. *Derivatives Quarterly*, 5 (2): 62-66.
- Kawaller, I. G. & Zabal, E. R. 2001. Complying with FAS 133: Hedging currency transactions. *Afp Exchange*, 21 (5): 80-86.
- Khazeh, K. & Winder, R. C. 2001. Managing transaction exposure through forward and money markets. *Derivative Risk Management Service*, August 2001: 4L.01-4L.14.
- Madura, J. 2003. *International Financial Management*, 7th edition. Thomson and Southwestern, pp. 337-339.
- McMurray, S. 2000. The lost art of hedging. *Institutional Investor*, 34 (12): 63.
- Murphy, R. 1999. New money. *Success*, 46 (2): 20-21.
- Ogden, J. 1997. Removing a risk: Hedging with NDFs and NDOs in

- emerging markets. *Global Finance*, 11 (2): 14.
- Redhead, K. 2001. Exchange rate risk management – Part 3. *Credit Control*, 22 (5): 27-31.
- Wallace, J. 1998. Best practices in foreign exchange risk management. *TMA Journal*, 18 (6): 48-55.
- Wilson, D. 1998. Hedging exotic currency risk. *TMA Journal*, 18 (2): 13-18.