CROSS CURRENCY HEDGING RESULTS:
IMPLICATIONS FOR EEC UNIFICATION AND LDC TRADE

ROBERT T. DAIGLER
Associate Professor of Finance
Florida International University

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INTRODUCTION

In 1992 The European Economic Community (EEC) will complete its long-planned economic unification. The trade and economic implications of this unification are multifaceted and suggest a partial realignment of economic forces in the Western world. This unification will drop trade barriers among those countries belonging to the EEC, including economic surcharges. However, the varying strengths of the currencies for the countries involved in the EEC implies difficulties concerning trading arrangements both within and outside the EEC. Concurrently, trade between EEC countries and Lesser Developed Countries (LDCs) is perceived to be risky because of weaker economies and uncertain currency fluctuations of the LDC's.

This paper examines the cross currency hedging results for countries that belong to the EEC and for selected LDCs. The mark, pound, and Swiss franc futures are employed as the hedging vehicles, with the cash rates for other countries in the EEC used as the currencies to be hedged. Hedging results for selected LDCs from the Far East, South America, and Africa are also examined in relation to the mark, pound, and franc futures.

The results for EEC countries provide evidence concerning

the relationships between the currencies for the countries within the EEC, as well as information on the ability to hedge non-futures currencies by those who are outside the EEC community. Similarly, hedges with currencies from LDC countries will show if it is possible to hedge effectively those trading arrangements which are denominated in the currencies of these LDC countries. Since cross currency hedging results have been largely ignored by academic researchers, these hedging results provide some interesting relationships which allow commentary on the EEC unification, trade with EEC countries, and trade with LDCs.

PREVIOUS EVIDENCE ON CURRENCY HEDGING

Hill and Schneeweis (1982b) examine hedging effectiveness for the five major currencies which possess futures contracts. Table 1 shows their hedging effectiveness and hedge ratio results for one-week, two-week, and four-week hedges using data from 1974-1978. The size of the R^2 values depend upon the length of the hedge and the currency employed. One week hedges have R^2 values below 50%, with the Canadian dollar and Japanese yen being below 25%. Two week hedges have R^2 values above 65% and four week hedges have R^2 values above 82%, except for the Japanese yen which has poorer hedging effectiveness measures. With one exception, the hedge ratios are all below one. The other currency hedging studies by Hill and Schneeweis (1981, 1982a)

provide nearly equivalent results, with the slight variability in hedging effectiveness and hedge ratio values attributable to slightly different time periods and/or the use of more futures maturities to obtain average hedging results.

TABLE 1 ABOUT HERE

Saunders and Sienkiewicz (1988) examine the hedging effectiveness of the ECU futures contract. The ECU cash instrument is a composite "currency" made up ten European currencies in varying weights. This currency is used for trade purposes within Europe. Saunders and Sienkiewicz use data for 15 months, starting in January 1986. They find that the ECU futures has high hedging effectiveness (R^2) values with European currencies for the one and two week hedges, with the R^2 values being above 80% for most countries, except for poorer results for the British pound. The authors also determine that the low volume of the ECU futures is most likely due to the ability to obtain equivalent hedging results for individual countries by using a combined mark and pound futures hedge.

THE CONCEPT

The ability to hedge cash currency value changes for European and other currencies is examined by the regression

procedure discussed by Ederington (1979) and others:

$$\Delta P_c = a + b \Delta P_f + e \quad (1)$$

Where:

ΔP_c = the change in the price of the cash currency

b = the hedge ratio for the period in question

ΔP_f = the change in the price of the futures contract

a = the intercept term, with E(a) = 0

e = the error term

The R^2 from the regression is used to determine the percentage variability in the cash currency which can be hedged with the futures contract, i.e. R^2 measures the hedging effectiveness. The variable "b" determines the hedge ratio for the futures contract which maximizes the hedging effectiveness value.

Cash currencies may be hedged either with other cash currencies or with futures contracts. Futures are employed instead of cash rates because futures contacts are more liquid and less costly than using cash currencies, especially for smaller lot sizes. Thus, currency trades in New York and London typically must be $5 million or larger, although sometimes trades as small as $1 million are executed (with reluctance). Trades below $5 million typically are not executed immediately. Hedging with cash currencies also is more costly, since the bid-ask spread for the cash currency used as the hedge is much larger than the spread for the futures contract plus the commission on

trading the futures.

Weekly cash and futures currency data from 1980 through 1986 are employed in this analysis. The weekly data is used to generate hedge ratios and hedging effectiveness (R^2) values for semi-annual time periods for individual currencies for the nearby contracts of the mark, pound, and Swiss franc futures. European countries analyzed are as follows: Germany, Britain, Switzerland, Belgium, Italy, Netherlands, Spain, France, and Greece. Other countries examined are: Australia, Hong Kong, Israel, Singapore, Taiwan, Argentina, Brazil, Mexico, Uruguay, and South Africa. The hedging results for these countries will provide information on the ability of the futures in the above European currencies to hedge European and LDC currency rate fluctuations in different time periods. Such information is important for potential trade and the EEC unification.

Note that all but two of the countries in the EEC, Britian and Greece being the exceptions, have their currencies pegged to each other under the European Monetary System. The objective of this pegging is to restrict the fluctuations of the member currencies to no more than 2 1/4% either side of a reference rate, except for the Italian lira which may fluctuate by 6%. However, realignments of the reference rate have averaged one per year since the EMS was initiated in 1979. The importance of the EMS is that hedging within the EEC should be very effective when the guidelines are adhered to, which would benefit trading

agreements across EEC countries.

DATA AND RESULTS

Data

Cash and futures currency values are employed from 1980-1986 to determine the hedge ratios and hedging effectiveness values for weekly intervals. Weekly data for 26 weeks are used for each time period. Each observation is taken as of the Wednesday of the week; Wednesday was chosen to avoid anomalies which may occur when traders close positions on Friday as well as to provide a more extensive database for cross-currency rates. The cash currency values are based on late afternoon prices from The Bank of American in London. Futures values used in the analysis are the opening values from the Chicago Mercantile Exchange; the use of opening futures data (Chicago) and closing cash data (London) eliminates most of the timing differences between the data sets. The use of the open futures data should provide significant liquidity, especially since the nearby contract is employed in the analysis.

Cash currency values for European and Lesser Developed countries are used for the data analysis. The cross-currency data allows an examination of cross hedging for currencies that has previously not been explored. Cash and futures currency values are converted to percentage changes to execute the

regression hedging model.[1] Subperiod results allow for the examination of potential instability of the hedge ratios and the effect on the hedging effectiveness.

Results

Tables 2 to 5 present a selected sample of individual country cross hedging results using the regression methodology to obtain the relevant hedge ratios and hedging effectiveness measures. These tables show the half year time periods, the hedge ratio "b" and the hedging effectiveness R^2 values between the relevant futures contract and the cash currency. The half year results are based on using weekly intervals over 26 week periods and therefore are designated in terms of the first and second half of the year.[2]

Tables 2 to 5 are selected from the over 50 futures to cash comparisons to show different types of associations between the futures and cash hedging results. Table 2 examines the German mark futures to the French franc. The hedging effectiveness for this cross hedge excellent cross hedging results, except for one or two periods. The hedge ratios are generally near one, which also suggests a strong hedging association. These results provide encouragement for hedging within the EEC. They also suggest some success in economic policy of keeping these two currency within the allowed range of 2 1/2% of the base rate.

TABLE 2 ABOUT HERE

Table 3 examines the cross hedging results for the British pound futures versus the Belgium franc. Here the hedging effectiveness values are inferior to the results in Table 2, with almost 2/3 of the R^2 values being below 50%. In fact, for the 1980-2 period there was no association between the British pound futures and the Belgium franc. Hence, these results show a more tentative association among these two European currency values, especially in terms of the variability of the hedging effectiveness and hedge ratio values from one period to another. Recall that Britian is not part of the EMS currency parity system.

TABLE 3 ABOUT HERE

Tables 4 and 5 examine the cross hedging results between European currency futures and the cash currencies from non-European countries. Table 4 illustrates the German mark futures versus the Australian dollar. While several of the periods provide reasonably high R^2 values, other periods give very poor hedging effectiveness results. In fact, for 7 of the 14 periods the hedging effectiveness value is below 17%! Table 5 compares the Swiss franc futures with the Hong Kong dollar. This comparison shows the worst R^2 values of the tables so far, with

the highest hedging effectiveness being 26%.

TABLES 4 AND 5 ABOUT HERE

Tables 6 to 8 provide summary figures for 1980-86 for the cross hedging results between the European futures contracts and the cash currencies from European and other countries. The results provided in these tables average the hedge ratio and hedging effectiveness measures from the individual periods for each of the futures/cash comparisons. While a few extreme results influence these average figures, in general the results in these tables provide an accurate picture of the cross-hedging effectiveness of the European futures contracts to the cash currencies.

Table 6 shows the British pound futures cross hedging results. The European currency results are lower than expected, with all of the cross-currency hedging effectiveness values being below 50%. These results suggest that the British pound futures is not a good hedging tool for EEC trade. Moreover, it indicates that the currency relationships between the British pound and other European currencies are not closely associated. These poor associations may be related to the fact that Britian does <u>not</u> belong to the EMS currency guidelines. The results for the non-European countries is even worse, with <u>no</u> hedging effectiveness value being above 25%. Hence, hedging trade agreements by using

the British pound futures for these cross-currency situations would not be desirable.

TABLE 6 ABOUT HERE

Table 7 presents the German mark futures cross hedging results. Table 8 shows the Swiss franc futures results. The European hedging effectiveness values in these tables are much more encouraging. The associations between the mark futures and the stronger European currencies (the Belgium franc, the French franc, the Italian lira, and the Netherlands guilder) averages above 75% for each currency. The results for Greece and Spain are less impressive, but still average above 50%. Note that these results suggest that the mark futures is an excellent hedging tool for most of the European currencies which do not have futures contracts. It also implies coordination between the economies of these countries. The cross hedging results for the non-European countries is poor, with the hedging effectiveness results being below 25%, and often below 10%. The results for the Swiss franc futures are less impressive than for the mark futures, but they are still respectable. European hedging results are good, while the non-European hedging results are poor (as with the mark futures).

TABLES 7 AND 8 ABOUT HERE

IMPLICATIONS AND CONCLUSIONS

The individual period hedging results between the European futures contracts and other European currencies provide mixed results. Some cross hedges show relatively high R^2 values, but others are much lower. In particular, the British pound futures tends to have low associations with other European currencies. Some other European cross-currency hedges provide high average hedging effectiveness values, but some individual periods have low R^2 values. The lesser developed countries within the European community, i.e. Spain and Greece, tend to have the worst hedging results with the European futures contracts.

The hedging effectiveness values between the European futures and non-European currencies provides very low R^2 values. These results are consistent regardless of the futures contract used, the specific non-European country, or the location of the non-European country.

These results suggest that in general hedging among countries within the EEC often will be fruitful, especially if the futures contract employed is chosen carefully. However, such hedging is not recommended when the British pound futures is

employed. These results indicate that the EEC economic unification has a good probability of succeeding, since trade can be accomplished without the participants being concerned about a loss in value of their product. The results also suggest that economic cooperation has already taken place, with the relative European currencies generally trading within their agreed upon bands.

On the other hand, trade between European countries and countries outside of Europe can not be effectively hedged with the European futures contracts. The low association between currency values will tend to restrict trade outside the EEC, since EEC members would want payment in an EEC currency.

FOOTNOTES

[1] Technically, price changes rather than percentage changes are typically employed in the regression model. Percentage changes are used here in order to provide a straightforward comparison of the size and variability of the hedge ratios across currencies. Using percentage changes does not affect the hedging effectiveness measures and one may easily convert the hedge ratios to correspond to price changes by multiplying by a scale factor. Rollovers for the futures contracts are conducted during the month of expiration of the futures; the appropriate percentage change is employed in the analysis, i.e. all percentage changes used to compute the hedge ratios are completed between like-maturity contracts.

[2] When the same country is used for both the cash and futures sides of the hedge then the hedging effectiveness values are typically above 90%. These one-week hedges are significantly better than the Hill and Schneeweis results presented in Table 1. Moreover, these results show that any timing difference between the futures and cash quotes is not significant.

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TABLE 1

Hill and Schneeweis Currency Hedging Results

All Maturities: 1974-78

	R^2			$b^*=HR_R$		
Currency	1 week	2 weeks	4 weeks	1 week	2 weeks	4 weeks
British Pound	0.450	0.736	0.885	0.462	0.751	0.914
German Mark	0.431	0.709	0.829	0.648	0.775	0.847
Swiss Franc	0.483	0.658	0.927	0.562	0.710	1.025
Canadian Dollar	0.245	0.761	0.897	0.409	0.745	0.953
Japanese Yen	0.167	0.288	0.666	0.246	0.344	0.697

Source: Hill and Schneeweis (1982b)

TABLE 2

German Mark Futures Vs. French Franc

DATE	b	R sq
80-1	0.942	0.911
80-2	1.080	0.862
81-1	0.814	0.785
81-2	0.809	0.702
82-1	0.892	0.390
82-2	0.928	0.942
83-1	1.039	0.667
83-2	0.923	0.955
84-1	0.925	0.970
84-2	0.996	0.962
85-1	0.950	0.899
85-2	0.941	0.972
86-1	0.935	0.825
86-2	0.692	0.808

TABLE 3

British Pound Futures Vs. Belgium Franc

DATE	b	R sq
80-1	0.915	0.514
80-2	0.013	0.000
81-1	0.488	0.249
81-2	0.502	0.251
82-1	0.948	0.314
82-2	0.619	0.384
83-1	0.228	0.090
83-2	0.729	0.441
84-1	0.970	0.572
84-2	0.760	0.685
85-1	0.645	0.693
85-2	0.616	0.724
86-1	0.703	0.320
86-2	0.433	0.130

TABLE 4

German Mark Futures Vs. Australian Dollar

DATE	b	R sq
80-1	0.119	0.071
80-2	0.197	0.160
81-1	0.269	0.567
81-2	0.235	0.481
82-1	0.307	0.627
82-2	0.434	0.514
83-1	-0.150	0.008
83-2	0.315	0.284
84-1	0.215	0.119
84-2	0.380	0.251
85-1	0.445	0.078
85-2	0.594	0.404
86-1	-0.104	0.009
86-2	0.084	0.008

TABLE 5

Swiss Franc Futures Vs. Hong Kong Dollar

DATE	b	R sq
80-1	0.026	0.003
80-2	0.078	0.096
81-1	0.050	0.002
81-2	0.224	0.222
82-1	0.202	0.203
82-2	0.519	0.261
83-1	0.615	0.159
83-2	-0.040	0.001
84-1	0.025	0.146
84-2	0.024	0.026
85-1	0.017	0.146
85-2	0.034	0.042
86-1	0.021	0.244
86-2	0.016	0.134

TABLE 6

British Pound Futures: Average Cross Hedging Results

	b	R sq
European:		
BELGIUM	0.612	0.383
FRANCE	0.665	0.422
GREECE	0.500	0.275
ITALY	0.575	0.373
NETHERLANDS	0.648	0.435
SPAIN	0.632	0.459
Other Countries:		
AUSTRALIA	0.223	0.215
ARGENTINA	-0.039	0.067
BRAZIL	0.034	0.030
CANADA	0.152	0.160
HONGKONG	0.087	0.086
ISRAEL	0.044	0.042
MEXICO	0.171	0.048
SINGAPORE	0.202	0.221
SAFRICA	0.254	0.219
TAIWAN	0.035	0.035
URUGUAY	-0.160	0.058

TABLE 7

German Mark Futures: Average Cross Hedging Results

	b	R sq
European:		
BELGIUM	0.890	0.777
FRANCE	0.919	0.832
GREECE	0.643	0.513
ITALY	0.831	0.802
NETHERLANDS	0.945	0.911
SPAIN	0.714	0.673
Other Countries:		
AUSTRALIA	0.239	0.256
ARGENTINA	0.000	0.043
BRAZIL	0.020	0.025
CANADA	0.138	0.185
HONGKONG	0.153	0.115
ISRAEL	0.126	0.042
MEXICO	0.133	0.032
SINGAPORE	0.212	0.275
SAFRICA	0.282	0.215
TAIWAN	0.023	0.025
URUGUAY	-0.201	0.075

TABLE 8

Swiss Franc Futures: Average Cross Hedging Results

	b	R sq
European:		
BELGIUM	0.731	0.666
FRANCE	0.764	0.709
GREECE	0.494	0.435
ITALY	0.693	0.695
NETHERLANDS	0.779	0.774
SPAIN	0.582	0.561
Other Countries:		
AUSTRALIA	0.223	0.242
ARGENTINA	0.041	0.026
BRAZIL	0.112	0.025
CANADA	0.112	0.159
HONGKONG	0.129	0.120
ISRAEL	0.129	0.057
MEXICO	-0.091	0.034
SINGAPORE	0.192	0.292
SAFRICA	0.325	0.200
TAIWAN	0.012	0.015
URUGUAY	-0.152	0.076