Out of Sample Effectiveness of a Joint Commodity and Currency Hedge: The Case of Soybean Meal in Italy

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INTRODUCTION

The Common Agricultural Policy (CAP) of the European Community (EC) does not impose any control on the trade of soybeans and soybean products. Therefore the EC domestic price should track the free market world price. Contrary to the case of wheat and corn, then, the potential importance of hedging soybean meal price risk is clear. Yet, hedging is not a common practice for the purchasing manager of the average Italian feed compounding company. This suggests that hedging is either technically very difficult, due to outdated Italian legislation, or not effective, or both.

Evidence of the former is unquestionable. This article empirically investigates the second possibility by addressing the following questions. Is it possible to hedge soybean meal price risk in Italy using the Chicago Board of Trade meal and the International Monetary Market Deutsche mark futures? What is the out-of-sample hedging effectiveness that can be achieved by trading jointly determined commodity and currency minimum variance hedge ratios? How does the out-of-sample results compare with the in-sample results? Does the minimum variance approach produce out-of-sample results that are superior to the one obtained with a naive hedge?

THE PROBLEM

The Italian feed compounding sector operates within the protective mechansim provided by the CAP. This has benefited the feed compounding sector that enjoys relatively limited price risk, at least by North American standards, for most of its input needs other

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than soybean meal. The sector is protected also from external competition, both by the variable import levy system that is applied to imported feed on a cereal-equivalent basis, and by the current cereal surplus in the Community that causes domestic feed grain prices to be much lower than those of imports.

On the other hand, the CAP does not interfere with international trade in soybeans, soybean products, and cereal substitutes that enter the Community without levies. Given the high dependence on imports, both the domestic and the imported commodity are normally available for processing at a price close to the free market level.[1] Italian feed compounders are therefore exposed to the world soybean meal price risk and to the Italian lira/US$ exchange rate risk for one of their most important production inputs.

In recent years, Italy has imported approximately 50% of its soybean meal needs. Most of the trading is done by large international companies or specialized commodity brokers. Direct import of the commodity by the feed compounder is not frequent.

Three methods of pricing soybean meal are rather common in Italy: spot purchases in lire; forward purchases in lire; and basis contracts in US dollars on the Chicago Board of Trade (CBOT) soybean meal futures.

Spot purchase is the method most often used by the smaller, less sophisticated, companies. The most liquid cash and forward meal market is held weekly in Milan, on Wednesday, but other smaller local markets are often active.

Forward purchases are normally available for periods of three to six months; standardized contract terms are rather uncommon. However, these contracts are more frequently used for the purchase of feed grains from EC producers which are mostly large French cooperatives.

Basis contracts on the CBOT meal futures are most often used by the larger companies buying directly from importers or commodity brokers. These contracts normally last three to six months, for forward dates up to a year in the future, and call for bi-monthly delivery of a specified quantity of the commodity. Each shipment is priced on the CBOT nearby futures contract, selected according to the month of delivery of the commodity. The basis is c.i.f. an Italian port, and regulated trucking rates are added for commodity delivered to the buyer plant or to the Milan market. Contract terms are standardized, but no data on the transacted basis nor on the actual volume of the product priced this way are publicly available.

Given the total absence of historical data on the contracted basis values, an objective comparison of the spot, forward and basis purchasing strategies is impossible. Several industry members, including top executives of Ass.Al.Zoo. the industry association, privately indicated that, over time, basis contracts are a better (cheaper) strategy than spot purchases. This is consistent with the presence of a substantial local basis risk, probably due more to local supply and demand conditions than to exchange rate instability.

Rather limited hedging opportunities are offered to the buyer by the terms of the basis contract: no selective hedging is allowed, and although the pricing of the commodity may take place at any time between the signing of the contract and the delivery of the physical commodity, an open position may be rolled-over to a different futures contract only once. In this case the original basis is adjusted to account for the relevant futures spread and for commission costs.[2] No maximum price proviso is yet offered with these basis contracts. Few feed compounding companies have hedging accounts with futures brokers. Foreign exchange risk is normally hedged in the interbank forward market.

[1]The crushing industry in the Community is, however, given some competitive advantage by means of a crushing subsidy.

[2]In this case all futures trading is handled by the importer or the commodity broker.

THE HEDGE MODEL

The objective of this section is to develop a minimum-variance hedge model that can be traded, if so desired, by Italian feed compounders. Following Anderson and Danthine's (1981) multiple cross hedging approach, the hedger is assumed to maximize a linear function of mean and variance of expected return from a portfolio consisting of a cash position and a number of futures positions . Equation (1) indicates the vector of optimal futures positions for the portfolio composed of soybean meal cash position and soybean meal and Deutsche mark futures positions used in this study.

$$f = 1/\phi \sum_{p}^{-1} (p_2 - p_1) + y \sum_{p}^{-1} \sum_{p,\mathrm{sp}}, \qquad (1)$$

where f is the vector of futures positions, ϕ is the coefficient of risk aversion, p_i is the vector of corresponding futures prices at times 1 and 2, Σ_p is the matrix of variances and covariances of the futures prices, $\Sigma_{p,sp}$ is the matrix of covariances between the spot price sp and the futures prices, y is the cash position, that is assumed given. It is easy to see that under the assumption of unbiasedness of futures markets, the first term in (1) is equal to zero.[3] In this case, the vector of optimal futures positions, expressed as a percentage of the cash position, f/y, is given by $\Sigma_p^{-1} \Sigma_{p,sp}$, the vector of the coefficients of the multiple regression of the cash price differences over the futures prices differences. Although according to Eldor, Benninga, and Zilcha (1983, 1984), a routine risk minimizing hedge ratio is the optimal hedge ratio under a reasonable set of assumptions, this approach is often criticized for not being representative of the real-world decision making process, as noted by Thompson (1987). Moreover, it is rather well established, at least in the industry and amongst some academicians, that selective hedging using technical and fundamental analysis is probably the most desirable strategy to effectively cope with the problem. However, a limitation of the selective hedging approach is that the results of any simulation are perfectly general, and as such do not provide an answer to the problem under investigation that is specific to the local cash market. In this sense, the empirical results of this study, even without the presumption of any normative implication, should provide useful information to the trade and may very well constitute a first and necessary input for the design of a selective hedging strategy.[4]

The problem of offshore commodity hedging has been recently analyzed, among others, by Thompson and Bond, and Sheales and Tomek for the case of Australian wheat exports, and Braga and Martin for the case of the EC variable import levy. The problem of cross-hedging the US$/Italian lira exchange rate using the International Monetary Market Deutsche mark futures is analyzed by Braga, Martin, and Meilke (1989), who proved its feasibility and effectiveness for a short lira hedge.[5] More general techniques for the estimation of the optimal hedge ratio have been proposed, among others, by Myers and Thompson (1987), Myers (1988), Herbst, Kare, and Caples (1989). Although these approaches constitute interesting suggestions for further empirical work, it may be argued that the complexity of these models represents a substantial barrier to their empirical application, in particular if the target market is rather unsophisticated, as is the

[3]Practically speaking, an extremely risk averse hedger may not want to consider a speculative position.

[4]Also, the hedger should consider carefully basis patterns.

[5]Note that the results presented by Braga, Martin, and Meilke are for US investors hedging with a futures contract priced in US dollars. This study considers a lira denominated portfolio and this may worsen the actual hedging results. This problem may arise in the presence of a currency fluctuation and is common to all hedging strategies using futures priced in a foreign currency. As indicated in the text, its impacts may be reduced by adjusting the currency position as frequently as needed.

case for Italy at this time. It is desireable to find a balanced approach between the complexity of the model and its practical relevance. The methodology adopted in this article tries to address this issue.

The estimation of multiple hedge ratios as suggested by Anderson and Danthine is relatively straightforward. A simple model is presented here to correctly link the soybean meal and the Deutsche mark futures price changes to the soybean meal cash price change in Milan. Soybean meal prices in Milan are in Lire whereas a cross hedge using soybean meal and Deutsche mark futures is priced in US dollars. Equation (2) links the value in lire of the soybean meal price in Italy, P_t, to the Chicago Board of Trade soybean meal futures price and the relevant exchange rate:

$$P_t = C_t/ER_t + FR_t/ER_t + B_t, \tag{2}$$

where C_t is the closing price of the nearby Chicago commodity futures, ER_t is the Italian lira/US$ exchange rate, the price in US dollars of the Italian lira, and FR_t, B_t are residual factors influencing the value of the local basis.

By calculating the total differential of eq. (2) with respect to a change in the price of the commodity futures and of the US dollar, it is possible to obtain an algebraic expression linking the changes in the price of the two independent variables to the change in the price of the commodity in Milan.[6] Although the empirical use of this expression for a finite price change involves the linearization for of a relation that holds for an infinitesimal price change only, it is argued that the distortion introduced by this approach is sufficiently small, in particular if the futures position is adjusted regularly.[7]

Equations (3) and (4) illustrate the effect of a change in the commodity futures price and of a change in the exchange rate, respectively.

$$dP_{t,c} = dC_t/ER_t \cdot [1 - \delta ER_t/\delta C_t \cdot C_t/ER_t + \delta FR_t/\delta C_t - \delta ER_t/\delta C_t \cdot FR_t/ER_t] \tag{3}$$

$$dP_{t,er} = dER_t/ER_t \cdot [\delta C_t/\delta ER_t - C_t/ER_t + \delta FR_t/\delta ER_t - FR_t/ER_t]. \tag{4}$$

If it is assumed that the elasticity of the exchange rate with respect to the change in the soybean meal futures price is negligible, in particular over the 1-week time interval, and that transportation cost changes are independent from changes in commodity futures price, and noting that FR_t is much smaller than C_t, it is possible to approximate (3) with eq. (3'):

$$dP_{t,c} = dC_t/ER_t, \tag{3'}$$

Following Braga, Martin, and Meilke (1989), the IMM Deutsche mark futures are used to hedge the exchange rate risk; eq. (4) may then be written as (4'):

$$\begin{aligned} dP_{t,er} &= dER_t^{IMM}/ER_t^{IMM} \cdot [(E_{c,er} - 1) \cdot C_t/ER_t + (E_{fr,er} - 1) \cdot FR_t/ER_t] \\ &= dP_{t,er,c} + dP_{t,er,fr} \end{aligned} \tag{4'}$$

where $E_{c,er}$ and $E_{fr,er}$ are the exchange rate elasticities of futures price and transportation costs, respectively, and FR_t in $dP_{t,er,fr}$ is approximated using the cost of ocean freight rates for grains between the Gulf of Mexico and Rotterdam.

[6]The differential of P_t with respect to FR_t reduces to dFR_t/ER_t: because no valid proxy was found for FR_t this component is not explicitly considered in eq. (5). Its effects are included in the error term.

[7]For convenience, this is done on a weekly basis. More frequent adjustments may be necessary in highly volatile commodity or exchange rate markets.

It is now possible to estimate the currency and commodity hedge ratios by regressing the changes in the commodity price (in Italian lire) over $dP_{t,c}$, obtained from eq. (3'), and $dP_{t,er,c}$ and $dP_{t,er,fr}$, obtained from (4'). To facilitate the estimation, $E_{c,er}$ and $E_{fr,er}$ are assumed constant over the sample period. The independent variables $dP_{t,er,c}$ and $dP_{t,er,fr}$ are calculated without the effects of $(E_{c,er} - 1)$ and $(E_{fr,er} - 1)$, and the resulting estimates of $\beta_{er,c}$ and $\beta_{er,fr}$ are net of the exchange rate elasticity component. This specification of the model is modified because of high multicollinearity between $dP_{t,er,c}$ and $dP_{t,er,fr}$. The term $dP_{t,er,fr}$ is dropped, and the price of the commodity in the Italian market is considered also in (4') as an alternative to C_t/ER_t to calculate $dP_{t,er,c}$. The estimated regression is given in (5):

$$dP_t = \alpha + \beta_c dP_{t,c} + \beta_{er} dP_{t,er} + \epsilon. \tag{5}$$

where $dP_{t,c}$ and $dP_{t,er}$ are calculated as described in text.

The estimates of β_c and β_{er} in (5) represent the in-sample risk minimizing commodity and currency hedge ratios, and are used in the out of sample simulation of the regression based hedging strategies. Note that, due to the time difference between the European and the US markets, all futures prices refer to the previous market day: this approach is suggested by Slabotzky (page 5) who notes that most of the grain prices quoted in Europe are normally valid up to the opening of the US futures markets. More importantly, the cash market closes in Milan before the open of the Chicago futures. Since the Milan market is on Wednesday, the futures prices are the close for the previous Tuesday.

In the empirical model of eq. (5), dP_t is the observed commodity price change in Italian lire in the Milan market, between week t and week $t + 1$, $dP_{t,c}$ is equal to the profit of a long commodity position between week t and $t + 1$, measured on Tuesday, divided by the Italian lira/US dollar spot exchange rate on Wednesday in week t + 1; $dP_{t,er}$ is equal to the profit of a short IMM Deutsche mark position between week t and $t + 1$, measured on Tuesday, expressed in Italian lire using the Wednesday's exchange rate on the European market in week $t + 1$. All data used in the empirical simulations are expressed in units per metric tonne; therefore, the Dm futures position is initially set equal to the US dollar price of one metric tonne of the commodity at the relevant commodity futures price in week t, or the Italian domestic price measured in dollars, both expressed in Dm at the futures rate. Lumpiness is ignored. A relatively straightforward interpretation of (5) suggests that in the case of a long naive hedge the hedger would buy a quantity of commodity futures equal to his cash position, and would sell an amount of Deutsche mark futures, priced in US terms, equal to the value of the commodity position. If, on the other hand, it is assumed that the hedger wants to minimize the variance of the weekly domestic price changes net of the futures profits (or losses), the desired commodity and currency futures positions, as a percentage of the given cash position or of its value in the case of the currency hedge, is given by the estimates of the coefficients $\beta_{t,c}$ and $\beta_{t,er}$ from (4).[8]

THE OUT-OF-SAMPLE SIMULATION

The estimates of the risk minimizing hedge ratios are obtained from eq. (5) using weekly and monthly (4-week) data.

In the case of the weekly hedge, a 52-week sample is used; the sample is updated every eight weeks, and the most recent estimates of the minimum variance hedge ratios

[8]Basis instability will affect the estimates of the risk-minimizing hedge ratios that may, therefore, differ from unity.

are used in the out-of-sample hedging simulation. The sample is not extended if the Milan market is closed; therefore, some regressions are estimated with less than 52 observations.[9]

In the case of the monthly hedge, a 52-week sample is initially used, gradually increasing it to 104-week sample by the end of 1981; this preserves the same 1981 to 1988 period for the out of sample simulation. The 8-week out-of-sample hedging simulation is unchanged. To reduce the possibility of a misspecification of the regression arising from rapidly changing commodity or currency values, the independent variable $dP_{t,er}$ is calculated on a weekly basis and then aggregated to a 4-week periodicity. From a practical standpoint, this simply means that the size of the currency futures position is adjusted weekly to reflect any change in the value of the commodity price in US dollars or the Deutsche mark value of one US dollar.

The results of the different hedging strategies are compared in terms of a modification of the hedging effectiveness measure proposed by Overdahl and Starleaf, and using stochastic dominance. The hedging effectiveness measure is defined as the percent reduction in the variance of the out-of-sample returns of the hedged portfolio, compared to the variance of the unhedged cash price in Milan. Stochastic dominance (SD) is used to rank the different strategies on the basis of the weekly or monthly out of sample returns of the hedged portfolio between January 1981 and October 1988. The SD algorithm used is that described by Levy and Lerman (1985) and Levy and Kroll (1979).

Eight combinations of different commodity and currency hedges are specified. The commodity price risk is hedged using either the CBOT nearby commodity contract until its expiration (specification 1, 2, 3, and 4), or until 4 weeks before expiration (specification 5, 6, 7, and 8). The size of the currency hedge position is calculated on the basis of the domestic spot commodity price (specification 1 and 2, 5, and 6), or the CBOT futures price (specification 3 and 4, 7, and 8). To investigate the possible impact of abnormal basis changes on the correct estimation of the hedge ratios, and therefore on the out-of-sample hedge effectiveness, binary variables are included in the odd numbered specifications; no binary variables are used in the out-of-sample simulation.[10]

Six different hedge strategies are simulated for each specification. The first three trade the estimated minimum variance hedge ratios obtained from eq. (5), hedging the commodity and the currency risk jointly or independently; the remaining three strategies repeat the simulation adopting a naive hedge ratio of one. This is relevant because many "technical barriers" to hedging are still present in Italy, particularly in the case of the currency risk. The results presented here can be used to point out the cost of these limitations, and to support the cause for full deregulation of the Italian financial markets. After all, the Italian feed compounding industry must compete within the Community with other companies that do not have to cope with outdated financial regulations.

THE DATA

Weekly data are used for this analysis that covers the period from January 1980 to October, 19, 1988. The Wednesday spot commodity price on the Milan market is from the official bulletins of the Milan Chamber of Commerce. Since no close price is re-

[9]During the sample period, the Milan market was closed on average 3.6 weeks per year.

[10]Binary variables are used for the following observations: 810805, 830727, 830824, 830921, 830928, 850123, 870513, 870520, 870624, 870701, 880622. In most cases the observations correspond to the last market day before, or the first market day after a holiday. Notable is the exception for May and June 1987, where the short term basis anomaly was due to a shortage of cash commodity apparently caused by technical problems suffered by a leading importer.

ported, the mid-point of the reported range is used. The Tuesday settlement price of the CBOT soybean meal and IMM Deutsche mark futures settlement prices are from a CFTF tape. Noon spot exchange rates in London are from the Financial Times. Oceanic freight rates for grains are from a US commercial source.

THE EMPIRICAL RESULTS

Figure 1 illustrates the nearby basis in Milan on the last available market day of each month. Basis is defined as the difference between the average reported price range of soybean meal in Milan, on Wednesday, and the previous Tuesday's settlement price of the nearby CBOT soybean meal futures contract, expressed in lire using the Wednesday noon exchange rate in the European market. All data are in thousand lire or US dollars per metric tonne. The average value of the basis in lire is relatively constant, in the 80,000 to 100,000 lire per metric tonne range, but the monthly data are rather volatile.[11] A hedger, however, may be more interested in Figure 2, which illustrates the cumulative change in the domestic commodity basis in Milan from the beginning of 1980. The basis change is defined as the weekly change of the domestic cash price less the corresponding change of the nearby meal futures at the CBOT. This closely approxi-

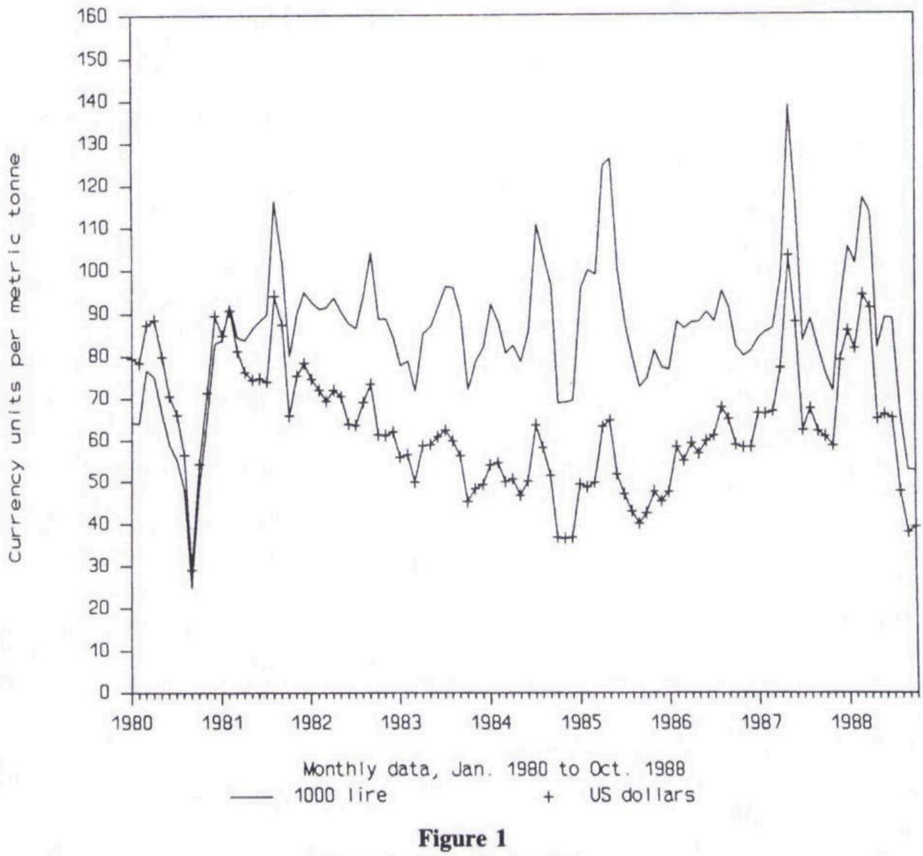

Figure 1
Domestic Meal Basis, Milan.

[11]No quarterly seasonal component is statistically significant.

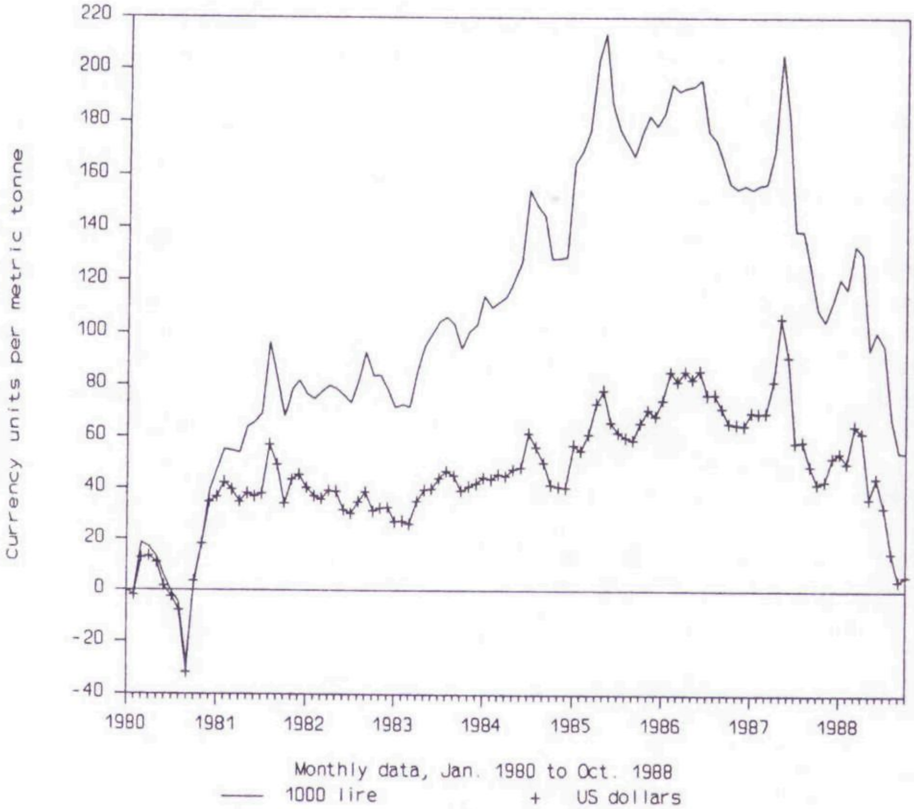

Figure 2
Domestic Meal Basis Changes, Milan.

mates a direct measure of the net change in the cost of the commodity with a continuously held naive hedge in the nearby contract.

Two points can be made. First, the cumulative basis change is more stable when measured in dollars than in lire, which is not surprising given the limited importance of the Italian market in the world context and the pattern of the exchange rate during the period considered. Second, the monthly changes tend to be positive during the period of increasing value of the dollar, and negative thereafter. The exception is a spike during the months of May and June 1987, which is caused by technical problems suffered by the largest Italian importer.

The general pattern of the basis in lire is not surprising because it follows the relative pattern of the exchange rate between the two currencies. Perhaps more interesting, however, is the fact that this picture is still valid when the currency hedge is calculated using the Italian domestic price, although, in this case, the absolute difference between the dollar and the lira values tend to be smaller. This may suggest that the basis in lire was in fact subject to long term fluctuations that cannot be entirely explained by changes in the commodity and currency prices.

In essence, figures 1 and 2 seem to suggest that the historical pattern of the basis before 1985 should have resulted in a net cost for the Italian purchaser adopting a naive hedge, and that a net saving would have ensued after that period.[12] This does not mean that hedging would have been useless: on the contrary, during most of the sample period the absolute value of the quarterly change in the domestic price was substantially higher than the net return of the jointly hedged portfolio.

Tables I to IV illustrate some summary statistics for the estimated hedge ratios using the different specifications of commodity and currency hedges.[13]

The currency hedge ratio is smaller when the position is calculated as a proportion of the domestic price rather than the CBOT nearby futures, (Table I vs. II, and III vs. IV) and is, in general, more volatile than the commodity hedge. This could be due to the use of the IMM Deutsche mark futures to cross hedge the exchange rate risk. An US dollar futures contract traded in Italy might be more effective.

Tables I to IV report the results of a regression estimated with dummy variables. When these are excluded, the range, standard deviation, and average absolute value of the hedge ratios are generally larger than those reported. More importantly, the out of sample hedging effectiveness often decreases.

Tables V and VI illustrate the out-of-sample overall hedging effectiveness of the different strategies. Note that the simulation began in January 1981, so that the basis pattern seen in Figure 2 for 1980 does not affect the reported results. The joint regression and the joint naive strategies are clearly superior, with overall hedging effectiveness ranging between 69% and 73% for the weekly regression strategies, 69% and 75% for

Table I
ESTIMATED HEDGE RATIOS, USING THE COMMODITY FUTURES UNTIL EXPIRATION AND THE DOMESTIC PRICE OF THE COMMODITY AS A BASIS FOR THE CURRENCY POSITION

Dependent Variable		Currency			Commodity	
Weekly, domestic						
Range	−1.110		−0.235	0.388		0.931
Average		−0.631			0.683	
Std. err.		0.169			0.099	
Monthly, domestic						
Range	−1.402		−0.426	0.570		1.406
Average		−0.762			0.868	
Std. err.		0.201			0.131	
Weekly, imported						
Range	−1.031		−0.230	0.557		0.965
Average		−0.629			0.747	
Std. err.		0.159			0.094	
Monthly, imported						
Range	−1.545		−0.394	0.725		1.280
Average		−0.733			0.941	
Std. err.		0.187			0.123	

[12]A long hedger is short the basis, and would therefore have suffered a loss in the period of increasing basis, before 1985, but would have profited thereafter.

[13]The same number of regressions, 51, is estimated for both the weekly and the monthly simulation.

Table II
ESTIMATED HEDGE RATIOS, USING THE COMMODITY FUTURES UNTIL EXPIRATION AND THE FUTURES PRICE OF THE COMMODITY AS A BASIS FOR THE CURRENCY POSITION

Dependent Variable	Currency			Commodity		
Weekly, domestic						
Range	−1.158		−0.312	0.390		0.935
Average		−0.801			0.690	
Std. err.		0.185			0.104	
Monthly, domestic						
Range	−1.847		−0.561	0.573		1.042
Average		−0.989			0.862	
Std. err.		0.272			0.125	
Weekly, imported						
Range	−1.309		−0.329	0.552		0.960
Average		−0.824			0.748	
Std. err.		0.203			0.094	
Monthly, imported						
Range	−2.024		−0.509	0.670		1.272
Average		−0.950			0.932	
Std. err.		0.272			0.127	

Table III
ESTIMATED HEDGE RATIOS, USING THE COMMODITY FUTURES UNTIL 4 WEEKS BEFORE EXPIRATION AND THE DOMESTIC PRICE OF THE COMMODITY AS A BASIS FOR THE CURRENCY POSITION

Dependent Variable	Currency			Commodity		
Weekly, domestic						
Range	−0.917		−0.252	0.464		0.943
Average		−0.593			0.710	
Std. err.		0.156			0.096	
Monthly, domestic						
Range	−1.091		−0.340	0.583		1.097
Average		−0.738			0.901	
Std. err.		0.170			0.151	
Weekly, imported						
Range	−1.055		−0.222	0.555		1.019
Average		−0.617			0.769	
Std. err.		0.179			0.105	
Monthly, imported						
Range	−1.241		−0.446	0.741		1.288
Average		−0.717			0.968	
Std. err.		0.144			0.132	

Table IV
ESTIMATED HEDGE RATIOS, USING THE COMMODITY FUTURES UNTIL 4 WEEKS BEFORE EXPIRATION AND THE FUTURES PRICE OF THE COMMODITY AS A BASIS FOR THE CURRENCY POSITION

Dependent Variable		Currency			Commodity	
Weekly, domestic						
Range	−1.128		−0.327	0.465		0.945
Average		−0.772			0.709	
Std. err.		0.182			0.097	
Monthly, domestic						
Range	−1.794		−0.459	0.586		1.092
Average		−0.963			0.890	
Std. err.		0.247			0.142	
Weekly, imported						
Range	−1.276		−0.323	0.551		1.008
Average		−0.791			0.769	
Std. err.		0.211			0.105	
Monthly, imported						
Range	−1.968		−0.565	0.678		1.279
Average		−0.927			0.959	
Std. err.		0.229			0.136	

the weekly naive strategies, 71% and 77% for the monthly regression strategies, and 74% and 77% for the monthly naive strategies. As a comparison, the range of in-sample hedge effectiveness over the same period was 74% to 75% in the case of the weekly regression strategies, and 75% to 76% in the case of the monthly regression strategies.

Table V
OUT OF SAMPLE HEDGE EFFECTIVENESS OF THE DIFFERENT SPECIFICATIONS OF THE CURRENCY AND THE COMMODITY HEDGES, JANUARY 1981 TO OCTOBER 1988, WEEKLY DATA

	Regression Strategies						Naive Strategies					
	Joint		Currency		Commodity		Joint		Currency		Commodity	
	A[a]	B	A	B	A	B	A	B	A	B	A	B
1[b]	70%	72%	3%	1%	61%	63%	69%	73%	−5%	−5%	57%	62%
2	69%	73%	2%	2%	60%	63%	69%	73%	−5%	−5%	57%	62%
3	70%	72%	2%	1%	61%	63%	71%	75%	1%	0%	57%	62%
4	69%	73%	1%	2%	60%	63%	71%	75%	1%	0%	57%	62%
5	71%	72%	3%	2%	62%	64%	69%	73%	−5%	−5%	58%	62%
6	69%	73%	2%	1%	61%	63%	69%	72%	−5%	−5%	58%	62%
7	71%	72%	3%	2%	62%	64%	71%	75%	5%	0%	58%	62%
8	69%	73%	1%	1%	61%	63%	71%	75%	5%	0%	58%	62%

[a]The data in column A refer to the price of the domestic commodity, those in column B to the price of the imported commodity.

[b]Indicates the specification used, as described in text.

Table VI
OUT OF SAMPLE HEDGE EFFECTIVENESS OF THE DIFFERENT SPECIFICATIONS OF THE CURRENCY AND THE COMMODITY HEDGES, JANUARY 1981 TO OCTOBER 1988, MONTHLY DATA

	Regression Strategies						Naive Strategies					
	Joint		Currency		Commodity		Joint		Currency		Commodity	
	A[a]	B	A	B	A	B	A	B	A	B	A	B
1[b]	76%	77%	5%	3%	58%	62%	74%	76%	6%	2%	56%	62%
2	75%	77%	5%	3%	58%	64%	74%	76%	6%	2%	56%	62%
3	76%	77%	6%	4%	58%	62%	75%	77%	10%	6%	56%	62%
4	75%	77%	6%	4%	59%	64%	75%	77%	10%	6%	56%	62%
5	76%	77%	6%	4%	58%	62%	74%	76%	6%	2%	56%	62%
6	71%	74%	6%	4%	55%	61%	74%	76%	6%	2%	56%	62%
7	75%	77%	6%	4%	58%	62%	75%	77%	9%	6%	56%	62%
8	71%	74%	6%	4%	56%	62%	75%	77%	9%	6%	56%	62%

[a]The data in column A refer to the price of the domestic commodity, those in column B to the price of the imported commodity.
[b]Indicates the specification used, as described in text.

The general results of the commodity only strategies are quite inferior to those of the joint strategies with corresponding hedging effectiveness ranges of 61% to 64%, 58% to 62%, 55% to 64%, and 56% to 62%.

The currency only strategies perform very poorly. The difference between the hedging effectiveness of the joint hedge strategies and that of the commodity or currency strategies is always statistically significant, using an F test, at least at the 10% probability level.[14] Although the results are for the entire 8-year period, no major variation in hedging effectiveness is immediately apparent for a sufficiently long subsample, and the reported figures are consistent with the figures for the 1987–88 period. It is also important to note that no observation is omitted from the out-of-sample simulation, and that the results are satisfactory even in periods of high basis volatility such as 1987 and 1988.

Figures 3 and 4 illustrate the quarterly changes in the cost of the domestic commodity on the Milan market for 1988, and the results of a regression and a joint naive hedging strategy using the CBOT nearby contract until expiration. The data reported for each quarter are the returns of the unhedged position, the minimum variance portfolio and the naive portfolio. Quarterly results for the entire sample period are reported in Figures 5 and 6. As expected, the monthly strategies perform better than the weekly strategies, and the improvement is common to all strategies. Interestingly, it seems easier to hedge the price of the imported commodity than that of the domestic commodity.

Stochastic dominance is also used to select the preferred hedging strategy. The results are reported in Table VII. For the given hedge length and commodity price considered, the dominant set includes the strategies that are never dominated by any other one or by the unhedged position in any of the eight different specifications of the commodity and currency hedges.

The results show that the joint regression strategy is perferred regardless of the length of the hedge and the price hedged. The joint naive hedge is not inferior to the joint regression hedge only in the case of the domestic commodity hedged on a weekly basis.

[14]The sample includes 378 weekly observations and 102 monthly observations.

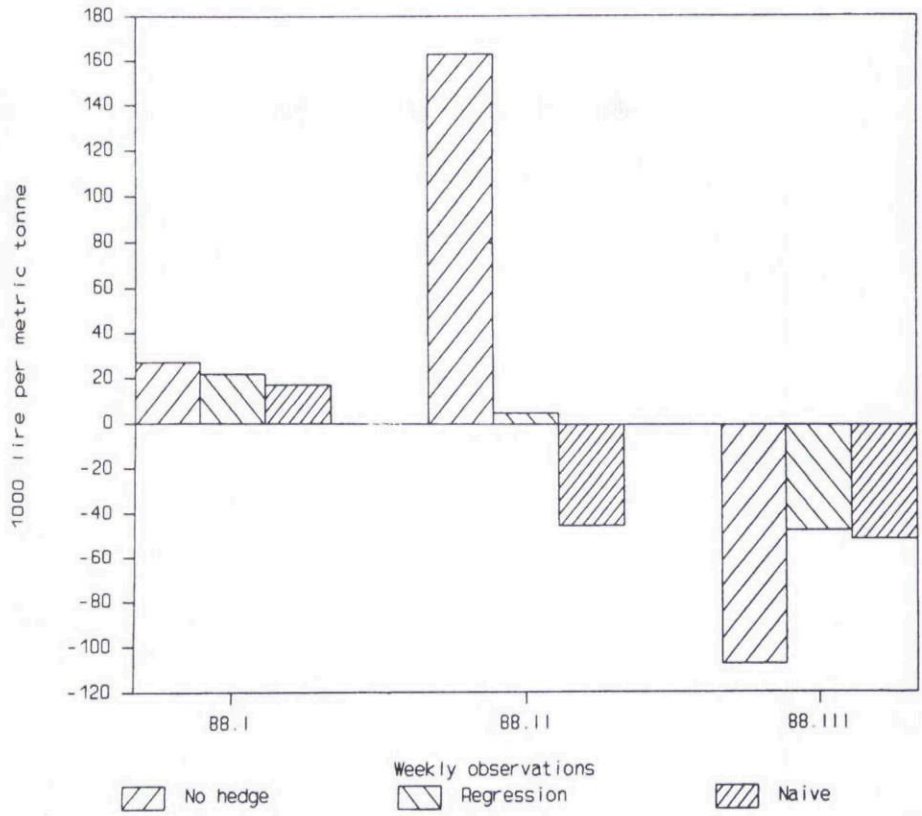

Figure 3
Quarterly Hedge Results, 1988, Weekly Observations.

The currency only regression is present in the optimal set for the weekly domestic commodity hedge, but this strategy never dominated any of the others, and is, in fact, superior only to the unhedged position. It could not be excluded from the optimal set because its average cost for the entire period is marginally inferior to that of all other strategies, irrespective of the specification used. However, the fact that the hedging effectiveness of this strategy is essentially zero suggests that this result may be unreliable.

CONCLUSION

The results show: (1) The soybean meal price risk in the Milan may be effectively hedged using the CBOT soybean meal and the IMM Deutsche mark futures; (2) It is necessary to hedge both the commodity and the currency components of the price risk, because the results of a commodity only hedge are statistically inferior to the results of the joint hedge both in terms of out-of-sample hedging effectiveness and overall cost of the strategies; and (3) A currency only hedge is essentially useless.

The out-of-sample hedge effectiveness of the joint regression strategies is very close to the in-sample results for both the weekly and the monthly hedges. Although no major differences can be noticed between the hedging effectiveness of the minimum variance and that of the naive hedge ratios, the minimum variance strategies are preferred under the second degree stochastic dominance criteria.

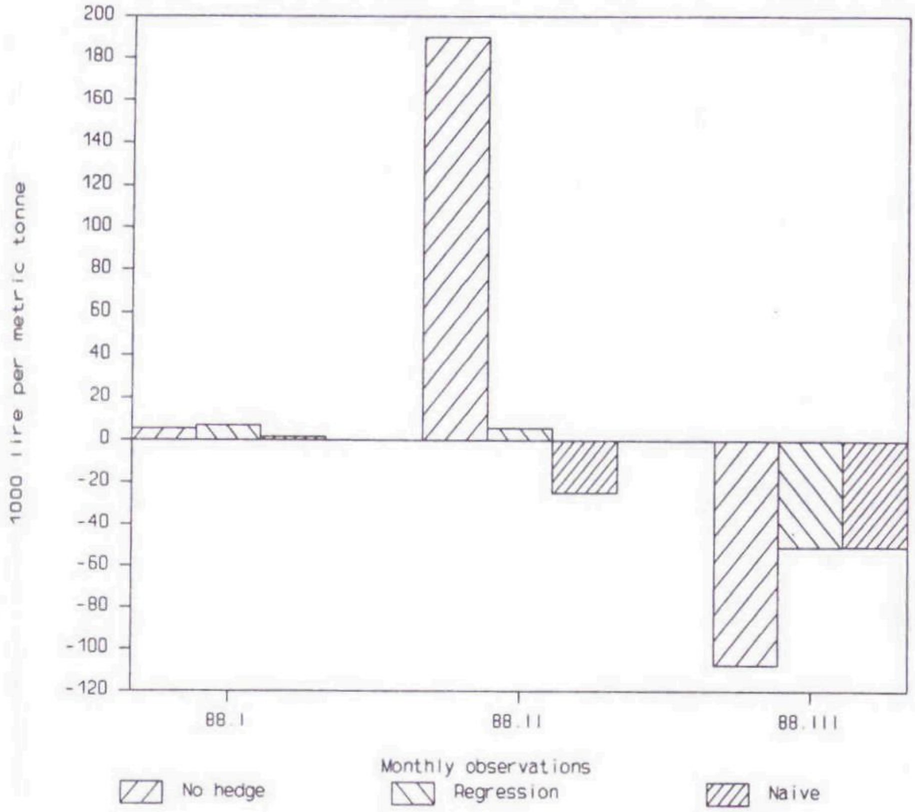

Figure 4
Quarterly Hedge Results, 1988, Monthly Observations.

The overall results of the study indirectly point out the cost to the Italian feed compounding industry of the barriers limiting access to futures trading and can be used to argue in favor of a full liberalization of the market. When the industry wishes to compete in the European market, either directly or indirectly, two points are worth noting: (1) Selective currency cross hedging should be allowed; and (2) The quasi-imposition of a naive hedge ratio should be fully relaxed. It goes without saying that these results are general in scope, which makes the plea for liberalization even more powerful.

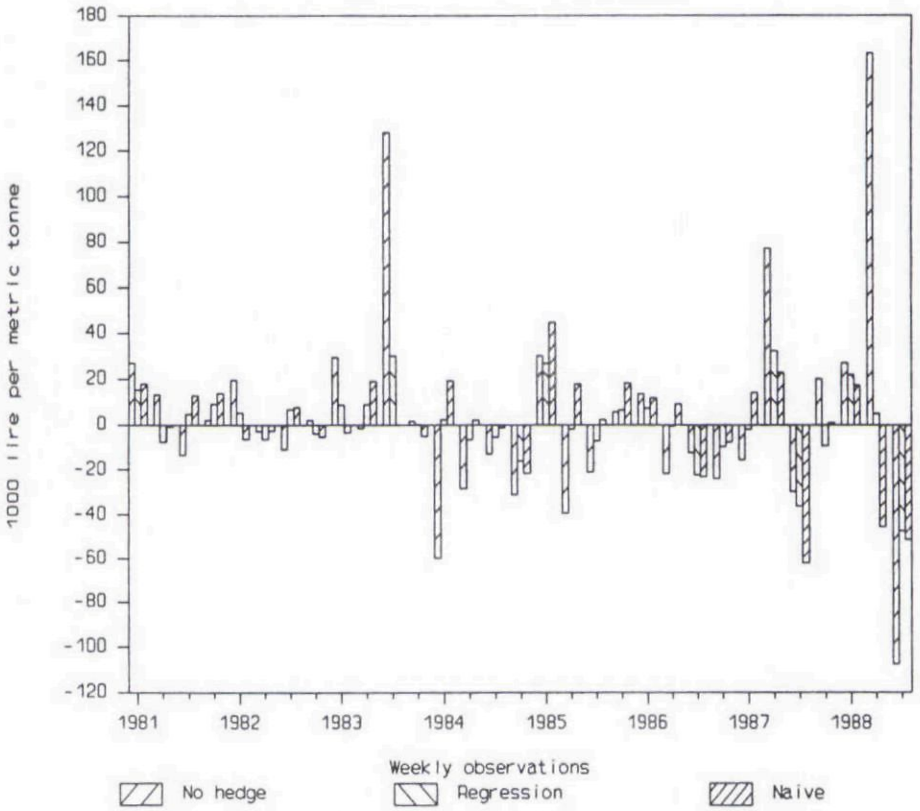

Figure 5
Quarterly Hedge Results, Entire Sample, Weekly Observations.

Table VII
DOMINANT STRATEGIES UNDER SECOND AND THIRD DEGREE STOCHASTIC DOMINANCE CRITERIA[a]

Monthly data	**Domestic Commodity**	**Imported Commodity**
Weekly data	Joint regression Currency regression	Joint regression
Monthly data	Joint regression Joint naive	Joint regression

[a]First degree stochastic dominance is inconclusive in selecting the efficient set of hedging strategies.

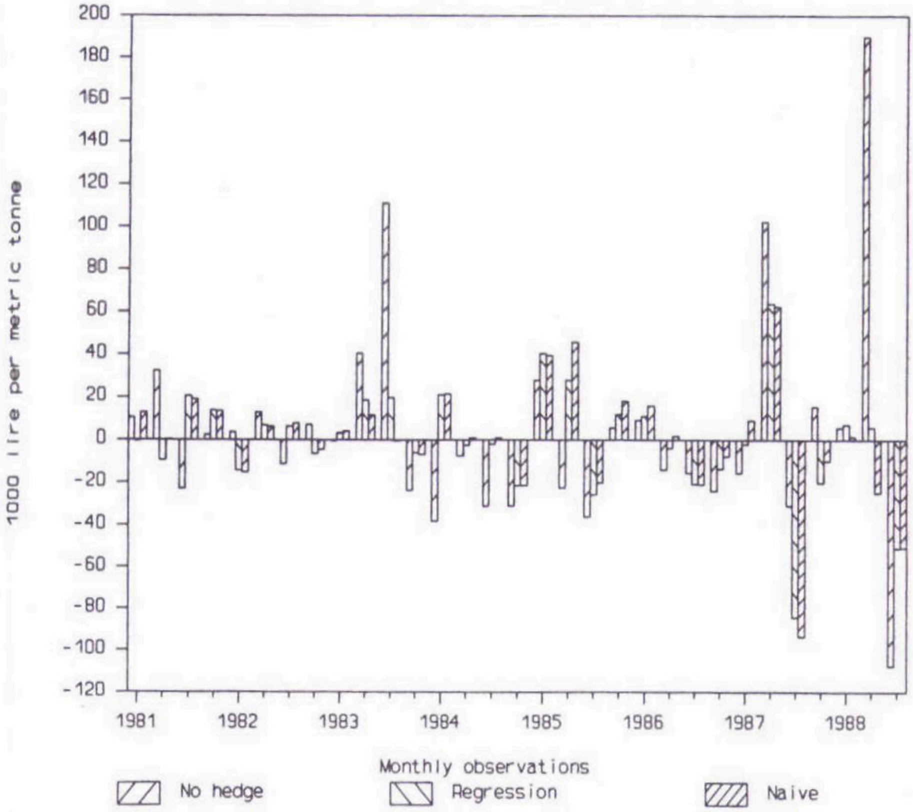

Figure 6
Quarterly Hedge Results, Entire Sample, Monthly Observations.

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