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ECONOMICS OF HEDGING—A NOTE

In his paper on "Economics of Hedging," M. G. Pavaskar[1] refuses to accept that hedging decisions are based on the estimation of net hedging returns. Because he observes that on theoretical plane long hedging appears to be more profitable than short hedging. However, in most futures markets hedging operations are found to be net short. For Pavaskar the solution of this apparent paradox is simple. Since most agricultural commodities are consumed evenly round the year, long hedging need is lower than short hedging. The primary motivation for all types of hedging is, therefore, risk reduction rather than hedging returns.

The main plank of Pavaskar's argument is that the nature of basis risk for short hedging differs from the one for long hedging. The level of basis

$$F_o - R_o = \pm\, k$$

is limited to the carrying charges in the case of positive k, while the negative k is supposed to have no downward limit. Pavaskar thinks that while the ready and futures markets are correlated in the case of positive k, they present prices of two different goods when k is negative. The analysis of negative k is rather intriguing. There are generally four different explanations for it:

(1) J. M. Keynes[2] considered this as the measure of risk-bearing in a normal futures market.

(2) Holbrook Working[3] explained it as the "inverse carrying charges" relevant to a market where stock is low and such disincentive is necessary for the release of stock.

(3) N. Kaldor's[4] explanation of 'convenience yield'—a subjective benefit for which the stock holders are ready to accept a negative k, is also relevant to low stock.

(4) Roger W. Gray[5] observed that in some markets even in otherwise normal situation a negative k exists because of the lack of speculation.

It is clear from the above that while (1) and (4) explain the negative k in terms of speculative activities necessary for hedging operations, the explana-

1. M. G. Pavaskar, "Economics of Hedging," *Indian Journal of Agricultural Economics*, Vol. XXVI, No. 3, July-September, 1971.
2. J. M. Keynes, "Some Aspects of Commodity Markets," *The Manchester Guardian Commercial*, March 29, 1923.
3. Holbrook Working, "Theory of the Inverse Carrying Charge in Futures Markets," *Journal of Farm Economics*, Vol. 30, No. 1, February, 1948.
4. Nicholas Kaldor, "Speculation and Economic Stability," *Review of Economic Studies*, Vol. VII, No. 3, 1939-40.
5. Roger W. Gray, "The Characteristic Bias in Some Thin Futures Markets," *Food Research Institute Studies*, Vol. I, No. 3, November, 1960.

tions in (2) and (3) focus attention to a non-normal situation of low stock. In Working's system the ready and futures prices are correlated even when there is a negative k. However, in none of the above cases the negative k can have an unlimited low level. In the Keynesian system[6] the normal backwardation is generally 10 per cent. Unless the situation is abnormal in Working's and Kaldor's system any non-normal low stock is not likely to rupture the marketing system by causing a very high negative k. In fact, as long as stock remains a connecting link between the ready and futures market the inverse carrying charges cannot be unlimited. Roger Gray's observation leads to the concept of market balance between hedging need and speculation, where a persistent lack of the latter may cause the futures market to decline.

In view of the above analyses Pavaskar's stand in this matter becomes a little confusing. The higher negative k is a non-normal phenomenon of temporary duration, hence it is not a result of the normal functions of futures market. As long as some inventory is carried the negative k will be influenced by the possibility of release of stock. In the case of non-inventory goods the ready and futures markets are divorced from each other. But there, futures prices are determined by some averages of the past quotations[7] rather than by 'goods anticipated to be produced in future.' Because it is rather impossible to anticipate with any reasonable accuracy, the prices of 'goods to be produced in future.' Under this situation it is difficult to agree with Pavaskar that a futures market is inherently biased to long hedging.

The net returns to hedgers depend not merely on the initial basis difference but also on the basis changes. If we assume that the ready and futures prices change in the same proportion then both short and long hedging turn out to be unbiased. The assumption that spot and futures prices converge with one another during the delivery period does not imply that the basis is narrowed down smoothly according to a certain well predictable pattern. Then there arises the question of bias in futures price trend. In the Keynesian system for long speculators to earn profit, it is necessary that the futures prices rise to maturity *on average*. By the same logic if speculators are net short in the market then prices should fall to maturity. In both the cases hedgers pay risk premium to speculators for risk-bearing. The net returns to hedgers depend on the relative changes in ready prices to their favour. But consistent research for many years with the price data of various futures commodities in the U.S.A. has failed to reveal any such bias in the futures prices.[8] Clearly, therefore, the speculators are more risk-seekers than mere

6. Keynes, *op. cit.*

7. William G. Tomek and Roger W. Gray, "Temporal Relationships Among Prices on Commodity Futures Markets: Their Allocative and Stabilizing Roles," *American Journal of Agricultural Economics*, Vol. 52, No. 3, August, 1970.

8. Roger W. Gray, "The Search for a Risk Premium," *The Journal of Political Economy*, Vol. LXIX, No. 3, June, 1961. L. G. Telser, "The Supply of Speculative Services in Wheat, Corn, and Soyabeans," *Food Research Institute Studies*, Proceedings of a Symposium on Price Effects of Speculation in Organised Commodity Markets, Supplement to Vol. VII, 1967.

risk-bearers. They earn their profit through skilful operations in availing of the opportunities of profit in futures market. But since the operations of futures market lead to a zero sum game, it becomes difficult to accept the hedgers' role as that of the sitting ducks.

The short hedgers in Pavaskar's system cannot expect to earn a positive net return from hedging operations, because of

$$F_o - R_o \leqslant F_t - R_t + C^*$$

This is because he makes the implicit assumptions that,

(a) $0 < F_o - R_o \leqslant C$ will remain valid throughout the life period of a futures contract;

(b) hedge is lifted only during the end of delivery month when F_t converges to R_t;

(c) a short hedger knows how long to store the raw material and therefore, purchases a contract of the similar life period.

Now, these are very strict assumptions. A short hedger does not really know how long he is going to carry the stock. Keeping an eye towards the return to storage indicated by futures prices he will try to play the game made available to him by the uncertainties of market. If, on the other hand, $F_o - R_o > 0$ provides a good indication of the larger expected difference between unhedged and hedged stock and therefore, induce short hedging to minimize negative return, then why on earth the long speculators would sustain a sure loss in the futures market for the benefit of short hedgers. Similarly, in the case of long hedging for $F_t - R_t$ to be greater than $F_o - R_o$ when $F_o - R_o < 0$, the condition to be fulfilled is

$$F_t/F_o > R_t/R_o.$$

Such situation is not an impossibility in the operations of futures market. But the question is whether it is possible to generalize on that ground! Because in that case long hedgers will make profit in the operations of futures market at the cost of short speculators as a matter of routine. But that will only enhance the decline of speculation in futures market. Under normal circumstances, therefore, a futures market does not show any bias to any group of traders.

This, however, poses the question of hedging being net short in futures market. There are generally two lines of analyses: Keynes-Hicks[9] and

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* R_o, F_o = the ready and futures prices at the same point of time when hedging is initiated.
  R_t, F_t = the ready and futures prices when hedging is set off.
  C, = marginal cost of storage for the intervening hedge period.
  9. J. M. Keynes, *op. cit.*; J. R. Hicks: *Value and Capital*, Second Edition, English Language Book Society and Oxford University Press, Oxford, 1964.

Telser-Houthakker.[10] In the former it is argued that the need for long hedging by the processors is much less than that for short hedging by the inventory firms: "In so far as the producer and the spinner can accommodate one another, no outside assistance is required and no expense need be incurred. But, generally speaking, the producer needs to look much further ahead than the spinner, and whilst the latter may provide a good deal of assistance as regards the near future, he is not so much of help for more distant future."[11] It is clear that since the production cycle of the processor being much shorter than that of the producer, it is not necessary for him to buy distant futures. Same is the case with the exporters. Moreover, some manufacturers may buy spot to save transaction cost and negative yield of convenience and then join the inventory firms in selling short in futures market. So at any point of time the supply of short sales is expected to be greater than the demand for them arising among the processors and exporters. I think Pavaskar's argument runs in a similar line: "The forward sales by processors and exporters are . . . . . much smaller than the stocks which the merchants and stockist are usually required to carry."[12] This is because the stock is to be carried for a longer period, while the production and consumption cycles are nearly continuous.

The Telser-Houthakker analysis focuses attention to the nature of risks involved in short and long hedging. According to them, short hedging has limited risk and is itself risk-reducing while long hedging has unlimited risk and is risk-increasing. Pavaskar has criticised this analysis in great details. I agree with Pavaskar in denying to brand short and long hedging as risk-reducing and risk-increasing. But, I would certainly say that comparative risk of long hedging is greater than that of short hedging. Alternatively, one can say that short hedging is more risk-reducing than long hedging. In this matter, a tabular representation following Telser is possible which though would not quantify the risk but at least name it:

Positive Inventory (Unhedged) (Risk of price fluctuations)	Negative Inventory (Unhedged) (Risk of price fluctuations) Risk of non-availability of specific quality of goods)

I. Sell Spot
    1. (No risk of price change
	I. Buy Spot
	    1. (No risk of price changes

2. Out of business)	2. Convenience of assured quantity and quality raw material
	3. Capital blocked for the period for which forward sale has been contracted) *(Contd.)*

10. L. G. Telser, *op. cit.*; H. S. Houthakker, "Normal Backwardation," in Value, Capital and Growth—Papers in Honour of Sir John Hicks, Edited by J. N. Wolfe, 1969.
11. Keynes, *op. cit.*
12. Pavaskar, *op. cit.*

II. Sell Forward	II. Buy Forward
1. (No risk of price change	1. (No risk of price changes
2. Convenience yield in meeting un-foreseen demand lost	2. Convenience of assured quantity and quality of goods
3. Larger transaction cost to meet random variation in demand '	3. No capital blocking
4. Risk of change in the forward basis)	4. Risk of change in the forward basis)
III. Sell Future	III. Buy Future
1. (Risk of basis change	1. Risk of basis change
2. Convenience yield saved	2. Risk of non-specific delivery
3. Transaction cost saved	3. Convenience of shopping around for the desired quantity of goods
4. No specific delivery)	4. Higher transaction cost)

It is clear from the above that while 'Sell Future' is the best alternative for short hedger, for long hedger it depends on whether he is a risk-averse or not. For a risk-averse long hedger 'Buy Forward' will be the best course, a variant of which is known as Non-Transferable Specific Delivery (n.t.s.d.) contracts in the Indian futures markets. But, if he is not a risk-averse then he would certainly opt for "Buy Future" which provides him with the convenience of shopping around against the risks of basis change and non-specific delivery (in case he is to accept delivery). In fact, between the two types of futures transactions the long hedging is marginally less risk-reducing. This is because the period of production in processing being shorter and continuous, it is necessary to concentrate in near futures only. But that provides the processors less time for shopping around and thereby involving more risk and transaction cost. Further, the processors may combine 'Buy Forward' and 'Sell Futures' in order to obtain the best of both worlds. All these factors together including the expected hedging returns cause the predominance of short over long hedging in organized futures markets.

One more point before we wind up our note. Pavaskar has conceded, notwithstanding the differences of opinions regarding the causes, that hedging in futures market is generally net short. But at the same time, he has asserted that risk-reducing is the primary function of hedging. This is more so when the ready prices are expected to fall. In such situation the short hedging provides some compensation in terms of profit in futures transactions. Since the operations in futures market is a zero sum game, it is implied that speculators pay for dealers' risk-aversion. It is quite possible for speculators to pay hedgers when their price expectations differ from that of the hedgers. But that should occur as a game of chance. However, for definite risk-aversion behaviours it is hedger who should pay risk premium

to speculator who is a risk-bearer. Or as Keynes preferred to put it that *on average* $F_o - R_o < 0$. But conceptually the 'normal backwardation' is not the same thing as the 'inverse carrying charges.' If we accept the line of analysis that futures markets determine the price of storage and hedging cost then it is difficult to concede the strait jacket argument of the risk premium theory. Any attempt to reconcile these two approaches is bound to be frustrating. However, it is essential to focus on the problems of speculation while discussing the economics of hedging. Because futures markets are expected to serve the interests of both hedgers and speculators through a competitive game of chances.

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ECONOMICS OF HEDGING—A REPLY

Raychaudhuri's note on my "Economics of Hedging"[1] betrays confusion. He has attributed to me views which I have not expressed and assumptions which I have not made.

Raychaudhuri alleges that I refuse "to accept that hedging decisions are based on the estimation of net hedging returns." What I have in fact argued is that the observed hedging paradox which discloses excess of 'short' hedges over 'long' hedges cannot be explained in terms of net hedging returns *alone* because 'short' hedging is generally less profitable than long hedging. My quarrel is with those who seek to explain the hedging paradox in terms of *only* hedging risks and returns. I think the paradox can be satisfactorily resolved through an appropriate analysis of hedging needs.

Raychaudhuri criticises me for 'supposing' that negative k (backwardation in futures price) has no downward limit. Again, I have nowhere made such a supposition. I have only emphasized that while positive k (contango in futures price) cannot normally exceed storage cost and delivery expenses, the negative k has "no corresponding *measurable* lower limit."[2] I agree with Raychaudhuri that negative k may be caused by one or more of several factors such as risk premium, inverse carrying charges, convenience yield, market imbalance, etc. I am sure Raychaudhuri will also agree with me that there are not precise measurable value limits for each of these determinants singly, let alone in combination.

Moreover, I am sure Raychaudhuri is aware that while positive k in almost all commodity futures markets never exceeds 3 to 4 per cent of the

spot price, negative k has often tended to be as large as even 20 per cent of the spot price. The limit to which a negative k may fall being thus much higher than the limit to which a positive k may rise, I do not understand how I am wrong in asserting that there is "no corresponding lower limit to which the futures price can fall below the ready price."[3]

What perplexes me is Raychaudhuri's statement that "the higher negative k is a non-normal phenomenon of temporary duration." What seemed non-normal to Raychaudhuri has been a normal phenomenon with Indian futures markets in the past two decades. My own study of the cotton futures market showed that between 1953-54 and 1963-64, the cotton futures market consistently ruled at a backwardation which generally exceeded 5 per cent of the spot price and was often higher than even 10 per cent.[4] In the recent years, the oilseeds futures prices too have been ruling not infrequently at a heavy backwardation. In fact, contrary to what Raychaudhuri believes, what is non-normal with the Indian futures markets now is a positive k and not a negative k. No wonder, Indian futures markets are decidedly biased against short hedgers.

What really surprised me were the two implicit assumptions which Raychaudhuri seems to have discovered in the equation

$$F_o - R_o \leqslant F_t - R_t + C$$

which establishes the structural bias of a futures market against short hedgers. Raychaudhuri alleges that I assume that (*i*) hedge is lifted only during the end of delivery month when F_t converges to R_t and (*ii*) a short hedger knows how long to store the raw material and therefore, purchases a contract of the similar life period.

I am once again at a loss to know how Raychaudhuri has implied these two assumptions from my paper. I have explicitly stated that R_o and F_o are "the ready and futures prices at the time of placing the hedge, and R_t and F_t the corresponding two prices at the time of lifting the hedge."[5] My contention is that since *normally, the ready-futures price spread, whether positive or negative, is expected to narrow down through the expectation period of a futures contract,*[6] one would normally expect

$$F_o - R_o \leqslant F_t - R_t + C$$

for all hedge periods, whether such periods were earlier anticipated by hedgers or not. Unless Raychaudhuri disproves the foregoing explicit (in italics)

    3. *ibid.*, p. 207.
    4. Economics of Hedging, Ph.D. Thesis, University of Bombay, 1971.
    5. "Economics of Hedging," *Indian Journal of Agricultural Economics*, July-September, 1971, *op. cit.*, p. 207.
    6. *ibid.*, p. 208.

assumption, he cannot refute my hypothesis that a futures market has an *inherent, structural* bias against short hedgers.

I do not deny that a short hedger "will try to play the game made available to him by the uncertainties of market." But so also will a long hedger. What I wish to emphasize, however, is that while playing such a game, a short hedger is inherently at a disadvantage vis-a-vis a long hedger because the structural bias of a futures market necessarily results in short hedgers generally receiving only 'net' negative returns from hedging.

The negative returns to short hedgers notwithstanding, merchants hedge 'short' in a futures market, especially when F_o—$R_o > 0$. This is because such a price relation between ready and futures prices tends to minimize net negative returns from short hedging. Therefore, if prices, ready and futures, fall over the intervening hedge period, the returns from short hedging even if negative, would be far less unfavourable than the large negative returns from unhedged stocks. But Raychaudhuri rhetorically asks "then why on earth the long speculators would sustain a sure loss in the futures market for the benefit of short hedgers"?

Raychaudhuri would have been right had the expectations of all operators—speculators and hedgers, both long and short—in a futures market been always the same or similar. Had these been so, a futures market would just vanish, for then there would be either only longs or only shorts in such a market, but never both together.

A long speculator necessarily buys in anticipation of a rise in futures price. A short hedger, on the other hand, sells for fear of a fall in ready price. The returns to speculators depend upon the change in the level of futures price. The returns to hedgers depend not so much upon the change in the level of futures prices as the change in the basis. And what I wish to stress is that the prospects of the basis changing in favour of a short hedger are brighter when F_o—$R_o > 0$ than when F_o—$R_o < 0$. A favourable change in the basis for a short hedger need not necessarily lead to an unfavourable change in the level of futures price for a long speculator as Raychaudhuri seems to believe.

I think Raychaudhuri would agree with me that before hedging, a short hedger would necessarily weigh his anticipated returns from hedging with his anticipated returns on unhedged stocks. If so, even if the anticipated returns from hedging are negative, a short hedger would hedge so long as such negative returns are smaller than the anticipated negative returns on unhedged stocks. Hence, it follows that "the larger the expected difference between these two negative returns, the greater the inducement for short hedging and vice versa. Since such expected difference is larger when F_o—$R_o > 0$ than when F_o—$R_o < 0$, short hedging generally tends to be

encouraged during the former period and discouraged during the latter period."[7]   The only earthly reason why the long speculators may absorb short hedges during the former period is that unlike short hedgers who anticipate fall in ready price, they may then anticipate rise in futures price.

Extending Telser's method of tabulating comparative risks of long and short hedging, Raychaudhuri also seeks to establish that short hedging is more risk-reducing than long hedging.   His argument rests on the assumption that unlike in selling futures, in buying futures a long hedger faces risk of non-specific delivery and higher transaction cost.

I do not understand the logic of including both the risk of basis change and the risk of non-specific delivery simultaneously in buying futures.   A long hedger assuming the risk of basis change cannot simultaneously face the risk of non-specific delivery.   This is because a long hedger would never stand for delivery unless he has cornered the market.   In a normal futures market, he would offset his transaction before the delivery period.   Evidently, he would not face the risk of non-specific delivery.

Higher transaction costs are actually saved by entering into what Working describes as 'operational' long hedging.   A long hedger would in fact incur higher transaction cost in buying forward immediately, since the market for n.t.s.d. contracts is much narrower than a futures market.   When he buys futures, he has the convenience of shopping around for both ready and n.t.s.d. contracts, which results in saving on transaction cost.

It then follows that the only risk in buying futures is the risk of basis change which corresponds to the similar risk involved in selling futures. Why should then the comparative risk of long hedging be greater than that of short hedging ?   On the other hand, because of the known structural bias of the futures contract against short hedgers, the risk of basis change is really larger in magnitude for short hedgers than for long hedgers.   Hence, it is difficult to subscribe to Raychaudhuri's view that short hedging is more risk-reducing than long hedging.

The last point raised by Raychaudhuri is rather irrelevant.   My "Economics of Hedging" does not attempt to reconcile the price of storage theory with the risk premium theory.   The purpose of '"Economics of Hedging" was limited.   It was to focus attention on the risk reduction aspect of hedging and to point out the inherent bias of a futures market against short hedging. Obviously, for this limited purpose, it was needless to study the problems of speculation.

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7. *ibid.*, p. 209.
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