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AN ANALYSIS OF MARKETING OPTIONS FOR COTTON
IN AUSTRALIA

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The number of methods of marketing open to Australian cotton growers has increased in recent years, providing growers with an opportunity to better manage financial risk. In particular, processing and marketing organisations now administer hedging strategies involving the use of futures markets. The main alternative marketing methods, including strategies using futures, have been simulated for the years from 1973-74 to 1987-88 in an attempt to quantify the levels of return and risk that they provide. It is concluded that the partial hedging strategies now available provide an opportunity to manage financial risk, albeit at a slight cost.

Introduction

Cotton prices are, and are expected to remain, volatile because of the residual nature of the world cotton market (Mues and Simmons 1988). During the 1970s and 1980s, however, cotton prices have fluctuated within seasons more widely than in the past (see Figure 1). At least in recent years, these wide price movements have been a result of large changes in world cotton stocks (see Figure 2) and changing government policies affecting cotton consumption and production (International Cotton Advisory Committee 1988). These factors are expected to continue to affect the world market. The volatility of prices has implications for the efficiency of farming operations, or more specifically, for production, resource allocation and marketing decisions.

The viability of agricultural producers depends partly on their ability to manage financial risk. During the 1980s, the number of ways in which Australian cotton growers can sell their crop has increased dramatically. These new marketing alternatives may provide growers with opportunities to manage the price risks they face in the volatile cotton market.

Growers will choose among the marketing alternatives according to - among other things - their attitude to risk, their financial position and the returns and risk characteristics of the marketing methods. A grower free from debt may choose the method offering the highest return, regardless of the uncertainty surrounding that return, whereas an indebted grower may choose a method offering a lower return but a greater probability that the price received will be close to that budgeted. The project reported here was undertaken with the object of providing growers with some indication of the characteristics of currently available marketing methods and with an assessment of the relative merits of each, to facilitate decisions between the alternatives.

Alternative Marketing Methods

There are, essentially, three main marketing options open to growers: a seasonal pool, a call pool (which allows hedging) and cash offer contracts (commonly forward contracts signed well before harvest). In addition, cotton futures options may be used in conjunction with any of these marketing methods or as an alternative to hedging through a call pool.

Seasonal pools

All three of the major Australian processors (Auscott, Namoi Cotton Co-operative and the Queensland Cotton Marketing Board) have offered seasonal pool marketing options since their respective inceptions. A grower may pledge all or part of the expected crop to the seasonal pool by a date set by the processor (usually in October after planting). The processor markets the pooled cotton by various means, starting well before harvest, and subsequently gives the growers an equalised return (adjusted for quality premiums or discounts), thus relieving them of time-consuming market analysis. In New South Wales, where all four marketing alternatives have been available for a number of seasons, almost two-thirds of the crop is sold through the seasonal pool.

Even in a season when the cash offer ('spot') prices are expected to rise, a processor may still choose to sell some of the pool cotton early in the season. In this way, the processor partially protects the seasonal pool return against the possibility of a subsequent price decline. In a season

Figure 1: Cotton price volatility

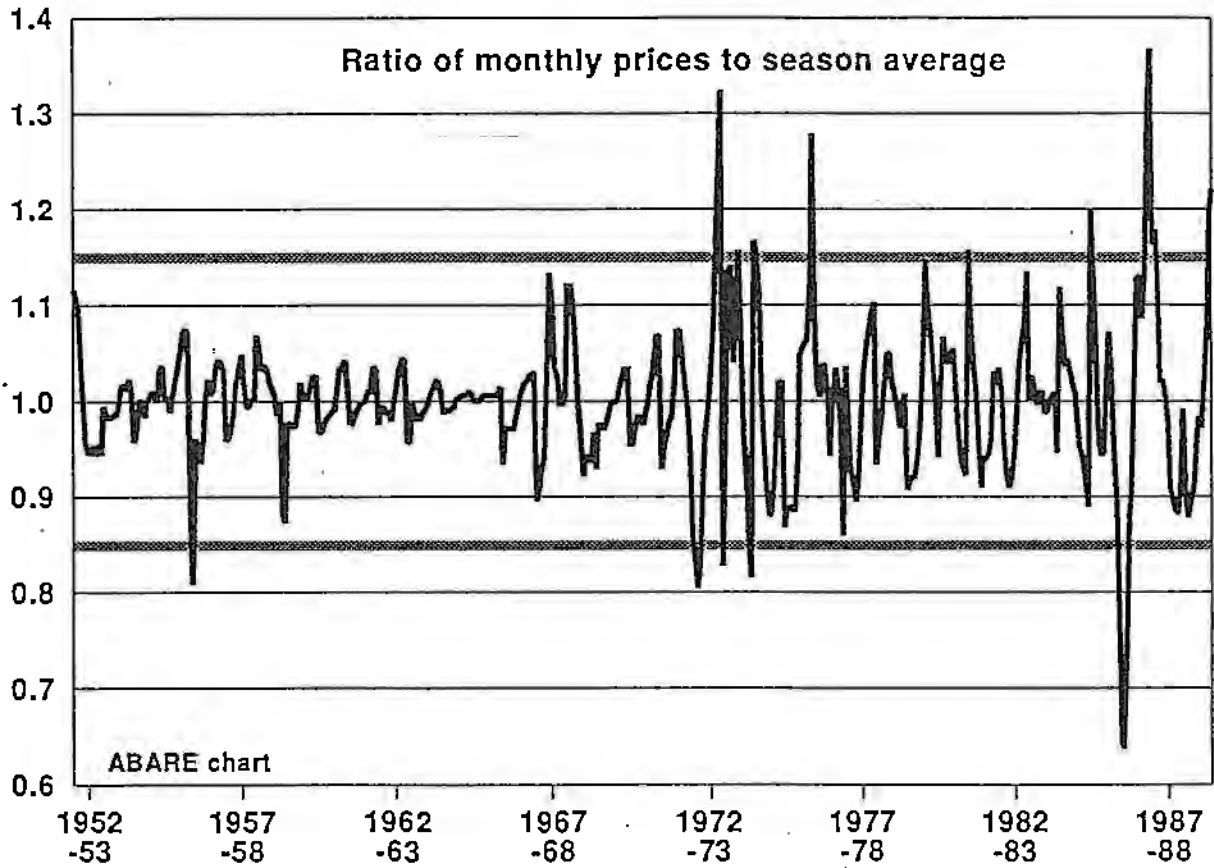
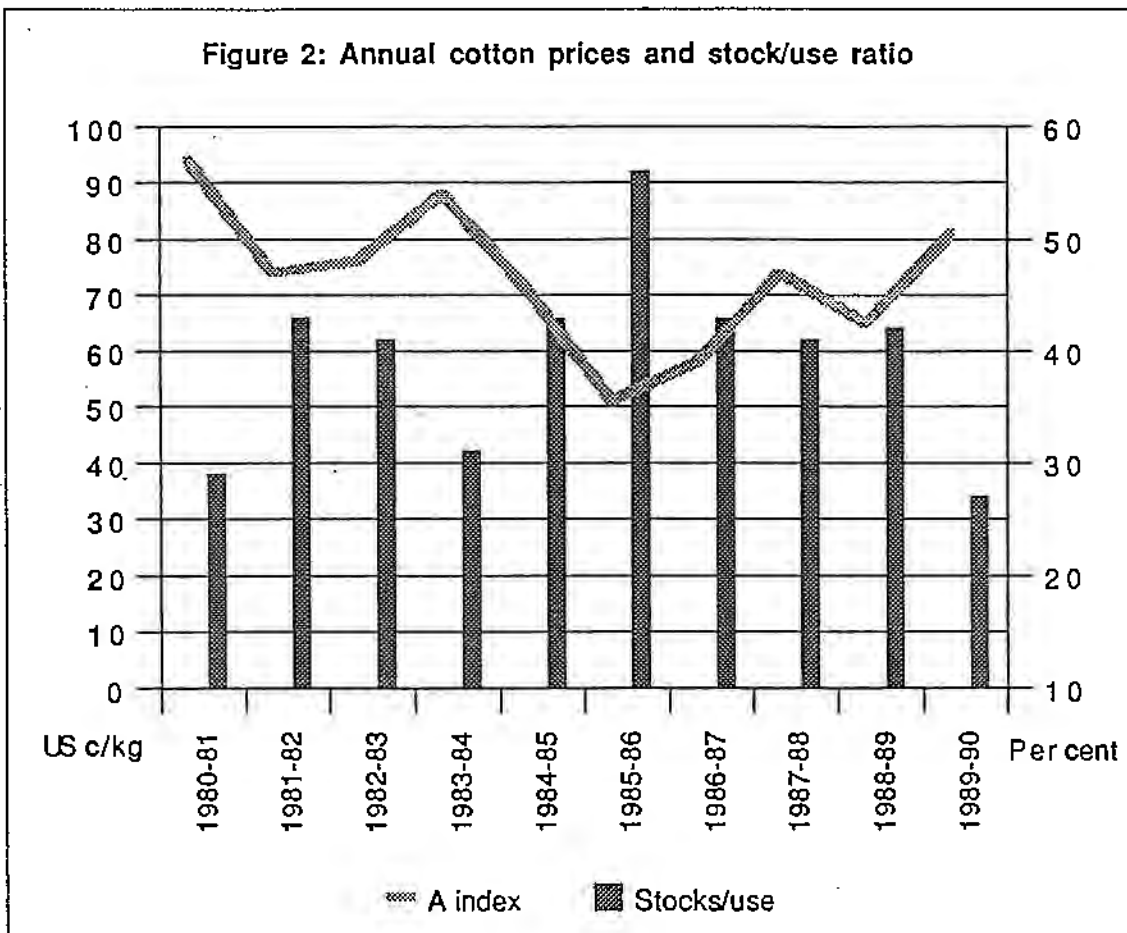


Figure 2: Annual cotton prices and stock/use ratio



when offer prices are expected to fall, on the other hand, yield uncertainty prevents the processor from selling all of the expected crop at the earlier, more favourable prices. In either case, many sales have to be made after harvest on the spot market.

In summary, the seasonal pools can be expected to yield an intermediate level of returns. Final returns are unlikely ever to be as great as the peak prices in a season, nor would they be expected to be as low as the lowest.

Call pools

A 'call pool' was introduced by Auscott in 1981-82, and by the Namoi Cotton Co-operative in 1983-84, to facilitate hedging by growers using New York futures. This method of sale accounts for less than 10 per cent of the New South Wales crop. Growers must state their intention to use the call pool by the same October date as for the seasonal pool. Growers assign a specified quantity of the crop to the call pool, instructing that it be hedged by selling futures contracts if and when a specified New York cotton future (typically July) reaches a specified price. (If that price is not reached, the cotton concerned remains unhedged.) After harvest the grower delivers the stated amount of cotton to the processor, who then sells it on the spot market and at the same time repurchases the futures contracts (if any) that were used for hedging. The cash receipts are then added to the profit or loss on the futures transactions to determine the grower's final price. The processor passes on the cost of margin calls and deposits directly to the grower according to the specific costs or profits incurred or received.

The main advantage of selling cotton through a call pool is that it provides protection from cash market price risk (though it does so only for that portion of the crop sold in this way). The price obtainable by hedging is generally higher than the forward cash price obtainable on the same date, because forward buyers bear some additional risk. In hedging, a grower would usually aim to achieve the cash price for immediate delivery prevailing at the time when the hedge is placed (that is, when the futures contract is sold). This will occur if there is no change in the basis (the difference between the cash market price for immediate delivery of Australian cotton and the specified New York futures price).

Many factors affect the basis. They include quality differentials (Australian cotton typically being of a higher quality than the grade specified in a New York futures contract), the fact that an Australian futures seller will not in general actually deliver on the futures contract at New York, and exchange rates. These factors change in importance over time. Change in the basis results in the change in cash prices not being exactly offset by the profit or loss on the futures transaction. Because of 'basis risk', hedging using futures does not totally insulate the grower from price risk. However, by adopting hedging strategies a reduction in price risk can be achieved, since the expected change in the basis is less than the expected change in the cash price.

Some authors have suggested that it may be possible to obtain through the futures market even better prices, on average, than the current price for immediate delivery. For example, Peck (1975) and Brandt (1985) have considered selective hedging strategies for this purpose. A grower using a selective hedging strategy forecasts price, and hedges only if the expected return from hedging exceeds the forecast price. Brandt (1985), in his analysis of the US hog industry, states that in addition to reducing the

risk of unfavourable price movements, a selective hedging strategy can raise the mean price received by the producers concerned (or, when used by buyers, lower the mean price they pay). To achieve this requires a forecasting procedure which can predict future cash price levels (adjusted for the relevant basis) more accurately than the futures market itself.

Research as to whether this is possible has yielded inconclusive results. Just and Rausser (1981) suggest that, in aggregate, futures market participants collectively perform much the same information-processing role as an econometric model. In other words, it is unlikely that the futures market has sufficiently large inefficiencies (arising from uninformed and apparently irrational market participants, risk aversion, imperfect capital markets and alternative transaction and information costs) to provide opportunities for speculative profits to be made by well informed traders. Indeed, they suggest that econometric models generally do a poorer job of including all relevant exogenous forces, forecasting them and transforming them into price forecasts, than does the aggregate intelligence of the futures market. On the other hand, Martin and Garcia (1981) conclude that rational price formation does not take place in the US live cattle and hog futures markets. Given the uncertainty surrounding this issue it is unclear whether, on average, a selective hedging strategy can improve the price obtained. Hence, a selective hedging strategy is not considered in this study.

There are commonly many options within a call pool. For example, exchange cover is readily available upon request (whereby the grower can obtain a known payment in Australian dollars in place of a US dollar payment whose Australian value will be subject to exchange uncertainty). Processors also offer fixed-basis futures purchases (at a discount) so that the grower can avoid the risk that the basis will diminish. The grower may choose to first lock in the basis, and lock in the price of the futures contract at a later date, or vice versa.

Disadvantages of hedging using futures contracts are the opportunity cost of financing margin deposits and margin calls, the large time commitment to monitoring market conditions and prices, and - where the basis has not been fixed by the grower - basis risk. Growers may, of course, trade on the futures market individually, but use of the call pool avoids the need for individual financial clearance - which may be difficult for a small business to obtain - and reduces brokerage fees. On the other hand, there is a possibility of delays (similar to those of the seasonal pool) in the calculation and distribution of final returns.

Cash offers

Growers may choose to sell their cotton ahead of production by accepting a cash offer forward contract on the spot market. Approximately 25 per cent of the New South Wales crop is sold in this way. Merchants, and more recently processors, offer a daily cash price for cotton delivered to the gin yard, usually payable within two weeks of ginning. Some processors require that intentions to use the cash offer method be stated at the start of the season. The offer price is usually determined by the prevailing New York futures quote and a quoted basis. When a cash offer is accepted by a grower, the merchant or processor usually negotiates a 'back-to-back' contract in the world market to cover the offer price to the grower. A grower can accept a cash offer at any time during the season for a certain number of bales, or may choose to sell the whole crop forward, irrespective of its size (though subject to inspection of progress by the purchaser). In

recent seasons, the use of these methods has increased significantly, especially when prices were high and appeared to have little likelihood of increasing further.

The biggest advantage of this selling method is that, once a cash offer has been accepted, the grower is totally insulated from subsequent price fluctuations, and prompt receipt of final returns is assured. There are no margin calls or deposits, and no basis risk. On the other hand, the advantage that can be achieved by accepting a cash offer at some time during the season depends critically on the grower's ability to predict future price movements. If successful, the grower may be able to pick the peaks of the market and avoid the troughs. But success is far from certain. And because of the need to assess the spot price in comparison with expected future prices, this method requires a larger time commitment than other methods. In addition, as has been mentioned, a cash offer price may be slightly below the equivalent call pool price obtainable at the same time by hedging, due to the merchant or processor assuming some risk when negotiating back-to-back contracts.

A simple strategy that could be adopted for selling on the spot market would be to sell some time after harvest. In theory, growers could store cotton on the farm for a time in anticipation of higher prices. In practice, the opportunity cost of this strategy, in terms of foregone interest, and the need to pay for planting the next crop, restrict the use of this strategy. Moreover, the grower is then totally exposed to price fluctuations which may occur between planting, harvesting and time of sale.

Futures options

The final method of sale available to growers is cotton futures options. The use of cotton options has increased significantly in recent years. A 'put' option is defined as the right, without the obligation, to sell a futures contract of specified maturity date at a specified price (Darneille and Brandon 1989). (The corresponding right to buy a futures contract is termed a 'call' option.) In exchange for this right, the buyer pays a premium to the seller of the option, who assumes all the risk associated with obligation to fulfil the contract.

The most commonly stated advantage of cotton put options is that they enable growers, while protected from downside price risk, to benefit from subsequent price increases. In a falling market, the put option increases in value because of the profitability of the underlying futures transaction. Thus, although the cotton itself will be sold at a low price, its price fall is offset by the value of the option contract (less the premium paid for the contract). In a period of rising cotton prices, the option would become worthless, its cost would be sunk and the cotton would be sold for a higher price than the futures contract would have yielded. In that case, the grower does not incur the opportunity costs of deposits or margin calls - another advantage of put options.

Options have several disadvantages. First, the grower is still subject to basis risk. Second, options are 'wasting assets' (Apperson 1988): the time remaining to expiration plays a big role in determining their value. The less time remaining before expiration, the less the chance that the option will be exercised and the less will be the price obtainable by re-selling it. Thus if everything else remained the same, the option would be worth less at harvest time than when it was purchased, representing a cost to the grower of using this method.

Finally, the greater the volatility in the price of the commodity, the greater will be the premium paid for the option. The market price of a given option represents market participants' expectations about future price volatility and their degree of risk aversion. In deciding whether to buy a cotton option, its price must be weighed against the price protection that it offers. If the grower expects greater price volatility than does the market, or is more risk averse than the average market participant, then the price insurance offered by the purchase of the option may be attractive.

Factors Influencing the Choice of Marketing Method

A grower will use a particular marketing method if the price from that method of sale is higher than the alternatives on offer, or if the method offers a sufficient reduction in risk to compensate for a slightly lower price. In deciding whether to hedge, there will be several factors which a grower will, at least implicitly, take into account. Initially, the grower formulates some expectation as to the price achievable through hedging and the associated range of uncertainty: that is, the probability distribution of possible prices. The uncertainty can be regarded as a mixture of price risk (that associated with cash sale prices) and basis risk. The costs of undertaking the hedging strategy (deposit financing and brokerage) would also need to be taken into account. The expected price and risks from hedging must then be compared with the expected prices and associated risks from alternative selling methods.

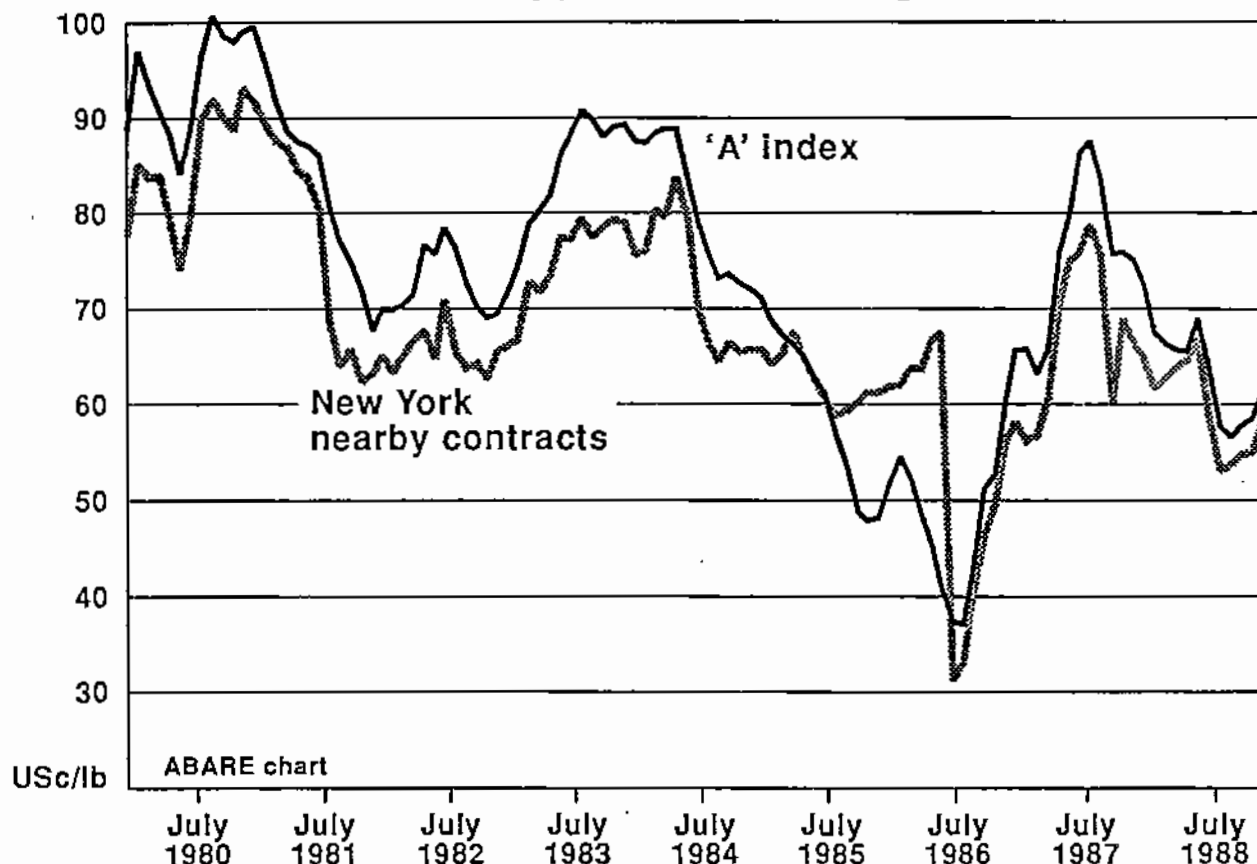
The decision of which marketing method to use would depend on these factors and others such as the grower's attitude to risk. In practice, many growers have considerable debt, and will therefore be concerned about the possible range of variation of price over time. 'Hedging and forward contracting can reduce the dispersion of the price distribution [obtained by those using these methods] and therefore may be beneficial to the decision maker even with no increase in the expected value of price' (Brandt 1985, p.25).

Measures Used to Compare Marketing Methods

The hedgers' perceived price distributions are not easy to observe econometrically. They are not given directly by the traditional measures of risk and returns - essentially, the mean and variance of historical prices. Hedging will yield more stable prices in these terms only if the year-to-year variation in futures prices is less than that in cash prices. This does not appear to be true (see figure 3). But growers do not necessarily seek a reduction in the variation of price itself. Peck (1975) states that, after planting, the only price variability of interest to growers is that of the difference between their actual harvest price and the initial forecast on which the planting decision was based. Hence, the focus of an analysis should be on the mean and variance of the difference between expected and final returns. It would be regarded as beneficial to reduce the variance of this difference - the level of risk faced - even if there were no increase in the expected value of the price.

Quiggin and Fisher (1989) note that some individuals who are generally risk-averse are risk-seeking in some circumstances. It follows that there is a need to examine not only the standard parameters of mean price and variance, but also the shape of the price distribution (that is, its skewness). This is particularly true in relation to events which have a low probability but impose a big loss if they occur, such as drought or total

Figure 3: 'A' index and New York futures quotes
Ratio of monthly prices to season average



crop loss due to flood. A marketing method may, on average, yield a price close to the expected price, and yet its distribution of possible outcomes may be skewed so that there is a greater probability of a disastrously low price than of exceeding the expected price by the same amount.

This study focuses on the prices achievable with each marketing method, and the costs and risks associated with hedging relative to alternative marketing methods. In estimating the risks associated with hedging and alternative methods, the difference between the grower's expected and actual returns is examined (using simulations for the actual returns from hedging).

Price Expectations

The grower who decides to hedge generally does so with the aim of securing the currently prevailing spot price for immediate delivery. Hence, the immediate delivery price prevailing during August, when final planting decisions are made and, presumably, when consideration is given to marketing strategies, can be taken to be the expected price. In an efficiently operating market, current cash prices will reflect all known market information. Hence, it is reasonable to accept the present price as the best available current forecast of future prices. Risk can be measured by the standard deviation of the difference between the expected and actual price - that is, between the pre-planting price and the net price received after harvest.

The characteristics of the hedging strategies need to be compared with those of other marketing alternatives. For this purpose, it is assumed that growers who intend to use a marketing method other than hedging also expect

to receive the immediate delivery price prevailing when planting decisions are made (August). The risks associated with the alternative marketing methods are then, again, measured as the standard deviation of the difference between the expected and actual price.

If growers employ another basis for the formation of price and risk expectations, the analysis described below is still relevant. The price achievable, on average, from hedging can still be taken as the prevailing cash price for immediate delivery at the time when the decision to hedge is made. The risk associated with hedging is that of the actual price falling below the expected price. Even if growers form their expectations about returns differently from the way assumed above, the perceived risks and returns from alternative marketing methods can still be compared with those from hedging, measured as outlined here.

Methodology

The returns from six marketing strategies were collected or, where necessary, simulated from 1973-74 to 1987-88. These strategies were: selling through the seasonal pool, selling by accepting a cash offer and four partial hedging strategies. The use of put options was not examined, because of the lack of option price data prior to 1985.

(a) Seasonal pool returns

The data series on seasonal pool returns is the weighted average of the gross receipts from the three seasonal pools. This was obtained from the processors, and is directly comparable with the grower's expected return (August immediate delivery price), since it is in Ac/kg.

(b) Cash offer returns

It was assumed that growers accept a cash offer price in May, after harvest, for immediate delivery (the simplest strategy) and that the price is the average value of the 'A' index over that month (adjusted for the relevant crop quality premium or discount). This price was converted to Ac/kg using the average exchange rate during May, making it directly comparable with the grower's expected return.

(c) Hedging strategies

The four hedging strategies simulated were chosen after consultation with processors concerning the use of the call pools. They were:

1. 40 per cent of the crop is hedged in August (when price expectations are formulated), and a further 25 per cent of the crop is hedged in January when the growers have a good estimate of yields. No exchange cover.
2. Same hedging strategy as 1, with exchange cover.
3. 40 per cent of the crop is hedged in October (end of planting), and a further 25 per cent is hedged in January. No exchange cover.
4. Same hedging strategy as 3, with exchange cover.

The farms were assumed large enough for their crops to be divided up in this way. (Futures contracts are in units of 100 bales.) A 'typical' cotton grower was assumed to produce around 1200 bales per season off approximately

200 ha of irrigated land. This level of production is similar to that estimated for the average cotton farm (Bardsley, Flavel, Mues, Serjeantson and Thelander 1986).

It was assumed that the growers hedge by selling July contracts, and that in May they sell all their cotton on the spot market (the returns from which are calculated in the same way as for the cash sale method outlined above), and at the same time they (or the buyers, on their behalf) buy back the July futures contracts. The profit or loss from the futures transactions, net of all hedging costs, is then added to (subtracted from) the cash sale receipts.

Exchange rate cover was simulated only from the 1983-84 season, when the Australian exchange rate regime was deregulated. Before that time, the currency risk faced by producers was less than it now is, and there is little data on exchange rate premiums. When a hedge was placed, the growers were assumed to obtain exchange cover for the amount of money equal to the 'strike price' (the price at which they sold the July contracts) multiplied by the amount of cotton hedged. The exchange cover was obtained at the prevailing exchange rate plus or minus any premium or discount obtainable on the exchange market for the forward period concerned. Remaining receipts from the sale of the cotton were converted to Australian currency at the average exchange rate for May.

The results are presented in Ac/kg, deflated to 1980-81 values. They apply to any grower who can undertake a hedging strategy similar to the ones outlined above.

Discussion of Results

When the returns from hedging were simulated, the average cost (brokerage, financing of deposits) of undertaking the August and October hedging strategies outlined previously was calculated to be 0.85c/kg and 0.62c/kg respectively (in 1980-81 dollars). When the expenses are spread over that portion of the crop hedged, the costs are 1.28c/kg and 0.93c/kg respectively. However, there has in recent years been some scope to offset the costs of the commodity hedging by securing exchange rate cover on the forward exchange market - an additional reason for hedging currency. When Australian interest rates are higher than those in the United States, as has been the case during the 1980s, a discount is usually offered on forward exchange markets. A grower can then secure an exchange rate for a future currency transaction which is lower than the spot exchange rate prevailing when the exchange cover is obtained.

None of the strategies studied offered, on average, returns which were significantly higher than the expected return or significantly different from the returns from the alternatives (at the 10 per cent level). Hence, the focus of the results become the risk characteristics of each of the marketing methods.

For an expected return of Acl58.1/kg, the levels of risk faced under the seasonal pool and the cash sale method, as measured by the standard deviation, were 36c/kg and 32c/kg respectively (see Table 1). Selling through the seasonal pool involves significantly more risk than undertaking any of the hedging strategies studied. Hedging presents the grower with the opportunity to manage the price risk because the basis risk faced on the cotton hedged is significantly less than the price risk faced in the open market. However, only the August hedging strategies involve less risk (at

TABLE 1
Standard Deviations of Returns from Marketing Methods(a)

Unit	Seasonal pool	Cash sale	Hedging from August		Hedging from October	
			No exchange hedging	With exchange hedging	No exchange hedging	With exchange hedging
Ac/kg	36.4	31.7	22.5	20.9	24.6	23.9

(a) Expected return Ac158.1/kg.

the 10 per cent significance level) than accepting a cash offer contract after harvest.

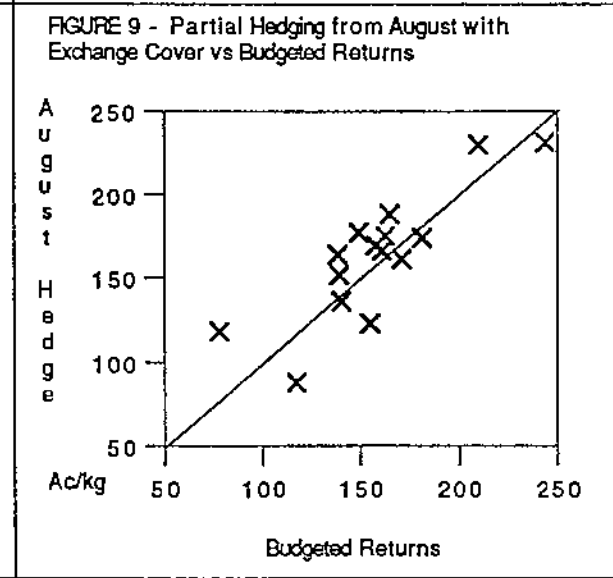
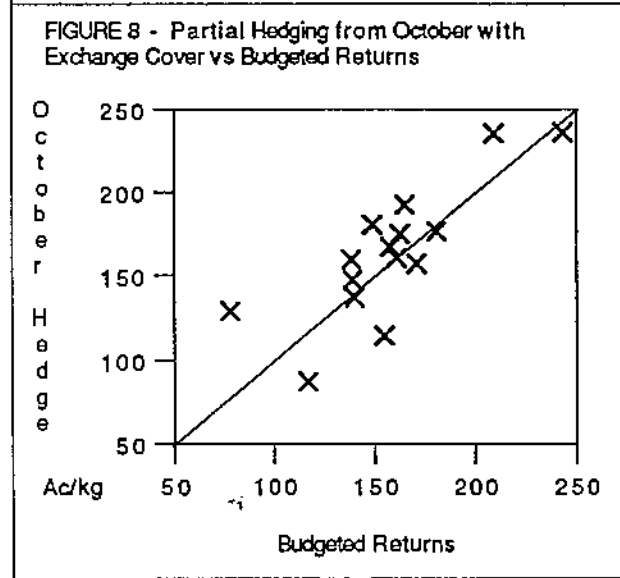
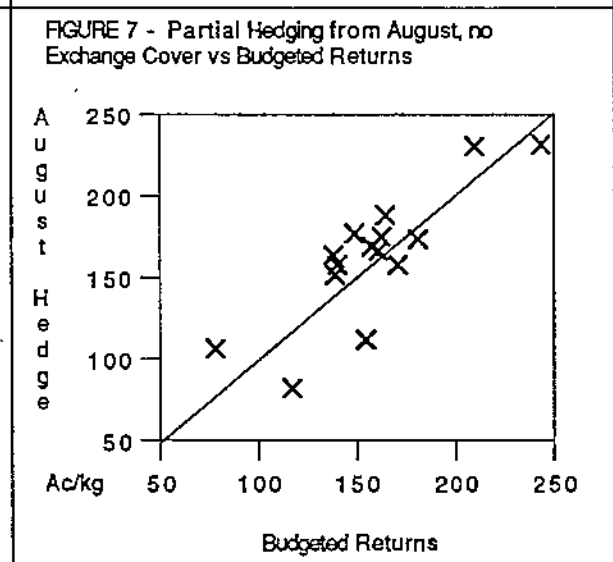
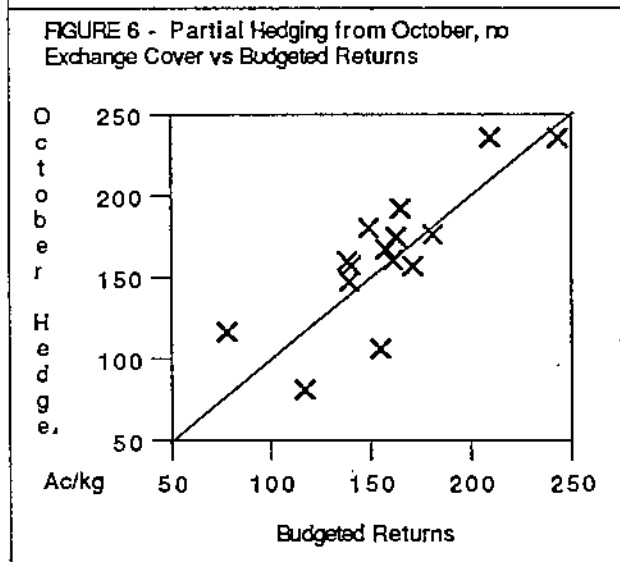
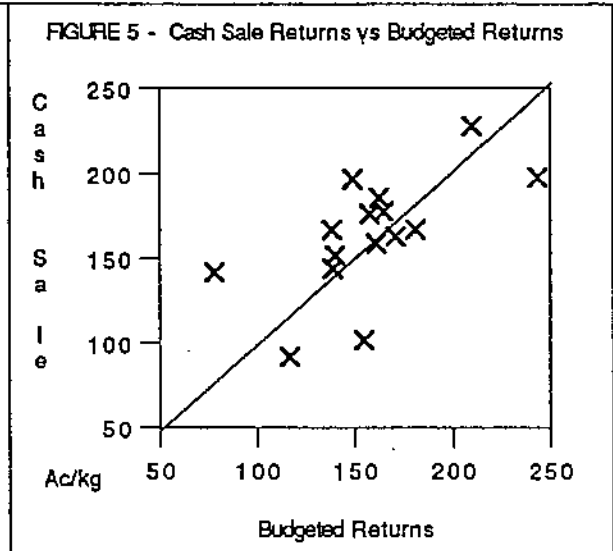
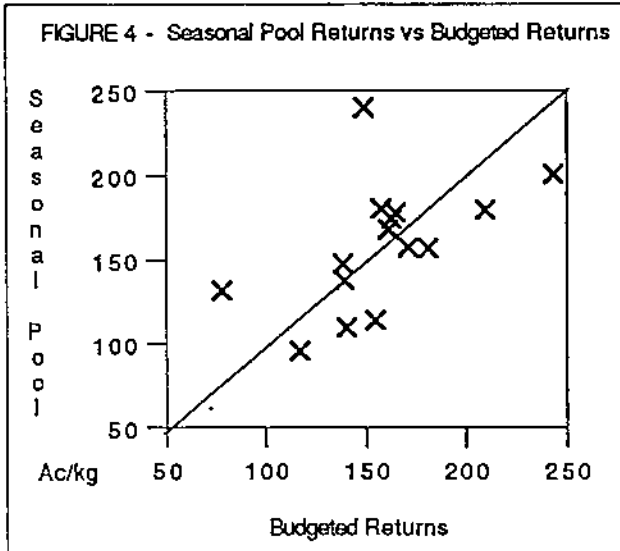
This result is also represented in Figures 4 to 9, where the returns from each method are plotted against expected returns for each of the 15 years of the study period. That the hedging strategies are more likely to result in a return close to the expected return is here indicated by the observations being clustered more closely around the 45 degree line.

There remains a need to study the skewness of the distributions. That is, given a marketing strategy which offers, on average, returns similar to the budgeted return, the grower would want to know if there was a greater chance of the final price being below the expected price by any given amount than of its being above that price by the same amount. When the distributions of returns from all the marketing methods were tested for skewness using the test suggested by Snedecor and Cochran (1967), no skewness was detected in any of the series. Equal deviations on either side of the mean are approximately equally likely. This result accords with the facts that the seasonal pool is operated to minimise the likelihood of exceptionally high or low returns, and the returns from cash sales and hedging strategies are dependent on cash and basis movements respectively, neither of which would be expected to have a bias in either direction.

Effect of Yield Variability

In these simulations, there was no consideration of yield variability. It must be asked how the various marketing strategies affect the grower in the event of a complete crop failure. Clearly, no special problems would be encountered in selling on the spot market after harvest. If selling through a seasonal pool, the grower is obliged to deliver only the quantity of cotton produced; and the processor continually monitors crop progress to ensure that the pool is not oversold in the event of a crop failure.

A grower who had sold the whole crop forward (regardless of amount) by accepting a cash offer would only be required to deliver the amount of cotton produced. However, a grower who contracted to sell a certain number of bales, but failed to produce sufficient cotton to make delivery, might be forced to enter the spot market and purchase a sufficient quantity to enable delivery on the cash offer contract. (One merchant contacted suggested that, to maintain relations with the clientele, delivery would not be enforced; however, the grower must not ignore that possibility.) The subsequent profit or loss per bale would be determined by the difference between the contracted price and the spot price at delivery time. Assuming that an



individual crop failure would have a negligible effect on the world market,¹ it is likely that growers would profit from such an occurrence as often as they would suffer from it, because prices are equally likely to rise or fall after a contract had been agreed to. (If Australian crop conditions had influenced the world price, it would be more probable that the grower would lose).

A similar situation may conceivably occur if a partial hedging strategy is adopted, but because only a proportion of the crop is hedged, the yield failure would have to be large. If, for example, flooding wiped out the whole crop, then in addition to losing the crop the grower would also be faced with either a loss or a profit from the hedging activities. If it is equally probable that prices would have risen rather than fallen after the hedge had been placed, then a profit would be incurred on the futures transaction as often as a loss. (Again, if the crop failure did affect the world price, it is more probable that the grower would be faced with an additional loss.) In addition, there would also be the costs associated with financing margin deposits and margin calls. These have in recent years generally been offset by the premium attainable on the forward exchange market, and since exchange hedging is conditional on making a sale, if the whole crop were lost the grower might be faced with a slight loss from this source.

Growers must therefore be careful to take account of yield variability when deciding on their marketing strategy. If the yield is very low, hedging is more likely to lead to the grower experiencing an additional loss than an offsetting profit even if the yield reduction has no effect on world price. It is partly for this reason that processors advise growers to hedge only part of the crop.

Conclusions and Implications

A cotton grower must take many factors into consideration when deciding whether to undertake a hedging program or to adopt an alternative marketing method. Hedging programs have a cost associated with brokerage and margin requirements of around 1c/kg. However, the cost of the hedging program may be at least partially offset by taking advantage of the favourable exchange rates which are available on the forward exchange market when hedging currency.

When the characteristics of hedging were compared to other marketing alternatives under a realistic assumption concerning growers' price expectations, it became apparent that a grower can trade off the costs of hedging against the reduction in price risk that hedging provides compared to the alternative selling methods studied. This can be done because the 'basis risk' faced when hedging is typically less than the price risk faced

1 The progress of the Australian cotton crop has only a small influence on the world market, as the industry accounts for only around 5 per cent of world exports. In addition, Australian cotton production is located in geographically distinct production areas, which reduces the likelihood of an Australia-wide crop loss. Hence, it would be unusual that a crop failure for an individual grower would have a significant effect on the world price. However, a significant crop loss for an individual grower may be associated with other crop losses within a region, which may in aggregate influence the world price. For example, the floods experienced in the Darling Downs during the harvest period of the 1987-88 season affected world cotton quotes.

in the cash market - that is, because of the close correlation between cash and futures prices. If growers formulate price expectations differently from the way assumed here, they will still need to compare the expected prices and risks associated with the alternative marketing methods, and the measures presented here are still of interest.

The distributions of outcomes showed no detectable skewness for any of the marketing alternatives, implying that no method has a greater probability of returning a disastrously low final price than a price which is above expectations to the same extent.

Finally, though catastrophic crop loss may not be predictable, normal inter-season yield variability must be taken into account when deciding on a marketing strategy. In the event of crop failure (assuming that it does not influence the world price), on average, the only additional losses the grower may incur associated with the use of futures are certain costs of hedging. If the crop failure is sufficiently widespread to influence world price, then a grower who has entered into a forward contract for a certain number of bales, or who has hedged, may be faced with some additional losses. The grower must design a marketing strategy with this in mind.

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