BASIC ROUTINE SOURCING STRATEGIES FOR PRICE HEDGING OF WHITE MAIZE IN SOUTH AFRICA

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Abstract

Maize Milling firms use complex procurement strategies to procure their raw materials which include price hedging strategies. In this, study basic routine price hedging strategies were analysed as part of the procurement of white maize over a ten year period ranging from 2002-2012. Part of the pricing strategies used to procure white maize over the period of ten years were a call and collar strategy. These strategies were compared to the baseline futures (spot) market. The data was obtained from the Johannesburg Stock Exchange's Agricultural Products Division better known as SAFEX. The data was analysed by using descriptive statistics and a Cumulative Distribution Function. However these routine price hedging strategies were used, by using the real (Not taking inflation into account) costs incurred were over the ten year,period is also revealed in the paper for implementation in each of the strategies. The results obtained from the study prove that by using basic routine price hedging strategies to procure white maize, it is more beneficial to do so then by procuring from the future (spot) market. Thus it can be concluded that it is not necessary to use a complex method of sourcing white maize through SAFEX, to be efficient, by implementing a basic routine price hedging strategy year on year it can be better than procuring from the futures (spot) market.

Keywords: b-asic routine procurement strategies, CDF

1. Introduction

Maize is the most important grain crop in South Africa, being both a major feed grain and the staple food for the majority of the South African population. About 60% of maize produced in South Africa is white maize and the other 40% yellow maize. Yellow maize is used for feed requirements and white maize primarily for human consumption. White maize meal plays an integral part in the diet of the poor in South Africa and accounts for 94% of consumption in the African continent. Taking these facts into consideration it is essential for millers, processors and grain pricing firms to make use of procurement strategies in order to procure raw materials at the lowest possible price and to do it in a predictable and reliable manner to ensure more efficient contracting with buyers of the processed product. Thus, risk and price risk management is a critical function in the operations of the agribusiness, whether they are involved in production, processing or trading activities. Price risk is important, due to the fact that high variability in profits is a result of variability in prices. This paper only focuses on price risk and how to use a standardized approach to price hedging, as part of procurement.

Prior to the deregulation of markets in 1996, grain prices were determined by the Commodity Boards of South Africa and a fixed price was set for the production season. This period of regulation ended with the implementation of the Marketing of Agricultural Products Act of 1996 ordering the demise of most of these control boards. Groenewald, Geldenhuys, Jooste (2003) argues that variability of prices has increased since deregulation. Jordaan & Grové (2007) confirmed the increase of variability means of determining the price volatility of field crops that are traded on the South African Futures Exchange (SAFEX).

The variability in prices does not only influence producers of maize but also the processors or procurers of maize. This highlights the emphasis that farmers and processors must have a mechanism to protect them against unwanted price movements that would lead to financial losses. Several instruments are available for agribusiness firms to manage and reduce their exposure to sources of price risk, in addition to forward contracts, futures and options on futures of maize.

The main objective of this paper is to evaluate basic standardized routine price hedging mechanisms to a baseline where the spot price for white maize is used to procure grain. The secondary objective is to determine what would be the probability of a certain outcome when using a specific strategy; this would be done by using a Cumulative Distribution Function (CDF). When referring to the baseline in this study it is considered to be the spot (futures) market price for white maize, for example it is the physical closing price of the April white maize contract on a specific day and time on SAFEX for the nearest contract. Also when referring to basic standardized routine price hedging mechanisms a call and collar strategy was used to compare against the baseline.

2. Basic routine grain procurement strategies

Effective price risk management strategies as part of procurement can give processors like millers a competitive advantage over rivals and increase the firm's profitability. Conventional alternatives for pricing strategies range from spot purchases, with specifications for easily measurable characteristics to varying forms of strategies with pre-commitment. In the case of grains these choices are complicated by two factors. First there is intrinsic uncertainty associated with end use qualities that are not easily measurable. Second, grain prices and therefor procurement costs vary spatially due to competing market regions (Wilson, Dahl and Johnson, 2000).

Due to the development and organisation of procurement strategies that have escalated in importance with food processing industries, as well as with the prospect of greater choice attributes to development of information (Wilson, Dahl and Johnson, 2000). For the purpose of this research, easy to use routine procurement strategies are identified and evaluated to determine the effect of these routine procurement strategies and to determine if it's more beneficial by using these strategies than buying on the spot market.

2.1. Routine procurement strategies

Strategy Spot: Purchase the crop in the cash market

Strategy spot is used as the baseline strategy and signifies a situation where no active procurement strategy is done. It is assumed that the decision maker buys white maize at the end of each month for twelve month sequence. The strategy is not amended with regards to price management and is only used to make comparisons.

Strategy Call: Buy a call option one year in future

Options are derivative instruments that can be used for price risk management (Hedging) or as a mean of speculation (Johannesburg Stock Exchange, 2010). The holder of an option has the right, but not the obligation to buy or sell an underlying instrument at a pre-determined price during a specific period or at a specific time. Buyers hold the rights, but not the obligations while sellers assume obligations to buy or sell an underlying futures contract if the option is exercised by the buyer (JSE, 2010). A miller or maize processor, who is concerned that the price of maize

will rise in the future, will make use of a call option to protect himself against unwanted price movements in an upward direction. Thus a call option is used to manage price risk and to hedge against unwanted price movements in the market. At the expiry date, the miller or processor will have the right to buy the maize at a minimum price which was agreed on at a specific time and date. When the miller or processor exercises this option, he developed protection against rising prices and has the opportunity to benefit from decreasing prices. The negative side of a call strategy is the effect of premium (the cost of taking out the option) that must be paid for purchasing the call strategy.

The data used for the strategies were historical SAFEX prices on the 1st of May for white Maize, an at the money call option was bought and expiry was the last five working days of April, one year in advance. The option cost was calculated by using the Black Scholes Model originally developed by Black Scholes (1973), given the SAFEX – price (at the money) while historical volatilities are obtained from SAFEX. The spot price is the alternative price when the option is not exercised (Spot price + Premium).

Strategy Collar: Buying a call option and put option simultaneously

A collar option strategy, also known as a ''hedge wrapper'' is used to lock in the maximum gain and maximum loss of a stock or commodity. To execute a collar, an investor, miller or processor buys a white maize at-the-money call contract while simultaneously selling an out-of-the-money put option. Thus the miller or processor locks in a floor price and a ceiling price. The collar option is also used to subsidise the call options premium.

The primary benefit of a collar option is to limit downside risk. However, collars also limit profits on the upside. A collar strategy is a conservative strategy that is generally implemented to protect profits or lock in prices, and not generate them. For the purpose of this research an at-the-money call option was purchased and an out-of-the-money put option was purchased simultaneously on the first business day of May with expiry of the option on the fifth last business day of April (May futures contract) one year on.

3. Risk quantification

A non-parametric approach is adopted in this study to quantify a Cumulative Distribution Function (CDF) of white maize prices for the basic routine procurement strategies. According to Goodwin and Mahul (2004) a non-parametric approach is the preferred method of analysis in cases where fewer data points are available, such as the case with this research. Historical data ranging from the year 2002-2012 were obtained from the Agricultural Products Division, better known as SAFEX (SAFEX 2010) on the Johannesburg Stock Exchange's website this was used to evaluate volatilities, spot and futures contract prices for white maize and also to quantify the price risk associated with each of the basic routine procurement strategies. Resulting price were expressed in 2002 real values, before constructing the CDF, assuming that each year has an equal chance of occurring

4. Results

4.1. Statistical moments of basic routine sourcing price hedging strategies for white maize in South Africa

Statistical measures are used in Table 1, to indicate the variability within basic routine procurement strategies of white maize. These values are expressed in real (taking out the effect of inflation) Rand values.

Table 1. Statistical moments of basic routine sourcing price hedging strategies for white maize in South Africa

	Call	Futures	Collar
Mean (R)	1496	1609	1475
Standard Error (R)	173	159	184
Median (R)	1526	1595	1483
Standard Deviation (R)	548	503	581
Minimum (R)	625	946	554
Maximum (R)	2279	2499	2442

Mean price received: The mean price received from basic routine procurement strategies is the primary indicator of their relative performance. The procurement strategy that returns the lowest mean price compared to another will be the more favourable strategy given price variability is not a concern. In the research, white maize prices were analysed according to their mean price received for each strategy. The lowest mean prices for white maize are as follows, ranging from the lowest to the highest, these values are derived from Table 1:

- Call Strategy,
- Collar Strategy,
- Futures (Spot) Strategy.

The mean prices for both strategies incorporated are lower than that of the Futures (spot) price.

Minimum and Maximum: The minimum and prices indicate the low/high range of the procurement strategy outcomes over the period of 2002 – 2012. The lowest price received for each strategy is arranged chronologically and derived from Table 1:

- Collar Strategy,
- Call Strategy,
- Futures (Spot) Strategy.

The collar strategy has the lowest minimum price, this is an advantage for the producer of white maize, thus purchasing at a lower price. It is evident that implementing a basic routine procurement strategy it is more beneficial than buying from the spot market.

Standard deviation: The standard deviation of the purchasing price received for a particular strategy is used as a statistical measure of annual price variability. The higher the standard deviation of annual purchasing prices of a specific strategy the more variable its returns. Interpretation of standard deviation of basic routine procurement strategies for white maize:

- Futures (Spot) Strategy: The Futures (Spot) Strategy has the lowest standard deviation,
- Call Strategy: The call strategy has the second lowest standard deviation,
- Collar Strategy: The collar strategy has the highest standard deviation.

Table 1 illustrates that the basic routine procurement strategies are better than the futures (spot) strategy. However, these statistical moments do not give you as a procurer or processor of grain a clear indication of which of the three strategies is the best. To gain more insight in the distribution of prices associated with each basic routine procurement strategy for white maize, the Cumulative Distribution Function of each of the three strategies will be portrayed in Figure 1.

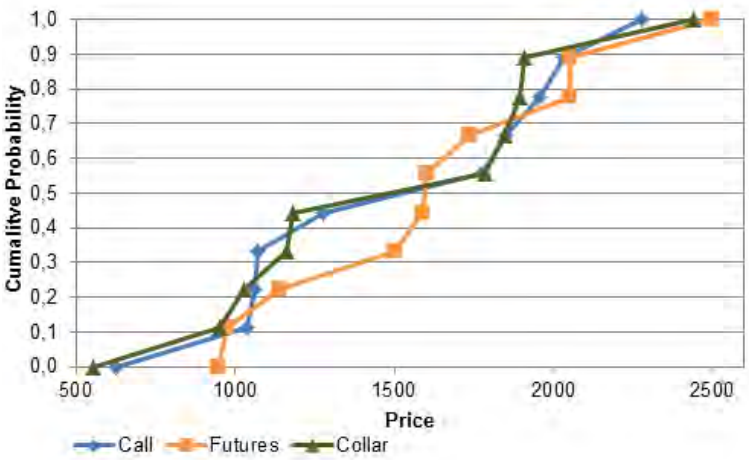

Figure 1. Cumulative Distribution Function for basic routine procurement strategies of white maize

The CDF illustrates if the producer decides to implement the futures (spot) strategy, there is a 28% probability for receiving a lower price. However, the minimum price that can be received for the futures (spot) strategy is much higher when compared to that other basic routine procurement strategies. This implies that the procurer of white maize will pay a higher minimum price for the white maize, this is not ideal due to the procurer want to purchase at the lowest possible price. The CDF also illustrates that both the call and collar routine procurement strategies have a 72% probability of receiving a lower minimum price for purchasing white maize compared to the futures (spot) price.

The trend of the CDF for both the basic routine procurement strategies are very similar, the one point gives some significant differences between the two is the presentation that a collar strategy would give a lower minimum price that the call strategy. With both these strategies showing very similar trends on the CDF lines of each, it is difficult to distinguish between which one of these two basic routine procurement strategies are better than the other.However it can be established that these two strategies outperform the futures (spot) price comprehensively, when trying to lock in at a minimum or lowest procuring/sourcing price for white maize.

Given the findings of statistical moments and the CDF, it was decided to create a theoretical milling firm which procures white maize and implements these strategies to determine if there is any financial benefit from doing these basic routine procurement strategies. The following assumptions were used: The milling company procures 1260 contracts on SAFEX, on the first business day of May in year one, and the expiry date of these contracts are twelve months in advance thus the fifth last business day of April one year on.

The milling company then agrees that each month 90 contracts of the 1260 contracts must be delivered to the firm until the numbers of contracts are zero. If the net price (Strike + Premium) in the options is lower than the price in the spot market the option is exercised, if the net futures (spot) (Spot + Premium) are lower, the futures (spot) will be exercised and then the price on the premium of the option is paid. These strategies have been repeated for ten year, year on year in exactly the same way. Figure 2 gives an indication to the reader on the total costs that were associated each year in the procurement of white maize over a ten year period, when implementing each strategy.

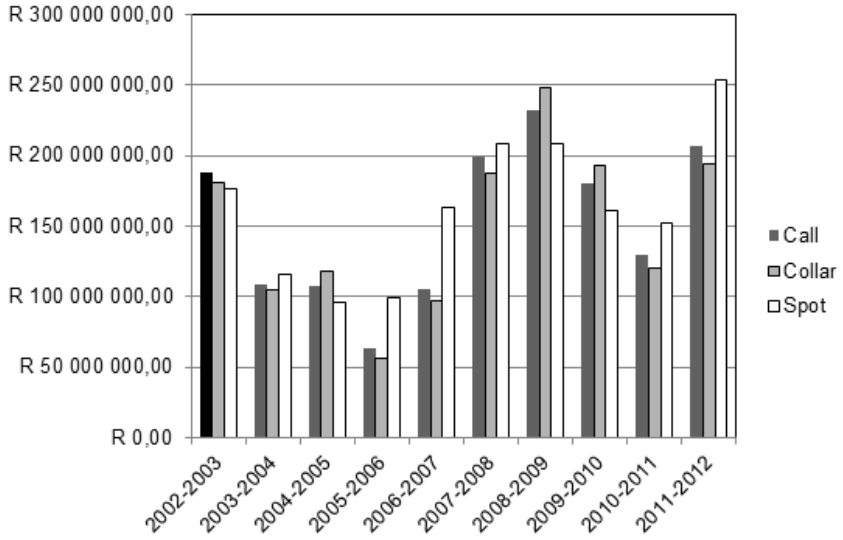

Figure 2. Total cost associated with each year

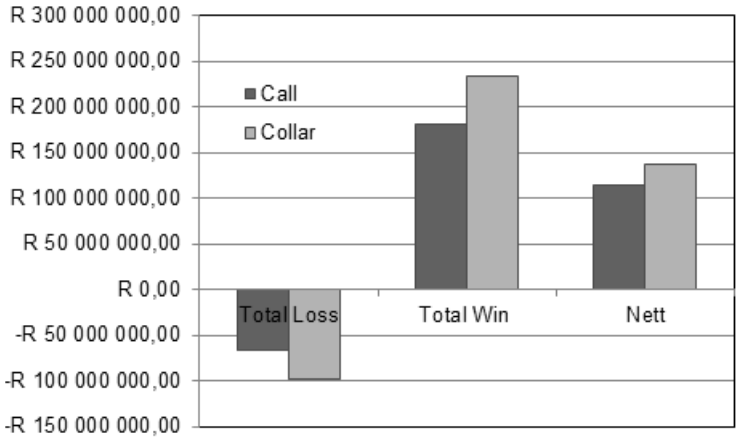

Figure 3. Total gains, losses and net gains

In figure 3 the reader is illustrated an indication on the winnings, losses and net gain by implementing these strategies over a ten year period. It has to be brought to the attention of the reader that the winnings were calculated by using the amount paid in a year to exercise the strategy and then taking the amount paid for the strategy and deducting that from what the procurer should have paid if the firm procured from the futures (spot) market.

The same principle applies for losses, where losses are calculated when the procurer made a loss by implementing the strategy where he could of performed better by procuring from the futures (spot) market. The winnings in comparison to the losses outperform the losses. The net gain is the Total winnings minus total losses over ten years. In table 2 the real cost incurred with each routine procurement strategy is revealed.

Table 2. Real values of total winnings, losses and net gain

	Call	Collar
Total Loss	-R 65 394 259.00	-R 97 232 814.79
Total Win	R 180 622 792.08	R 234 328 963.51
Nett gain	R 115 228 533.07	R 137 096 148.72

When interpreting figure 3 and table 2 it indicates that there are financial benefits when using basic routine procurement strategies to hedge lower prices.

5. Summary and conclusions

Various authors such as O'Brien (2000) and Scheepers (2005) proved that the derivative market is efficient in price risk management. The main objective of this research paper was to determine if basic routine sourcing procurement price hedging strategies for white maize are more efficient in locking in lower prices for the sourcing of white maize compared to buying on the futures (spot) market. The strategies that were used were a call strategy which is bought out-of-the-money, a collar strategy which is a combination of a call and put strategy, and then a baseline strategy future (spot). The call and collar strategy were compared to the futures (spot) strategy over ten years of market data received from the Johannesburg Stock Exchange Agricultural Product Division named SAFEX. The data was analysed using descriptive statistics to determine the significance of the data. Out of the descriptive statistics, evidence was obtained that the two basic routine procurement strategies can lock in lower prices than compared to buying on the futures (spot) market. However, by just using statistical analysis does not provide enough evidence that these strategies over power the future (spot) strategy. Thus a Cumulative Distribution Function was compiled to indicate what the probability will be in actually receiving a lower price by using the basic routine procurement strategies compared to futures (spot).

The author opted to create a theoretical milling company which basic routine sourcing price hedging strategies for white maize was used and, implemented over a ten year period. This theoretical firm gives an indication to the reader on the financial gains and loss possibilities by applying these basic routine procurement strategies over a ten year period. It can be concluded that many grain procuring firms use complex methods in price hedging or procuring raw material and in this case white maize. The research proves that by using basic routine procurement strategies it will be beneficial to the procurer than to just procure on the futures (spot) market.

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