STOCHASTIC EFFICIENCY ANALYSIS OF ALTERNATIVE BASIC GRAIN MARKETING STRATEGIES

By:

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ABSTRACT

The use of modern routine marketing strategies to minimize risk exposure is not a widely adopted practice amongst grain producers. The producers tend to use high risk strategies which include the selling of the crop on the cash market after harvest; whilst the high market risks require innovative strategies including the use of futures and options as traded on South African Futures Exchange (SAFEX). This is mostly due to a lack of interest and knowledge of the market. The purpose of the study is to examine whether the adoption of basic routine strategies is better than adopting no strategy at all. The study illustrates that by using a Stochastic Efficiency with Respect to a Function (SERF) and Cumulative Distribution Function (CDF) that the use of five basic strategies for each crop type namely a Put (plant time)-, , Three-segment-,) (Critical Moment in production/marketing process) and Sell after pollination can be more rewarding. These strategies can be adopted by farmers without an in-depth understanding of the market and market-signals. The results obtained from the study illustrate that each strategy is different for each crop. It also indicates that no strategy is worse than a specific strategy and that the choice between strategies depends on the risk aversion level of the producer. It is imperative to note that the using hedging strategies are better than no strategy at all.

Keywords: Marketing strategies, futures, options, SERF

1. INTRODUCTION

Grain farmers are continuously searching for ways to improve returns and manage the risks associated with grain production. Future markets are one way of managing risk and improving returns. Future markets have two primary functions in agricultural marketing i.e. (1) a price discovery role, and (2) a price risk management role (McKenzie, 2001; Singh 2001).

Selling price risk is a major source of risk to producers both locally and internationally (Woodburn,1993; Coble and Barnett,1999). Price risk is important, mainly due to the fact that high variability in profits is a direct result of variability in prices. Prior to the deregulation of markets in 1996 grain prices were determined by the Commodity Boards and set at fixed prices for the production season. This period of regulation ended with the employment of the Marketing of Agricultural Products Act of 1996 ordering the demise of most of these control boards. Groenewald et al.(2003) argue that the variability of prices has increased since deregulation. Jordaan et al. (2007) confirmed the increase of variability by
means of determining the price volatility of field crops that are traded on the South African Futures Exchange (SAFEX). The increase in price variability has exposed South African producers’ price risk management abilities.

Risk is uncertainty that affects an individual’s welfare and is often associated with adversity and loss. There are many sources of risk in agriculture, ranging from price and yield risk to the personal risk associated with injury or poor health. Dealing with risky situations, risk management involves choosing among alternatives to reduce the effects of the various types of risk. It typically requires the evaluation of trade-offs between changes in risk, changes in expected returns, entrepreneurial freedom and other variables. (Harwood, Heifner, Cable, Perry, Samwaru 1999). Because farmers vary in attitudes toward risk, risk management cannot be viewed within a “one size fits all” approach. (Harwood, Heifner, Cable, Perry, Samwaru 1999). Different farmers confront different situations and their preferences to ward off risk and their risk return trade-offs have a major effect on decision-making in each given situation. Farmers have many strategies of managing agricultural risk; basic hedging strategies to market grains are only one strategy that can be used. Farmers can adopt other strategies too, in managing their risk by enterprise diversifications, financial structure of the farm etc. However, forward contracting of produce is a much more effective and relatively widely used form of risk management for farmers, the most common being a contract for the sale of a crop (Varangis, Donald and Anderson, 2002).

In financial markets, the term “derivatives” is used to refer to a group of instruments that derive their value from some underlying commodity in the market. Forwards, futures, swaps and options are all types of derivative instruments and are widely used for hedging or speculative purposes (JSE, 2010). The markets are highly dynamic and continuously changing. It requires an in-depth understanding of global markets and knowledge of present and future trends with regard to the agricultural sector.

Agricultural economists have devoted much effort in attempting to analyze futures markets systematically and to show how risk-averse producers ‘should’ use such markets. However, the reality is that relatively few farmers actually use futures hedging. Most probably the reason is due to a lack of knowledge on how the market works (Varangis, Donald and Anderson, 2002). Jordaan and Grové (2007) also found that only 44% of their sample of respondents used forward pricing strategies. None of these respondents used option strategies. These researchers indicated that respondents perceive the market as ineffective and that the producers have a lack of human capital to apply more complicated marketing strategies. Various international authors including O’Brien (2000), Zulauf, Larson, Alexander and Irwin (2001), Bates (2003), and local authors such as Grönum and van
Schalkwyk (2000) Scheepers (2005) and Cass (2009) evaluated marketing strategies consisting of futures and options. In many instances these strategies are too complicated for farmers to apply.

Selling Price risk management is hampered by the presence of highly sophisticated marketing strategies that are will probably not be adopted by producers that are not highly unskilled in the application of these strategies. The question remains to what extent less complicated marketing strategies such as routine marketing strategies, will aid farmers in price risk management. O’Brien (2000) defined routine strategies as “Those in which grain is marketed each year during the same time period using the same marketing tools regardless of market conditions”.

The main objective of this paper is to determine the benefit of routine marketing strategies compared to a baseline where only the Spot market is used for decision-makers with varying degrees of risk aversion. When referring to the baseline it is considered to be the Spot market, for example, the baseline or spot market for maize is July and for soybeans it is May. In the case of the winter crop wheat, the baseline or spot market is December. Another way of explaining the baseline is that it is the physical selling of the crop in a certain month. It has to be noted that these strategies are focused on producers that do not possess the time or knowledge to market their products in a sophisticated way. A constant absolute risk aversion utility function is employed to calculate the benefit of routine marketing strategies.

2. ALTERNATIVE MARKETING STRATEGIES

There are multiple marketing strategies that can be used to manage risks in marketing. The complexity of grain marketing strategies may vary significantly between alternatives. Examples of more complex strategies are amongst others buying a synthetic Put or Call option, using bull spreads or the Butterfly option strategy. For the purposes of this research, easy-to-use routine strategies are identified and evaluated mainly due to the fact that producers do not implement complex strategies, nor they have the time and knowledge assessing the market. The following basic marketing strategies will be explained for three different primary commodities traded on SAFEX namely; maize, wheat and soybeans. The same basic marketing strategies are used for all three crops with adjustments to the planting time and harvest time of each crop.

2.1. Basic marketing strategies for all three grain types:

2.1.1. Strategy Spot: Sell the crop in the cash market after harvesting

Strategy Spot is used as the baseline strategy and signifies a situation where no active marketing is done. More specifically it is assumed that the decision maker sells his produce on the Spot market during July for white maize and May for soybeans. Wheat will be sold in
In cases where the market moves upwards since planting time, this strategy will ensure best results but provides no price risk management against a declining market. The strategy is not amended with regards to price risk management and is only used to make comparisons.

2.1.2. **Strategy Put: Buy a Put-option after commodity is planted**

Options are derivative instruments that can be used for price risk management (hedging) or as a means of speculation. 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 no obligations while sellers assume obligations to buy or sell an underlying futures contract if the option is exercised by the buyer (JSE, 2010). A producer, who has just planted, and is concerned that the market may decline sharply in the near future, will buy a Put. The producer buys the right to sell at a minimum price to manage the price risk. Thus, at the expiring date, the producer will have the right to sell his crop at a minimum price which was agreed on at planting time. When a producer exercises this option, he developed protection against falling prices and has the opportunity to benefit from increasing prices. The Put strategy has the negative effect of a premium that must be paid for the Put strategy.

Data used for this strategy is SAFEX-prices on the 1\textsuperscript{st} of December,\textsuperscript{4} for white maize this is also the Strike price. The option cost is calculated by using the Black Scholes Model originally developed by Black and Scholes (1973), given the SAFEX-price (at the money) while historic volatilities are obtained from SAFEX. The expiry date for the option is July, May, and December for the different grains respectively. The Spot price is the alternative price when the option is not exercised (Spot price - premium).

2.1.3. **Strategy 3x: Sell production in three segments on the futures market**

A futures contract is a contract requiring commitment to take or make delivery of a specific commodity according to a specific quantity and quality as stated in the contract at a specific location on a specific time frame in the future. Futures are mainly exchanged in the process of price discovery and price risk management. In the case of grain marketing using futures a farmer will sell his crop on a future market at a specific price at a specific point in time prior to harvesting time. When the futures contract expires, the producer is obligated to deliver the exact amount and quality grain in exchange for the agreed price at the agreed location. The futures contract can also create a new risk for the producer, named yield risks. If the producer did not achieve his expected yield he/she have a shortage of production on the

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\textsuperscript{4} Year of planting
contract, which means that the producer must buy grain to fill his contract quantities which can be negative or positive.

When a producer is concerned that the price of the commodity will decline with the maturing of the season, the producer has the choice to sell his crop on the future market in which the producer commits to sell a specific quantity and quality of his crop at a specific time and place. The strategy states that the production is sold in three segments of equal quantities, the first is sold when the crop is planted (December) for maize, and soybeans. The second at pollination phase (February) and the third segment at harvesting (July) for maize and (May) for soybeans. The pollination phase is the same for maize and soybeans. This is seen as three important time frames within the industry for summer crops. The three important time frames for wheat are planting (May), critical time in global wheat market (September) and harvest (December). To lock the producer’s price level at the beginning of the season, the producer obtains a short position on the futures market. The producer is protected against declining prices but cannot benefit from an increase in commodity prices. A short future position locks the same price level regardless of the direction of the market.

2.1.5. **Strategy month: Sell crop in critical (pollination phase) month**

In this strategy the produce is in its pollination phase and the producer has a fair idea what his yields will be. The producer sells his produce in this month; in order to lock the producer’s price level at pollination, the producer obtains a short position in futures.

3. **RISK QUANTIFICATION**

A non-parametric approach is adopted in this study to quantify cumulative distribution functions (CDF) of all three commodity prices and gross margins for the alternative marketing strategies. According to Goodwin and Mahul (2004) a non-parametric approach is the preferred method of analysis in cases where few data points are available, such as the case in this study. Historical data ranging from 2001-2011 was obtained from the Agricultural Products Division, better known as SAFEX (SAFEX, 2010) and it was used to evaluate volatilities, spot and futures contract prices for the selected commodities and also used to quantify the price risk associated with each of the marketing strategies. Resulting marketing prices were expressed in 2001 rand values before constructing the CDF, assuming each year has an equal chance of occurring.
4. STOCHASTIC EFFICIENCY ANALYSIS

4.1. Stochastic efficiency with respect to a function (SERF)

The stochastic efficiency of alternative marketing strategies for decision-makers with varying levels of risk aversion is determined with a technique developed by Hardaker et al. (2004) called stochastic efficiency with respect to a function (SERF). SERF is based on the notion that ranking risky alternatives in terms of utility is the same as ranking alternatives with certainty equivalents \( (CE) \). \( CE \) is defined as the sure sum with the same utility as the expected utility of the risky prospect (Hardaker et al., 2004). Thus, the decision-maker will be indifferent to both the \( CE \) and the risky prospect. \( CE \) is calculated as the inverse of the utility function and is therefore dependent on the form of the utility function. Assuming an exponential utility function and a discrete distribution of \( x \), \( CE \) is calculated as (Hardaker et al., 2004:257):

\[
CE(x, r_a(x)) = \ln \left( \frac{1}{n} \sum_{j} e^{-r_a(x) x_j} \right)^{-1}
\]

Where \( r_a(x) \) is the level of absolute risk aversion and \( n \) defines the size of the random sample of risky alternative \( x \). The relationship between risk aversion and \( CE \) is determined by evaluating Equation (1) over a range of \( r_a(x) \) values. Repeating for different risky alternatives yields the relationship for several alternatives which are best compared by means of graphing the results (Hardaker et al., 2004). The alternatives are ranked based on \( CE \) whereby the alternative with the highest \( CE \) is preferred, given the specific level of risk aversion. The difference between two alternatives at a specified \( r_a(x) \) level yields a utility weighted risk premium which is defined as the minimum sure amount that has to be paid to a decision-maker to justify a switch between a preferred and a less preferred alternative (Hardaker et al., 2004).

Application of SERF requires from the analyst to quantify the risk associated with a risky alternative as a CDF and to specify the range of risk aversion levels. The analyses are conducted in Excel© using the SIMETAR add-in (Richardson et al., 2004).

4.2. Choice of absolute risk aversion levels

In the absence of utility functions for decision-makers a practical alternative is to assume a specific utility function and then to use risk aversion levels utilised in other studies to represent risk aversion. Assuming an exponential utility function a measure of absolute risk

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\(^5\) Note that this concept is different from the risk premium defined by Pratt (1964).
aversion is required. Choice of appropriate ranges of \( r_a(x) \) is difficult because although \( r_a(x) \) is unaffected by an arbitrary linear transformation of the utility function, the invariance property of arbitrary linear transformation of the utility function does not apply to arbitrary rescaling of the outcome variable \( x \) (Raskin and Cochran, 1986). Due to the above mentioned; \( r_a(x) \) cannot be transferred from one study to another without applying some sort of rescaling.

In our analyses the link between the risk aversion parameter used in applied MOTAD studies and the \( r_a(x) \) risk aversion parameter used in mean-variance quadratic programming problem formulations is used to guide the choice of \( r_a(x) \).

Following Biosvert and McCarl (1990) the link may be developed as follows:

\[
\text{MOTAD} \quad \begin{align*}
\text{Max} & \quad CX - \alpha \sigma \\
\text{St} & \quad AX \leq b \\
& \quad X \geq 0
\end{align*}
\]

\[
\text{MEAN VARIANCE} \quad \begin{align*}
& \quad CX - 0.5r_a(x) \sigma^2 \\
\text{St} & \quad AX \leq b \\
& \quad X \geq 0
\end{align*}
\]

The Kuhn-Tucker conditions with respect to \( X \) of these two models are:

\[
\text{MOTAD} \quad \begin{align*}
C - \alpha \frac{\partial \sigma}{\partial X} - uA & \leq 0 \\
\left( C - \alpha \frac{\partial \sigma}{\partial X} - uA \right) X & = 0 \\
X & \geq 0
\end{align*}
\]

\[
\text{MEAN VARIANCE} \quad \begin{align*}
C - 2 \cdot 0.5r_a(x) \sigma \frac{\partial \sigma}{\partial X} - uA & \leq 0 \\
\left( C - 2 \cdot 0.5r_a(x) \sigma \frac{\partial \sigma}{\partial X} - uA \right) X & = 0 \\
X & \geq 0
\end{align*}
\]

For these two models solutions to be identical\(^6\) in terms of \( X \) and \( u \), then

\[
\alpha = 2 \cdot 0.5 r_a(x) \sigma \quad (2)
\]

\[
\alpha = r_a(x) \sigma \quad (3)
\]

Equation (3) shows that the risk aversion parameter of the MOTAD model is equivalent to the \( r_a(x) \) multiplied with the standard deviation of the risky prospect. Thus, for any assumed level of \( \alpha \), \( r_a(x) \) can be calculated. McCarl and Bessler (1989) state that \( \alpha = 2.5 \) is typically

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\(^6\) The relationship between the risk aversion parameters of the MOTAD and EV models presented in Equation (3) is different from the relationship presented by Biosvert and McCarl (1990) because their specification treats \( 0.5r_a(x) \) as the E-V risk aversion parameter.
reported as the maximum value in applied MOTAD studies. Recently Conradie (2002) compared the observed crop mixes of 16 different farm types to those simulated with MOTAD in the Fish-Sundays irrigation scheme in South Africa. Reported \( \alpha \) values varied from 0.25 to 5 with only two farms having values greater than \( \alpha =2.5 \). In our analysis a value of \( \alpha =2.5 \) and the standard deviation of the baseline strategy are used to calculate the upper bound on \( r_a(x) \).

5. RESULTS

5.1. Stochastic efficiency of marketing strategies

5.1.1. Marketing risk

A number of statistical measures are used in Table 1 to describe the variability associated with the marketing strategies for each of the three crops.

Table 1: Statistical moments of alternative marketing strategies from 2001 - 2011.

<table>
<thead>
<tr>
<th></th>
<th>Maize</th>
<th>Put</th>
<th>3 X</th>
<th>Feb</th>
<th>Spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1558</td>
<td>1482</td>
<td>1491</td>
<td>1429</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>1006</td>
<td>893</td>
<td>711</td>
<td>755</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>2215</td>
<td>2088</td>
<td>2261</td>
<td>2261</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>366</td>
<td>312</td>
<td>438</td>
<td>461</td>
<td></td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>23</td>
<td>21</td>
<td>29</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Soybeans</th>
<th>Put</th>
<th>3 X</th>
<th>Feb</th>
<th>Spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2660</td>
<td>2731</td>
<td>2821</td>
<td>2644</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>1531</td>
<td>1663</td>
<td>1589</td>
<td>1400</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>3585</td>
<td>3942</td>
<td>4470</td>
<td>3891</td>
<td></td>
</tr>
<tr>
<td>Standard deviation</td>
<td>565</td>
<td>627</td>
<td>786</td>
<td>722</td>
<td></td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>21</td>
<td>23</td>
<td>28</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Wheat</th>
<th>Put</th>
<th>3 X</th>
<th>Sep</th>
<th>Spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2370</td>
<td>2323</td>
<td>2455</td>
<td>2244</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>1887</td>
<td>1719</td>
<td>1741</td>
<td>1716</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>3277</td>
<td>3155</td>
<td>3579</td>
<td>3303</td>
<td></td>
</tr>
<tr>
<td>Standard deviation</td>
<td>466</td>
<td>436</td>
<td>578</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>20</td>
<td>19</td>
<td>24</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

Mean price received: The mean price received from alternative grain marketing strategies is a primary indicator of their relative performance. The grain marketing strategy that returns the highest mean price compared to another will always be the best strategy given that price variability is not a concern. In this study, all three grains are analysed separately according to
their mean price received for each strategy. The highest mean prices for the different grains are as follows, derived from Table 1:

- Maize: Put strategy.
- Soybeans: February strategy.
- Wheat: September strategy.

The mean price for all strategies and all grain types are higher than the Spot price.

Minimum and Maximum: The minimum and maximum prices indicate the low/high range of the marketing strategy price outcomes over the period of 2001 up to 2011. The following strategies had the highest price for each of the three grain types with respect to Table 1:

- Maize: February strategy.
- Soybeans: February strategy.
- Wheat: September strategy.

The Put-strategy covered the bottom price range; the Put strategy also had no effect since the expiry date is July. The strategy with the lowest value is the Spot strategy.

Standard deviation: The standard deviation of the selling price received for a particular market strategy is used as a statistical measure of annual price variability. The higher the standard deviation of annual selling prices of a specific strategy the more variable its return is.

Interpretation of standard deviation of marketing strategies for all three grain types:

- Maize: The Spot strategy has the lowest standard deviation, while the 3x strategy has the highest standard deviation which highlights the importance of the other strategies to reduce the price variability.
- Soybeans: In the case with soybeans the February strategy has the lowest standard deviation, while the Put strategy has the highest standard deviation which highlights the importance of the other strategies to reduce the price variability.
- Wheat: The September strategy has the lowest standard deviation, while the Spot strategy has the highest standard deviation which highlights the importance of the other strategies to reduce the price variability.

Table 1 illustrates that all of the alternative marketing strategies are better than the base strategy (Spot) for all three grain types; however one cannot pinpoint the most efficient strategy from these statistics.
To gain more insight in the distribution of prices associated with each marketing strategy and each grain type it represents, the CDF of each of the strategies for each of the three grain types are portrayed in Figure 1-3.

![Cumulative Distribution Function for alternative maize price marketing strategies.](image)

**Figure 1**: Cumulative Distribution Function for alternative maize price marketing strategies.

The CDF illustrates that if the producers decide to implement the Spot strategy there is a 50% probability that he will receive a lower price than with the other alternative strategies. Thus, the alternative marketing strategies proved to be valuable in increasing prices at the lower probability ranges: the 3x strategy having a higher minimum value and a lower maximum value. The Put strategy has the highest minimum price of an R1000/ton but between 5% and 25% probability it is dominated by the 3x strategy. The Put strategy also has a 75% chance of creating a higher outcome when compared to strategy 3x, and February. The Put strategy only has a 50% chance of obtaining a higher price. Choices between the alternative marketing strategies are difficult since none of the strategies clearly dominates the others and the choice will depend on the risk preferences of decision-makers. However, overwhelming evidence exists that the alternative strategies are capable of increasing minimum prices which is the main purpose of a risk management strategy.
In terms of soybeans the 3x strategy has a 79% probability of obtaining prices higher than spot prices. The Feb strategy has an 80% probability of obtaining higher prices than the other strategies and this probability excludes low price regions. It cannot be concluded that any strategy is better than the other, because it will depend on the risk preferences of the producer.
The September strategy has the highest maximum price and has a probability of 52% of obtaining better prices than R2200/ton relative to the other strategies. However, it is close to the Put strategy and when the two are compared one can state that the September strategy almost have a 100% probability as the difference between the Put and the September is small. The September strategy also has the highest minimum price. Although the September is the dominating strategy it is important to note that all the strategies are better than the Spot strategy.

5.1.2 Utility weighted premiums

Negative exponential utility weighted risk premiums are graphed for decision-makers with varying degrees of absolute risk aversion in Figure 4. Risk neutrality is characterised by a zero absolute risk aversion level and risk aversion increases with increasing levels of absolute risk aversion. The premium at a specific level of risk aversion indicates the difference between CE of the spot market and the alternative marketing with which the spot marketing strategy is compared.
Figure 4: Negative Exponential utility weighted risk premiums relative to Spot for maize

Results indicate that risk averse decision-makers will benefit most from employing the Put strategy. More specifically, the calculated benefit for a risk neutral producer to move from the Spot market strategy to the put strategy is R130 per ton. The benefit increases to over R200 per ton for a decision maker that is severely risk averse. When the 3x strategy is compared to the baseline, the 3x strategy is more favourable. The differences between these two strategies increase as the level of risk aversion increases. For most of the range the absolute difference is more than R25 per ton. At relatively lower levels of risk aversion <0.001 the 3x strategy is less beneficial whereas the 3x strategy dominates at higher levels of absolute risk aversion. The trade-off is that the strategy is governed by the specific form of the CDF. However, more important is the fact that this strategy is significantly more beneficial when compared to the Spot market.

When the rest of the strategies are compared, one can conclude that the February is less beneficial as the level of risk aversion increases. However, it is important to notice that the strategies are significantly more beneficial when compared to the Spot market until a risk aversion between 0.004 and 0.005 is reached.
The 3 x strategy is more suitable for the risk averse producer. The benefit increases to over R200 per ton for a decision maker that is severely risk averse relative to the spot strategy. When 3 x strategy is compared to the baseline the 3x is more suitable. When the rest of the strategies is compared one can conclude that the February is less beneficial as the level of risk aversion increases. Yet again, it is important to note that all the strategies are significantly more beneficial when compared to the Spot market.

Figure 5: Negative Exponential utility weighted risk premiums relative to Spot for soybeans
Employing the Put strategy will be the most beneficial for the risk averse producer with a premium of R119/ton relative to the Spot. For the risk neutral producer the September strategy will be the best with a premium of R210/ton. As the risk aversion level increases the September strategy becomes less beneficial. At higher levels of risk aversion all the strategies are more beneficial than the Spot price.

6. Summary and conclusions

According to Jordaan and Grové (2007) most of the producers in South Africa do not make use of pre-harvesting strategies. One of the reasons for this could be that producers do not have the knowledge to apply complex strategies. Various authors such as O’Brien (2000) and Scheepers (2005) proved that the derivative market is efficient. The main objective of this paper was to evaluate the risk efficiency of alternative basic routine market strategies as well as the probability that a specific strategy will increase the probability of receiving a better price than doing nothing and just delivering on the Spot market. The three strategies that were compared for summer crops with the spot market are selling in three segments (3x) on the futures market, and buying a Put at plant time (Put) buying a put at and a put and sell the produce after pollination (Feb). The same strategies were used for winter crops but February is replaced with September and July with December. This is done because September is identified as a critical time in the global market for wheat and December is the Spot delivery month. The calculations of these strategies can be seen in the Annexure, where white Maize
has been used as an example. Quantifying the risk of the alternative strategies clearly indicated the potential of the alternative marketing strategies to increase minimum prices. The CDFs of the alternatives marketing strategies indicated that the spot strategy has a higher probability of generating lower prices when compared to the alternative strategies. Utility weighted premiums indicated that any of the three basic alternative marketing strategies are better than delivering on the Spot market. Each commodity differs in terms of which strategy dominates over the others which is illustrated in Table 2 for a risk neutral producer:

<table>
<thead>
<tr>
<th>Preferred strategy</th>
<th>CDF</th>
<th>SERF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>put</td>
<td>put</td>
</tr>
<tr>
<td>Wheat</td>
<td>sep</td>
<td>sep</td>
</tr>
<tr>
<td>Soybeans</td>
<td>feb</td>
<td>feb</td>
</tr>
</tbody>
</table>

In the case of summer crops a Put strategy is better to follow for maize, and a February strategy is more suitable for soybeans. For the winter crop wheat, the September strategy is more suitable. However, these strategies were able to realise significantly higher prices compared to the Spot marketing baseline. Thus, the conclusion is that routine pre-harvest marketing strategies that employ little information requirements, might be of significant benefit to grain producers. Cognisance should be taken that the analyses are based on relative short-time series of price information and the probabilities might not be associated with the true underlying probabilities. It also has to be noted that this article focuses on pre-harvest strategies and that post-harvest strategies is a topic for future research and can be combined with pre-harvest strategies.

7. REFERENCES


Grain SA, 2010. Electronic communication with Ms. Petru Fourie at Grain South Africa. on 13/05/2010 Available at petru@grainsa.co.za.


ANNEXURE:

**Table A: Short description of strategy calculations**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Calculation</th>
<th>Net option</th>
<th>Net Cash</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put</td>
<td>Premium = Black Sholes (Dec for delivery Jul) - Premium</td>
<td>Spot (Jul) - Premium</td>
<td>Option = Net option &gt; Net cash or Net Cash = Net cash &gt; Net Option</td>
<td></td>
</tr>
<tr>
<td>3 x</td>
<td>3 different dates</td>
<td></td>
<td></td>
<td>Fixed price contracts for delivery July</td>
</tr>
<tr>
<td>Feb</td>
<td>Price in February</td>
<td></td>
<td>Fixed price contract for delivery July</td>
<td></td>
</tr>
<tr>
<td>Spot</td>
<td>Sell in cash market</td>
<td></td>
<td>Sell at harvesting (Spot - July)</td>
<td></td>
</tr>
</tbody>
</table>