UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Scenario thinking and stochastic modelling for strategic and policy decisions in agriculture

by

Petrus Gerhardus Strauss

A Thesis in partial fulfilment for a PhD degree

Department of Agricultural Economics, Extension and Rural Development

University of Pretoria

September 2009

DECLARATION

I declare that the thesis which I hereby submit for the degree PhD Agricultural Economics at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

SIGNATURE: …….. DATE: **17 September 2009**

ACKNOWLEDGEMENTS

I would hereby like to thank the following people and institutions for their continued support, advice, help and patience in helping me to get this thesis completed:

- My friend and colleague, Ferdinand Meyer. Thank you Ferdi, it's been a huge privilege and adventure working with you on these ideas.
- Prof. Johann Kirsten. Thank you for providing the opportunity, as well as for the continued advice and support, I appreciate it.
- The people at FAPRI, the University of Missouri, and Texas A & M who partly trained me, supported me, and who provided opportunities for developing the idea. Specifically thanks to Pat Westhoff, Julian Binfield, Willi Meyers, Abner Womack, Peter Zimmel, Brent Carpenter, James Richardson, Peter Klein, Oksana Loginova, Vicki Trower, and Joe Truillo.
- Thank you to the Boessens, the greatest family, who housed us and provided many adventures while staying in the US.
- Thank you to Bankies Malan, Venete Klein, Pienaar Viviers, Andrew Makanete, Pine Pienaar and Smiley Kamffer who provided me with the opportunity and support to study while working at Absa Bank.
- Thank you to all the private sector partners who were willing to finance and take part in testing and developing the ideas in this thesis. I would like to thank specifically Pieter Fourie, Jaco Heckroodt, Jeanette de Beer, Marius Nel, Bankies Malan, and Abraham Bekker.
- Thank you to the University of Pretoria for providing me the opportunity to study at such an excellent institution.
- To all my colleagues at BFAP and LEVLO who assisted, directly and indirectly, in getting the thesis done, thank you.
- To my parents (all four of you!), thank you for the opportunities and support that you gave me.
- To my wife, Ilse, thank you for your continued support, encouragement and love – you are the best!
- To God Almighty, thank You: To You be all the honour and glory and praise. Amen.

ABSTRACT

Scenario thinking and stochastic modelling for strategic and policy decisions in agriculture

by

Petrus Gerhardus Strauss

Degree: PhD
Department: Agricultural Economics, Extension and Rural Development
Supervisor: Dr. Ferdinand Meyer
Co-supervisor: Prof. Johann Kirsten
Keywords: scenario thinking, strategy, risk analysis, stochastic modelling, agricultural policy

In 1985, Pierre Wack, arguably the father of modern scenario thinking, wrote the following: *"Forecasts often work because the world does not always change. But sooner or later forecasts will fail when they are needed most: in anticipating major shifts…"* (Wack, 1985: 73). The truth of this statement have again become apparent, first as the "food price crisis" played out during 2007 and 2008, and secondly as the current financial and economic crisis are playing out. Respected market commentators and analysts, both internationally and within South Africa, made all sorts of "informed predictions" on topics ranging from oil prices, interest rates, and economic growth rates to input costs and food prices. The problem is that none of these "respected views" and "informed predictions and estimates" became true within the period that was assigned to these predictions. In fact, just the opposite occurred: the unexpected implosion of the global economy and hence commodity markets.

The result of the experts "getting it so wrong", is that questions are being asked about the reliability of risk and uncertainty analysis. Even though the experts used highly advanced analytical techniques in analyzing the risks and uncertainties in order to formulate

predictions and outlooks, both the "food price crisis" and the economic implosion were totally unanticipated. The same questions need to be asked in terms of risk and uncertainty analyses in agricultural economics. With agriculture experiencing a period of fundamental changes causing significant uncertainty, risk and uncertainty analyses in agriculture will need to move to the next level in order to ensure that policies and business strategies are robust enough to withstand these newly arising uncertainties.

The proposed solution to this problem and therefore the hypothesis offered and tested by this thesis is to work with two techniques in conjunction without combining it when developing a view of the future. The two techniques used, namely intuitive scenario thinking and stochastic modelling are based on two fundamentally different hypotheses namely: the future is like the past and present (stochastic modelling), and the future is not like the past and present but is a result of combining current and unexpectedly new forces or factors (intuitive scenario thinking). The idea behind this stems from the philosophy of Socrates, whereby he postulated that the truth can never be fully known and therefore, when working with the truth, one needs to work with multi-hypotheses about the truth until all but one hypothesis can be discarded. This will then bring one closer to the truth, but never lead you to know the truth in full, since the truth can't be known in full.

Applying this idea means conjunctively using two techniques which are based on the two hypotheses about the future. From a literature review it was realised that two such techniques existed, namely, stochastic modelling and scenario thinking. Stochastic modelling, by its very nature, is based on the assumption that the future is like the past and present since historical data, historical inter-relationships, experience, and modelling techniques are used to develop the model, apply it, and to interpret its results. Scenario thinking on the other hand, and specifically intuitive logics scenario thinking, is based on the notion that the future is not like the past or present, but is rather a combination of existing and new and unknown factors and forces.

At first the perceived problem with this idea was thought to exist in the problem of using both techniques in combination, since the two techniques are fundamentally different

because of the fundamentally different assumptions on which they are based. The question and challenge was therefore whether these two techniques could be used in combination, and how? However, the solution to this problem was more elementary than what was initially thought. As the two techniques are fundamentally different, it implies that the two techniques can't be combined because the two underlying assumptions can't be combined. However, what is possible is to use it in conjunction without adjusting either technique. Rather, one would allow each technique to run its course, which at the same time leads to cross-pollination in terms of ideas and perspectives, where possible and applicable. The cross-pollination of ideas and perspectives will then create a process whereby ideas regarding the two basic assumptions on the future are crystallised and refined through a learning process, hence resulting in clearer perspectives on both hypotheses about whether the future will be like the past and present, or whether the future will be a combination of existing and new but unknown factors and forces. These clearer perspectives provide a framework to the decision-maker whereby the two basic hypotheses on the future can be applied simultaneously to develop strategies and policies that are likely robust enough to be successful in both instances. It also provides a framework whereby reality can be interpreted as it unfolds, which signals to the decision-maker which of the two hypotheses is playing out. This will assist the decision-maker in better perceiving what is in fact happening, hence what the newly perceived truth is in terms of the future, and therefore what needs to be done in order to survive and grow within this newly developing future, reality, or truth.

The presentation of three case studies assists in testing the hypothesis of this thesis as presented in chapter one, and concludes that the hypothesis can't be rejected. Hence, through the presentation of the case studies it is found that using scenario thinking in conjunction with stochastic modelling does indeed facilitate a more complete understanding of the risks and uncertainties pertaining to policy and strategic business decisions in agricultural commodity markets, through fostering a more complete learning experience. It therefore does facilitate better decision-making in an increasingly turbulent and uncertain environment.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES