A Stochastic Budgeting Analysis of Off-farm Investment Strategies for Wool Producers in the New England Region

A Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of Masters of Economics

Andrew Robert Taylor

Department of Agricultural & Resource Economics
University of New England

1995

Declaration

I certify that the substance of this dissertation has not already been submitted for any degree and is not currently being submitted for any other degree.

I certify that, to the best of my knowledge, any help received in preparing this dissertation, and all sources used, have been acknowledged.

[redacted].....

Andrew Robert Taylor

Abstract

An obvious strategy available to Australian farmers to counter the vagaries of market and seasonal variation, is to diversify investments derived from income in favourable times.

The objective of the present research dissertation is to examine the financial implications of alternative off-farm investments to the farm business, whilst analysing the risks involved.

To achieve this objective a stochastic budgeting model of two case study farms in the New England region were simulated, with three different investment options over a ten year period. The investment options include selected representatives from the shares, property and cash type of investment groups.

Each simulation provided probabilistic results to display the likely returns and risk associated with each investment strategy. The results from each strategy were then analysed in two ways. One analysis included the stochastic efficiency criteria of stochastic dominance with respect to a function (SDRF). The second analysis included an approach which relied upon the individual farmer to rank the strategies from a set of illustrated simulation results. With this approach the complex beliefs and preferences of individual farmers were included in the analysis.

After ranking the investment strategies, it was concluded that with the exception of one case study farm with the SDRF criterion, the most preferred investment option was shares on both case study farms. Property and cash differed in ranking between case study farms and between analyses.

Contents

Declaration ii

Abstract iii

List of Tables vii

List of Figures viii

Acknowledgments ix

1. Introduction 1

1.1 Background 1

1.2 Risk 1

1.2.1 Financial risk 2

1.2.2 Business risk 2

1.3 Business Risk Management Strategies 3

1.3.1 Stable enterprise selection 3

1.3.2 Diversification 4

1.3.3 Production flexibility 4

1.3.4 Forward contracts 4

1.3.5 Plant and Machinery 5

1.3.6 Insurance 5

1.3.7 Futures market 5

1.4 Efficiency Criteria 6

1.4.1 First degree stochastic dominance 7

1.4.2 Second degree stochastic dominance 8

1.4.3 Third degree stochastic dominance 8

1.4.4 Stochastic dominance with respect to a function 8

1.5 Research Objective 9

1.6 Chapter Outline 10

2. The Case Studies 11

2.1 Background 11

2.2 Risk Management Objectives 11

2.3 Investment Options 12

2.3.1 Capital reserve 12

2.3.2 Plant and machinery, and farm improvements 12

2.3.3 Lowering debt levels 12

2.3.4 Rural land 13

2.3.5 Off-farm investments 13
2.4 The Case Study Properties 15
2.4.1 Farm A 16
2.4.2 Farm B 16
2.5 Selected Investment Alternatives 17
2.5.1 Shares 17
2.5.2 Property 17
2.5.3 Cash 17

3. Risk Analysis of the Case Studies 18
3.1 Stochastic Budgeting 18
3.2 Simulation 19
3.3 Whole Farm Planning Analysis 20
3.4 The Stochastic Budgeting Model 21
3.4.1 Stochastic Variables 23
3.4.2 Correlations 25
3.4.3 Climate Link 26
3.4.4 Performance Measures 28
3.5 Stochastic Dominance with Respect to a Function 29
3.6 @Risk Presentations 30

4. Results 31
4.1 Data Generation 31
4.2 Analysis of Data 31
4.2.1 Analysis A: Stochastic dominance with respect to a function (SDRF) 31
4.2.2 Analysis B: @Risk presentations 37

5. Discussion and Conclusions 48
5.1 Assessment of Investment Strategies 48
5.1.1 Stochastic dominance with respect to a function (SDRF) 48
5.1.2 @Risk presentations 48
5.1.3 Method comparison 49
5.3 Limitations of the Study 49
5.4 Suggestions for Further Research 50
5.5 Conclusions 51

References 52

Appendix 1: Financial Budgets for Farm A 57

Appendix 2: Financial Budgets for Farm B 63

Appendix 3: Parameters for Stochastic Variables 68

Appendix 4: Stochastic Simulation Results 70

Appendix 5: Correlated Variables 72

List of Tables

Table 2.1 Physical and Financial Features of Case Study Farms 16

Table 4.1 SDRF Ranking of Net Worth and Net Cash Surplus with the Alternative Investment Strategies for Farm A 34

Table 4.2 SDRF Ranking of Net Worth and Net Cash Surplus with the Alternative Investment Strategies for Farm B 37

Table 5.1 Ranking of Alternative Investment Strategies 49

List of Figures

Figure 3.1. The Risk Simulation Methodology 19

Figure 3.2 General Flows of Whole Farm Planning Analysis 20

Figure 3.3 General Flows and Linkages of Stochastic Budgeting Model 22

Figure 3.4: Probability Distribution for Steer Prices as a Normal Function 24

Figure 3.5: Probability Distribution for Steer Weights as a Triangular Function 24

Figure 3.6 Probability Distribution of Annual Rainfall 28

Figure 4.1 Cumulative Distribution Functions of Net Cash Surplus for Farm A in Year 10 with the Three Investment Strategies 32

Figure 4.2 Cumulative Distribution Functions of Net Worth for Farm A after Year 10 with the Three Investment Strategies 33

Figure 4.3 Cumulative Distribution Functions of Net Cash Surplus for Farm B in Year 10 with the Three Investment Strategies 35

Figure 4.2 Cumulative Distribution Functions of Net Worth for Farm B after Year 10 with the Three Investment Strategies 36

Figure 4.5 Net Cash Flow For Farm A with Shares Investment Strategy 40

Figure 4.6 Net Cash Flow For Farm A with Property Investment Strategy 40

Figure 4.7 Net Cash Flow For Farm A with Cash Investment Strategy 41

Figure 4.8 Net Worth For Farm A with Shares Investment Strategy 41

Figure 4.9 Net Worth For Farm A with Property Investment Strategy 42

Figure 4.10 Net Worth For Farm A with Cash Investment Alternative 42

Figure 4.11 Net Cash Flow For Farm B with Shares Investment Strategy 45

Figure 4.12 Net Cash Flow For Farm B with Property Investment Strategy 45

Figure 4.13 Net Cash Flow For Farm B with Cash Investment Strategy 46

Figure 4.14 Net Worth For Farm B with Shares Investment Strategy 46

Figure 4.15 Net Worth For Farm B with Property Investment Strategy 47

Figure 4.16 Net Worth for Farm B with Cash Investment Strategy 47

Acknowledgments

I would like to thank Dr Merv Hill, Dr Kevin Parton and Mr David Thompson for their time and expertise. In particular I am most appreciative of the encouragement offered by Merv and his wife Janet.

The contribution from the wool growers who co-operated in this study is also gratefully appreciated. For confidentiality reasons they will remain nameless.

Finally, I am forever grateful to my family and close friends for their tremendous support throughout my studies. My post graduate studies have proved to be a long hard haul and without their encouragement and their emotional and financial support, I would never have made it.