Using alterative whole-farm modelling approaches to assess farm enterprise selection, risk and welfare

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Objectives

- Impact of budget allocation and risk aversion on indirect utility
- Five-year rolling planning horizon vs. no planning horizon
- Observed practice vs. an optimisation program's predicted results

Case-study farm

- Located in wheat-sheep zone of Australia
- Family owned, focused on merino sheep
- 3300 ha native pasture and 700 ha crops

Modelling approach

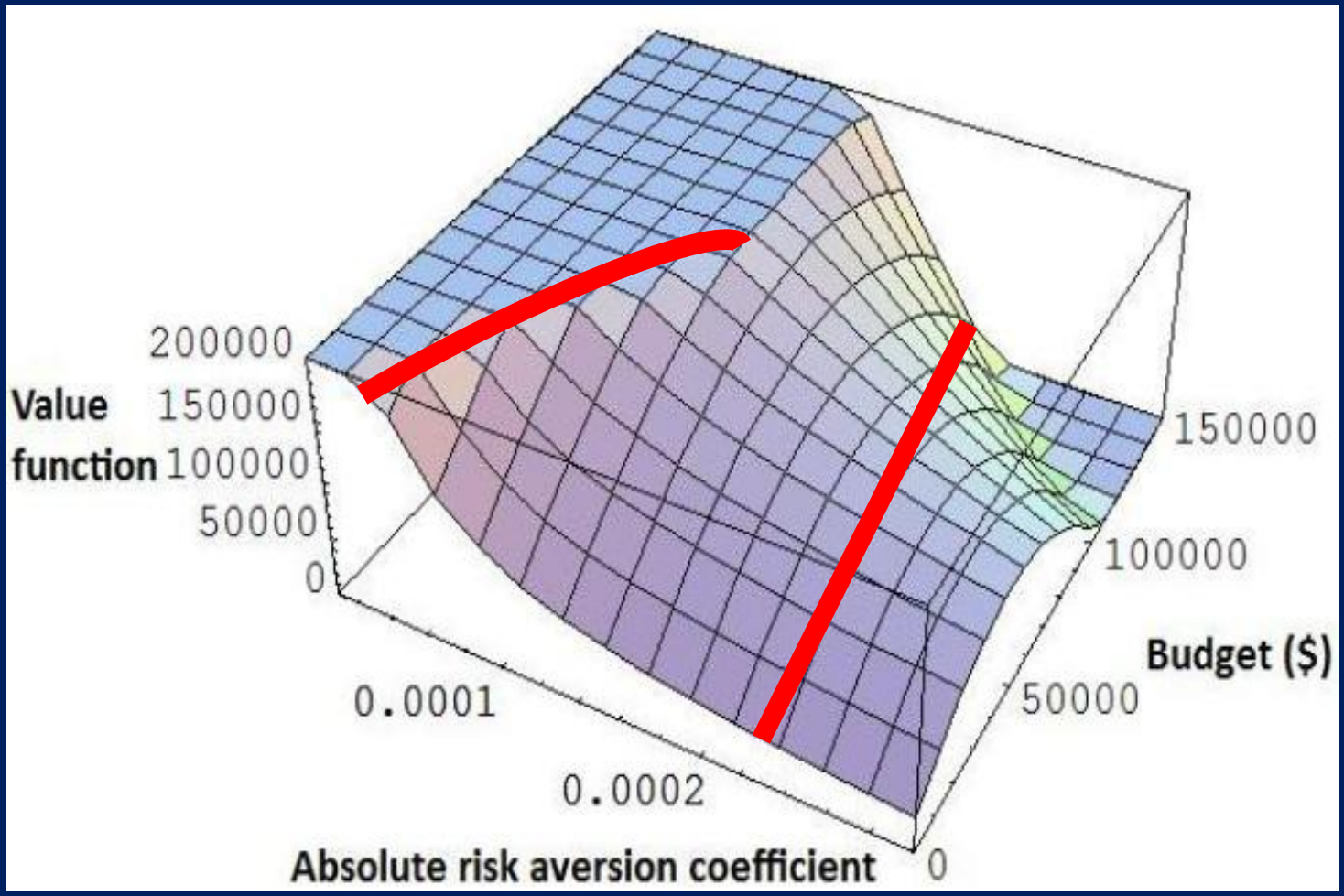
- Expected mean-variance model finds a set of activities that maximises expected total returns for different levels of variance of the total return
- Dynamic model and a static model
- Restrict dynamic model to match farm enterprise mixes

Comparative statics

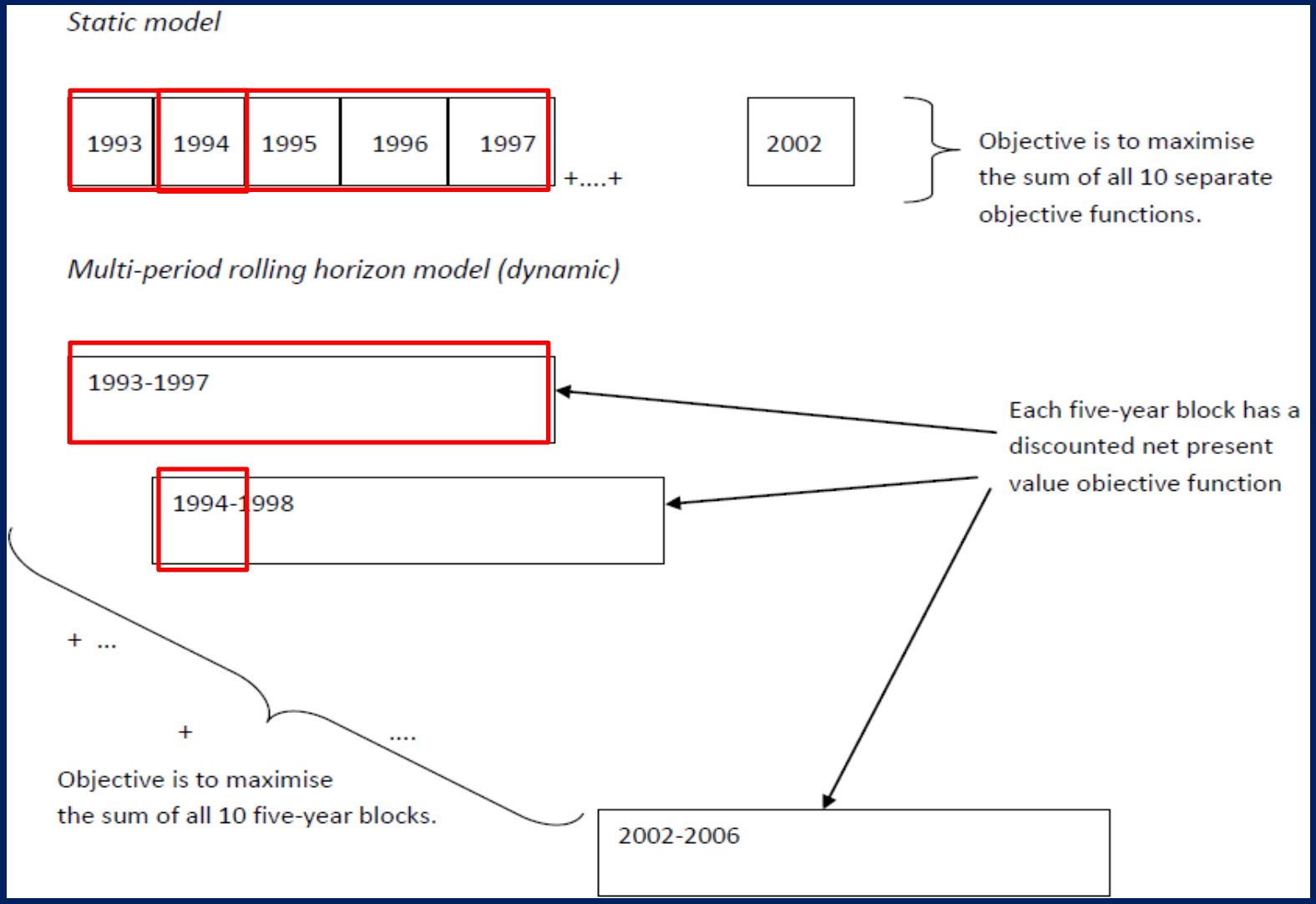
$$Z = c_1 x_1 + c_2 x_2 - \frac{\alpha}{2} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \begin{bmatrix} q_1 & q_{12} \\ q_{21} & q_2 \end{bmatrix} \quad x_1 \quad x_2$$

$$L = Z + \lambda(b - a_1 x_1 + a_2 x_2)$$

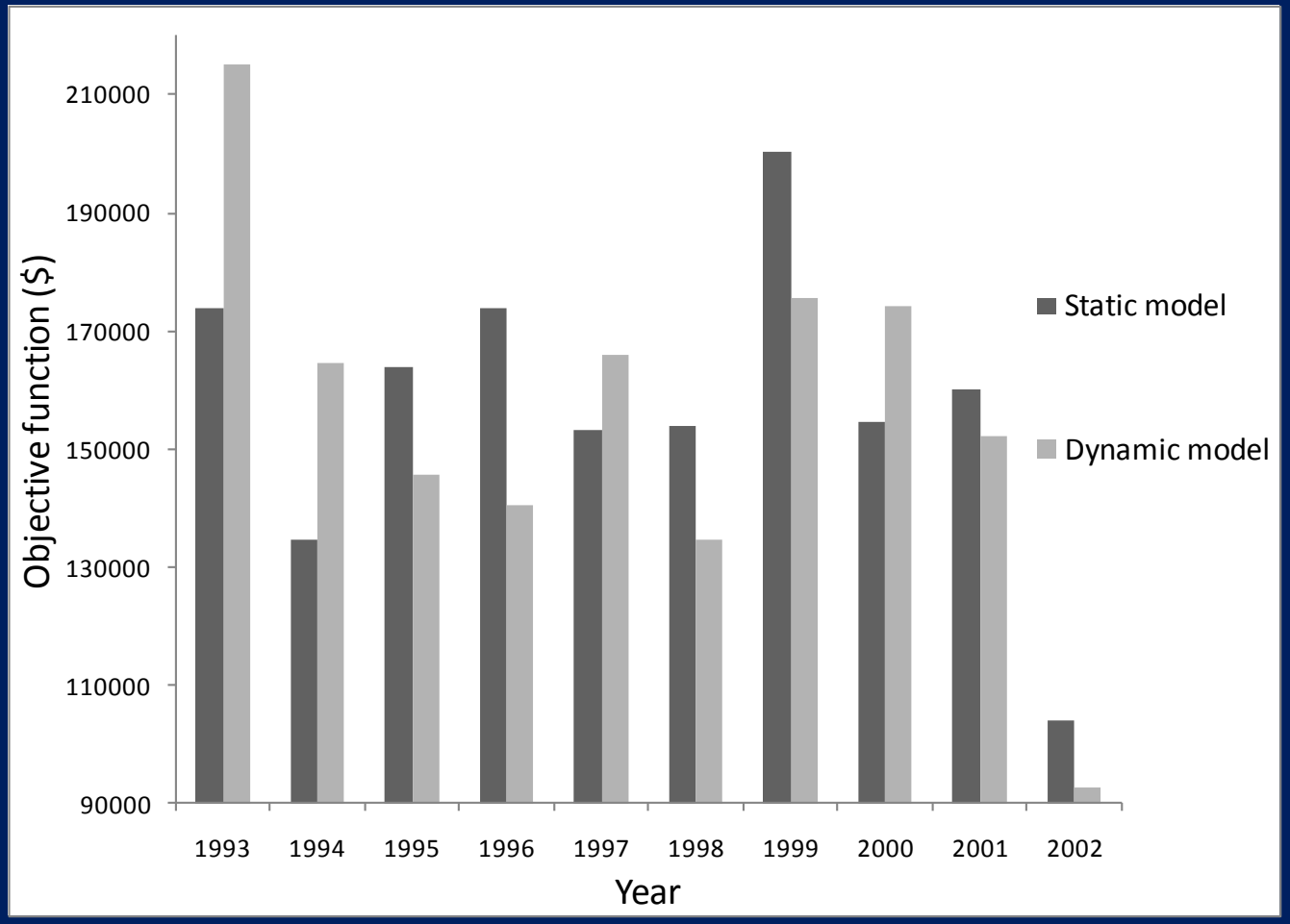
Comparative statics



Whole-farm model objective functions



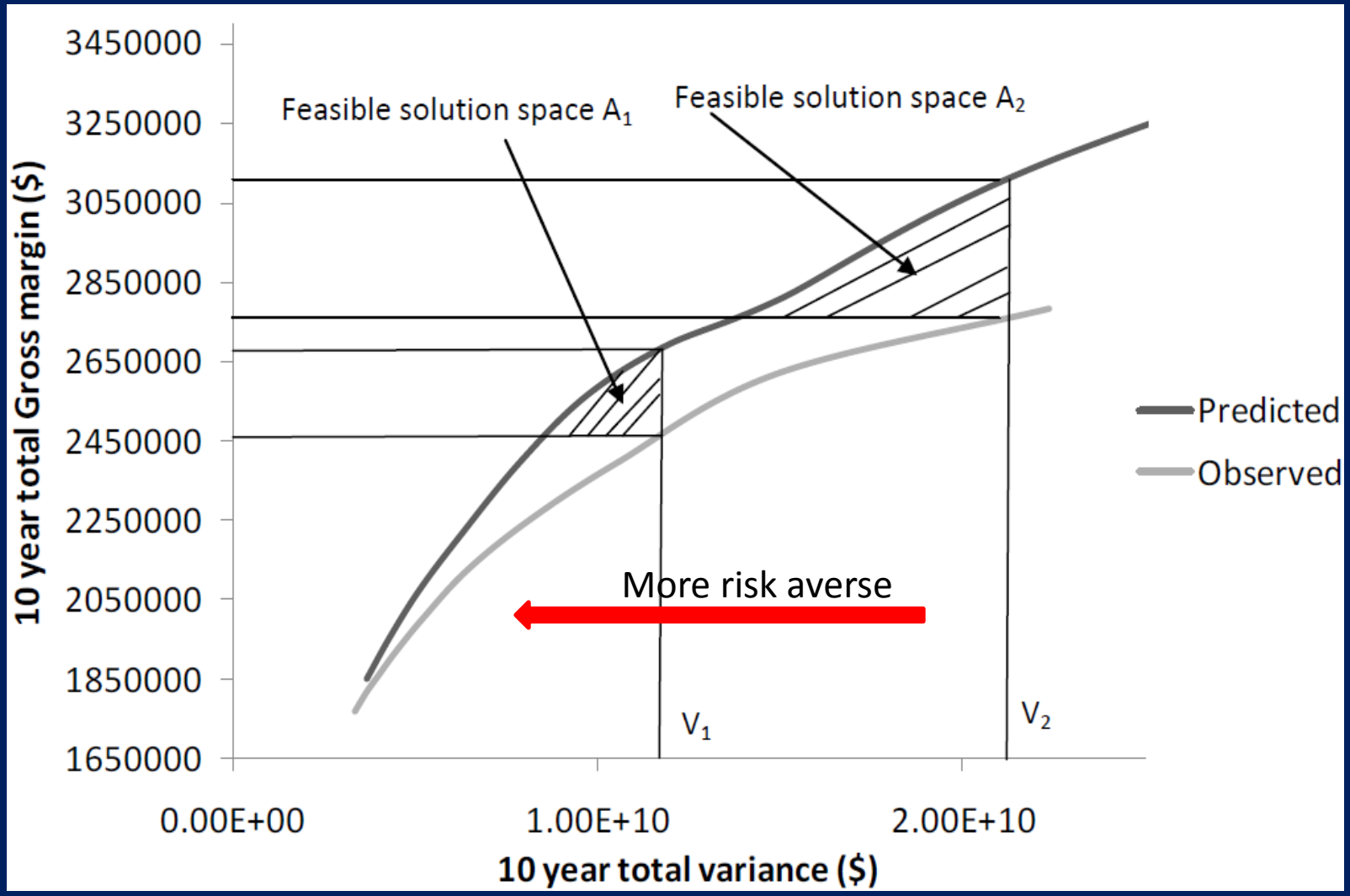
Objective function: static model and first year of each 5 year dynamic model



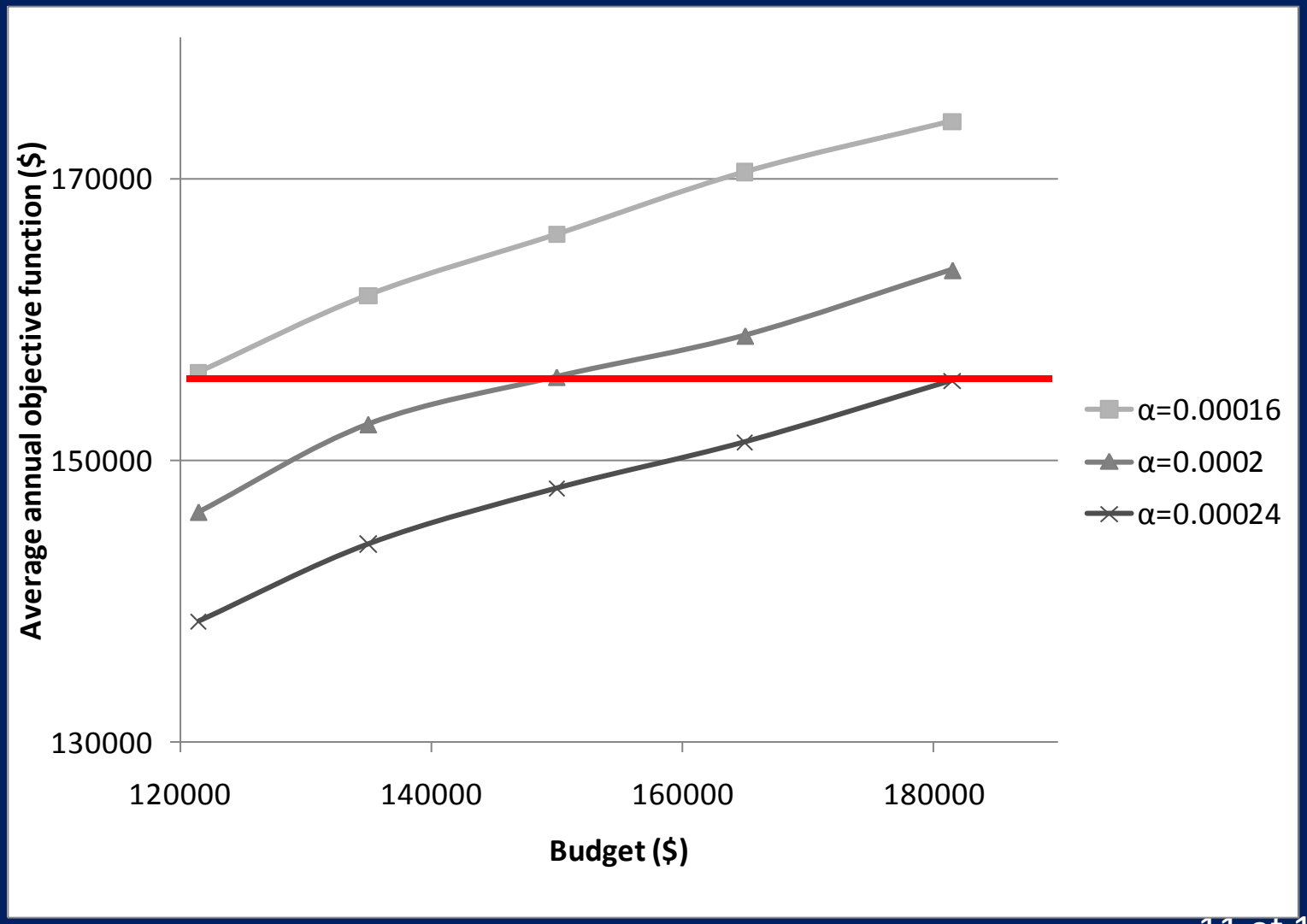
Whole-farm model results for 5 year block

Variable	Static	Dynamic
Objective function ($'000)	196	261
Crossbred lambs (1000 head)	3.88	3.98
Calves (100 head)	1.03	1.82
Area grain (ha)	156	75
Area forages (ha)	446	604
Feed purchased (tonnes)	312	227

Observed vs. predicted model



Budget, risk and objective function



Conclusions

- Smaller operators require a relatively larger budget allocation to obtain the same objective function value as larger operators
- Smaller farmers appear to have fewer options in changing enterprise mixes
- Static and dynamic model differ if compare a 5 year block