

NOVA SCOTIA AGRICULTURAL COLLEGE
Department of Business and Social Sciences
AGRI 5710: Module Course I
Graduate Modules in Production Economics (Modules I, II & III)

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Office Hours:
Monday: 15.00-16.00
Wednesday: 15.00-16.00

Pre-requisites for each Module: Undergraduate ECON 4000 (Advanced Microeconomics) or equivalent, or in consultation with and approval by instructor).

Module Objectives and Overview: The purpose of these modules is to introduce graduate students to theoretical and applied models and techniques used to investigate firm level production economics decisions.

The class will meet for 3 hours a week for 4 weeks, for each of the 3 modules. Class times will be determined by the students in consultation with the module instructor. Each of the 3 modules is offered independent of each other.

Evaluation: For each module, final grade will be based on:

- i) 1 take home assignment [20%]; **and**
- ii) Student to choose between a final in-class test **OR** a term paper [80%]

The term paper may involve a literature review paper or a critical essay of an interesting Agricultural Economics problem that can be solved using some of the techniques from this course.

Textbooks: Three primary textbooks are used:

- Chambers, R. G. 1988. *Applied Production Analysis: A Dual Approach*. New York: Cambridge University Press.
- Beattie, B.R., and C. R. Taylor. 1985. *The Economics of Production*. New York: John Wiley & Sons).
- Varian, Hal R. 1992. *Microeconomic Analysis* Third Edition. New York: W.W. Norton & Company).

Other References:

- Fare, R. and D. Primont. 1995. *Multi-Output Production and Duality: Theory and Applications*. Boston: Kluwer Academic Publishers.

- Mas-Colell, A., M.D. Whinston, and J.R. Green. 1995. *Microeconomic Theory*. New York: Oxford University Press.
- Jorgenson, Dale W. 2000. *Econometrics Volume 1: Econometric Modeling of Producer Behavior*. Cambridge, MA: The MIT Press.
- Shephard, Ronald W. 1970. *Theory of Cost and Production Functions*. Princeton, New Jersey: Princeton University Press.
- Theil, H. 1980. *The System-Wide Approach to Microeconomics*. Chicago: Chicago University Press.

A senior undergraduate Production Economics background material can be found in:

- Doll, John P. and Frank Orazem. *Production Economics: Theory with Applications* Second Edition (Malabar, Florida: Krieger Publishing Company, 1984).

Module Outlines

Module I: Production Functions and Cost Functions

1.1 Production Functions

1.1.1 Concept of the Production Function

- The Single Input Production Function
- The Multiple Input Production Function
- Readings
 - Beattie and Taylor Chapter 2

1.1.2 Properties of the Production Function

- The Production Function Defined
- Properties of the Production Function
- Law of Variable Proportions
- Measure of Simultaneous Input Variation: Elasticity of Scale.
- Readings
 - Chambers Chapter 1
 - Varian Chapter 1
 - Mas-Colell *et al.* Chapter 5B

1.1.3 Input Substitution

- Elasticity of Scale, and Law of Variable Proportion [Chambers 1.6]
- Measures of Input Substitution [Chambers 1.7]
- Structure of Production Function [Chambers 1.8]
- Readings
 - Sato, Ryuzo and Tetsunori Koizumi "On the Elasticities of Substitution and Complementarity." *Oxford Economic Papers* 25(1)(Mar 1973): 44-56.
 - Syrquin, Moshe and Gideon Hollander "Elasticities of Substitution and Complementarity: The General Case." *Oxford Economic Papers* 34(3)(Nov 1982): 515-19.
 - Blackorby, Charles and R. Rober Russell "Will the Real Elasticity of Substitution Please Stand Up? (A Comparison of the Allen/Uzawa and Morishima Elasticities)." *American Economic Review* 79(4)(Sep 1989): 882-888.
 - Thompson, H. "Substitution Elasticities with Many Inputs." *Applied Mathematics Letters* 10(3)(May 1997): 123-27.

1.1.4 Estimation of the Primal Production Function

- Simple Estimation with Ordinary Least Squares and Nonparametric Regression

Readings

- Halter, A.N., H.O. Carter, and J.G. Hocking "A Note on the Transcendental Production Function." *Journal of Farm Economics* 39(4)(Nov 1957): 966-74.

- Gallant, A. Ronald "The Fourier Flexible Form" *American Journal of Agricultural Economics* 66(2)(May 1984): 204-8
- Kmenta, J. "On Estimation of the CES Production Function" *International Economic Review* 8(2)(Jun 1967): 180-9.
- McCarthy, Michael D. "Approximation of the CES Production Function: A Comment." *International Economic Review* 8(2)(Jun 1967): 190-2.
- Mundlak, Yair "Production Function Estimation: Reviving the Primal" *Econometrica* 64(2)(Mar 1996): 431-438.

Module II: Cost Functions and Profit Maximization

2.1 Cost Functions

2.1.1 Definition and Properties of the Cost Function

- Readings
 - Chambers Chapter 2.1-2.2
 - Fuss, M. and D.L. McFadden *Production Economics: A Dual Approach to Theory and Applications* Amsterdam: North-Holland, 1978.

2.1.2 Cost Minimization

- Derived Demand (output conditional)
- Cost Function
- Marginal Cost
- Readings
 - Varian Chapters 2,3,4
 - Mas-Colell *et al.* Chapter 5C

2.2 Profit Functions

- Definition of the Profit Function [Chambers 4.2]
- Comparative Statics of the Profit Function [Chambers 4.3]
- The Profit Function and Duality [Chambers 4.4]

2.3 Duality

2.3.1 Comparative Statics and Duality of the Cost Function

- Readings
 - Chambers 2.3-2.4

2.3.2 Shephard's Duality Proof

2.3.3 An Application of Duality

- Readings
 - Diewert, W.E. "An Application of the Shephard Duality Theorem: A Generalized Leontief Production Function." *Journal of Political Economy* 79(3)(May-June 1971): 481-507.

2.4 Estimation of Cost Functions

2.4.1 Cost Functions and the Estimation of Flexible Functional Forms

- Flexible Function Forms [Chambers 5.1 and 5.2]
- Fourier Function Forms
- Estimation of Seemingly Unrelated Regression Models

Module III: Advance Topics in Production Economics

3.1 Stochastic Production Functions

Readings

- Bernardo, D.J., N. Coulibaly, and G.W. Horn. "Use of a Stochastic Production Function to Evaluate the Effect of Energy Supplementation of Wheat Pasture Stocker Cattle on Production Risk." Working Paper.
- Buccola, Steven T. and Bruce A. McCarl "Small-Sample Evaluation of Mean-Variance Production Function Estimators." *American Journal of Agricultural Economics* 68(3)(Aug 1986): 732-8.
- Just, Richard E. and Rulan D. Pope "Stochastic Specification of Production Functions and Economic Implications." *Journal of Econometrics* 7(1)(Feb 1978): 67-86.
- Just, Richard E. and Rulan D. Pope "Production Function Estimation and Related Risk Considerations." *American Journal of Agricultural Economics* 61(2)(May 1979): 276-84.

3.2 Technical Change and Efficiency: Theory and Measurement

3.2.1 Measuring Productivity Change

- Measurement of Technical Change from Indirect Objective Functions [Chambers 6.2]
- Divisia Indices and Technical Change [Chambers 6.3]
- Total Factor Productivity [Chambers 6.4]

3.2.2 Measuring Technical Efficiency

- Technical Efficiency
- Data Envelope Analysis
- Directed Distance Functions

3.3 Risk in Agriculture

Readings:

- Hardaker, J.B., R.B.M. Huine, J.R. Anderson, and G. Lien. 1997. *Coping with Risk in Agriculture*. Second Edition. Cambridge, MA: CABI Publishing. (Chapter s2 & 3)
- Robison L.J., and P.J. Barry. 1987. *The Competitive Firm's Response to Risk*. New York: MacMillan Publishers. (chapters 3 & 9)
- Levy, H. 1998. *Stochastic Dominance: Investment Decision Making Under Uncertainty*. Boston, MA: Kluwer Academic Publishers.