Online Quizzes and Exam on Demand and Price Analysis

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Abstract

The manuscript presents three quizzes and exam on demand and price analysis taught in a senior level "Prices" course. The quizzes and exam are developed for conducting student assessment in an on-line format using Canvas. The quizzes and exam cover several topics on demand and price analysis, which are explained in standard textbooks in the areas of agricultural markets and prices, and managerial economics. The answers to questions are structured using a multiple-choice format. The answer keys are provided. The manuscript also presents a summary of lecture topics, a list of economic concepts and definitions, and a summary of economic and econometric models used in the empirical demand and price analysis.

Key words: Canvas, demand and price analysis, online assessment.

Summary

The online quizzes and exam are developed for lecture topics on demand and price analysis taught in a senior level "Prices" course in the Agribusiness program at Clemson University. The average class size of students assessed using these quizzes and exam was approximately 50 students. The lecture topics are summarized in Table 1. The economic concepts and definitions, which students are supposed to learn are summarized in Table 2.

The majority of lecture topics are explained in standard textbooks in the areas of agricultural markets and prices, and managerial economics (Hirschey 2006; Hudson 2007; Norwood and Lusk 2007; Tomek and Kaiser 2014). The recommended textbooks to use in this course are "Agricultural Markets and Prices" by Hudson (2007) and "Agricultural Product Prices" by Tomek and Kaiser (2014). Table 1 presents recommended pages to read from these two textbooks in the case of each lecture topic.

The main teaching resource for this course is a course pack developed by the author, which includes all lecture notes, problem sets and assignments on the lecture topics summarized in Table 1. In addition, the course pack provides lecture notes and assignments for the topics that are not discussed in greater details in the textbooks, but relevant questions are included in the quizzes and exam. These are the topics about empirical demand and price analysis based on the inverse demand framework applied so as to analyze agricultural product price-quantity relationships at the farm-gate level (Bolotova 2019), as well as the topic of a vertical price transmission.

Table 3 provides a summary of economic models, and Table 4 provides a summary of econometric models used for the empirical demand and price analysis. These summaries were distributed to students during the review session for the exam conducted during a regular in-person class session.

While the lecture topics were taught in a regular in-person class setting, students had to complete the quizzes and exam on Canvas during a regular in-person class session. The instructor entered questions and answers in "Quizzes" section on Canvas. Once students submitted their answers on Canvas, the quizzes and exam were automatically graded by Canvas. For the majority of students, each quiz required no more than 20 minutes to complete. The exam was also given during a regular in-person class session. The exam was designed to be completed in 1 hour and 15 minutes. This was a midterm exam. The time students took to complete the exam varied from 30 minutes to 1 hour and 15 minutes. The majority of students completed the exam in less than one hour.

Given that these quizzes and exam were administered during in-person class meetings, students were provided with paper copies for their convenience. It was recommended to complete the quizzes and exam on paper first and then enter the answers in Canvas. If these assessment materials are to be used in an online format, the PDF files with quizzes and exam can be posted on Canvas 10 to 15 minutes before administering the quiz or exam. Students can print them out and complete them on paper first if they prefer.

The maximum number of points students can earn on each quiz and exam is 100 points. Quiz#1 includes 35 questions, quiz #2 includes 28 questions, and quiz #3 includes 25 questions. In the case of quizzes, there are base points students received by confirming a simple statement at the end. The exam includes 50 questions. The exam does not have base points; all 100 points are allocated to 50 questions. The majority of students (approximately 65%-70%) earned at least 80 points on these quizzes and exam.

References

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Hudson, D. 2007. Agricultural Markets and Prices. Blackwell Publishing.

Norwood, F.B., and J.L. Lusk. 2007. Agricultural Marketing and Price Analysis. Pearson Prentice Hall.

Tomek, W.G., and H.M. Kaiser. 2014. Agricultural Product Prices. Cornell University Press.

Table 1. Demand and price analysis: Summary of lecture topics and recommended readings.

	Lecture topic	Recommended chapters and pages	
		Agricultural Markets and Prices by Hudson	*Agricultural Product Prices by Tomek and Kaiser*
Lecture #1	Consumer demand: Utility theory	Ch.1 pages 11-16 and 34-37	Ch. 2 pages 9-16
Lecture #2	The overview of basis for demand	Ch.1 pages 16-21 and 26-28	Ch. 2 pages 16-28
Lecture #3	Demand analysis	Ch. 1 pages 21-26 and 31	Ch. 3 pages 29-49
Lecture #4	Empirical demand and price analysis	Ch.1 pages 28-32 Ch.7 pages 104-123	Ch. 14 pages 307-344 Ch. 15 pages 345-369
	MIDTERM EXAM		

Table 2. Demand and price analysis: Summary of economic concepts and definitions.

Lecture #1 Consumer Demand: Utility Theory
1. Consumer economic objective. Be able to set up a simple model of consumer behavior: consumer maximizes the total utility subject to the budget constraint. Know the variables included in this model. 2. Total utility definition. Total utility function: structure and variables. Know that total utility represents consumer preferences. 3. Budget constraint: structure and variables. Know that budget constraint represents consumer income (budget) and its allocation between spending on two products (in a simple two-product problem). 4. Consumer preferences: key assumptions. 5. Total utility and marginal utility: definitions and differences. 6. Law of diminishing marginal utility. 7. Indifference curves: definition and properties. Know that indifference curve is a graphical representation of the utility function. 8. Product classifications: products-substitutes (perfect and imperfect); products-complements. 9. Consumer income and budget constraint. Know how to set up a budget constraint (assume a two-product problem). Know that budget line is a graphical representation of the budget constraint. 10. Budget line: shift versus rotation (a graphical analysis). 11. Optimal consumption bundle: definition and graphical analysis. 12. Tangency condition: understand the structure and meaning. 13. Marginal rate of substitution (MRS). Know that MRS is the ratio of marginal utilities and the slope of the indifference curve on a graph. 14. Understand the meaning of the price ratio. Know that the price ratio is the slope of the budget line on a graph. 15. Know how to calculate the optimal consumption bundle by using the tangency condition and budget constraint (analytical analysis). Know how to show the optimal consumption bundle, indifference curve and budget line on the same graph (graphical analysis). Understand the properties of the consumption bundles located to the left and to the right of the budget line on which the optimal consumption bundle is situated.
Lecture #2 Basis for Demand
1. Demand: definitions. Demand function and demand curve. 2. Individual demand and market demand. 3. Direct (final or primary) demand and derived (intermediate) demand. 4. Quantity-dependent univariate demand function. Know how to write down a representative demand function. 5. Quantity-dependent multivariate demand function and demand determinants. Know how to write down a representative demand function. 6. Understand the difference between a change in the product quantity demanded due to a movement along the same demand curve (i.e. due to a change in the own price) and a change in the product quantity demanded due to a shift of the original demand curve (i.e. due to a change in any demand determinant, but the own price). Be able to show these two situations on a graph. 7. Know how to interpret the coefficients in the demand functions and how to use these coefficients to analyze (to predict) changes in demand.

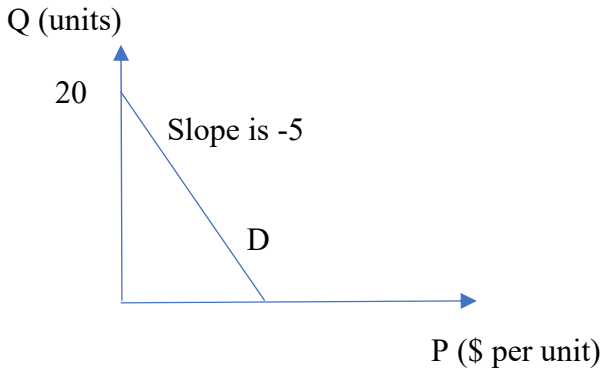
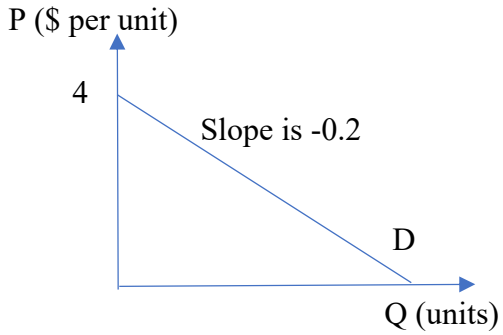
Table 2 (cont.)

Lecture #3 Demand Analysis
1. Ordinary demand (a quantity-dependent demand function) and inverse demand (a price-dependent demand function): the differences. 2. Know how to derive inverse demand function, if you are given ordinary demand function. 3. Know how to derive ordinary demand function, if you are given inverse demand function. 4. Know how to show demand curves representing the ordinary demand function and inverse demand function on a graph. 5. The elasticity concept: definition and general formula. 6. Know how to interpret any elasticity. 7. Point-specific elasticities. 8. Ordinary demand elasticity and inverse demand elasticity, which is referred to as price flexibility: the difference. 9. Know how to calculate and interpret the own-price elasticity, cross-price elasticity and income elasticity in a multivariate quantity-dependent (ordinary) demand function. 10. Know how to calculate and interpret price flexibility in a price-dependent (inverse) demand function. 11. Know how to use the own price elasticity of demand to analyze (to predict) changes in quantity demanded. 12. Know how to use the price flexibility to analyze (to predict) changes in price.
Lecture #4 Empirical Demand and Price Analysis
1. Know how to develop (to write down) an economic model of consumer demand to be used to specify an econometric model in order to conduct empirical demand analysis. 2. Know how to develop (to write down) an economic model of intermediate demand at the farm-gate level to be used to specify an econometric model in order to conduct empirical price analysis. 3. Know how to develop (to write down) an economic model of vertical price transmission to be used to specify an econometric model in order to conduct empirical price analysis. 4. Know how to develop (to write down) an econometric (regression) model to be used to estimate consumer demand functions at the retail level. 5. Know how to develop (to write down) an econometric (regression) model to be used to estimate intermediate demand functions at the farm-gate level. 6. Know how to develop (to write down) an econometric (regression) model to be used to estimate the input-output price relationship in a vertical price transmission framework. 7. Know how to use Excel (or any other suitable for you software program) to estimate econometric models. 8. Know how to use the Excel regression output to write down the estimated econometric (regression) models. 9. Understand the difference between the dependent and independent variables. 10. Know how to interpret the magnitude of the estimated coefficients. 11. Know the difference between a simple linear regression model and a multiple linear regression model. 12. Know the difference between a linear regression model and a log-linear regression model. 13. Know that the estimated coefficients in linear regression models are marginal effects (partial derivatives: use the variables' units of measurement to interpret the coefficients).

Table 2 (cont.)

Lecture #4 Empirical Demand and Price Analysis (cont.)
14. Know that the estimated coefficients in log-linear regression models are elasticities (percentage changes). 15. Understand the OLS estimation procedure. 16. Know how to interpret the Excel regression output: • Coefficient of determination (R2) • The magnitude of the estimated coefficients • Statistical significance of the estimated coefficients • Overall performance of a regression model. 17. Know how to conduct a T-test, which includes • Stating the null hypothesis and the alternative hypothesis • Selecting a significance (alpha) level and a corresponding cut-off value of T-statistic • Concluding on statistical significance of the estimated coefficient using a T-statistic from the regression output and the chosen cut-off value of T-statistic. 18. Know how to calculate T-statistic.

Table 3. Demand and price analysis: Summary of economic models.

Quantity-dependent linear demand function (ordinary demand)	**Price-dependent linear demand function (inverse demand)**
General formula: Y = *a* - *b*X Causation effect direction: a change in X causes Y to change Two alternative interpretations of *b*: an increase in X by 1 unit causes Y to decrease by *b* units a decrease in X by 1 unit causes Y to increase by *b* units	
Q is dependent variable (Y) P is independent variable (X)	P is dependent variable (Y) Q is independent variable (X)
Q = *a* - *b*P Q is product quantity measured in units P is product price measured in $ per unit *Example: Q = 20 – 5P*	P = *a* - *b*Q P is product price measured in $ per unit Q is product quantity measured in units *Example: P = 4 – 0.2Q*
Causation effect direction: a change in P causes Q to change *Example: a $1 per unit increase (decrease) in P causes Q to decrease (to increase) by 5 units*	Causation effect direction: a change in Q causes P to change *Example: a 1unit increase (decrease) in Q causes P to decrease (to increase) by $0.20 per unit*
	

Rearrange ordinary demand function ***Q = 20 – 5P*** *to express P as a function of Q to derive inverse demand function: 5P = 20 – Q;* ***P = 4 – 0.2Q.***

Table 4. Demand and price analysis: Summary of econometric models.

A linear regression model	**A log-linear regression model (or a log-log model)**
Quantity-dependent demand function	
Econometric model to be estimated $Q = \alpha + \beta P + \varepsilon, \beta < 0$ Q is product quantity measured in units P is product price measured in $ per unit *Example of the estimated demand function:* *$Q = 20 - 5P$*	Econometric model to be estimated $\ln Q = \alpha + \beta \ln P + \varepsilon, \beta < 0$ lnQ and lnP are transformed in natural log form Q and P *Example of the estimated demand function:* *$\ln Q = 5 - 2\ln P$*
β interpretation: it is a marginal effect *a $1 per unit increase (decrease) in P causes Q to decrease (to increase) by 5 units*	β interpretation: it is an elasticity *a 1% increase (decrease) in P causes Q to decrease (to increase) by 2%*
β formula: the derivative of Q with respect to P $\beta = \frac{change\ in\ Q}{change\ in\ P}$	β formula: $\beta = \frac{\%\ change\ in\ Q}{\%\ change\ in\ P} = \frac{change\ in\ Q}{change\ in\ P} * \frac{P}{Q}$
Price-dependent demand function	
Econometric model to be estimated $P = \alpha + \beta Q + \varepsilon, \beta < 0$ P is product price measured in $ per unit Q is product quantity measured in units *Example of the estimated demand function:* *$P = 4 - 0.2Q$*	Econometric model to be estimated $\ln P = \alpha + \beta \ln Q + \varepsilon, \beta < 0$ lnP and lnQ are transformed in natural log form P and Q *Example of the estimated demand function:* *$\ln P = 2 - 0.5\ln Q$*
β interpretation: it is a marginal effect *a 1unit increase (decrease) in Q causes P to decrease (to increase) by $0.2 per unit*	β interpretation: it is an elasticity (a price flexibility in the demand analysis) *a 1% increase (decrease) in Q causes P to decrease (to increase) by 0.5%*
β formula: the derivative of P with respect to Q $\beta = \frac{change\ in\ P}{change\ in\ Q}$	β formula: $\beta = \frac{\%\ change\ in\ P}{\%\ change\ in\ Q} = \frac{change\ in\ P}{change\ in\ Q} * \frac{Q}{P}$