



**ECON490/860**  
**Advanced Microeconomics**

**Semester 1, 2009**

*Department of Economics*

## **ADVANCED MICROECONOMICS**

### **1. Aims and Coverage of the Course.**

The philosophy underlying the Economics Honours and Masters program is that it aims to take highly capable graduates and introduce them to the professional literature in Economics. One consequence of that aim is that courses, such as Advanced Microeconomics, need to be wide ranging in topic coverage and pitched at an appropriately sophisticated level in order to give students the sort of exposure which will equip them for their encounters with the professional literature. The topics in the Advanced Microeconomics course outlined below, and the Textbook, References and Journal Articles selected to explain those topics, have all been chosen with that aim in mind.

### **2. Textbook and References.**

The **textbook** for the course is:

A. Mas-Colell, M. D. Whinston and J. R. Green (1995), *Microeconomic Theory*. Oxford University Press, New York and Oxford.

**Reference** will also be made from time to time to the following works:

J. Eatwell, M. Milgate and P. Newman (1987) eds., *The New Palgrave Dictionary of Economics* (1<sup>st</sup> Edition). MacMillan, London, (abbreviated throughout as NPDE1).

M. C. Blad and H. Keiding (1990), *Microeconomics: Institutions, Equilibrium and Optimality*. North-Holland, Amsterdam.

D. M. Kreps (1990), *A Course in Microeconomic Theory*. Harvester-Wheatsheaf, N.Y.

G. A. Jehle (1991), *Advanced Microeconomic Theory*, Prentice Hal, Englewood Cliffs.

R. Cornes (1992), *Duality and Modern Economics*. Cambridge University Press, Cambridge.

H. R Varian (1992), *Microeconomic Analysis*. Norton, N.Y. (3rd Edition).

D. G. Luenberger (1995), *Microeconomic Theory*, McGraw-Hill, New York.

L. W. McKenzie (2002), *Classical General Equilibrium Theory*, MIT Press, Cambridge Mass.

S. N. Durlauf and L. E. Blume (2008) eds., *The New Palgrave Dictionary of Economics*, (2<sup>nd</sup> Edition) London: Palgrave-Macmillan, (abbreviated throughout as NPDE2).

W. D. A. Bryant (2009), *General Equilibrium: Theory and Evidence*, World Scientific and Imperial College Press, London.

### **3. Tutorials.**

For details see the Tutorial handout.

### **4. Assessment.**

#### **Assignment 1: Tutorials**

You need to submit *any ten (10)* of the twelve (12) Tutorials in the course. These will be marked on the basis S<sup>+</sup> ('Satisfactory plus' = 2 marks), or S ('Satisfactory' = 1 marks) or S<sup>-</sup> ('Satisfactory minus' = 0 marks). The maximum value of the Tutorials is 20 marks.

#### **Assignment 2 : Essay**

Choose any one of the essays to be distributed a little later in the course. Submit the essay by the due date, which is the morning of the first exam in Advanced Microeconomics. The total value of the Essay is 10.

#### **Final exam**

For Honours students taking this course, there will be two (2) three hour (3 hr) final exams in this subject (details to be supplied nearer the time). For Masters students taking this course, there will be one (1) three hour (3hr) final exam.

#### **Assessment:**

*You have to pass the final exam to pass the course.* We have had to introduce this condition across the board because it has become apparent that the integrity of the in course assessment process has potentially become degraded by the existence of 'web resources' and other things which potentially mean that the person getting the credit is not necessarily the person doing the work. I'm pretty sure this won't be happening at this level but it is a blanket rule in the Department so it has been adopted here.

That said, the arithmetic of assessment works as follows:

Exam is worth 100 marks, Tutorials are worth 20 marks, Essay is worth 10 marks.

Final grade expressed out of 100.

All the best and I hope you learn something from the course.

## Coarse Diary<sup>1</sup>

---

| Teaching Week | Lecture | Other things happening |
|---------------|---------|------------------------|
| 1             | 1       |                        |
| 2             | 2       | Tute 1 Due             |
| 3             | 3       | Tute 2 Due             |
| 4             | 4       | Tute 3 Due             |
| 5             | 5       | Tute 4 Due             |
| 6             | 6       | Tute 5 Due             |
| 7             | 7       | Tute 6 Due             |
| 8             | 8       | Tute 7 Due             |
| 9             | 9       | Tute 8 Due             |
| 10            | 10      | Tute 9 Due             |
| 11            | 11      | Tute 10 Due            |
| 12            | 12      | Tute 11 Due            |
| 13            | 13      | Tute 12 Due            |

---

FIRST WEEK OF EXAMINATIONS  
SECOND WEEK OF EXAMINATIONS

---

---

<sup>1</sup> “Misspelling” intended because this dairy is intended to be a rough guide to the rate at which I think we will progress through the material. However, it will not be adhered to at the expense of your understanding. If something is taking a bit longer to deal with than is envisaged in this diary (or if we get through some topic faster than I imagined we would), then so be it. Your learning is what matters here, not a regimented march through the subject.

## **COURSE OUTLINE**

**Lecture 1:** Microeconomics and the Arrow – Debreu model.

**Lectures 2, 3 and 4:** Arrow – Debreu Consumers.

**Lecture 5:** Arrow – Debreu Producers.

**Lecture 6:** The Existence of equilibrium.

**Lecture 7:** Uniqueness of equilibrium.

**Lecture 8:** Stability of equilibrium.

**Lecture 9:** Optimality and the Welfare Theorems.

**Lecture 10:** Comparative Statics of equilibrium.

**Lecture 11:** Some applications of the Arrow – Debreu model.

**Lecture 12:** Empirically testing the Arrow – Debreu model.

**Lecture 13:** Some extensions of the Arrow – Debreu model

## **Lecture 1 Introduction, motivation and the Arrow-Debreu model**

### **1.1 The Field of Microeconomics**

See *Journal of Economic Literature* 'Classification System' for Articles

This standard classification may give you some idea of the scope of the subject.

### **1.2 The Framework of Microeconomics**

A. Mas-Colell, M. Whinston and J. Green (1995), *Microeconomic Theory*, Oxford, pp. 3-4.

Very brief introduction to and overview of the nature and structure of Microeconomics.

D. Kreps (1990), *A Course in Microeconomic Theory*, Harvester-Wheatsheaf, Ch. 1.

Introduces the “Actors, behaviour, institutions and outcomes” picture, which can be a very useful organising device.

M. Blad and H. Keiding (1990), *Microeconomics: Institutions, Equilibrium and Optimality*, Ch. 1.

Gives an overview of Microeconomics with particular emphasis on the environment in which agents are imagined to be operating and introduces some of the available equilibrium concepts by which their behaviour might be modelled.

### **1.3 Methodology and Scientific Method**

E. Silberberg (1978), *The Structure of Economics*, pp. 1-20.

Introduces the idea that Microeconomics exploits the information contained in the maximisation hypothesis to make predictions about the comparative statics of economic agents, (‘the Samuelson program’).

P. Suppes (1987), "Axiomatic theories", *NPDE1* (1), pp. 163-165.

Defines the notions of primitives, axiom, proof and theorem as well as indicating the flexibility of “axiomatics”.

A. Jehle (1992), *Advanced Microeconomics*, pp. 1-3.

Useful summary of basic scientific method.

C.W.J. Granger (1992), "Fellows Opinion: Evaluating Economic Theory",  
*Journal of Econometrics*, pp 3-5.

Presents an interesting perspective on 'testing the theory'.

#### **1.4 The Framework of the Arrow-Debreu Model**

Mas-Colell, Whinston and Green (1995), pp. 511-513.

Very brief introduction to the A-D model and the field of general equilibrium theory.

J. Geanakoplos (2008), "Arrow-Debreu model of general equilibrium", (in)  
*NPDE2*.

A very useful guide to the Arrow-Debreu model. At this stage it is probably easiest for you to read just the first three pages and glance at the rest. You might like to retain the article as a map of where we are going.

#### **Lectures 2, 3 and 4 Arrow-Debreu Consumers**

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 5-9, 17-22, 40-50.

This introduces the basic notions of "commodity", "preference relation", "budget set" and "utility function".

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 50-56, 23-28.

This section presents some of the basic results which make up neo-classical or Arrow-Debreu consumer theory.

L. W. McKenzie (2002), pp. 15–22.

Gives a very nice, compact treatment of demand theory via what we have called the 'primal' approach. Includes a neat derivation of the Slutsky equation. See also pp. 36–38 for a discussion of the remarkable Mitushin-Polterovich theorem.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 28-36, (optional pp. 91-92).

Presents information about the Slutsky matrix and also introduces the Weak Axiom of Revealed Preference (and optionally the Strong Axiom of Revealed Preference).

L. W. McKenzie (2002), pp. 22–25.

Gives a thorough and uncluttered account of the revealed preference approach.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 56-63 and 67-75 (pp. 64-67 optional).

This introduces the “Duality” approach to consumer theory. There are in a sense no new results here, but there are number of new techniques which are now pervasive in economic analysis.

L. W. McKenzie (2002), pp. 1–13.

Discusses the dual approach to consumer demand. Note there are some notational differences between the approach of McKenzie and that of Mas-Collell *et. al.*, Varian and co.

M. Blad and H. Keiding (1990), Ch. 2.

Defines the notion of a “consumer”; writes down neoclassical choice theory and derives the comparative statics of neoclassical consumers acting in an Arrow-Debreu environment.

V. Bohm and H. Halket (1987), "Demand theory", *NPDE1* (1), pp. 785–792.

Compliment to Mas-Colell, Whinston and Green and gives a very complete (reference level) account of consumer choice and demand theory.

L. W. McKenzie (2002), pp. 13–15.

This section presents a nice discussion of the classic Sonnenschein theorem on choice without transitivity. Such discussions are hard to find outside the research literature and this one in particular would repay careful study.

C. Blackorby (2008), “Lexicographic orderings”, (in) *NPDE2*.

Nice discussion of an interesting (and widespread?) class of preferences.

E. Silberberg (2008), “Hicksian and Marshallian Demand Curves”, (in) *NPDE2*.

A nice account of Arrow – Debreu consumer theory.

### **Lecture 5 Arrow-Debreu Producers**

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 127–154.

An account of Arrow-Debreu producer theory from the “Primal” and “Dual” points of view.

M. Blad and H. Keiding (1990), Ch. 3.

Presents the theory of production in an Arrow-Debreu environment from the set theoretic, production function and dual points of view. Notice the attention given to the question of the existence of profit maximising decisions.

G. Debreu (1959), *Theory of Value*, Ch. 3.

Classic and fairly easy to follow treatment of firm behaviour in an Arrow-Debreu environment written by the second part of the famous team.

M. Fuss (1987), "Production and Cost Functions", *NPDE1* (3), pp. 995-999.

A detailed presentation of producer theory with particular emphasis on the duality between production, cost and profit functions. Again this is a reference level treatment

D. W. Jorgensen (2008), "Production functions", (in) *NPDE2*.

Complement to and extension of Fuss (1987).

### **Lecture 6 Existence of Market Equilibrium**

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 578-589 (optionally pp. 632-641).

Introduction to the basic existence question for market or Walrasian equilibrium.

H. Varian (1992), *Microeconomic Analysis*, (3rd. Edition) pp. 313-323.

Gives an account of an approach to the existence question, originally due to Arrow and Hahn (1971), which exploits the properties of the excess demand map in an Arrow-Debreu economy to achieve an existence result. Note that Varian's approach appears to be for the exchange case, but as we will see in the lectures, it easily generalises to the production case.

M. Allingham (1987), "Excess Demand and Supply", *NPDE1* (2), pp. 201-222.

Also comes at the existence problem from the "excess demand end".

M. Blad and H. Keiding (1990), pp. 156-162.

Existence from the "primitives" point of view.

G. Debreu (1987), "Existence of General Equilibrium", *NPDE1* (2) pp. 234-242.

A nice account of the existence problem which allows you to get a feel for what has to be assumed about the primitives of the economy if an existence argument is to go through.

W. D. A. Bryant (1997), "Conditions for the existence of market equilibrium" *Journal of Economic Education*, 28(3), pp. 230-254.

This is a critical survey of the available sufficient conditions for the existence of market equilibrium, in particular the conditions which appear in the 'third level' proofs of the equilibrium existence theorem. The paper also discusses an apparently little known necessary condition due to Arrow and Debreu (1954) as well as providing an introduction to the recent and emerging literature on necessary and sufficient conditions for the existence of market equilibrium.

L. W. McKenzie (2002), pp. 189 – 214.

Has an extensive discussion of issues associated with the existence of competitive equilibrium. Also discusses in detail some of the issues discussed in Bryant (1997).

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 598-606 (optionally Chapter 4.)

A fundamental result which tells us something about the "aggregate" implications of Arrow-Debreu Microeconomics and also conditions the search for conditions which yield Uniqueness, Stability and Comparative Static properties of market equilibrium.

M. Blad and H. Keiding (1990), pp.173-176.

Nice treatment of the classic Sonnenschein-Mantel-Debreu theorem, which apart from being interesting in its own right, underpins a lot of the work to be discussed in the sections to follow.

L. W. McKenzie (2002), pp. 25 – 33.

Contains a discussion of the properties of market demand functions that is slightly more accessible than that presented in Mas- Colell, Whinston and Green (1995).

W. D. A. Bryant (2009), Ch 2 and 3.

Presents more detail on sufficient, necessary and necessary and sufficient conditions for the existence of equilibrium. Recommended reading only if you are having trouble sleeping!

### **Lecture 7 Uniqueness of Market Equilibrium**

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 589-598 and 606-615.

Presents a thorough analysis of the conditions needed for uniqueness (and local uniqueness) and does so from a number of "angles".

M. Blad and H. Keiding (1990), pp. 162-166.

Gives a nice introduction to the "conditions on excess demand functions" approach to the uniqueness question.

H. Varian (1992), pp. 394-397.

Presents a reasonably accessible summary of the modern “index analysis” approach to the uniqueness question.

L. W. McKenzie (2002), pp. 229 – 235.

Provides a unified view of some relatively recent work on the uniqueness of equilibrium.

W. D. A. Bryant (2009), Ch 7.

Gives an overview of the uniqueness problem, particularly in a production context – and suggests a potentially new approach to getting uniqueness conditions via contraction mappings.

### **Lecture 8 Stability of Market Equilibrium**

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 620-626.

Interesting account of price and quantity adjustment processes.

M. Blad and H. Keiding (1990), pp. 169-173.

Are there forces at work in the economy that will take the prevailing price vector to equilibrium, supposing that one exists? This is the “stability question” for market equilibrium and in these pages Blad and Keiding present an introduction to the field of answers to this question.

H. Varian (1992), pp. 398-402.

Gives an account parallel to that in Blad and Keiding for the first few pages, but then introduces the important 'Non-Tatonnement' adjustment processes.

F. H. Hahn (2008), “Auctioneer”, (in) *NPDE2*.

Interesting discussion of the stability problem. Also, if you get interested in this problem, then a place where you might start a serious study is Hahn (1982), both for details about known results and for 'attitude'.

D.G. Saari and C.T. Simon (1978), "Effective price mechanisms", *Econometrica*, pp. 1097-1125.

This is an extremely important paper in the Stability literature. A summary of the main conclusion will be presented in lectures.

L. W. McKenzie (2002), pp. 45 – 96.

Provides a unified treatment of numerous important issues in stability analysis.

W. D. A. Bryant (2009), Ch 8.

Discusses various approaches to and results about the stability problem in a GE context.

### **Lecture 9 Optimality of Market Equilibrium**

A. Mas-Colell, M Whinston and J. Green (1995), (background: pp. 515-525; see also the course notes.)

Provides the geometric intuition for what is going on with the Welfare Theorems.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 545-566.

Extensive account of the First and Second Fundamental Theorems of Welfare Economics.

M. Blad and H. Keiding (1990), Ch. 4.

Market or Walrasian equilibrium might be an interesting solution concept for certain abstract games and even a way of understanding market prices, trades and sometimes a vehicle for obtaining comparative static predictions. Possibly even more interesting is the fact that under certain conditions Walrasian equilibrium decentralises a Pareto optimal allocation. This chapter deals with the optimality of equilibrium.

G. Debreu (1959), Ch. 6.

Classic treatment of the first and second fundamental theorems of Welfare Economics. Note in particular the hypotheses *and* conclusions of these theorems.

L. W. McKenzie (2002), pp. 165–171.

Gives a very nice account of the Welfare theorems and their context.

W. D. A Bryant (1994), "Misinterpretations of the Second Fundamental Theorem of Welfare Economics", *Journal of Economic Education*, 25(1), pp. 75 – 80.

The informal and semi-formal literature which interprets the SFTWE often claims more than the theorem does. "Support" is not analogous in English to "achieve". This distinction matters when policy design is considered.

L. Kaplow (2008), "Pareto principle", (in) *NPDE2*.

An interesting and insightful discussion of the optimality principle that has come to dominate thinking about welfare economics, at least at the undergraduate level.

W. D. A. Bryant (2009), Ch 9.

Discusses both the First and Second welfare theorems. Explores some circumstances where they hold and also some circumstances where they fail.

### **Lecture 10 Comparative Statics of Market Equilibrium**

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 616-620.

What happens to (equilibrium) prices and quantities if the economy is “shocked” (≠ morally outraged) by a variation in the parameters which define it, in particular, tastes, endowments and technologies? This is a fundamental applied issue and also one of considerable theoretical and “methodological” significance.

M. Blad and H. Keiding (1990), pp. 166-168.

If we are serious about the “Samuelson-program” and also if we want to make bread and butter predictions about the effects on prices and quantities traded of various parameter changes, then we need to be able to extract from our multi-market models, so called comparative static predictions. Blad and Keiding give an introduction to the circumstances in which this might be possible.

T. Kehoe (1987), "Comparative Statics" *NPDE1* (1), pp.487-494.

Excellent (reference level) survey of what is involved in obtaining comparative static results in disaggregated systems.

L. W. McKenzie (2002), pp. 133–153.

Ties up a number of the issues associated with comparative statics in GE systems as well as providing an introduction to some of the emerging modern techniques for tackling this task.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 652-673.

When does price taking behaviour make sense and what precisely is meant by the term “competitive”? A fundamental result due to Aumann answered these questions and that answer and the associated extensions is presented here.

M. Blad and H. Keiding (1991), Ch. 10.

This chapter introduces an alternative to the “Walrasian auctioneer” mediated exchange and presents a discussion of the solution concept which arises in this set-up, namely the “core”.

W. Hildenbrand (1987), "Cores", *NPDE1*(1), pp. 326- 337.

A very nice treatment of the conceptual issues and of the classic theorems about cores and equilibria.

L. W. McKenzie (2002), pp. 171 – 187.

Introduces Edgeworth's approach to understanding the exchange process via introducing the idea of the core. McKenzie presents many interesting classical and new results on the core and competitive equilibrium.

W. D. A. Bryant (2009), Ch 10.

Discusses the major approaches to, and results for, comparative statics in a GE context.

## **Lecture 11 Some Applications of the Arrow-Debreu Model**

### **(The Gains from Trade Proposition)**

M. Kemp (1987), "Gains from Trade", *NPDE1* (2), pp. 453-454.

There are numerous applications of Arrow-Debreu model. Here Kemp shows how the model underpins standard "gains from trade" arguments.

M. Kemp and K. Shimomura (1997), "Trade gains: A unified exposition based on duality", *The Japanese Economic Review*, Volume 48, No. 2, pp. 121–131.

This paper provides an in depth look at the propositions which constitute the gains from trade proposition in international trade.

### **(The Transfer Problem)**

M. Rao (1992), "On the transfer and advantageous reallocation paradoxes" *Social Choice and Welfare*, pp. 131–139.

Presents a nice account of the so-called 'Transfer Paradox', which although it appears to be a highly academic question, actually has historical antecedents in the debates (between Keynes and Ohlin among others) about the appropriate size of post WW1 German reparations. Can be applied in many contemporary situations also. If you get interested in this problem you might read M.-P. Donsimoni and H.

Polemarchakis (1994), "Redistribution and Welfare", *Journal of Mathematical Economics*, vol 23, No.3 pp. 235–242.

### **(Piecemeal variations of taxes and tariffs)**

A. Woodland (1982), *International Trade and Resource Allocation*, pp. 341–344.

Presents an introduction to the tax and tariff reform literature which uses the Arrow-Debreu model as its laboratory.

A. Turenen-Red and A. Woodland (1991), "Tariff Reform in a Small Open Multi-Household Economy with Domestic Distortions and Nontraded Goods", *International Economic Review*, pp. 937-957.

Advanced contribution to the Arrow-Debreu tariff reform literature, which relaxes some of the assumptions previously made in the literature.

## **Lecture 12 Testing Arrow-Debreu Theory**

### **(Testing Arrow-Debreu Consumer Theory)**

A. Deaton (1984), "Demand Analysis", *Handbook of Econometrics*, Vol. 3, Ch. 30.

Presents a summary of the outcome of testing Neoclassical consumer demand theory and some background material on how to conduct such tests.

J. Sabelhaus (1990), "Testing Neoclassical Consumer Theory with Aggregate and Household Data", *Applied Economics*, pp. 1471-1479.

Presents a test of Neoclassical consumer demand theory using the AID demand system and draws attention to the contrast between results for aggregate and individual data.

R. Cooper and K. McLaren (1992), "An empirically oriented demand system with improved regularity properties", *Canadian Journal of Economics*, pp.652–668.

An important development in the methodology of testing A-D consumer theory is presented here along with an interesting empirical application.

M. Familiar (1995), "A household-based non-parametric test of Demand Theory", *Review of Economics and Statistics*, pp. 372-382.

A non-parametric test of consumer theory.

A. P. Barten (2003) "The empirical content of consumer theory", *Journal of Agricultural and Applied Economics*, Supplement 2003, v. 35, pp. 7-17

Falsification of nontrivial empirical statements, of a statistical nature or not, is basically destructive. No wonder that it is rarely practiced. Rather than then abandoning a rejected null hypothesis, one tries to salvage it by looking for reasons why the rejection of an otherwise credible, plausible hypothesis occurs. One then attempts to modify the set-up in such a manner that formal rejection is avoided. Testing, in general, but specifically of nonnested hypotheses, can be seen as a kind of model selection. These issues are illustrated with examples from applied demand analysis: the testing of the homogeneity condition and of Slutsky symmetry and the choice of functional form for demand systems.

### **(Testing Arrow-Debreu Producer Theory)**

K. Conrad and R. Unger (1987), "Expost Tests for Short - and Long-Run Optimisation", *Journal of Econometrics*, pp. 339-1479.

Tests Neoclassical producer theory by exploiting consequences of various dual equivalence's.

J. Pencaval and B. Craig (1994), "Empirical Performance of Orthodox Models of the Firm: Conventional Firms and Worker Co-operatives." *Journal of Political Economy*, pp. 718–744.

Cleverly does (at least) two things: (i) See's how well the standard price taking, profit maximising model of the firm performs as far as predicting how firms will react to changes in their economic environment and (ii) check to see how different this behaviour is from that which one observes in firms which have objectives other than straight profit maximisation. Also claims to be doing this work without appeal to restrictive assumptions about returns to scale.

*Barnett, William A. (2002), "Tastes and technology: Curvature is not enough for regularity", Journal of Econometrics, May 2002, v. 108, iss. 1, pp. 199-202*

An interesting discussion of some basic issues in the econometrics of testing producer (and consumer) theory.

### **(Testing The Market Clearing Hypothesis)**

G. Rudebusch (1989), "An Empirical Disequilibrium Model of Labor, Consumption and Investment", *International Economic Review*, pp. 633-654.

Tests the Walrasian-equilibrium hypothesis using a disaggregated model of the US economy and aggregate data.

Mishra, D. and D. Talman (2006), "Overdemand and underdemand in economies with invisible goods and unit demands", *Tilburg University, Center for Economic Research*, Discussion Paper No. 84.

Considers the possibility of disequilibrium on markets due to various sorts of indivisibilities. Also presents some informal evidence in this direction.

W. D. A. Bryant (2009), Ch 11.

Considers the conceptual issues involved in testing the A – D model. Also presents some empirical evidence derived from actual tests of the theory.

F. Kleibergen (2008), "Testing", (in) *NPDE2*.

Interesting discussion of the testing in an economics context.

## **Some Extensions of the Arrow - Debreu Model**

### **(Uncertainty)**

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 167-207.

Detailed introduction to the theory of individual behaviour under uncertainty, including a review of some of the modern developments in the field.

D. Kreps (1990), Ch. 3.

There are many ways to model the choice, by an individual, of an action when there is an uncertain connection between any particular action and the resulting outcomes. Kreps provides an introduction and useful discussion of one of the most heavily investigated models of choice under uncertainty, that due to von Neumann and Morgenstern.

G. Debreu (1959), Ch.7.

Provides a classic treatment of the results obtainable about an economy in which there is a complete set of contingent markets.

A. Mas-Colell, M. Whinston and J. Green (1995), pp. 687-724.

Gives a thorough account of the advanced topic of “general equilibrium under uncertainty”.

### **(Temporary Equilibrium Models)**

J.M. Grandmont (1987), "Temporary Equilibrium", *NPDE1* (4), pp. 620-623.

Presents a treatment of temporary equilibrium models up to existence and optimality, with particular emphasis on the role of expectations.

M. Blad and H. Keiding (1990), pp. 353-357.

Gives a brief introduction to the important temporary equilibrium class of models.

W. D. A. Bryant (2009), Ch 6.

Considers the existence question in some non Arrow – Debreu environments.

P. J-J Herings (2008), “Underemployment equilibria”, *NPDE2*.

An important reconsideration of some old themes in economics.

## **Summary and Revision**

F. Hahn (1982), "Reflections on the Invisible Hand", *Lloyds Bank Review*, pp. 1-21.

A delightful summary of much of what we have seen, presented with flair and great "attitude".

W. D. A. Bryant (2009), Ch 12.

An attempt to summarise some of what GET has to teach us.