

Australian Graduate School of Management

5306 STRATEGIC GAME THEORY FOR MANAGERS

AGSM 5306

Term 3, 2007

R.E. Marks

Lectures: in Boral on Mon, Wed @ 9:30

Ext. 271, Room 305

www.agsm.edu.au/~bobm/teaching/SGTM.html

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Reading / Reference List & Course Outline

Game theory provides a simple, but rich, framework for analysing once-off and repeated interplay between people or firms, where the manner in which each reacts depends upon the other's reaction: strategic interaction. These interactions occur in markets, in organisations, and in the household. This course—through lectures, experiential learning, and computer simulations—will attempt to provide students with understanding of many interactions they may encounter as managers, including price wars, wars of attrition, the value of cooperation interactions, and the value of information.

Outline of course:

<i>Lecture</i>	<i>Topic</i>
1	Introduction and General principles
2	Simultaneous-Move Games I
3	Games with Sequential Moves
4	Simultaneous-Move Games II
5	Combining Sequential and Simultaneous
6, 7	Decision Analysis: Games Against Nature
8	Mixed Strategies and Unpredictability
9, 10	Uncertainty and Information
11	Strategic Moves, Credibility, and Commitment
12, 13	The Prisoner's Dilemma and Repetition
14	Bidding and Auction Design
15	Bargaining
16	Contracting — Employing, Financing, Franchising
17, 18	Choosing the Right Game: Co-opetition
19	Student presentations

Recommended texts:

Dixit A., & Skeath S., *Games of Strategy*, New York: Norton: 2nd edition, 2004. AGSM 519.3/38 (On reserve)

As well, the following books might be found useful:

Dixit A., & Nalebuff B., *Thinking Strategically: the Competitive Edge in Business, Politics, and Everyday Life*, New York: Norton, 1991. AGSM 658.4012/115 (On reserve) I have no hesitation in saying that **all** MBAs should have become familiar with this book.

McMillan J., *Games, Strategies, and Managers*, Oxford: OUP, 1992. AGSM 658.4035/8 (On reserve) A really good verbal discussion of the uses of game theory, but no game trees!

Bierman H.S. & Fernandez L., *Game Theory with Economic Applications*, Addison-Wesley, 2nd ed., 1998. 330.015193/4 (On reserve) This is highly recommended. It has good sections on games against nature (decision analysis), Nash equilibrium, subgame perfection, and mixed strategies.

Additional readings will be found below. Recommended readings are marked with an asterisk (*). A **Package** of course notes is available. Readings in the **Package** are marked with a **P**.

I have listed the readings for each topic under three headings: *A: Light Background Readings* (can be read before the lecture), *B: Lecture Follow-Ups*, and *C: Deep* (more technical) *Background Readings*.

Lecture 1: Introduction and General Principles

Dixit & Skeath, Chapters 1 and 2, Basic ideas and examples, How to think about strategic games.

McMillan J., Ch3 Understanding cooperation and conflict.

Light Background Readings—

* AGSM SGTM students Rod Chisholm and Mike Lindren, Beautiful game theory, *AFR*, **P-1**

* Wylie I., Mars wins the shipping game, *FastCompany*, **P-2**

* *The Economist*, A big pay-off for two theorists, **P-3**

* Singh S., The greatest game theorist of all, *New Stateman*. **P-4**

Deep Background Readings—

* Basu K., The traveller's dilemma, *Scientific American*, May 2007. **P-6**

Lectures 2 to 5: Concepts and Techniques

Lecture 2: Simultaneous-Move Games I

Dixit & Skeath, Chapter 4, Simultaneous-Move Games

Lecture 3: Games with Sequential Moves

Dixit & Skeath, Chapter 3, Sequential-Move Games

Lecture 4: Simultaneous-Move Games II

Dixit & Skeath, Chapter 5, Simultaneous Moves with Continuous Strategies

Lecture 5: Combining Sequential and Simultaneous

Dixit & Skeath, Chapter 6, Combined Games

Light Background Readings—

- * Klarreich E., The bidding game, U.S.N.A.S. **P-5**
- * Oster C., Can the risk of terrorism be calculated by insurers? Game theory might do it. *Wall Street Journal Online*, 8 April 2002. **P-7**
- * Begley S., A beautiful science: getting the math right can help thwart terrorism, *Wall Street Journal*, May 16, 2003. **P-8**
- * Barber L., Cinema rivalry, *The Australian*, 1998. **P-9**
- * *The Economist*, Preying on theory, 1999. **P-10**

Smith R., Business as war game: a report from the battlefield, at

www.business2.com/articles/mag/0,1640,1570,FF.html

Lecture Follow-Ups—

- * Garicano, L., Game theory: how to make it pay, *Financial Times*, **P-11**
- * Courtney H.G., Games managers should play, *The McKinsey Quarterly*, 2000. **P-12**
- * Rothschild R., Ten simple lessons in strategy from the games firms play, *Management Today*, **P-12**
- * Schelling T.C., Ch7 Hockey helmets, daylight saving, and other binary choices, in his *Micromotives and Macrobehavior*, NY: Norton, 1978. **P-14**
- * Marks R.E., Competition and common property, 1998, at www.agsm.edu.au/~bobm/papers/ccp.pdf
- McAfee R.P. & J. McMillan, Competition and game theory, *Journal of Marketing Research*, 1996.
- Schelling T.C., What is game theory? in his *Choice and Consequence: Perspectives of an Errant Economist*, Camb.: Harvard UP, 1980. AGSM 300/35

Deep Background Readings—

- * O'Neill B., International escalation and the dollar auction, *Journal of Conflict Resolution*, 1986. **P-15**

Lectures 6 and 7: Decision Analysis — Games Against Nature

Dixit & Skeath, Appendix 7: Probability and Expected Utility, pp. 222–231;
Appendix 9: Inferring probabilities, pp. 300–303.

Kreps D.M., *Microeconomics for Managers*, NY: Norton, 2004, Ch 15 Risk aversion and expected utility, Ch 16 Expected utility as a normative decision aid. AGSM 338.5024658/16

Light Background Reading—

- * Guthrie J., The dismal scientists studying dismal television, *FT*, 19 April 2007. **P-16**
- * Apocalypse maybe, An insurer's worst nightmare, and Getting the goat. *The Economist*, 1995/96/99 **P-17**

Lecture Follow-Ups—

- * Clemen R.T., Structuring decisions, and Sensitivity analysis, *Making Hard Decisions: An Introduction to Decision Analysis*, Belmont, CA: Duxbury, 1996 AGSM 658.403/242C
- * Skinner D.C., A thirty-minute guide to better decisions, *Introduction to Decision Analysis*, Gainesville: Probabilistic Press, 2nd ed., 1999. AGSM 658.403/269

Bierman & Fernandez, Ch 10.5–10.7

Deep Background Reading—

- * Howard R.A., Decision analysis: practice and promise, *Management Science*, 1988. (Handout)

Lectures 8 to 13: Broad Classes of Games and Strategies

Lecture 8: Mixed Strategies and Unpredictability

Dixit & Skeath, Chapter 7 and 8

Lecture Follow-Ups—

- * Dixit & Nalebuff, Ch 7 Unpredictability
- Bierman & Fernandez, Ch10.4

Lectures 9 and 10: Using Information Strategically

* Dixit & Skeath, Ch 9 Uncertainty and Information
McMillan, Ch6 Using information strategically

Light Background Readings—

- * Gans, Gifts as signals. 2004. **P-18**
- * The lemon dilemma, and The economics of understatement, *The Economist*, 2001, 3 May 2003. **P-9,19**

Deep Background Readings—

Bierman & Fernandez, Ch13 Bayesian Nash equilibrium, Ch15 Perfect Bayesian equilibrium, Ch18 Adverse selection and credit rationing

Lecture 11: Strategic Moves, Commitment, and Credibility

Dixit & Nalebuff, Ch 5 and 6, Strategic Moves, and Credible commitments.

Dixit & Skeath, Chapter 10, Strategic Moves

Lectures 12 and 13: Solving the Prisoner's Dilemma, and Applications

Dixit & Skeath, Chapter 11, The Prisoner's Dilemma and Repeated Games

Besanko D., Dranove D., Shanley M., and Schaefer S., The Dynamics of Pricing Rivalry, Chapter 8 of *Economics of Strategy*, 3rd ed., NY: Wiley, 2003. **P-20**

Lecture Follow-Ups—

* Dixit & Nalebuff, Ch 4, Resolving the Prisoner's Dilemma

* Rao A.R., Bergen M.E., and Davis S., How to Fight a Price War, *Harvard Business Review*, March–April 2000. **P-21**

Deep Background Reading—

* Marks R.E., Midgley F.D.F., & Cooper L.G., Adaptive behaviour in an oligopoly, in *Evolutionary Algorithms in Management Applications*, ed. by J. Biethahn & V. Nissen, (Berlin: Springer-Verlag), 1995.

<http://www.agsm.edu.au/~bobm/papers/marks-midgley-cooper-95.pdf>

Lectures 14 to 18: Applications

Lecture 14: Bargaining

Dixit & Skeath, Chapter 17, Bargaining

McMillan, Ch5 Gaining bargaining power

Lecture Follow-Ups—

Dixit & Nalebuff, Ch 11 Bargaining

* Bierman & Fernandez, Ch7 Bargaining.

* Murnighan J.K., Game's End, Chapter 15 in his: *Bargaining Games: A New Approach to Strategic Thinking in Negotiations*, NY: William Morrow, 1992. **P-22**

Schelling T.C., Ch2 Essay on bargaining, in *The Strategy of Conflict*, Camb.: Harvard UP, 1980.

Deep Background Reading—

Brams S.J., *Negotiation Games: Applying Game Theory to Bargaining and Arbitration*, NY: Routledge, 1990. AGSM 302.3/30

Lecture 15: Bidding and Auction Design

Dixit & Skeath, Ch 16, Bidding Strategy and Auction Design

McMillan, Ch11 Bidding in competition

Light Background Readings—

- * Auction fever, It's only a game, Learning to play the game, What am I bid? *The Economist*, 1994, 1996, 1997, 2000 **P-23**
- * *The Economist*, Secrets and the prize, 1996. **P-10**
- * Abrams M., The mathematics of ... auctions: going once, going twice, *Discovery*, 2002. **P-24**
- * *Scientific American*, Making honesty pay, January 1997, p.13. **P-25**
- * Landsburg S.E., Cursed winners and glum losers, Ch. 18 of his: *The Armchair Economist: Economics and Everyday Life*, N.Y.: The Free Press, 1993. **P-26**

Lecture Follow-Ups—

- * Bierman & Fernandez, Ch14 Auctions
Milgrom P., *Putting Auction Theory to Work*, CUP, 2004. AGSM 381.17/2

Deep Background Readings—

- * Klemperer P., What really matters in auction design, *Journal of Economic Perspectives*, Winter, 2002. (On Reserve)
 - * R. Marks, Efficient, competitive, and informed markets: Australian Corporations Law and auctions, 2000, at www.agsm.edu.au/~bobm/papers/auctions.pdf
- Brams S.J. & A.D. Taylor, Fair division by auctions, Ch. 9 in their *Fair Division: From Cake-Cutting to Dispute Resolution*, Cambridge: CUP, 1996. AGSM 303.69/4

Lecture 16: Contracting

- * Dixit & Nalebuff, Ch12 Incentives.
McMillan, Ch8 Creating incentives; Ch9 Designing contracts; Ch10 Setting executives' salaries.

Lecture Follow-Ups—

- * Williamson O.E., Strategizing, economizing, and economic organization, *Strategic Management Journal*, 1991. **P-27**
- * Bierman & Fernandez, Ch12 Moral hazard and involuntary unemployment.

Deep Background Reading—

- Milgrom P. & Roberts J., Ch5 Bounded rationality and private information; Ch6 Moral hazard and performance incentives. *Economics, Organization and Management*, Englewood Cliffs: Prentice-Hall, 1992. AGSM 338.502465/55

Lectures 17 and 18: Choosing the Right Game: Co-opetition

- * Brandenburger A.M. & B.J. Nalebuff, The right game: using Game Theory to shape strategy, *Harvard Business Review*, 1995 **P-29**
and this Web page:
<http://mayet.som.yale.edu/coopetition/index2.html>

Light Background Readings—

- * R. Koselka, Businessman's dilemma, and Evolutionary economics: nice guys don't finish last, *Forbes*, October 11, 1993. **P-28**

Deep Background Readings—

- * Brandenburger A.M. & B.J. Nalebuff, *Co-opetition: 1. A revolutionary mindset that combines competition and cooperation; 2. The Game Theory Strategy that's changing the game of business*. NY: Currency Doubleday, 1996. (On reserve)

Brandenburger A.M. & Harborne W.S.Jr., Value-based business strategy, *J of Econ & Management Strategy*, **5**(1), 1996.

And Beyond ...

For topical readings from the media (ideas for term projects, for instance), on-line games, and other goodies, see:

www.gametheory.net

For a history of game theory (by Paul Walker) since Old Testament times, point your browser at the following URL:

www.econ.canterbury.ac.nz/personal_pages/paul_walker/gt/hist.htm

For further surfing on the 'Net about game theory, start at the following URL:

<http://kuznets.fas.harvard.edu/~aroth/alroth.html>

And the Game Theory Society at

www.gametheorysociety.org

Assessment

There will be three individual assignments and a short term project (which may be done in groups).

1. The first assignment will be handed out on Wednesday, July 18, and is due on Monday, July 30, by 4 pm. This assignment is worth 15% of the final grade, and must be done individually, although students may talk (but *not copy others' work*).
2. The second assignment will be handed out on Wednesday, August 1, and is due on Monday, August 20, by 4 pm. This assignment is worth 15% of the final grade.
3. The third assignment will be handed out on Monday, August 20, and is due on Wednesday, August 29, by 4 pm. This assignment is worth 15% of the final grade.
4. Your project is due by 4 pm on Wednesday, September 19, and is worth 55% of the final grade. It may be done in groups of one, two, or three students. Please hand in a one- or two-page outline of the project topic by Wednesday, August 1, outlining the issue, the players, your data sources, and how you intend analysing it. I expect *applications* of the framework described in class, not further theory. Groups will present brief outlines of their work on the last week of class.
5. You should start thinking about a project as soon as possible. Please come and talk to me about (a) possible topics of application, and (b) if you want to form a team to do it. You might like to look at some projects from previous years. I'd like decision trees, game trees, and/or payoff matrices. Look for issues with *strategic interactions* between players, whether simultaneous or sequential. (But avoid movies especially with (1) extensive chases, (2) more than one person shot dead with revolver or pistol.)

Previous projects available from Bob for perusal:

(M/N = movie or novel, S = sport, W = war, B = business, P = politics)

Blumberg	The ARL versus Super League Rugby B/S: Was the tussle a PD? Could much anguish and money have been saved? Analysing the battle for control of rugby league.
Boyd	Rupert Murdoch, Game Player B/P: Rupert conquers the world from Adelaide, doh.
Bugg	The natural-gas-pipeline game B: BHP v. AGL for NSW–Victoria interconnection.
Carlin	Home loan wars B: Two types of player in the highly rivalrous oligopoly of mortgage lending in 1996 NSW.
Chan	Bargaining in the H.K. property market B: Behaviour, from a seller's perspective, on the roiling Hong Kong property market.
Cheung	The Hong Kong IDD price war. B: CTI v. HKT and the resulting price war for phone calls.
Chisholm	Telstra versus the Government.

	B/P: In the lead up to T3, Sol y son amigos threaten the Government with a low Telstra price or freedom from the ACCC.
Collins	Australian discount variety sector price wars. B: The \$2 stores fight it out.
Coristine	Canadian beer wars B: Molson and Labatt ignore the micros, sell out, and then descend to a price war, eh?
Davis	The shifting sands: OPEC B: A game-theory analysis of the development, formation, and demise of OPEC.
Dehne	Co-opetition in the Supply Chain software market. B: SAP vies with i2 and others: what is the right game?
El-Rakshy	Granada v. Forte B: the ins and outs of a hostile takeover.
Falendysz	NASDAQ v. the LSE B: An analysis of a takeover attempt.
Field	Video-game console wars B: Nintendo v. Sega v. Sony v. Microsoft, and continuing.
Germanos	A subsidy war between Regional Aircraft manufacturers B/P: Canada's Aerospace-Bombardier v. Brazil's Embraer.
Guo	The 3G auction in the UK B: Expensive lessons for the winner
Hicks	The World Series Cricket Revolution B/S: Kerry Packer v. the Australian Cricket Board.
Hui	QANTAS in the post-deregulation world B: and Compass, Virgin, Ansett, SIA, ANZ.
Karanjia	The war of the browsers B: Microsoft v. the US Justice Dept., with focus on the battle between Netscape and Explorer. Uses a <i>Coopetition</i> perspective.
Kelly	Shopping for Safeway (UK)— 4 supermarkets & a regulator B: Five bidders vie for Safeay UK in 2003. Who will win?
Koo	The battle for AFL first and last rights B/S: Sport is big business. The bidding battle for AFL TV rights among Network Seven, The Nine Network, the AFL, and the rest of us.
Leong	KKR, the company B: the leveraged buyout LBO battles.
Li	The TV price war in China B: the evolving technology and market among the nine (three major) TV manufacturers in China.
Lin	Tamasek Holdings v. Wee Cho Yaw B: Unlocking the value of Singapore's United Overseas Land.
Low	R.J.R. Nabisco: the world's richest auction B: <i>Barbarians at the Gate</i> helps answer two questions: <ul style="list-style-type: none">• can game theory explain the protagonists' action in the L.B.O.?• would a game theorist have acted differently?
Lui	Cathay Pacific v. its pilots' union B: both sides learn from three successive industrial disputes between management and the pilots.
McDonald	S.E. Asian Telecoms battle for growth 1999–2000 B: SingTel, PCCW, Telstra, and Optus.
Pandey	Winning the Sydney 2000 Olympics B/S: "The Bid" — Australia's strategy in winning the Olympics.

Quan	Rivalry in China's petroleum duopoly B: The two largest players compete for sales and sites.
Riordan	Coles v. Woolworths B: The two rivals compete.
Rivlin	The Israeli & Canadian cellular markets B: A comparison of the evolution of two markets for mobiles.
Shergold	Australian pay-TV B: Game theory applied to three key interactions: 1. Optus and Telecom's cable rollouts 2. (S) Murdoch v. Packer over Rugby League 3. Foxtel v. Optus Vision for the Seven Network.
Sommer	Intel v. AMD B: non-price rivalries between the two chip manufacturers
Strudwick	Celluloid games: Cannes Film Festival B: Selling cinematic rights for independently produced motion pictures on the Riviera analysed.
Wang	Hainan Airlines against the world. B: A small airline in China grows and takes on the bureaucracy and the larger airlines.
West	David Jones v. Myer B: Australia's premium department store chains in combat.
Whitten	Entering the ERP software industry B: Should Innovit enter the industry? Is it a zero-sum game? An analysis suggests that Innovit's perspective was limited.
Williams	The Battle for AFL TV Rights B/S: Nine versus Seven, with Ten and Foxtel as well, in 2005/6.
Yan	Hong Kong Chinese newspaper price war B: The entrance of the "Apple Daily" and the following price wars.
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Beale	The America's Cup, 1983 S: An analysis of the strategic interactions of the winning campaign of <i>Australia II</i> .
Basnayake	<i>The Hunt for Red October</i> , the movie M/N: Game theory applications in naval warfare.
Carter	<i>House of Games</i> , the movie M: David Mamet's classic movie of games within games and deception within deception.
Chaney	<i>Survivor</i> : a game theory analysis TV: how to win at <i>Survivor</i> ; how to keep your audience coming for more.
Flynn	<i>Wall Street</i> , the movie M/N: Applying the rules and core concepts of game theory to the world of Wall Street and the actions of Bud Fox, of the movie.
Fogarty	Sexual politics in <i>Disclosure</i> , the novel & movie M/N: Sexual harassment — a strategic weapon in the game of office politics?
French	Playing <i>Diplomacy</i> and its appeal. Game: A board game with much greater freedom: to diplomate, to threaten, to promise, to ally, to stab, to die, to conquer — how and why?
Koestoer	<i>The Good, the Bad, and the Ugly</i> , the movie M/N: The classic road movie, many 2- and 3-person interactions.
Sayers	<i>The Bonfire of the Vanities</i> M/N: Master of the Universe or Master of the Game. McCoy falls. Analysis of three interactions in the novel.

Smith	Conrad's <i>Nostramo</i> , the novel M/N: By modelling three games embedded in the novel's storyline, shows how game theory can help in the analysis of the plot.
Sun	<i>Other People's Money</i> , the movie M/N: a corporate takeover battle.
Beaver	The Gulf War I W: Trying to unravel the misunderstandings and motives and strategies of the two sides which resulted in war and death.
Fahey	Waterloo, the battle W: Napoleon v. Wellington and von Blücher.
Fahy	Midway, the battle W: Yamamoto's attack on the island failed: it relied on faulty logic, a non-credible threat, and was known of in advance.
Loncar	Croatia's strategies in the fall of Yugoslavia W: David v. Goliath: Croatia's political and military strategies during the fall of Yugoslavia.
Mazlin	The Pacific War: Nippon v. the USA W: Bushido against Western rationalism. Misunderstandings and war.
Mckay	The Pacific War 1941-45: its beginning and end W: Was the war inevitable? Why did the negotiations to end it fail? Analysis of the Japanese and US diplomatic and military strategies.
Bruns	North Korea's nuclear games P: Should the Dear Leader continue to develop a nuclear arsenal?
Cheung	Wahid's downfall (with Tjia) P: Gus Durr's fall in Jakarta.
Eggleton	Soeharto's Resignation P: Soeharto's decisions and influence diagrams.
Foong	The Whitlam dismissal P: The framework of game theory enlightens Gough's and Malcolm's deliberations in 1975.
Frith	<i>Rats in the Ranks</i> , the famous documentary film P: Analyses the interactions of the candidates for Mayor of Leichhardt. The movie records the words, actions, and musings as they happened.
Jackson	<i>Thirteen Days</i> , the movie P: The Cuban missile crisis of October 1962.
Joullié	Signals of war before the Falklands conflict P: How to misread your adversary.
Killeen	The Northern Ireland Troubles P: Sinn Féin, the IRA, the Ulstermen, Catholics, and the British government.
Krishnakumar	Iran v. the IAEA P: Iran games the West over its nuclear program
Richard	The (eastern) enlargement of the E.U. P: the countries playing, their payoffs, and their strategies to do better.
Salvador	The Marcos ouster P: In 75 hours a small group of soldiers toppled the President. Credible commitments and asymmetric information in the coup.
Shah	Machiavelli's <i>The Prince</i> , Composite Principalities P: How to hold a conquered country. (Listen up, George.)
Tziolis	The <i>Tampa</i> crisis P: Lies, refugees, and the 2001 election.

Viney Mahathir–Keating: recalcitrant duo?
P: Malaysia v. Australia: A three-week spat analysed.

Wong Taiwan’s 2000 Presidential Election
P: From Taipei mayor to beating the KMT candidate.

Germes Designing “interesting games”
Theory: Dixit & Nalebuff’s strategic-voting example corrected.

Email Bob for copies of any of these.