Literature search results
for the report
Complexity science – an introduction for actuaries

Alan Mills, FSA ND
INTRODUCTION
This document presents the detailed results of a literature search performed during December 2009 - February 2010 to find resources for the report Complexity Science – an introduction (and invitation) for actuaries. It is in two sections:

I. Search chronicle
Section I chronicles the search process. It lists the databases that I searched, in the chronological order searched, and lists the primary and referenced resources (see sidebar) I found within each database. For example, because the first database I searched was the Society of Actuaries online database, it is listed first.

For each database searched, the primary references found are listed by search term (see sidebar). For example, in the Society of Actuaries database, the article “Emerging risks: the signs are there” was found using the search term “complexity science”, and so in the search chronicle it is listed accordingly.

Indented under each primary resource are the referenced resources found within that primary resource. I looked for referenced resources after finding all the primary resources. Because of time constraints (and the potential for infinite regress), I did not specifically search for additional resources within all referenced resources. However, in a few cases, I did find referenced resources within referenced resources, and denoted this in the chronicle by further indentation.

The primary resources and referenced resources are the works that I found to be potentially interesting for actuaries. From these, I selected the approximately one hundred resources that I found to be most important for actuaries (which I call the Essential resources), and from these I selected and annotated the ten most important books (the Top ten Complexity Science books). In the chronicle, the Essential resources are listed in bold type, and the Top ten Complexity Science books are bolded and underlined.

At the end of each database section is a summary giving the total hits, as well as the number of primary and referenced resources found.

II. Bibliography
Section II lists the primary and referenced resources found, sorted alphabetically by the primary author’s last name.
I. SEARCH CHRONICLE
A. ACTUARIAL ONLINE DATABASES

1. Society of Actuaries (www.soa.org)
To search the Society of Actuaries (SOA) online database, I used its Advanced Search function. In the “Find results with the EXACT phrase” area, I put each search term in quotes (e.g., “complexity science”). Following are the results:

a. CS search terms

“complexity science”: 10 hits, 3 potential resources:
- 2009: Emerging risk – the signs are there; N Cantle, N Allan.
- 2002: The coming revolution in risk management; L Segre-Tossani

“complex adaptive system(s)”: 29 hits, 6 potential resources:
- 2009: How to spot emerging enterprise risk (.ppt); N Allan, N Cantle
- 2009: Why we need to transform our view of risk (.ppt); A Lo
- 2009: White, gray, and black swans – identifying, forecasting and managing medical expenditure trend drivers in a complex world; A Mills
  - 2008: Complexity of service value networks; RC Basole, WB Rouse
  - 2007: The black swan: the impact of the highly improbable; N Taleb
  - 2003: Health care organizations as complex adaptive systems; JW Begun, B Zimmerman, K Dooley
  - 2001: Crossing the quality chasm: a new health system for the 21st century (Appendix B); Institute of Medicine
  - 2000: Business dynamics: systems thinking and modeling for a complex world; J Sterman
  - 1998: Design of simulators to enhance learning, examples from a health care microworld; G Hirsch, C Immediato
  - 1997: On the critical behavior of simple epidemics; CJ Rhodes, HJ Jensen, RM Anderson
  - 1996: How nature works; P Bak
- 2004: Complexity and complex adaptive systems: applications for actuarial science, finance, and risk management; Rick Gorvett (.ppt). References:
  - 2000: A hitchhiker’s guide to the techniques of adaptive nonlinear models; AF Shapiro
- 2000: How is behavioral finance behaving?; B Brizeli
- 1999: Applying complex adaptive systems to actuarial problems; HM Shumrak, V Darley:
  - 1999: Modeling annuity policy holder behavior using behavioral economics and complexity science; M Shumrak, M Greenbaum, VD, R Axtell (from conversation with M Shumrak)

“network science”: 0 hits, 0 potential resources

“network theory”: 2 hits, 0 potential resources

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I. SEARCH CHRONICLE CONTINUED
A. ACTUARIAL ONLINE DATABASES CONTINUED

1. Society of Actuaries (www.soa.org) continued

b. ABMS search terms

agent-based”/“agent based”: 44 hits, 1 potential resource:
  - 2005: Concurrent simulation to explain reinsurance market price dynamics; J Alkemper, D Mango.

“multiagent”/“multi-agent”/“multi agent”: 4 hits, 0 potential resources

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I. SEARCH CHRONICLE CONTINUED
   A. ACTUARIAL ONLINE DATABASES CONTINUED

2. Casualty Actuarial Society (www.casact.org)
   For searches on the Casualty Actuarial Society (CAS) website, I used its Google Site Search engine, and put the search term in quotes (e.g., “complexity science”). The DARE search engine on the CAS website was not useful for these searches, because it does not accept search phrases in quotes (e.g., for “complexity science”, it returns all documents containing the words complexity and science whether or not the words are contiguous). Following are the results:

   a. CS search terms

   “complexity science”: 8 hits, 3 potential resources:
   - 2003: Advanced modeling, visualization and data mining techniques for a new risk landscape; L Smith, L Segre-Tossani.
   - 1990: The actuarial paradigm – a nontechnical exposition; L Smith
   - 2003: Applications of advanced science in the new era of risk management; L Smith, L Segre-Tossani.
   - 2003: Applications of advanced science in the new era of risk management (.ppt); L Smith.

   “complex adaptive system(s)”: 2 hits, 0 potential resources

   “network science”: 0 hits, 0 potential resources

   “network theory”: 2 hits, 0 potential resources

   Resource Total
   type Hits Potential 100 best Top ten  
   Primary 12 3 0 0  
   Referenced NA 1 1 0

   b. ABMS search terms

   “agent-based”/“agent based”: 28 hits, 3 potential resources:
   - 2004: Nonlinear dynamics and complex systems (.ppt); R Gorvett
   - 2004: The agents are coming; Donald F. Mango
   - 2001: Agent-based modeling: a revolution?; SC Bankes
   - 2001: Tools and techniques for developing policies for simulating human systems; SC Bankes
   - 2001: Agent-based modeling: methods and techniques for simulating human systems; E Bonabeau
   - 2001: Adaptive agents, intelligence, and emergent human organization: Capturing complexity through agent-based modeling; JL Brian, L Berry, D Kiel, E Elliott
   - 2001: Computational organization science: a new frontier; KM Carley
   - 2001: Invariance and universality in social agent-based simulations; C Cioffi-Revilla
   - 2001: Exploring cooperation and competition using agent-based modeling; E Elliott, D Kiel
   - 2001: Platforms and methods for agent-based modeling; N Gilbert, SC Bankes
   - 2001: Overcoming design and development challenges in agent-based modeling using ASCAPE; ME Inchlosa, MT Parket
   - 2001: Agent-based modeling as organizational and public policy simulators; R Lempert
   - 2001: A new decision sciences for complex systems; R Lempert
   - 2001: Policy analysis from first principles; S Moss
   - 2001: Economic agents and markets as emergent phenomena; L Tesfatsion
   - 2003: Dynamic pricing analysis; CH Boucek, TP Conway
I. SEARCH CHRONICLE CONTINUED
A. ACTUARIAL ONLINE DATABASES CONTINUED

2. Casualty Actuarial Society (www.casact.org) continued
   b. ABMS search terms continued

“multiagent”/“multi-agent”/“multi agent”: 1 hit, 0 potential resources

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I. SEARCH CHRONICLE CONTINUED  
A. ACTUARIAL ONLINE DATABASES CONTINUED

3. International Actuarial Association (www.actuaries.org)  
I used the site’s advanced search function, with the search terms entered in the “exact phrase” box. Following are the results.

a. CS search terms

“complexity science”: 17 hits, 2 potential resources:
- 2000: Insurance World 2 – A complex model to manage risk in the age of globalization; G Gionta

“complex adaptive system”: 7 hits, 1 potential resources:
- 2009: Systemic risk in financial services; D Besar et al
  - 2009: Rethinking the financial network; A Haldane
  - 2008: The physics of networks; M Newman
  - 2003: The structure and function of complex networks; M Newman

“network science”: 0 hits, 0 potential resources

“network theory”: 7 hits, 0 potential resources

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b. ABMS search terms

“agent-based”/”agent based”: 66 hits, 2 potential resources
- 2008: Agent-based modeling in health care (ppt); P Gaudiano
- 2007: An introduction to insurer strategic risk; D Mango

“multiagent”/”multi-agent”/”multi agent”: 11 hits, 0 potential resources

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LITERATURE SEARCH RESULTS

I. SEARCH CHRONICLE CONTINUED
A. ACTUARIAL ONLINE DATABASES CONTINUED

4. Institute of Actuaries and Faculty of Actuaries (UK) (www.actuaries.org.uk)
For searches on this website, I used its Advanced Search engine. I used the “Search term” function and put the search term in quotes (e.g., “complexity science”); however, it does not appear that the search algorithm recognizes quotes as denoting contiguous search terms. For the “Search within” category, I selected “All”. Following are the results:

a. CS search terms

“complexity science”: 1 hit, 0 potential resources

“complex adaptive system”: 0 hits

“network science”: 0 hits, 0 potential resources

“network theory”: 15 hits, 0 potential resources

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b. ABMS search terms

“agent-based”/“agent based”: 3 hits, 2 potential resources:
- 2008: Complexity economics – application and relevance to actuarial work; J Palin et al
  - 2007: The origin of wealth; E Beinhocker.
  - 2002: Seeing around corners; J Rauch
  - 2002: Tired of strategic planning?; E Beinhocker, S Kaplan
  - 2006: The (mis)behavior of markets; B Mandelbrot, R Hudson
  - 2002: Agent-based stockmarket models: calibration issues and application; J Palin
- 2008: Complexity economics – application and relevance to actuarial work (.ppt); J Palin et al

“multi-agent”/“multi agent”/“multiagent”: 1 hit; 1 potential resource:
- 2009: What is the appropriate framework in which to describe and understand risk?; P Parodi, A Benfield.

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I. SEARCH CHRONICLE CONTINUED
A. ACTUARIAL ONLINE DATABASES CONTINUED

5. Institute of Actuaries of Australia (www.actuaries.asn.au)
For searches on this website, I used its Google site-specific search engine. I put the search term in quotes (e.g., “complexity science”); however, it does not appear that the search algorithm recognizes quotes as denoting contiguous search terms. Following are the results:

a. CS search terms
“complexity science”: 0 hits
“complex adaptive system”: 0 hits
“network science”: 0 hits, 0 potential resources
“network theory”: 0 hits, 0 potential resources

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b. ABMS search terms
“agent-based”/”agent based”: 0 hits:
“multi-agent”/”multi agent”/”multiagent”: 1 hit, 0 potential resources

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I. SEARCH CHRONICLE CONTINUED

B. BOOKS

1. Library of Congress (catalog.loc.gov)

For searches of the Library of Congress online catalog (LOC), I used its Basic Search function. For each book hit, I reviewed it on Amazon.com or Google Books. For this search, I added a few search terms: Following are the results:

a. CS search terms

“complexity science” as a “Keyword (match all words)” search: 18 hits, 1 potential resource:

- 2000: The soul at work; R Lewin
  - 1998: Emergence: from chaos to order; JH Holland
  - 1995: At home in the universe; S Kauffman
  - 1987: Chaos: making a new science; J Gleick

“complex adaptive system?” as a “Keyword (match all words)” search: 58 hits, 3 potential resources:

- 2007: Complex adaptive systems: an introduction to computational models of social life; J Miller, SE Page
  - 2006: Essay: Path dependence; SE Page
  - 2004: The interplay between analytics and computation in the study of congestion externalities: the case of the El Farol problem; E Zambrano
  - 2002: A new kind of science; S Wolfram
  - 2001: Zipf distribution of U.S. firm sizes; R Axtell
  - 2000: An illustration of the essential difference between individual and social learning, and its consequences for computational analyses; NJ Vriend
  - 1999: A day at the beach: human agents self-organizing on the sand pile; H Ishii, SE Page
  - 1999: The computational complexity of sandpiles; C Moore, M Nilsson.
  - 1997: On the minority game: analytical and numerical studies; D Challet, YC Zhang
  - 1997: No free lunch theorems for optimization; DH Wolpert
  - 1996: Aligning simulation models: a case study and results; R Axtell, R Axelrod, J Epstein, M Cohen
  - 1996: The coevolution of automata in the repeated prisoner’s dilemma; JH Miller
  - 1994: The calculi of emergence: computation, dynamics, and induction; JP Crutchfield
  - 1978: A guide for the perplexed; EF Schumacher

- 1996: Introduction to genetic algorithms; M Mitchell
- 1996: Growing artificial societies: social science from the bottom up; JM Epstein, R Axtell

“complexity (philosophy)” as a “Subject Keyword” search: 148 hits, 6 potential resources:

- 2010: Complexity and public policy: a new approach to 21st century politics, policy, and society; R Geyer, S Rihani (not yet available)
- 2009: Complexity: a guided tour; Melanie Mitchell
  - 2007: The stabilizing effect of noise on the dynamics of a Boolean network; CS Goodrick, MT Matache
  - 2007: Control without hierarchy; D M Gordon
  - 2007: The powers that be; B Grant
  - 2007: Power law distributions, 1/f noise, long-memory time series; C Shalizi
  - 2005: Revisiting ‘scale-free’ networks; EG Keller
  - 2005: Power laws, Pareto distributions and Zipf’s law; MEJ Newman
  - 2004: Ant colony optimization; M Dorigo, T Stutzle
  - 2004: Sync: how order emerges from chaos in the universe, nature, and daily life; S Strogatz
I.  SEARCH CHRONICLE CONTINUED
B.  BOOKS CONTINUED

1. Library of Congress (catalog.loc.gov)

a. CS search terms continued

- 2004: Life’s universal scaling laws; GB West and JH Brown
- 2003: Effective complexity as a measure of information content; JW McAllister
- 2003: Efficient immunization strategies for computer networks and populations; R Cohen, D ben-Avraham, S Havlin
- 2003: A brief history of generative models for power law and lognormal distributions; M Mitzenmacher
- 2002: Statistical fraud detection: a review; RJ Bolton, DJ Hand
- 2002: Complexity and robustness; JM Carlson, J Doyle
- 2002: Statistical mechanics of complex networks; R Albert, A-L Barabasi
- 2002: Linked: the new science of networks; A-L. Barabasi
- 2001: Measures of complexity: a non-exhaustive list; S Lloyd
- 2000: Survival of the fittest in drug design; MJ Felton
- 2000: The tipping point: how little things can make a big difference; M Gladwell
- 1999: Emergence of scaling in random networks; A-L Barabasi, R Albert
- 1999: Thermodynamic depth of causal states: when paddling around in Occam’s pool shallowness is a virtue; JP Crutchfield, CR Shalizi
- 1999: Long-term Capital Management: regulators need to focus greater attention on systemic risk; Government Accounting Office
- 1999: A brief history of the concept of chaos; HA Liu
- 1998: Computation in cellular automata: a selected review; M Mitchell
- 1989: Inferring statistical complexity; JP Crutchfield, K Young
- 2004: Deep simplicity: bringing order to chaos and complexity; J Gribben
- 2002: Emergence of everything: how the world became complex; HJ Morowitz.
- 1999: Complexity: life at the edge of chaos; R Lewin
- 1988: Dreams of reason: the computer and the rise of the sciences of complexity; HR Pagels

“network science”: 10 hits, 2 potential resources
- 2008: Network science: theory and practice; TG Lewis
- 2007: Driving forces in physical, biological and socio-economic phenomena; BM Roehner

“network theory”: 97 hits, 0 potential resources

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I. **SEARCH CHRONICLE CONTINUED**

B. **BOOKS CONTINUED**

1. **Library of Congress** (catalog.loc.gov) continued

b. **ABMS search terms**

“agent-based”/“agent based” as a “Keyword (match all words)”: 107 hits, 6 potential resources:
- 2009: Multi-agent systems for healthcare simulation and modeling: applications for system improvement; Paranjape
- 2008: Emergent macroeconomics: an agent-based approach to business fluctuations; D Delli Gatti
- **2008: Agent-based models; N Gilbert**
  - 2004: Simulating organizational decision-making using a cognitively realistic agent model; R Sun, I Naveh
- **2007: Managing business complexity: discovering strategic solutions with agent-based modeling and simulation; MJ North and CM Macal.**
  - 2001: What is complexity science, really?; SE Phelan
- **2006: Generative social science: studies in agent-based computational modeling; JM Epstein**
  - 1999: The emergence of firms in a population of agents: local increasing returns, unstable Nash equilibria, and power law size distributions; R Axtell
  - 2006: Agent-based models of organizations; M Chang, JE Harrington
- **1997: Complexity of cooperation: agent-based models of competition and collaboration; Robert Axelrod.**

“multiagent”/“multi-agent”/“multi agent” as a “Keyword (match all words)”: 178 hits; 1 potential resource
- 2009: Data mining and multi-agent integration; L Cao

“social systems (computer simulation) as a “Subject Keyword” search: 4 hits, 0 resources

“social systems (mathematical models)” as a “Subject Keyword” search: 16 hits; 0 resources

“social sciences (computer simulation)” as a “Subject Keyword” search: 8 hits; 0 resources

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I. SEARCH CHRONICLE CONTINUED

B. BOOKS CONTINUED

2. Google Books (www.google.com)
I used Google Book’s Advanced Search function, with the following settings:
- this exact wording or phrase: e.g.: complexity science
- Language: any language

For each search, I reviewed the top 200 hits. Following are the results:

a. CS search terms

“complexity science”: 640 hits; 2 potential resources:
- 1992: Complexity: the emerging science at the edge of order and chaos; MM Waldrop

“complex adaptive system”: 838 hits, 4 potential resources:
- 2008: The mind of the market; M Sherrmer
- 2008: Complex and adaptive dynamical systems; C Gros
- 1996: Hidden order; JH Holland
- 1995: The quark and the jaguar. M Gell-Mann

“network science”: 746 hits, 0 potential resources

“network theory”: 2572 hits, 0 potential resources

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b. ABMS search terms

“agent-based”/“agent based”: 2,601 hits, 3 resources:
- 2008: Behavioral modeling and simulation – from individuals to societies; National Research Council
- 2003: Introduction: agent-based computational demography; FC Billari, A Prskawetz
- 2002: The hare and the tortoise – cumulative progress in agent-based simulation; K Takadama, K Shimohara

“multiagent”/“multi-agent”/“multi agent”: 2,531 hits; 0 resource

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I. SEARCH CHRONICLE CONTINUED

B. BOOKS CONTINUED

I manually inspected the list of books. Following are the results:

- 1992: Time series prediction: forecasting the future and understanding the past; AS Weigend, NA Gershenfield

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I. SEARCH CHRONICLE CONTINUED
C. INTERNET

1. Google Web (www.google.com)
I used Google’s Advanced Search function, with the following settings:

- this exact wording or phrase: e.g. complexity science
- one or more of these words: e.g. actuarial OR actuary OR actuaries
- Language: any language
- File type: Adobe Acrobat PDF (.pdf) (because PDF files often contain interesting reports, I did a separate search for PDF files) as well as files that are not PDF.

For each search, I reviewed the top 200 hits. Following are the results:

a. CS search terms + Actuarial search terms
   i. PDF documents

"complexity science" actuarial OR actuary OR actuaries filetype:pdf: 234 hits; 3 potential resources:
- 2009: A complex model for managing risk in the age of globalization; G Gionta
- 2002: Complicated and complex systems: what would successful reform of Medicare look like?; S Glouberman, B Zimmerman
- 2009: Applications of complexity science for public policy; OECD Global Science Forum
- 2009: Complex systems modeling for obesity research; RA Hammond
- 2008: Complexity in the real world – grand challenges for complexity science; EPSRC
- 2005: General practice as a complex system; T Love
- 2004: Complex adaptive systems: a different way of thinking about health care systems; B Sibthorpe
- 2003: Power laws & the new science of complexity management; M Buchanan
- 2002: Learning about complexity science; NAPCRG
- 2008: Complexity science and long term care in Pennsylvania: an ecological analysis of the organizational landscape in 2020; M Lin
- 2008: Governance and complexity – emerging issues for governance theory; A Duit, V Galaz
- 2008: The complexity approach to economics: a paradigm shift; M Fontana
- 2002: Predicting the unpredictable; E Bonabeau

"complexity science" healthcare OR "health care" filetype:pdf: 1,520 hits; 4 potential resources:
- 2006: Complexity, simplicity, and epidemiology; N Pearce
- 2003: Health care organizations as complex adaptive systems; JW Begun
- 2003: Complexity and the adoption of innovation in health care; P Plsek
- 2001: The challenge of complexity in health care; P Plsek
I. SEARCH CHRONICLE CONTINUED
C. INTERNET CONTINUED

1. Google Web (www.google.com) continued

a. CS search terms + Actuarial search terms continued
i. PDF documents continued

"complexity science" "risk management" filetype:pdf: 1,480 hits; 8 potential resources:
- 2009: Emerging risks – sources, drivers and governance issues; IRGC
- 2008: A complexity science based approach to programme risk management; NJ Smith, D Bower, B Aritua
- 2008: Explaining what leads up to stock market crashes: a phase transition model and scalability dynamics; R Yalamove, B McKelvey
- 2007: Complexity and chaos – state of the art; M. Couture
- 2007: Econophysics and the complexity of financial markets; D Rickles
- 2007: Tackling complexity in science; M Couture
- 2006: Crisis management or crisis response system? – A complexity science approach to organizational crises; A Paraskevas
- 2003: The promises and perils of agent-based computational economics; M Richiardi

"complex adaptive system" actuarial OR actuary OR actuaries filetype:pdf: 298 hits; 0 potential resources:

"complex adaptive system" investment OR "asset allocation" filetype:pdf: 48,300 hits; 1 potential resource:
- 2002: The cellular automaton model of investment behavior in the stock market; Y Wei

"complex adaptive system" insurance OR reinsurance filetype:pdf: 598 hits; 1 potential resource:
- 2008: Health care as a complex adaptive system: implications for design and management; WB Rouse

"complex adaptive system" pension OR retirement filetype:pdf: 5,200 hits; 3 potential resources:
- 2009: Complex adaptive systems: how informed patient choice influences the distribution of complex surgical procedures; J Studnicki
  - 2008: A new tool for epidemiology: the usefulness of dynamic-agent models in understanding place effects on health; AH Auchincloss and D Roux.
  - 2007: Optimization of HAART with genetic algorithms and agent-based models of HIV infection; F Castiglione, F Pappalardo, M Bernaschi, S Motta
  - 2002: Modeling infection transmission: the pursuit of complexities that matter; JS Koopman
- 2001: A complexity and Darwinian approach to management with failure avoidance as the key tool; R Willis

"complex adaptive system" healthcare OR “health care” filetype:pdf: 632,000 hits; 0 potential resources

"complex adaptive system" “risk management” filetype:pdf: 10,700 hits; 0 potential resources

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I. SEARCH CHRONICLE CONTINUED
C. INTERNET CONTINUED

1. Google Web (www.google.com) continued

a. CS search terms + Actuarial search terms continued
   ii. General resources (but not PDF documents)

"complexity science" actuarial OR actuary OR actuaries –filetype:pdf: 496 hits; 1 resource:
   ▪ 2004: Humana announces latest release of SmartStart

"complexity science" investment OR “asset allocation” –filetype:pdf: 13,700 hits; 0 resources:

"complexity science" insurance OR reinsurance –filetype:pdf: 11,800 hits; 0 resources:

"complexity science" pension OR retirement –filetype:pdf: 3,500 hits; 0 resources:

"complexity science" healthcare OR “health care”: 23,400 hits; 1 resource:
   ▪ 2008: Why model?; Joshua Epstein

"complexity science" “risk management” –filetype:pdf: 9,420 hits; 4 resources:
   ▪ 2009: The implications of complexity science for economics and finance; G Fisher
   ▪ 2009: From Gaussian to Paretian thinking: causes and implications of power laws in organizations; P Andriani
   ▪ 2009: ‘Power curves’: what natural and economic disasters have in common; M Zanini
   ▪ 2008: Using ‘power curves’ to assess industry dynamics; M Zanini

"complex adaptive system" actuarial OR actuary OR actuaries –filetype:pdf: 15,700 hits; 1 resource:
   ▪ 2002: The role of futurism in creating actuarial models; P Bishop

"complex adaptive system" insurance OR reinsurance –filetype:pdf: 30,600 hits; 0 resources

"complex adaptive system" pension OR retirement –filetype:pdf: 610 hits; 0 resources:

"complex adaptive system" healthcare OR “health care” –filetype:pdf: 1,600,000 hits; 0 resources:

"complex adaptive system" “risk management” –filetype:pdf: 33,000 hits; 2 resources:
   ▪ 2008: Evolution management in a complex adaptive system: engineering the future; D Smith, NF Johnson

"network science" actuarial OR actuary OR actuaries –filetype:pdf: 95 hits; 0 resource:

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I. SEARCH CHRONICLE CONTINUED
C. INTERNET CONTINUED

1. Google Web (www.google.com) continued

b. ABMS search terms + Actuarial search terms
i. PDF documents

“agent-based”/“agent based” actuarial OR actuary OR actuaries filetype:pdf: 2,150 hits; 2 potential resources:
- 2008: An agent-based computational approach to explaining persistent spatial unemployment disparities; D McArthur, I Thorsen, J Uboe
- 2009: Back to basics: systemic risk and everyday behavior; N Cantle, BM Smith

“agent-based”/“agent based” investment OR “asset allocation” filetype:pdf: 41,800 hits; 1 potential resource:
- 2001: Toward agent-based models for investment; D Farmer

“agent-based”/“agent based” insurance OR reinsurance filetype:pdf: 30,800 hits; 4 potential resources:
- ?: Data integration in agent based modeling; T Bossomaier et al
- 2005: Modeling the US healthcare system – predicting the consequences of policy decisions through computational modeling; D Strip et al
- 2009: Experimental economics and agent-based models; S Heckbert

“agent-based”/“agent based” pension OR retirement filetype:pdf: 19,400 hits; 0 potential resources:

“agent-based”/“agent based” healthcare OR “health care” filetype:pdf: 83,600 hits; 2 potential resources:
- 2008: Agent-based modeling: new methodologies in impact analysis (ppt); S Chakravarty
- 2008: A survey of agent-based modeling practices; B Heath, R Hill, F Ciarallo

“agent-based”/“agent based” “risk management” filetype:pdf: 16,600 hits; 3 potential resources:
- 2009: Agent-based computer simulation for operational risk analysis (ppt); EP MacKerrow
- 2005: Risk management research imperatives; D Mango
- 2009: Is network theory the best hope for regulating systemic risk? (ppt); K Soramaki
  - 2009: Six degrees of rumination; C Wright
  - 2009: Meltdown modeling: could agent-based computer models prevent another financial crisis?; M Buchanan
  - 2009: Complex systems and networks: July 24 issue of Science

“multi-agent”/“multi agent”/“multiagent” actuarial OR actuary OR actuaries filetype:pdf: 1,350 hits; 0 potential resources

“multi-agent”/“multi agent”/“multiagent” investment OR “asset allocation” filetype:pdf: 24,200 hits; 0 potential resources

“multi-agent”/“multi agent”/“multiagent” insurance OR reinsurance filetype:pdf: 11,700 hits; 0 potential resources
LITERATURE SEARCH RESULTS

I. SEARCH CHRONICLE CONTINUED
C. INTERNET CONTINUED

1. Google Web (www.google.com) continued

b. ABMS search terms + Actuarial search terms continued
i. PDF documents continued

“multi-agent”/”multi agent”/”multiagent” pension OR retirement filetype:pdf: 11,800 hits; 3 potential resources:
- 2005: A study on Japanese public pension system using multi agent based simulation; N Tanida, M Murakami
- 2006: Revisiting to agent based modelling for unpayment behaviour on Japanese public pension system; M Murakami, N Tanida
- 2005: Multi-agent modeling and analysis of the Brazilian food-poisoning scenario; V Mysore et al

“multi-agent”/”multi agent”/”multiagent” healthcare OR “health care” filetype:pdf: 20,400 hits; 2 potential resources:
- 2005: Modeling malaria with multi-agent systems; F Rateb et al
- 2005: Multi-agent modeling and analysis of the Brazilian food-poisoning scenario; V. Mysore

“multi-agent”/”multi agent”/”multiagent” “risk management” filetype:pdf: 8,250 hits; 1 potential resource:
- ?: Multi-agent simulation of financial markets; O Streltchenko, Y Yesha, T Finin

“network theory”/”network science” “actuary” OR “actuaries” OR “actuarial” filetype:pdf: 4,300 hits; 0 potential resources:

“behavioral economics”/”behavioural economics” “health care” OR “healthcare” filetype:pdf: 9,500 hits; 0 potential resources:
- 2009: Obesity: can behavioral economics help?: DR Just, CR Payne
- 2009: Economic regulation of physicians: a behavioral economics perspective; TL Greaney
- 2008: Health care and behavioral economics: a presentation to the National Academy of Social Insurance; P Orszag
  — 2007: Behavioral economics and its applications; P Diamond, H Vartiainen, J Yrjo
- 2008: Behavioral economics: lessons from retirement research for health care and beyond; P Orszag
- 2007: The behavioral economics of retirement savings behavior; RH Thaler, S Benartzi
- 2005: The health care challenge: some perspectives from behavioral economics; RG Frank
- 2005: Behavioral economics: the art and science of making choices; JWC Stark
- 2004: Behavioral economics and health economics; RG Frank
  — 2008: Optimal decision making, rules of thumb, and age; T Besedes
  — 2009: Quality and consumer decision making in the market for health insurance and health care services; J Kolstad
- ?: Concentration & competition in health care (PowerPoint); T Greaney

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C. INTERNET CONTINUED

1. Google Web (www.google.com) continued

b. ABMS search terms + Actuarial search terms
   ii. General resources (but not PDF documents)

"agent-based"/"agent based" actuarial OR actuary OR actuaries –filetype:pdf: 9,750 hits; 0 potential resources

"agent-based"/"agent based" investment OR “asset allocation” –filetype:pdf: 131,000 hits; 1 potential resource:
   ▪ 2008: An agent-based macroeconomic model with interacting firms, socio-economic opinion formation and optimistic/pessimistic sales expectations; F Westerhoff

"agent-based"/"agent based" insurance OR reinsurance –filetype:pdf: 111,000 hits; 2 potential resources:
   ▪ 2006: Experimental investigation in medical markets and institutional sources of price inflation; CA Johnston
   ▪ 2000: Agent-based modeling of disrupted market ecologies: a strategic tool to think with; MJ Jacobson, MA Allison, GEP Ropella

"agent-based"/"agent based" pension OR retirement –filetype:pdf: 59,000 hits; 0 potential resources

"agent-based"/"agent based" healthcare OR “health care” –filetype:pdf: 111,000 hits; 1 potential resource:
   ▪ 2008: Behavioral economics: implications for an aging population’s wealth and health decisions; AS Rao

“multi-agent”/“multi agent”/“multiagent” actuarial OR actuary OR actuaries –filetype:pdf: 6,530 hits; 0 potential resources

“multi-agent”/“multi agent”/“multiagent” investment OR “asset allocation” –filetype:pdf: 55,100 hits; 0 potential resources:

“multi-agent”/“multi agent”/“multiagent” insurance OR reinsurance –filetype:pdf: 38,100 hits; 0 potential resources:

“multi-agent”/“multi agent”/“multiagent” pension OR retirement –filetype:pdf: 22,500 hits; 0 potential resources:

“multi-agent”/“multi agent”/“multiagent” healthcare OR “health care” –filetype:pdf: 81,500 hits; 0 potential resources:

“multi-agent”/“multi agent”/“multiagent” “risk management” –filetype:pdf: 27,500 hits; 1 potential resource:
   ▪ 2001: Application of multi-agent games to the prediction of financial time-series; N Johnson et al

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I. SEARCH CHRONICLE CONTINUED

D. JOURNALS

1. Google Scholar (scholar.google.com/advanced_scholar_search)

I used Google Scholar’s Advanced Search function, with the following settings:

- with the exact phrase: e.g.: complexity science
- Return articles published between 2008 – 2010 (inclusive)
- Search only articles in the following subject areas:
  - Business, Administration, Finance, and Economics
  - Social Sciences, Arts, and Humanities

For each search, I reviewed the top 200 hits. Following are the results:

a. CS search terms

"complexity science": 893 hits; 2 potential resources:
- 2009: Toward a systems biology framework for understanding aging and health span; West, Bergman
- 2009: Complexity science: an alternative framework for understanding strategic management in public serving organizations; L Paarlberg, Bielefeld

"complex adaptive system" OR "complex adaptive systems": 1,870 hits; 2 potential resources:
- 2009: Is U.S. health care an appropriate system? A strategic perspective from systems science; IP Janecka
- 2008: An agent-based model of a minimal economy; CK Chan, K Steiglitz

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a. ABMS search terms

“agent-based” OR “agent based”: 4,800 hits; 3 potential resources:
- 2008: Agent-based economic models and econometrics; S Chen, C Chang, Y Du
- 2008: Agent-based models and simulations in economics and social sciences: from conceptual exploration to distinct ways of experimenting; D Phan, F Varenne
- 2008: Agent-based financial modelling as an alternative to the standard representative-agent paradigm; T Ramauskas

“multi-agent” OR “multi agent” OR “multiagent”: 3,300 hits; 0 potential resources

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I. SEARCH CHRONICLE CONTINUED
D. JOURNALS CONTINUED

I used PubMed’s Advanced Search function, with the following settings:
• with the exact phrase(e.g.: “complexity science”) using “All Fields” as the focus
• Publication Date from 2008 to present

Following are the results:

a. CS search terms
"complexity science": 33 hits; 6 potential resources:
• 2010: Improving care in nursing homes using quality measures/indicators and complexity science; MJ Rantz, MK Fiesner, and M Zwygart-Stauffacher
• 2009: Insight: the application of complexity science to decision making; J Koerner
• 2009: Complexity science: how may it help oncology nurses?; W Duggleby
• 2009: Complexity science may help in defining health; VS Rambihar, V Rambihar
• 2008: Moving beyond nostalgia and motives: towards a complexity science view of medical professionalism; FW Hafferty
• 2008: Complexity science: core concepts and applications for medical practice; AM Patel, TM Sundt, P Varkey

"complex adaptive system": 25 hits; 3 potential resource:
• 2009: The complexity of medical organizations in the 21st century; A Afek
• 2009: Heterogeneous preferences, decision-making capacity, and phase transitions in a complex adaptive system; W Wang
• 2008: Embracing chaos and complexity: a quantum change for public health; K Resnicow and SE Page

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D. JOURNALS CONTINUED

   b. ABMS search terms

“agent-based”/“agent based”: 199 hits; 13 potential resources:
- 2010: Health outcomes and costs of community mitigation strategies for an influenza pandemic in the United States; DJ Perlroth et al
- 2009: A computer simulation of employee vaccination to mitigate influenza epidemic; BY Lee et al
- 2009: Simulating school closure strategies to mitigate an influenza epidemic; BY Lee et al
- 2009: Agent-based model for friendship in social networks
- **2009: The economy needs agent-based modeling; JD Farmer, D Foley**
- 2009: Modeling to contain pandemics; JM Epstein
- 2009: An agent-based approach for modeling dynamics of contagious disease spread; L Perez, S Dragicevic
- 2009: Modeling the cost-effectiveness of colorectal cancer screening: policy guidance based on patient preferences and compliance; S Subramanian, G Bobashev, RJ Morris
- 2009: Computational disease modeling: fact or fiction?: JN Tegner et al
- 2009: A novel approach to multihazard modeling and simulation; SW Smith et al
- 2009: Multiscale agent-based cancer modeling; L Zhang et al
- 2008: Virtual epidemic in a virtual city: simulating the spread of influenza in a US metropolitan area; BY Lee et al
- 2008: The virtue of virtuality: the promise of agent-based epidemic modeling; N Hupert, W Xiong, A Mushin

“multi-agent”/“multi agent”/“multiagent”: 214 hits; 4 potential resources:
- 2008: Multi-agent systems in epidemiology: a first step for computational biology in the study of vector-borne disease transmission; B Roche, JF Guegan, F Bousquet
- 2008: The geosimulation of West Nile virus propagation: a multi-agent and climate sensitive tool for risk management in public health; M Bouden, B Moulin, P Gosselin
- 2008: An adaptive system for home monitoring using a multiagent classification of patterns; A Rammal et al
- 2008: Evolution of a multi-agent system in a cyclical environment; T Baptista and E Costa

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I. SEARCH CHRONICLE CONTINUED
D. JOURNALS CONTINUED

3. Santa Fe Institute Working Papers (www.santafe.edu/research/publications/wpist)
I manually inspected the Santa Fe Institute Working Papers for 2008 and 2009. Results:

- 2009: The hidden fragility of complex systems: consequences of change, changing consequences; JP Crutchfield
- 2009: Systemic risks in society and economics; D Helbing
- 2009: El Farol revisited: a note on emergence, game theory and society; M Shubik
- 2009: Economic networks: what do we know and what do we need to know?; F Schweitzer et al
  – 2009: Predictably irrational: the hidden forces that shape our decisions; D Ariely
- 2008: On the generative nature of prediction; W Lohr, A Nihat

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I. SEARCH CHRONICLE CONTINUED
D. JOURNALS CONTINUED

4a. Journal of Artificial Societies and Social Simulation
(jasss.soc.surrey.ac.uk)
I manually inspected the journal’s articles for all of its issues, 1998 - 2009. Results:

- **2009**: The development of social simulation as reflected in the first ten years of JASS: a citation and co-citation analysis; M Meyer, I Lorscheid, KG Troitzsch
- **2009**: Social circles: a simple structure for agent-based social network models; L Hamill, N Gilbert
- **2009**: Design guidelines for agent based model visualization; D Kornhauser, U Wilensky, W Rand
- **2009**: Tools of the trade: a survey of various agent based modeling platforms; C Nikolai, G Madey
- **2008**: Alternative approaches to the empirical validation of agent-based models; S Moss
- **2007**: Making models match: replicating an agent-based model; U Wilensky, W Rand
- **2007**: Empirical validation of agent-based models: alternatives and prospects; P Windrum, G Fagiolo, A Moneta
- **2006**: Dialogues concerning a (possibly) new science; G Deffuant, S Moss, W Jager
- **2004**: Evaluation of free Java-libraries for social-scientific agent based simulation; R Tobias, C Hofmann
- **2003**: Replication, replication and replication: some hard lessons from model alignment; B Edmonds, D Hales
- **2002**: A comparison of simulation models applied to epidemics; R Bagni, R Berchi, P Cariello
- **2001**: Do irregular grids make a difference? Relaxing the spatial regularity assumption in cellular models of social dynamics; A Flache, R Hegselmann
- **2001**: Creating artificial worlds: a note on Sugarscape and two comments; P Terna
- **1998**: Just how (un)realistic are evolutionary algorithms as representations of social processes?; E Chattoe-Brown
- **1998**: Understanding complex social dynamics: a plea for cellular automata based modelling; R Hegselmann, A Flache

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I. SEARCH CHRONICLE CONTINUED
D. JOURNALS CONTINUED

4b. Computational and mathematical organization theory
(www.springerlink.com/content/1381-298X)
I manually inspected the journal’s articles for all of its issues, from 2002 through 2009. Results:

- 2009: Models as lab equipment: science from computational experiments; S Bankes
- 2008: Pandemic simulation of antivirals + school closures: buying time until strain-specific vaccine is available; SM Mniszewski et al

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I. SEARCH CHRONICLE CONTINUED
D. JOURNALS CONTINUED

4c. Complexity (www3.interscience.wiley.com/journal/388804/home)
I manually inspected the journal’s articles for 2008 and 2009. Results:

- 2008: A synthesis and a practical approach to complex systems; N Brodú

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I. SEARCH CHRONICLE CONTINUED
E. CONFERENCE PAPERS

1. Winter Simulation Conference (www.wintersim.org)
I manually inspected the conference papers for 2008 and 2009, for the following tracks: Education (all sections), Methodology (all sections), Health care applications, General applications, Business process modeling, and Case study applications. Results:

- **2009:** How to build valid and credible simulation models; AM Law
- **2009:** Agent-based modeling and simulation; CM Macal, MJ North
- **2009:** Verification and validation of simulation models; RG Sargent
- 2009: Three critical challenges for modeling and simulation in healthcare; T Young et al
- 2009: Implementation issues of modeling healthcare problems: misconceptions and lessons; T Eldabi
- **2008:** Agent-based modeling and simulation: ABMS examples; CM Macal, MJ North

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LITERATURE SEARCH RESULTS

I. SEARCH CHRONICLE CONTINUED
F. VIDEOS

1. Google Video (www.google.com)
I used Google’s Advanced Video Search function, with the following settings:
- this exact wording or phrase: e.g.: complexity science
- Language: any language
- Duration: all durations
- Date: all dates
- File types: all file types

For each search, I reviewed the top 200 hits. Following are the results:

a. CS search terms

“complexity science”: 82 hits; 6 potential resources
- 2009: Adapting the Cynefin framework to encompass systemic change; N Radford
- **2008**: Modeling complex adaptive systems; J Holland
- 2007: On the relevance of extremes vs. means in organization science; P Andriani
- 2007: On the relevance of extremes vs. means in organization science (.ppt); P Andriani
- **2007**: Emergence – complexity from simplicity, order from chaos (1 of 2), with J Holland; NOVA
- 2007: Emergence – complexity from simplicity, order from chaos (2 of 2), with J Holland; NOVA

“complex adaptive system”: 24 hits, 1 new resource
- 2009: Modeling the complex healthcare system; W Rouse

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b. ABMS search terms

“agent-based”/“agent based”: 277 hits; 3 potential resources
- 2009: Anatomy of financial crisis; S Thurner
- **2008**: Agent-based modeling and the smallpox example; J Epstein
- 2007: The prospects and perils of complex systems modeling; M Mitchell

“multiagent”/“multi-agent”/“multi agent”: 241 hits; 0 resources

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I. SEARCH CHRONICLE CONTINUED
F. VIDEOS CONTINUED

1. Google Video (www.google.com) continued

c. Other
I also searched for videos by author name, and found:

2009: Complexity (Chapter 5 of 6): The complexity of life
2009: A simple explanation of the Cynefin framework
**2009: Interview with Richard Dawkins: The Genius of Darwin (part 1); ED Beinhocker**
2008: Complexity & economics (part 1)
2008: Complexity & economics (part 2)
**2008: A documentary on networks, social and otherwise (part 1)**
**2008: A documentary on networks, social and otherwise (part 2)**
**2008: A documentary on networks, social and otherwise (part 3)**
2008: A new kind of science; Stephen Wolfram
2008: Presentation of the book Predictably irrational; D Ariely
2007: John Conway talks about the Game of Life (part 1), with John Conway
2007: John Conway talks about the Game of Life (part 2), with John Conway
2007: Murray Gell-Mann on emergence
2006: A new centre for complexity science, with Robert Mackay; Lesley Carr

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I. SEARCH CHRONICLE CONTINUED

G. GENERAL REFERENCE

1. Wikipedia (en.wikipedia.org)
I used the basic Wikipedia search function for the search.

a. CS search terms

“complexity science”: 1 hit, 1 potential resource:
  • Complex systems: en.wikipedia.org/wiki/Complexity_science

“complex adaptive system”: 1 hit, 1 potential resource:
  • Complex adaptive system: en.wikipedia.org/wiki/Complex_adaptive_system

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b. ABMS search terms

“agent-based”/“agent based”: 1 hit, 1 potential resources
  • Agent-based model: 2009: en.wikipedia.org/wiki/Agent_based

“multiagent”/“multi-agent”/“multi agent”: 0 hits, 0 potential resources

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I. SEARCH CHRONICLE CONTINUED

H. MISCELLANEOUS SEARCHES

1. Google Web (www.google.com)

a. Cellular automata search terms

“cellular automata” OR “cellular automaton” actuary OR actuarial OR actuaries filetype:pdf: 593 hits, 3 potential resources:

- 2007: Critical review of stochastic simulation literature and applications for health actuaries; L Anderson et al
- 2005: Evolving techniques and capabilities: Part 2; P Lacko
- ?: Actuarial applications of multifractal modeling Part I; JA Major, Y Lantsman

“cellular automata” OR “cellular automaton” insurance filetype:pdf: 3,140 hits, 5 potential resources:

- 2008: A genetically modified liability insurance contract; S Chandler
- 2004: Simpler games: using cellular automata to model social interaction; S Chandler
- 2002: Visualizing adverse selection: an economic approach to the law of insurance underwriting; S Chandler
- 2001: Behavior and learning under law: automata containing evolutionary algorithms; S Chandler
- 2005: High deductible health plans: the limits of analytic economics; S Chandler

“cellular automata” OR “cellular automaton” “healthcare” OR “health care” OR “health” filetype:pdf: x hits, y potential resource:

“cellular automata” OR “cellular automaton” “risk management” filetype:pdf: x hits, x potential resource:

“cellular automata” OR “cellular automaton” filetype:pdf: x hits, x potential resource:

2000: Introduction to cellular automata; JP Rennard

“cellular automata” OR “cellular automaton” fractal filetype:pdf: x hits, x potential resource:

“cellular automata” OR “cellular automaton” self-organization filetype:pdf: x hits, x potential resource:

“cellular automata” OR “cellular automaton” prediction filetype:pdf: 24,200 hits, 3 potential resource:

- 2004: Is prediction possible? Chaotic behavior of multiple equilibria regulation model in cellular automata topology; ID Katerelos
- 2005: Genetic algorithm evolution of cellular automata rules for complex binary sequence prediction; AV Adamopoulos
- 2010: Predicting chaotic sequences using cellular automata; WL Meier

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II. BIBLIOGRAPHY


Boscuetti, F., Prokopenko, M., Macreadie, I., & Grisogono, A.-M. *Defining and detecting emergence in complex networks*.

Bossomaier, T., Jarratt, D., Anver, M. M., Scott, T., & Thompson, J. *Data integration in agent based modelling*.


Streltchenko, O., Yesha, Y., & Finin, T. *Multi-agent simulation of financial markets*.


LITERATURE SEARCH RESULTS


Willis, R. (2001). *A complexity and Darwinian approach to management with failure avoidance as the key tool*: University of Lecce.


LITERATURE SEARCH RESULTS


