Nathan Palmer

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Education

Ph.D. Candidate in Computational Social Science
George Mason University, Fairfax, Virginia — Expected **May 2016**

M.A. in Economics
Boston University, Boston, Massachusetts — **May 2011**
Concentrations: Macroeconomics and Finance

B.S. in Computer Science
Trinity University, San Antonio, Texas — **May 2005**
Minors: Economics, Mathematics

LSE Macro Methods Summer School, non-degree, London, UK — **August 2014**
Johns Hopkins University, non-degree, Washington, DC — **May 2008 – July 2008**
George Washington University, non-degree, Washington, DC — **September 2007 – May 2008**
Georgetown University, non-degree, Washington, DC — **July 2007 – August 2007**

Notable Coursework: Macroeconomics and Financial Markets, Advanced Microeconomic Theory, Econometrics I, II, Agent-based Computational Economics, Working with Large Scale Data.

Experience

PhD Intern Rotation, Consumer Financial Protection Bureau, Washington, DC
August 2014 – Present

- Working directly for Assistant Director, Chris Carroll, to update and standardize code to solve microeconomic dynamic optimization problems using multiple languages (Python, Matlab, Mathematica). Initial results include roughly 400x estimation speed-up.
- Creating heterogeneous-agent toolkit and collaboration efforts.
- Continued work on dissertation regarding approximate dynamic programing, reinforcement learning, and social learning methods applied to the household consumption/savings problem. Numerical results show uninformed household learning can accelerate 20- to 100-fold under simple extensions.

PhD Intern, Office of Financial Research, U.S. Department of the Treasury, Washington, DC
January 2012 – Present

- Over two years of experience constructing multiple agent-based models of financial markets in Java and Python to explore systemic risk associated with leverage, concentration, and liquidity. Aims to quantify systemic risk and explore robustness of risk metrics.
- Heavily involved in planning and conducting research project - reviewing literature, solving agent policies, writing the code base, defining and executing the requirements for simulation and analytical analysis tools.

References Upon Request

Graduate Research Assistant, Department of Computational Social Science, George Mason University
January 2011 – May 2012

- Worked with Rob Axtell, Doyne Farmer, John Geanakoplos, and Peter Howitt on an agent-based model of the Mortgage Crisis, using Java, R, Python, and the MASON toolkit.
- Research was presented at the AEA Annual Conference 2012, and appeared in the May 2012 Proceedings.
- Work consisted of researching and constructing underlying income and consumption models, writing code, organizing and analyzing large datasets, and building the researcher interface to the model.
- On theoretical side, worked on the household income process and household behavior (household policies).
- On data side, worked with project leads to determine data required to populate the model with extensive public and private micro-level data sources, nearly a dozen data sources in total. Constructed and maintained a custom data storage system in R and Python to meet this need.
- Helped establish estimation routines.

Artificial Intelligence Engineer, Agent-Based Modeling group, MITRE Corporation, McLean, VA
July 2011 – August 2011

- Worked as a summer intern on the early stages of an agent-based model of the Financial Crisis, with an emphasis on networks of financial firm interaction.
- Employed statistical tests and treatment effects models on USDA data to determine policy effectiveness.

Senior Research Assistant, Federal Reserve Board, Washington, DC **June 2006 – July 2009**

- Regularly forecast macroeconomic variables and provide country coverage for Nordic countries.
- Regularly presented detailed macroeconomic and financial forecasts at internal forecast meetings.
- Wrote country briefings for Sweden, Norway, and Finland for members of the Board of Governors when foreign dignitaries visited. Was commended for anticipating Swedish Parliamentary concerns prior to meeting.
- Wrote and assisted with memos concerning the financial crisis and macroeconomic developments in Iceland during its banking crisis and collapse for both internal and external audiences.
- Assist with price, risk, and demographic research projects: choose models; wrote simulations; analyzed data. Included models of correlated mortgage defaults and expectations-driven house price growth and crashes.
- Constructed a simple bank financial data monitoring system, updated daily; wrote briefs for internal audience.
- Wrote and managed economic, financial, and forecasting data systems in the Advanced Foreign Economies section.
- In my last year, trained an entire 4-person Research Assistant (RA) staff when turnover synchronized. Managed the team & regularly reported to section management about progress on a number of projects.

Research and Publications

"*Getting at Systemic Risk via an Agent-Based Model of the Housing Market,*" with Geanakoplos et al. *American Economic Review,* May 2012, 102(3): 53–58.

Systemic risk must include the housing market, though economists have not generally focused on it. We begin construction of an agent-based model of the housing market with individual data from Washington, DC. Twenty years of success with agent-based models of mortgage prepayments give us hope that such a model could be useful. Preliminary analysis suggests that the housing boom and bust of 1997-2007 was due in large part to changes in leverage rather than interest rates.

"*Learning to Consume: Individual vs. Social Learning,*" dissertation in progress. Preliminary version presented at the Society for Computational Economics' 18th International Conference: Computing in Economics and Finance (CEF 2012), Prague, Czech Republic.

Obtaining the exact solution to the consumption-under-uncertainty problem can be an extraordinarily difficult mathematical problem. Allen and Carroll (2001), however, show that a simple linear approximation to the optimal policy rule can yield utility trivially close to that of the exact solution. Furthermore, Allen and Carroll show that consumers can consistently find the near-optimal approximate solution using simple trial-and-error statistical learning, which has an attractive and intuitive interpretation. Their result comes with a negative corollary: the amount of time necessary to consistently find a near-optimal rule is astronomical and unattainable under any plausible scenarios. This paper extends Allen and Carroll's original agent-based model in two ways: first, we incorporate social learning into the process, and second, we introduce an new, intuitively motived estimator of the value of a simple linear consumption rule. Social learning occurs through a simple form of information sharing. This addition retains the original model's results that consumers can consistently find an optimal rule, but lowers the time required to find such a rule arbitrarily close to the lowest possible bound. The time required to find a rule is now a function of the number of agents in the model. Furthermore, the new estimator we identify further decreases the amount of time required to find a near-optimal rule by a full order of magnitude. This estimator also opens the door for the social learning process to incorporate heterogeneous initial endowment values across agents, a welcome extension to the original model.

"*Encoding Transparency: Literate Programming and Test Generation for Scientific Function Libraries,*" Working paper with Mark Flood and Matthew McCormick, 2012.

We present a variation on literate programming (see Knuth: 1984, 1992) targeting multiple simultaneous readerships, both human (e.g., coders, testers, analysts, etc.) and compilers/interpreters (e.g., C , Python, Fortran, etc.). The technique exploits existing commenting syntax available in all common programming languages to provide inline documentation and other semantic markup, which can then be used in test generation and code translation. To keep the problem manageable, we restrict attention to scientific function libraries (i.e., libraries of numerical routines adhering to the functional programming rule of "no side effects"). We offer a prototype implementation in XSLT and DocBook.

Technical Skills

Software: Java, Python, R, MATLAB/Octave, NetLogo, FAME, Visual Basic, C/C++, Stata, Eviews, Perl, XML.

Methods: Agent-based modeling, dynamic programming, reinforcement learning, parallel computation, distributed computation, Monte Carlo simulation, econometric analysis, heuristic optimization, network analysis.

Database Experience: Haver, Federal Reserve Board FAME databases, custom Python and R data management systems. Particular large-scale datasets employed include: HMDA, PSID, ACS, AHS.

Computer Platforms: Proficient in UNIX/Linux, Apple Mac OS X, and Microsoft Windows.

References Upon Request

Awards and Honors

- Dean's List with Distinction, Boston University, 2010
- Dean′s List at Trinity University, 2004; National Dean′s List, 2004 – 2005
- Member of Upsilon Pi Epsilon, International Computer Science honor society, 2005
- Member of Omicron Delta Epsilon, International Economics honor society, 2005