Introducing the Econ-ARK: Economics "Algorithmic Repository and toolKit"

Minicourse by Chris Carroll and Matt White at Goethe University
SAFE

May 28-29, 2018

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State-of-the-art set of tools for:

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Solving dynamic stochastic optimization problems

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 - 'Hard' Bellman problems with uncertainty, 'kinks,' nonconvexities

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- Solving dynamic stochastic optimization problems
 - 'Hard' Bellman problems with uncertainty, 'kinks,' nonconvexities
- Simulate behavior of populations of agents
- Finding equilibria for markets/economies populated by such agents

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Who Has Produced It?

Name	TLA	Affiliation
Christopher D Carroll	CDC	JHU, CFPB
David C Low	DCL	CFPB
Nathan M Palmer	NMP	OFR
Matthew N White	MNW	UDel, CFPB
Alex Kaufman	ABK	$CFPB \to Princeton$

Nothing herein may be interpreted as reflecing opinions of

CFPB - United States Consumer Financial Protection Bureau

JHU - Johns Hopkins University

IMF - International Monetary Fund

OFR - Office of Financial Research, U.S. Treasury

UDel - University of Delaware

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Just Received Big Grant from Alfred P. Sloan Foundation!

Three Years

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Three Years

• Hire Programmers, RA's, Open Source Project Managers, etc etc

• Heterogeneous Agent Macro Models

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- Heterogeneous Agent Macro Models
 - Original name: Heterogeneous Agent Resources and toolKit

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- Structural Micro Models (e.g., labor, health)

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- IO models with equilibrim between consumer agents and firm agents

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Make it *much* easier:

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• To get started doing structural Heterogeneous Agent modeling

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Remove the excuse 'Structural model was not worth the effort'

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Browse without installing:

• Browse on our webpage at econ-ark.org

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Run notebooks on your own computer:

Install Jupyter



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References I

- BLANCHARD, OLIVIER (2016): "Do DSGE Models Have a Future?," Discussion paper, Petersen Institute for International Economics, Available at https://piie.com/system/files/documents/pb16-11.pdf.
- COEURE, BENOIT (2013): "The relevance of household-level data for monetary policy and financial stability analysis," .
- HALDANE, ANDY (2016): "The Dappled World," Discussion paper, Bank of England, Available at http://www.bankofengland.co.uk/publications/Pages/speeches/2016/937.aspx.
- SUMMERS, LAWRENCE H. (2011): "Larry Summers and Martin Wolf on New Economic Thinking," Financial Times interview, http://larrysummers.com/commentary/speeches/brenton-woods-speech/.
- Yellen, Janet (2016): "Macroeconomic Research After the Crisis," Available at https://www.federalreserve.gov/newsevents/speech/yellen20161014a.htm.

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