

# Mathematical Modeling of Social Phenomena

Introduction

**Who are we?**

Name?

Why this course?

Experience with models?

# Expectations

What are your expectations on this course?

# Outline of the course

Basic Theory Segment

Project Segment

Advanced Theory Segment

# Basic Theory Segment

Modeling exposé

Modeling worthwhile?

What is a good model?

# Project Segment

From popular knowledge

To question

To model - and beyond!

# Advanced Theory Segment

Frameworks and techniques

Agent-based modeling, simulation

Game theory, evolution and behavior

# Examination

40 %      Participation

40 %      Project

20 %      Final project



# Rough introduction

# Introduction

Why models?

What is modeling?

How does models relate to theory and the real world?

# Why modeling?

Ubiquitous in modern world, science and more

Help us think (stringency)

Help us communicate (well-defined)

# Why modeling?

Explorative

Contrafactual

point estimates

boundaries

stories

# Why modeling?

Assuring deduction:

“Rather deduction from the false, than induction  
from the true.”

# Caveats

All models are wrong

We gain deduction, but we lose worldliness

Mislead us. Get us into trouble

# What is modeling

Finding the stuff that matters

Describing relationships between that stuff

Deduce “insights” about the workings of stuff

# Models and stories

A model [...] is a story with a specified structure. The structure is given by the logical and mathematical form of a set of postulates, the assumptions of the model. The structure forms an uninterpreted system, [...] Although the term 'model' is often applied to a structure alone, we shall use it in another sense. In economists' use of models, there is always an element of interpretation: the models always tells a story.  
(Gibbard & Varian, 1978)



# Models and stories - incoherent

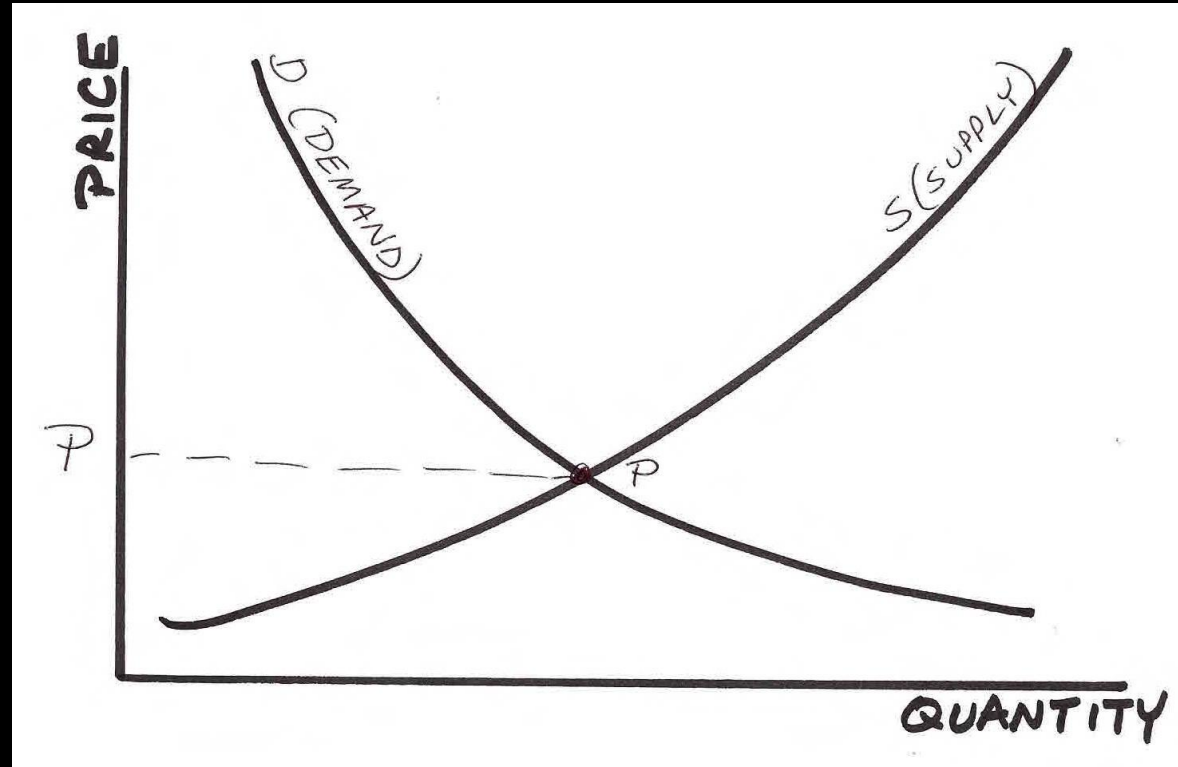
Deirdre McCloskey:

The vaguer the model the better the story can fit into the historical world, while the more exact the model, the more absurd the history becomes.

# Vague may be OK?

“The models I wrote down [...] were incomplete, if one demanded of them they specify exactly who produced what. And yet they told meaningful stories” (Krugman 1993)

# An example: Supply demand curve



# Models and reality

At build time

And at use time

Models need to be employed!

# Isolation and simplification

Not the whole real

Hence simpler - dynamics need not be simpler  
though

Isolation of the “heart of the issue”

# The End

Next time we will take a flyover glance at a few models.

I promise more pictures.