Economic Dynamics

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Lecture 2: Simple Keynesian Dynamics (closed economy)

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ISM University, Lithuania

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Virginia Western College, USA

UNIVERSITETET I BERGEN

System Dynamics Group

Lectures: Thursdays, 16:30-17:30

Sep 17	Introduction to Dynamic Modeling
Sep 24	Simple Keynesian Dynamics (closed economy)
Oct 1	Simple Keynesian Dynamics (open economy)
Oct 8	IS-LM Dynamics
Oct 15	Money Stocks in Keynesian Models
Oct 16-28	—- autumn break—-
Oct 29	Dynamics of Economic Instability
Nov 5	Dynamics of Economic Growth
Nov 12	Economic Policy Dynamics
Nov 19	Open Economy Dynamics
Dec 7	Submit Final Exam Project

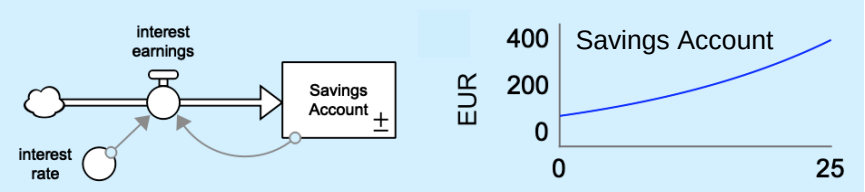
lab dates to be announced, by **Alina Novik** and **Marianna Oliskevych**

Goal-Seeking Flow Equation

Last week: positive feedback loop

Reinforcing process leading to exponential growth

interest earnings = interest rate *Savings Account



This week: negative feedback loop

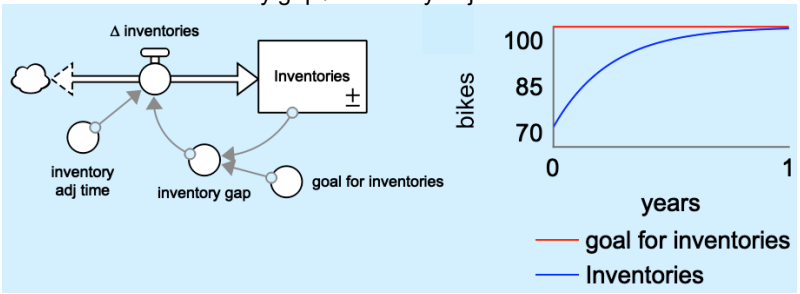
Balancing process in search of a goal:

(1) Material stock

Δ inventories = inventory gap / inventory adj time

inventory gap = goal for inventories - inventories

Δ inventories = inventory gap / inventory adj time



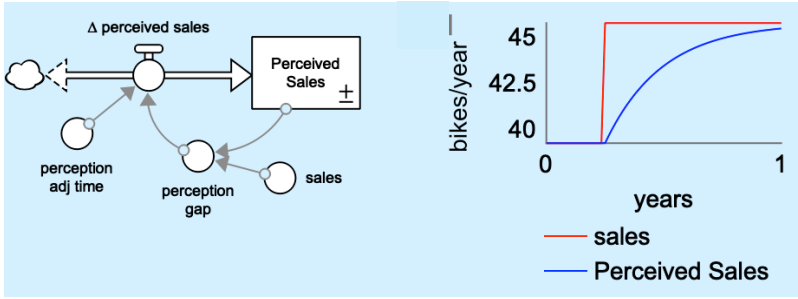
inventory gap = goal for inventories - inventories

(2) Information stock

Δ perceived sales = perception gap / perception adj time

perception gap = sales – perceived sales

Δ perceived sales = perception gap / perception adj time



perception gap = sales – perceived sales

John M. Keynes (1883-1946)

The General Theory of Employment, Interest, and Money (1936)

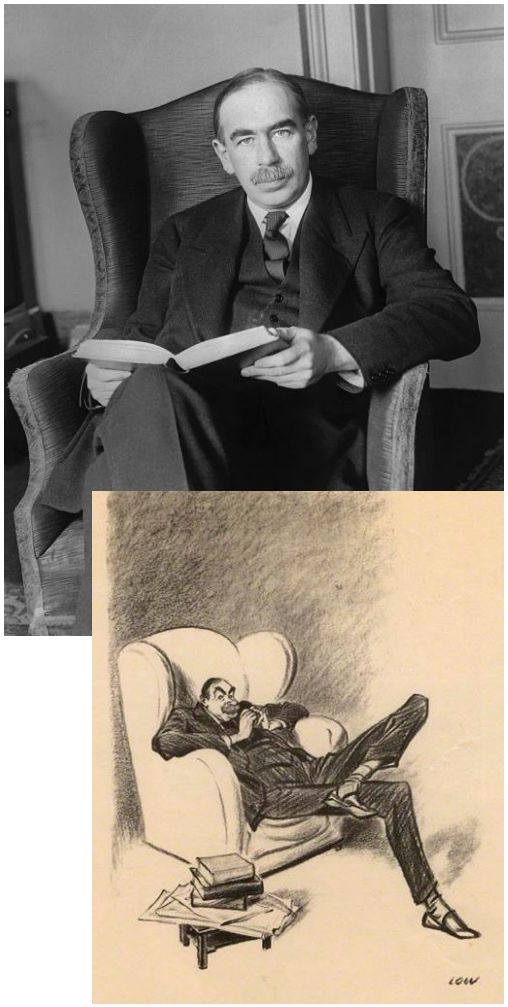
Depression era book: focused on restoring jobs

”Keynesian” (‘Kanzien’) theory emphasized the ‘demand’ side of the economy.

Two opposing views:
Say’s Law: “supply creates its own demand”
Keynes’ Law: “demand creates its own supply”

Simplest expression of Keynes’ theory for closed economy:
$E = C + I + G$
$C = a + bY$
$Y = E$
$Y = (a + bY) + I + G$

$Y^* = (1/(1-b) *(a + I + G)$ → ‘multiplier’ = $k = 1/(1-b)$
example: $b = .75$ → $k = 4$



Keynesian Multiplier *with* Taxes

Without taxes:

$E = C + I + G$

$C = a + bY$

$Y = E$

$Y = (a + bY) + I + G$

$Y^* = (1/(1-b)) * (a + I + G)$ → 'multiplier' = $k = 1/(1-b)$

example: $b = .75$ → $k = 4$

With taxes

$E = C + I + G$

$C = a + bY_d$

$Y_d = Y - T$ where $T = Y*tx$

$Y_d = Y - tx*Y$

$C = a + b(Y - txY)$

$Y = E$

$Y = a + b(Y - txY) + I + G$

$Y^* = (1/(1-b(1-tx))) * (a + I + G)$ → 'multiplier' = $k = (1/(1-b(1-tx))$

example: $b = .75$ and $tx = .20$ → $k = (1/(1-.75*(1-.20)) = 2.5$

Shone, Fig 3.5

Fig 3.5 in Shone (p. 58)

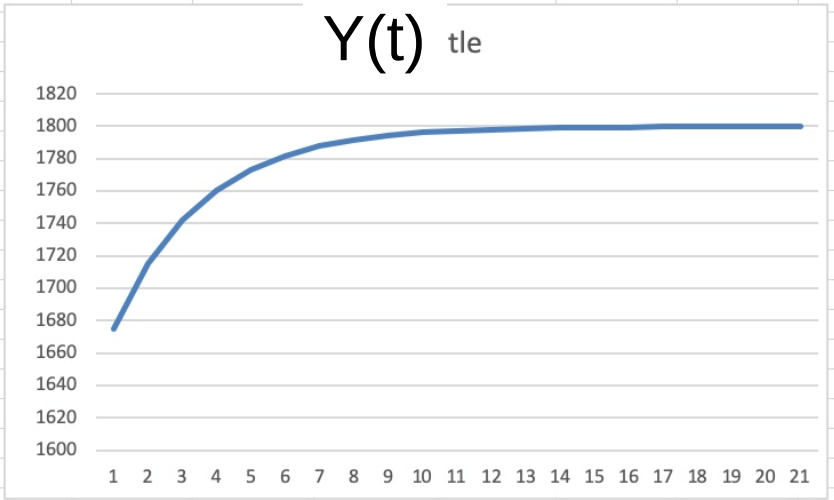
Dynamic model with taxes

$$C(t) = a + bYd(t)$$
$$Yd(t) = Y(t) - Tx(t)$$
$$Tx(t) = Tx_0 + tx\,Y(t)$$
$$E(t) = C(t) + I + G$$
$$\Delta Y(t+1) = \lambda(E(t) - Y(t)) \quad \lambda > 0$$

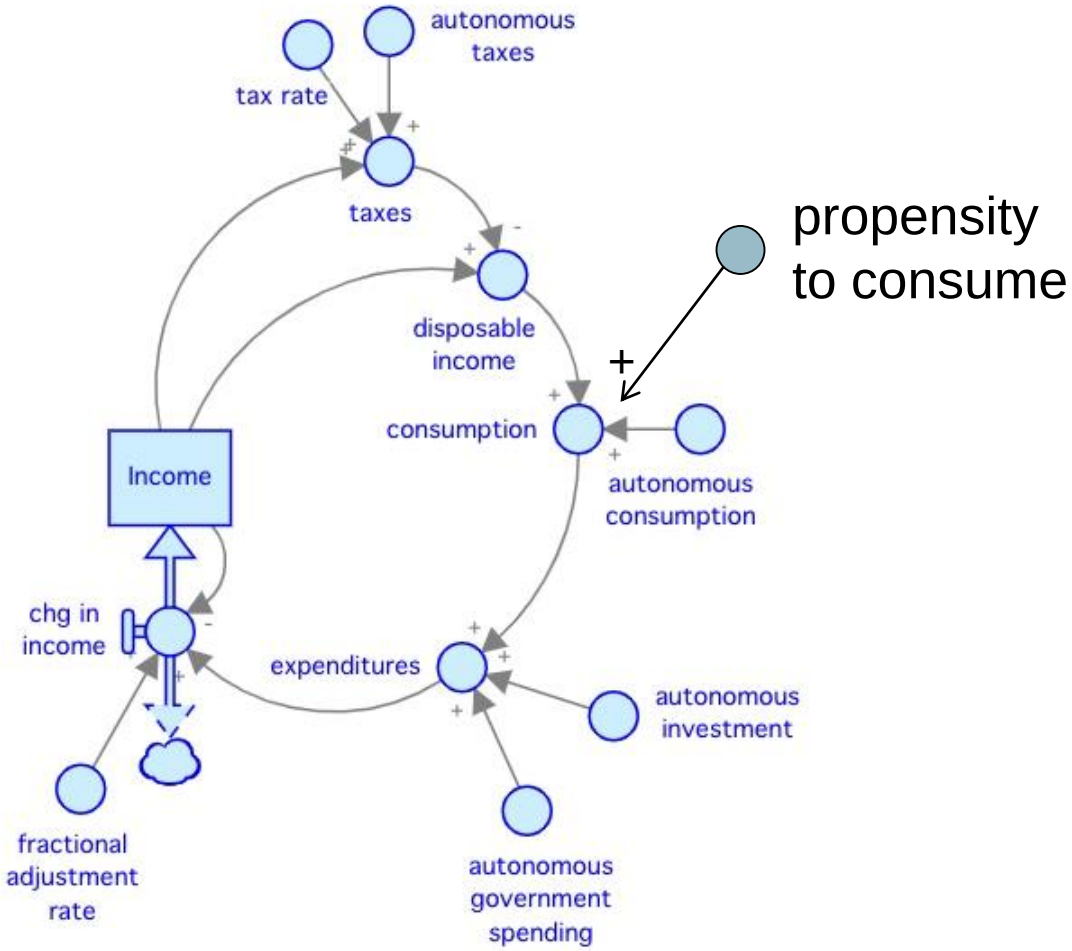
a =	110			
b =	0.75			
Tx0 =	-80			
tx =	0.2	Y* =	1800	
I =	250	BD* =	20	
G =	300			
λ =	0.8			

$Y^* = k * (a - Tx_0 * b + I + G)$
$= 2.5 * (110 - (-80 * 0.75) + 250 + 300)$
$= 2.5 * 720 = 1800$

	Y(t)	Tx(t)	Yd(t)	C(t)	E(t)	E(t)-Y(t)	BD(t)
0	1675	255	1420	1175	1725	50	45
1	1715	263	1452	1199	1749	34	37
2	1742	268	1474	1215	1765	23	32
3	1761	272	1489	1226	1776	16	28
4	1773	275	1499	1234	1784	11	25
5	1782	276	1505	1239	1789	7	24
6	1788	278	1510	1243	1793	5	22
7	1792	278	1513	1245	1795	3	22
8	1794	279	1515	1247	1797	2	21
9	1796	279	1517	1248	1798	2	21
10	1797	279	1518	1248	1798	1	21
11	1798	280	1519	1249	1799	1	20
12	1799	280	1519	1249	1799	0	20
13	1799	280	1519	1250	1800	0	20
14	1799	280	1520	1250	1800	0	20
15	1800	280	1520	1250	1800	0	20
16	1800	280	1520	1250	1800	0	20
17	1800	280	1520	1250	1800	0	20
18	1800	280	1520	1250	1800	0	20
19	1800	280	1520	1250	1800	0	20
20	1800	280	1520	1250	1800	0	20



SD Version of Simple Keynesian Model



https://exchange.iseesystems.com/public/david-wheat/model-35/index.html#page1

Assignments

1. Write the ‘story’ for online SD Model 3.5

   https://exchange.iseesystems.com/public/david-wheat/model-35/index.html#page1

   - 1st in your notes - 2nd in Stella Architect

2. Study Spreadsheet Model in Fig 3.8.

3. Build SD Model 3.8 by adding exports & imports to SD Model 3.5.
   - ‘save as ...” Model 3.8
   - then add another ‘chapter’ to your story

I. David Wheat

Professor of System Dynamics, University of Bergen, Norway
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Professor, Monetary Policy, ISM University of Management & Economics, Lithuania
Professor, Economic Dynamics, National University of Kyiv-Mohyla Academy, Ukraine

Professor Wheat studies economic systems. His research specialty is simulation modeling of European economies, including Ukraine, Lithuania, Latvia, and the Euro Area.

He teaches monetary policy and economic dynamics to graduate students in Lithuania and Ukraine. He also teaches macroeconomics and microeconomics to undergraduates in the United States. In Norway, after teaching the system dynamics modeling process for many years, he continues to offer courses in macroeconomic dynamics and policy design & implementation. Current projects include collaboration with Ukrainian economists to build dynamic modeling capacity at national universities in Kyiv and Lviv, plus development of monetary policy models with economists at Ukraine's central bank. He has worked with economists at Lithuania's central bank to develop a multi-industry system dynamics model of price dynamics in Europe.

For nearly twenty years, his system dynamics-based *MacroLab* model has been used by macroeconomics students in the United States. That model is available online, and students can use it without special software. He is currently writing a textbook to supplement student use of *MacroLab*. His latest economics journal article is *Teaching Endogenous Money with Systems Thinking and Simulation Tools*, and the most recent conference paper was *The Canonical New Keynesian Monetary Policy Model: A System Dynamics Translation* (with M. Oliskevych). He is co-editor of *Feedback Dynamics*, a book that will be published by Springer in 2020.

Wheat is past-president of the economics chapter of the International System Dynamics Society. He served as Associate Editor of the *System Dynamics Review* and on the Advisory Board of the *International Journal of Pluralism and Economics Education*. He has given more than thirty international guest lectures. For three decades, he was president of Wheat Resources Inc, a consulting firm serving business and government clients. His current firm, Praktika LLC, specializes in coaching others to build useful models. He received his PhD at the University of Bergen, his master's degree at Harvard University, and his bachelor's degree at Texas Tech University. During the 1970s, he served at the White House as staff assistant to the President of the United States.