

Exogenous vs. Endogenous High-powered Money in Keynesian Monetary Growth Models

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Outline of presentation

- Research question and methodology
- Overview of models in paper
- Model in detail: SFC accounting
- Presentation of model results and where we go from here

Research question and
methodological approach

Research questions

- Many sophisticated models in the distribution and growth literature assume exogenous money
- How does an assumption regarding the endogeneity of the money supply change the results of a good post-Keynesian model regarding the best fiscal policies to stabilize an economy?
- We try to ask the question in the setting of a good model in several regards:
 - Fealty to insights from Keynes's *General Theory*
 - Stock-flow consistency
 - Endogenous dynamics, rather than reliance on exogenous shocks
 - Robustness to critiques involving instability of claimed stable equilibria (Harrodian critique of Kaleckian model), e.g., Skott 2012, *Metroeconomica*

Some related papers from the existing literature

M=Metroeconomica; CJE = Cambridge Journal of Econ.; JPKE = Journal of Post-Keynesian Econ.; SCED = Structural Change and Econ. Dynamics; B = book (list not exhaustive!)

- Godley and Lavoie (B 2012), Greenwood-Nimmo (CJE 2014), and Martin (JPKE 2008) (SFC models with fiscal policy)
- Dutt (CJE 1984, M 1986, JPKE 2012) (Kalecki-Steindl model, including endogenous productivity and countercyclical markup)
- Commendatore, Panico, Pinto (2009) and Commendatore, Pinto, Sushko (2014) (SCED bifurcations and other nonlinear phenomena in Harrodian and Kaleckian models)
- Asada (SCED 2006), Yoshida and Asada (2007) (countercyclical fiscal-policy functions and out-of-equilibrium dynamics in Keynes-Tobin-type setting)
- Skott and subsequently Ryoo sound money vs. functional finance fiscal policy functions; Kaleckian and Harrodian themes; “radical” distrib curve) (e.g. Ryoo and Skott JPKE 2013, M FORTHCOMING)
- Isaac (M 2009)
- Allain (CJE 2014)
- Palley (ROKE 2013)
- Hannsgen (M 2014)

What this models adds relative to our earlier papers

- Compared to Hannsgen (M 2014):
 - Addition of government bills/bonds b as state variable allows nontrivial SFC asset effects relative to 3D model in Hannsgen (M 2014) and Hannsgen and Young-Taft (WP 2015)
 - Addition of exogenous money option, allowing simulated pathways to be compared with those generated by endogenous money version
 - MODEL WITH VARIABLE NOMINAL WAGE AND PRICE (AND POSSIBLY PRODUCTIVITY) Allows for *nominal* SFC asset effects, such as Pigou effects
- Compared to Hannsgen and Young-Taft (WP 2015)
 - More compact model allows us to get more quickly to simulations and to focus on a manageable set of issues.

Methodology of study

- Look at comparative dynamics using numerical solutions of initial value problems while holding basic properties of model constant
- Look for implausible simulation pathways, including those that imply a model that is too unstable or too stable
- Compare policy outcomes with *functional finance* and *sound money* fiscal policy functions with the rest of the model held constant.
- Get a sense of qualitative dynamics
- Look for bifurcations, other emergent properties

Formal mathematical propositions

- Existence and uniqueness of equilibrium point in everything but b in the basic model with no stock feedback effects, countercyclical fiscal policy rule, and endogenous money.
- Existence and uniqueness of solution pathways, given initial conditions. **This proposition, based straightforwardly on our assumptions, allows us to know that we have results to look for numerically.**

Overview of models

Versions, sectors, variables modeled

Technical overview of model in this paper, slide 1

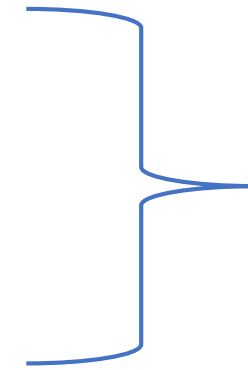
- Models reduce to n differential equations in n *dynamically endogenous* variables
- Three sectors: K (capitalist), P (public and central bank), W (workers)
- All stocks and flows and their implications accounted for
- Nonlinearities in (1) investment function (two kinds); (2) markup curve; (3) wage-Phillips curve; (4) technical progress function

Technical overview of model in this paper, slide 2

- Feedbacks between stocks of assets and aggregate demand
- Options for nominal and distributional closure allow feedback from real variables to nominal variables to real normalized stocks to aggregate demand
- Kaldor-Kalecki-Steindl investment function with CSAP (capital-stock adjustment principle): net investment depends on (1) after-tax profit rate and (2) nonlinearly on distance from full capacity utilization
- Kaleckian savings propensities

Dynamically endogenous variables (variables for which there is a d.e. in reduced form)

- p public spending
- u capacity utilization
- b government debt securities
- g net investment



Basic Model:
Section 3

- pr_B relative price of bonds (exogenous money models only)
- Various distributional and nominal variables, depending on closure, including goods price pr . \mathcal{M} (money) then also needed.
- θ productivity optional

Exogenous
Money
versions only

Section 5

Section 6

Model framework: choose one option in each block to get a simulatable model

{counteryclical, balanced budget targeting} ×	{endogenous money, exogenous money} ×	{variable nominal wage, markup, and goods price} and option of {variable labor productivity} ×	{liquid wealth term in consumption function for K sector, Only disposable income effects}
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In detail: Exogenous vs. Endogenous Money assumptions

Endogenous Money

- Central bank holds interest rate r steady
- Government debt is made up of bills with constant price p_B
- Central bank stands ready to trade bills for money on demand
- K sector chooses portfolio allocation (b vs. \mathcal{M})

Exogenous Money

- Steady growth rate for government non-interest-bearing liabilities imposed
- Price of bonds changes to clear asset markets. This price equals reciprocal of interest rate.
- Interest rate affects aggregate demand via (1) income effects on consumption; (2) real wealth effects on consumption IF included

Model in more detail

SFC accounting

List of equations

- On separate document

	P (Public)	K (Capitalist)	W (Worker)	Total
(1) Government debt	-b	b	0	0
(2) Money	$-\mathcal{M}$	\mathcal{M}	0	0
(3) Capital goods	0	1	0	1
(4) Net worth (sum of (1)-(3))	$-\ell$	$\ell+1$	0	1
(5) Net financial position (sum of (1) and (2))	$-\ell$	ℓ	0	0

	P sector		K sector		W sector	Sum
	Current	Capital	Current	Capital		
Consumption			$+c_W$		$-c_W$	0
Wages	$-p$		$-(1-s)(g+\delta+c)$		$+p+(1-s)(g+\delta+c)$	0
Bill interest	$-\bar{ib}$		$+\bar{ib}$			0
Taxes	$+(1-\tau)(u+p+\bar{ib})$		$-(1-\tau)(su+\bar{ib})$		$-(1-\tau)[(1-s)u+p]$	0
Rate of change in bills		$+\dot{b}+gb$		$-\dot{b}-gb$		0
Rate of change in currency		$+\dot{\mathcal{M}}+g\mathcal{M}$		$-\dot{\mathcal{M}}-g\mathcal{M}$		0
Rate of change in capital				0		0
Sum	$-df$	$+\dot{\ell}+g\ell$	$+df$	$-\dot{\ell}-g\ell$	0	0

Preliminary results, and a look
forward

Issues to be resolved at current time

- We are seeking to isolate issues in papers with smaller models than [Levy Institute paper 839](#). Tai presenting in this session on models with stochastic processes that represent changing expectations of various kinds
- One author working to get embedded versions of online interactive figures back up and running (Wolfram CDFs) after technological shock; many downloadable ap versions still available:
greghannsgen.org
- Slight revisions to flow-of-funds equations are in process of being incorporated into simulation runs of model; hence, we have no simulation results applicable to this paper

Key preliminary results

- All simulation results tentative at this time due to need to simulate with correct equations
- Early (pre-corrections) simulations show exogenous money models tend to be unstable, given same parameter values
- Budget-balancing rule tends to destabilize
- Asset effects in consumption function seemed to stabilize when used
- No simulations of non-real model completed at this time; we regret this situation

End

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Relation to our past work on same basic model (not part of presentation as given)

- Hannsgen (2014): 2 variable model with p and u ; 3 variable model with p , u , m ; multiple distributional closures; 5 variable model with labor-force variables (no stock-flow effects)
- Hannsgen (conference papers 2014, 2015) concave consumption function
- Hannsgen and Young-Taft (2015 working paper): added nominal variables, Poisson model of financial fragility, greenhouse gases, consumer debt to same Kaldor-Kalecki-Steindl AD framework.
- This paper and its companion break out pieces to look at single issues in isolation
 - (1) exogeneity and endogeneity of money and fiscal policy and
 - (2) expectational change arising from (a) random movement and (b) jumps whose rate of occurrence is endogenous.