Lessons We Can Learn from Post-Keynesian Theory and Nonlinear Dynamics for Macroeconomics Modelling: A Toy Model for Indonesia Case

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ABSTRACT

It has been known for long time that most macroeconomics models normally used for economics forecast are based on neoclassical paradigm, which relies on certain assumptions such as Efficient Market Hypothesis and Near to Equilibrium condition. But in recent years, there is growing awareness that world economy is getting more unstable and unpredictable. This condition is more appropriate for Keynesian and Hyman Minsky's idea of FIH (financial instability hypothesis).Therefore it seems better for this unstable situation to consider what lessons we can learn from Post-Keynesian theory and also nonlinear dynamics for macroeconomics modelling. In this paper we will discuss one of the most discussed PK author, Steve Keen who is able to offer a mathematical model of Hyman Minsky's ideas. We will discuss a toy model for Indonesia case, but of course this toy model needs to be verified with more robust model such MINSKY software.

Keywords: Hyman Minsky, Post-Keynesian theory, Steve Keen, Indonesia, macroeconomics, financial instability hypothesis.

1. Introduction

It has been known for long time that most macroeconomics models normally used for economics forecast are based on neoclassical paradigm, which relies on certain assumptions such as *Efficient Market Hypothesis* (EMH) and Near to Equilibrium condition. But in recent years, there is growing awareness that world economy is getting more unstable and unpredictable. This condition is more appropriate for Keynesian and

Hyman Minsky's idea of FIH (*financial instability hypothesis*).Therefore it seems better for this unstable situation to consider what lessons we can learn from Post-Keynesian theory and also nonlinear dynamics for macroeconomics modelling. In this paper we will discuss one of the most discussed PK author, Steve Keen who is able to offer a mathematical model of Hyman Minsky's ideas. We will discuss a toy model for Indonesia case, but of course this toy model needs to be verified with more robust model such MINSKY software.

It is our hope that this small paper may be found useful for policy makers in Indonesia and other developing countries.

We do not yet discuss implications of nonlinear dynamics for international economy, that is beyond the scope of this paper.

Nonetheless, we admit that our model is still in its infancy, more researches are needed to fill all the missing details.

2. Nonlinear Dynamics, Complex Dynamics, Hyman Minsky and Steve Keen

While some authors argue that complex dynamics will be a kind of classical sin in Post-Keynesian theory, Rosser wrote instead:[1]

> "Dynamic complexity provides a foundation for fundamental uncertainty in Keynesian and PK models, and this applies to most of the various sub-branches of PKE besides Davidson's "fundamentalist" or "Keynes-Post Keynesian"[1] approach."

However, we should admit that there are some unclear connections between nonlinear dynamics, complex dynamics, PKE models, although the latter may be associated with system dynamics modelling. On one thing that may be certain is that these new models

[1] The term "fundamentalist Keynesianism" is due to Coddington (1976). Not particularly liking that, Davidson (1994) introduced "Keynes-Post Keynesianism" as an alternative.

are based on dynamical models, which predict instabilities, either exogenous or endogenous.

What is complex dynamics? Elsewhere (Rosser, 1999a), Rosser has discussed defining complex dynamics for applications in economics. Richard Day (1994) argues that a system is dynamically complex if due to endogenous reasons it fails to converge to a point, a limit cycle,[2] or a smooth explosion or implosion. Such systems can generate endogenous discontinuities in system variables. Nonlinearity[3] somewhere in the system is a necessary but not sufficient condition for such endogenous dynamics in an economy, with simple exponential growth models showing how nonlinear dynamics may not be complex as defined above. [1]

Again, according to Rosser [1], complex dynamics enter into the analysis of Keynesia uncertainty in at least two ways. Complex dynamics provide an independent source of such fundamental uncertainty and uncertainty, as discussed by Keynes in Chapter 12 of the *General Theory*, can lead to speculative bubbles in asset markets. These can lead to financial fragility (Minsky, 1972) and follow a variety of complex dynamics (Day and Huang, 1990; Keen, 1995, 1997; Rosser, 2000a, Chaps. 4-5).

Even without financial speculation, there is a large literature showing how money itself can lead to chaotic dynamics within more or less Keynesian models. Many of these models are less fundamentalist Keynesian in nature than Kaleckian (Foley, 1987; Delli

[2] Some Keynesian observers would include convergence to limit cycles as part of complex dynamics. This is sufficient for endogenous macroeconomic cycles implying the need for government intervention to stabilize the economy.

[3] Davidson argues that the core Keynesian ideas will hold in linear models as long as non-ergodicity and thus fundamental uncertainty is assumed to hold axiomatically and ontologically, thus implying that the complexity view is insufficiently general. However, nonlinear systems may generate fundamental uncertainty even when they are ergodic, as for example in cases of chaotic dynamics, hence rendering this argument about generality undetermined (Rosser, 1998).

Gatti, Gallegatti, and Gardini, 1993; Semmler and Sieveking, 1993; Chiarella and Flaschel, 2000), or Minskian (Keen, 1995, 1997). See [1].

One of the most innovative thinker in PKE models was Hyman Minsky, who suggested that financial market is inherently unstable, and his hypothesis is known as FIH (financial instability hypothesis).

And among PKE economists, Steve Keen is one among key figures because he offers a mathematical model which admits instability as envisaged by Hyman Minsky. In a series of papers, Steve Keen offers a set of dynamical equations which govern the market fluctuations[3][4][5].

We will not discuss more detailed his ideas here, because analysis on his model have been published elsewhere [6]. Suffice it to say, that Keen's model includes 14 equations which can be summarized as follows:

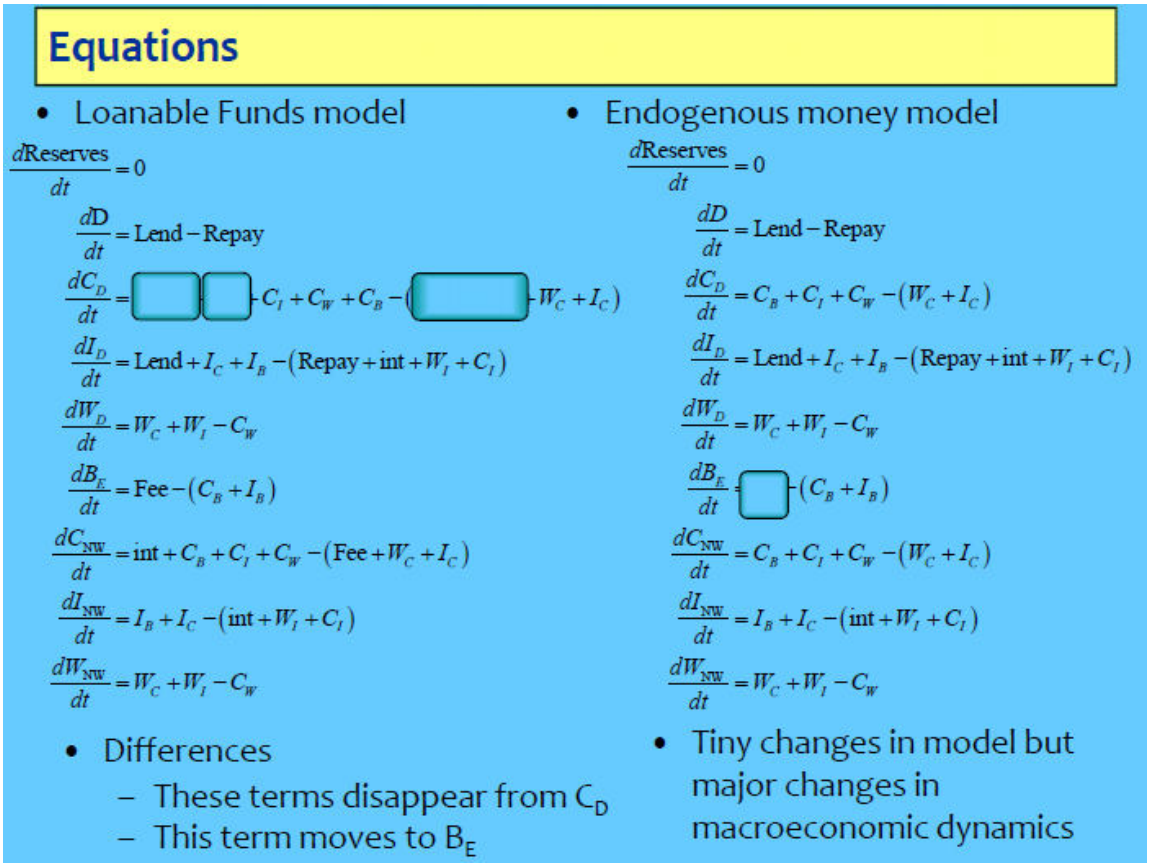
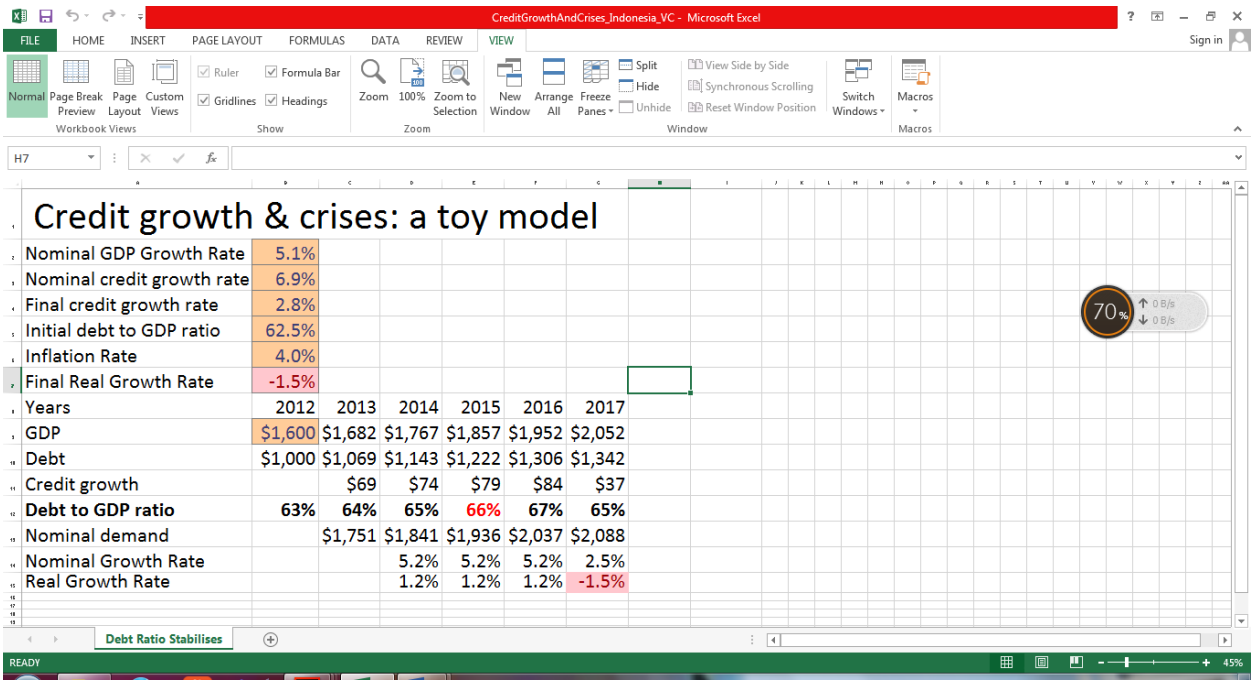


Table 1. Steve Keen's model [5].

3. A simple toy model for Indonesia case, 2012-2017

The above analysis by Keen can be very complicated, and for real world situation one is advised to download MINSKY software (GNU license).

But for this paper, we will only discuss a simple toy model for Indonesia case, which is shown below:



Credit growth & crises: a toy model

Nominal GDP Growth Rate	5.1%					
Nominal credit growth rate	6.9%					
Final credit growth rate	2.8%					
Initial debt to GDP ratio	62.5%					
Inflation Rate	4.0%					
Final Real Growth Rate	-1.5%					
Years	2012	2013	2014	2015	2016	2017
GDP	$1,600	$1,682	$1,767	$1,857	$1,952	$2,052
Debt	$1,000	$1,069	$1,143	$1,222	$1,306	$1,342
Credit growth		$69	$74	$79	$84	$37
Debt to GDP ratio	**63%**	**64%**	**65%**	**66%**	**67%**	**65%**
Nominal demand		$1,751	$1,841	$1,936	$2,037	$2,088
Nominal Growth Rate			5.2%	5.2%	5.2%	2.5%
Real Growth Rate			1.2%	1.2%	1.2%	-1.5%

Table 2. A simple toy model for Indonesia based on Steve Keen.

In this toy model, we use some simple assumptions such as flat GDP Growth rate of 5.1%/year, and nominal credit growth rate of 6.9%/year, and debt to GDP ratio starts with 63% for 2012. The result yields Debt to GDP ratio of 66% for 2015 which actually took place. But what is surprising in this toy model is that it predicts that the real growth rate by the end of 2017 is negative 1.5% (red colour). This indicates nonlinearity which is key ingredient in Keen-Minskyan model. Of course this toy model is very rough, and it needs to be verified with more robust model such MINSKY software.

4. Concluding Remarks

It has been known for long time that most macroeconomics models normally used for economics forecast are based on neoclassical paradigm, which relies on certain assumptions such as *Efficient Market Hypothesis* (EMH) and Near to Equilibrium condition. But in recent years, there is growing awareness that world economy is getting

more unstable and unpredictable. This condition is more appropriate for Keynesian and Hyman Minsky's idea of FIH (*financial instability hypothesis*).Therefore it seems better for this unstable situation to consider what lessons we can learn from Post-Keynesian theory and also nonlinear dynamics for macroeconomics modelling. In this paper we discuss one of the most discussed PK author, Steve Keen who is able to offer a mathematical model of Hyman Minsky's ideas.

We also discuss a toy model for Indonesia case, but of course this toy model needs to be verified with more robust model such MINSKY software. It is our hope that this small paper may be found useful for policy makers in Indonesia and other developing countries. We do not yet discuss implications of nonlinear dynamics for international economy. That is beyond the scope of this paper.

But we admit that our model is still in its infancy, more researches are needed to fill all the missing details. Further observations are recommended to verify the above propositions.

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