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 forecasting 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 the world economy is getting more unstable and unpredictable (VUCA). 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 Post-Keynesian proponents, 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 as MINSKY software.

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

JEL code: B16, B22

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*).\(^1\) 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 Post-Keynesian authors, 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 as 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 very rough, 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”\(^2\) approach.”

However, we should admit that there are some unclear connections between nonlinear dynamics, complex dynamics, Post-Keynesian models, although the latter may be

\(^1\) Added note: In the context of neutrosophic logic, we can add that there is neutrosophy like in between stable/unstable and in between predictable/unpredictable.

\(^2\) The term “fundamentalist Keynesianism” is due to Coddington (1976). Not particularly liking that, Davidson (1994) introduced “Keynes-Post Keynesianism” as an alternative.
associated with system dynamics modelling. On one thing that may be certain is that these new models 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,\(^3\) or a smooth explosion or implosion. Such systems can generate endogenous discontinuities in system variables. Nonlinearity\(^4\) 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 Keynesian 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

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\(^3\) 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.

\(^4\) 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).
are less fundamentalist Keynesian in nature than Kaleckian (Foley, 1987; Delli Gatti, Gallegati, 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 Post-Keynesian Economics models was Hyman Minsky, who suggested that financial market is inherently unstable, and his hypothesis is known as FIH (financial instability hypothesis).

And among Post-Keynesian 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:
3. A simple toy model for Indonesia case, 2015-2020

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:
<table>
<thead>
<tr>
<th>Nominal GDP Growth</th>
<th>5.1 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Credit Growth</td>
<td>6.9 %</td>
</tr>
<tr>
<td>Final credit growth</td>
<td>2.8 %</td>
</tr>
<tr>
<td>Initial debt to GDP ratio</td>
<td>62.5 %</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>4.0 %</td>
</tr>
<tr>
<td>Final real growth rate</td>
<td>-1.5 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>$1,600</td>
<td>$1,682</td>
<td>$1,767</td>
<td>$1,857</td>
<td>$1,952</td>
<td>$2,052</td>
</tr>
<tr>
<td>Debt</td>
<td>$1,000</td>
<td>$1,069</td>
<td>$1,143</td>
<td>$1,222</td>
<td>$1,306</td>
<td>$1,342</td>
</tr>
<tr>
<td>Credit Growth</td>
<td>$69</td>
<td>$74</td>
<td>$79</td>
<td>$84</td>
<td>$37</td>
<td></td>
</tr>
</tbody>
</table>
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 2015. But what is surprising in this toy model is that it predicts that the real growth rate by the end of 2020 is negative 1.5% (red colour). This indicates nonlinearity which is key ingredient in Keen-Minskian model. Of course this toy model is very rough, and it needs to be verified with more robust model such MINSKY software.

In comparison with recent statistics data, for the past several years Indonesia experienced around 5.01 – 5.14% growth rate, but for this year (2020) it is predicted to be negative or

<table>
<thead>
<tr>
<th>Debt to GDP Ratio</th>
<th>63%</th>
<th>64%</th>
<th>65%</th>
<th>66%</th>
<th>67%</th>
<th>65%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Demand</td>
<td>$1,751</td>
<td>$1,841</td>
<td>$1,936</td>
<td>$2,037</td>
<td>$2,088</td>
<td></td>
</tr>
<tr>
<td>Nominal Growth Rate</td>
<td>5.2%</td>
<td>5.2%</td>
<td>5.2%</td>
<td>2.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Growth Rate</td>
<td>1.2%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>-1.5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. A simple toy model for Indonesia based on Steve Keen.
zero growth rate. The question: is this negative growth rate caused solely by the covid-19 pandemic, or also contributed by nonlinearities in Post-Keynesian dynamics?

Grafik 1. Quarterly economic growth of Indonesia

(source: Investor Daily, 6 Nov. 2020)

4. A few remarks on Indonesia’s economic growth in recent years

It is known that in recent years, Indonesia’s economic growth is steadily declining. This declining growth imposed certain vulnerabilities because it creates obstacle for potential development. Some vulnerabilities have been analyzed in [8].

Such a declining growth was experienced since 2015 [9]. Although World Bank predicted in 2016 that the growth will improve, but it seems that this case does not happen as good as predicted [10].

As for the cause of declining, there are some factors:
a. Declining oil and other raw materials’ prices in world market

b. Declining competitiveness for textile products from Indonesia

c. Other inefficiency issues such as high electricity cost in Indonesia. It is known that cost of electricity for industry may take 13 cent US$/kWh in Indonesia, while in USA it only takes 3 cent US$/kWh.

d. Other factors such as idle/queueing in major ports such as Priok.

According to an investment news source [11], Indonesia's export performance tumbled 10.3 percent month-to-month (m/m) to USD $13.17 billion in April 2017. Suhariyanto, Head of Statistics Indonesia (BPS), attributed this decline to a steep 35.4 percent (m/m) decline in exports of oil and gas products. Nearly all components in the oil and gas balance were plagued by declining prices. However, also in terms of volume these oil and gas exports tumbled, implying weakening global demand for energy (perhaps a sign the Chinese economy remains in slowdown-mode).

Meanwhile, the significance of Indonesian exports toward the country's gross domestic product (GDP) is also on the decline. While in 2014 exports of goods and services contributed 23.67 percent to GDP, this figure fell to 19.08 percent in 2016. The declining role of exports toward the economy, despite generally rising commodity prices, is a worrying sign.[11]

Bhima Yudhistira, researcher at the Institute for Development of Economics and Finance (Indef), says the decline in exports of textiles is particularly alarming, having tumbled more than 20 percent (m/m) in April 2017. This drop is not only attributed to declining demand in the United States and Europe but also to rogue exporters. Illegal shipments of textile are estimated to cause IDR 125 billion (nearly USD $10 million) in missed
earnings for the government. Customs have detected 465 cases of smuggling over the January-April 2017 period (while in full-year 2016 it only detected 551 cases of smuggling). Indef therefore recommends the Indonesian government to resolve this issue (illegal textile and clothes shipments). On a year-on-year basis, however, Indonesia's export performance in April 2017 still forms an improvement compared to the same month in 2016. Indonesia's April 2017 exports grew 12.6 percent year-on-year (y/y) compared to the same month one year earlier.

Moreover, bureaucracy problems, inequality issues and worker education may add further complications.

Comparing with Hyman Minsky’s idea, he once remarked that a period of tranquility may be followed by a rapid declining period. Looking at our toy model for Indonesia (Table 2), the debt burden along with declining export growth created some kind of tranquility period since around 2015-2016. It remains to be seen whether Minsky’s prediction of tranquility-rapid decline will come to reality.

More detailed analysis using robust model such as MINSKY is recommended in this case.

5. **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
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References:


