



Analysis

Consistency and stability analysis of models of a monetary growth imperative

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ABSTRACT

Is fostering economic growth ‘only’ a question of political will or ‘unavoidable’ to maintain economic stability? It is disputed whether such a ‘growth imperative’ is located within the current monetary system, creating conflicts with sustainability. To examine the claim that compound interest compels economies to grow, we present five post-Keynesian models and show how to perform a stability analysis in the parameter space. A stationary state with zero net saving and investment can be reached with positive interest rates, if the parameter ‘consumption out of wealth’ is above a threshold that rises with the interest rate. The other claim that retained profits from the interest revenues of banks create an imperative is based on circuitist models that we consider refutable. Their accounting is inconsistent, and a modeling assumption central for a growth imperative is not underpinned theoretically: Bank’s equity capital has to increase even if debt does not. This is a discrepancy between the authors’ intentions in their texts and their actual models. We conclude that a monetary system based on interest-bearing debt–money with private banks does not lead to an ‘inherent’ growth imperative. If the stationary state is unstable, it is caused by agents’ decisions, not by structural inevitableness.

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1. Introduction

The debate about ecological limits and ‘planetary boundaries’ (Rockström et al., 2009; Steffen et al., 2015) has propelled forward the debate whether the economy will reach a non-growing, stationary state (D’Alisa et al., 2014; Jackson, 2009; Schmelzer, 2015; Steurer, 2002). This is in conflict with the ‘credo of unlimited growth’ (Schmelzer, 2015, pp. 262–70) that was based on the notion of the economic circuit as a self-contained, ‘perpetual’ flow of exchange value, while the inevitable ‘physical flow of matter–energy which is not circular’ was neglected (Daly, 1985, pp. 279–81). Gordon and Rosenthal (2003, p. 26) argued that in neoclassical theory, ‘growth is a matter of taste’, ‘no more than preference between present and future consumption’, and Robert Solow as a founder of neoclassical growth theory summed it up by saying that there is ‘nothing intrinsic in the system that says it cannot exist happily in a stationary state’

(Stoll, 2008, p. 92). But some authors have argued that for structural or systemic reasons only a growing economy is compatible with economic stability. The lack of any viable alternative to growth seems to create a ‘growth imperative’, creating a conflict with sustainability. Beltrani (1999, p. 123) claimed that immanent systemic mechanisms exist that the economy has to grow to maintain economic stability, *independent of the will* of the economic agents. Discussing cultural and societal influences in relation to economic growth, Richters and Siemoneit (2017a) provide a more detailed discussion on terminology. A (weaker) ‘constant incentive for growth’ caused by voluntary decisions of economic agents is called ‘growth impetus’ (Binswanger, 2013, p. 116) or ‘driver’ (Jackson and Victor, 2015, p. 39).

Beltrani (1999), Binswanger (2013), Binswanger (2009), Douthwaite (2000), Farley et al. (2013), and Lietaer et al. (2012) locate a growth imperative within the monetary system, while Berg et al. (2015), Cahen-Fourot et al. (2016), Jackson and Victor (2015), Strunz et al. (2017), and Wenzlaff et al. (2014) dispute this claim. The political relevance of this controversy is emphasized by some members of the Study Commission on ‘Growth, Wellbeing and Quality of Life’ by the German parliament: They suggest to study the different positions

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on the relation of growth, money, and credit to improve the basis for decision-making (Deutscher Bundestag, 2013, p. 794). This paper adds insights to the question of whether a stationary state (with non-growing GDP, Gross Domestic Product) is feasible in monetary models driven by effective demand. The study can be considered as part of the emerging field of ecological macroeconomics at the frontier of ecological and post-Keynesian ideas (Berg et al., 2015; Fontana and Sawyer, 2016; Holt et al., 2009; Jackson et al., 2014; Kronenberg, 2010; Rezai and Stagl, 2016).

In the following, we review two different lines of argument and corresponding mathematical models from the literature. The central aim is to clarify *why* certain modeling approaches lead to a growth imperative and others do not. Section 2 analyzes the arguments for a monetary growth imperative stemming from the existence of credit money and compound interest. This claim is examined with five post-Keynesian models of a monetary economy from the literature, some of which were explicitly designed to investigate this argument. The stability analyses reveal that the interplay of consumption decisions and interest income determines whether a stable stationary state exists. Section 3 critically reviews models locating the growth imperative within retained profits of private banks. Our analysis shows that they are based on inconsistencies and a discrepancy between the authors' intention in their texts and their actual models. Section 4 presents results and conclusions, trying to help to resolve the controversy of whether a monetary growth imperative exists.

Note that two definitions for profit are used parallel in economic literature (Mankiw and Taylor, 2011, ch. 13). *Accounting profit* (as used in all models) is the increase of a firm's equity capital *before profit appropriation*, i. e., the surplus of revenues over costs. For *economic profit* revenues not only have to compensate for the explicit costs of accounting, but for all costs required to keep factor inputs in their current use. This includes an appropriate estimation of the owners for the value of their working time, but also the losses of income due to the renunciation of better job or investment alternatives (opportunity costs). Thus, firms with an economic profit of zero can be 'profitable' and provide a living for their owners, realizing accounting profits which are fully distributed.

2. The Interplay of Consumption Decisions, Credit Money and Compound Interest

Several authors locate a growth imperative within the monetary system, particularly within interest bearing debt. For an overview on arguments and theoretical foundations, see Strunz et al. (2017) and Wenzlaff et al. (2014). One of the arguments is that credit and interest can only be paid back if 'new' money enters the system, increasing the money supply: 'Debt grows exponentially, obeying the abstract laws of mathematics' (Farley et al., 2013, p. 2809) because of 'compounded interest' or 'interest on interest' (Lietaer et al., 2012, pp. 100–1). This would imply that 'the economy must grow continuously if it is not to collapse' (Douthwaite, 2000, p. 6). The central argument along these lines is that debt claims increase exponentially because of interest dues, and therefore liabilities have to increase in lockstep. The looming debt overload could only be neutralized by defaults and crisis, or mitigated by steady economic growth. Farley et al. (2013, p. 2811) concluded that in a stable non-growing economy, 'money creation ... cannot be debt-based and interest-bearing.' Dittmer (2015) has critically discussed non debt-based money extensively, thus we focus on investigating whether a stationary state is compatible with positive interest rates.

Do positive interest rates on money necessarily lead to accumulation of financial assets? If creditors spend their interest income for investments or consumption, money flows back into circulation and is available for repayment, so exponential growth of debt and

deposits does not happen (Berg et al., 2015). This possibility is omitted by those cited above arguing that positive interest rates are incompatible with zero growth for systemic reasons. Glözl (1999, 2009) objected that it is unrealistic that creditors decide to fully spend their interest income, which is why credit claims increase and the collective of debtors is powerless to repay the debt. But note that this is not 'independent of the will of agents', but dependent on consumption decisions of those who achieve income. Only if agents decide to increase their money stocks permanently and boundlessly, no stationary state can be obtained. The conclusion is that the relevant condition for a stationary state is not interest rates, but the aggregate net saving ratio and net investment to be zero, i. e., the proportion of income which is saved and invested on top of replacement investment. The relation between income (from wages or interest) and consumption can be studied in post-Keynesian models.

2.1. Insights from Post-Keynesian Models

Models describing a monetary economy were used to investigate whether a monetary growth imperative exists. The theoretical foundation of these models driven by effective demand is the 'Monetary Theory of Production' (Fontana and Realforzo, 2005; Godley and Lavoie, 2012) in the tradition of Keynes (1936, 1973).

Jackson and Victor (2015, p. 44) 'found no evidence of a growth imperative arising from the existence of a debt-based money system' in their model, because simulations converged to a stationary state. Cahen-Fourot et al. (2016) came to the same conclusion, emphasizing that it is necessary to include consumption out of wealth to reach a stationary state, because saving out of profit has to be compensated. The parameter 'consumption out of wealth' c_v indicates the percentage of the stock of wealth of households at the end of one period that they spend during the next period. Both papers concluded that positive interest rates and debt-money are compatible with a stationary economy.

Berg et al. (2015) provided a more nuanced view based on a systematic approach, further explained in Richters (2015): The stability analysis of their model showed that the question of whether a stationary state is stable depends on the interplay of interest rates and consumption parameters. If the interest rate is high and 'consumption out of wealth' c_v low, a stable, non-growing economy is impossible.

We will show in the following that this result can be generalized to other models, because they are based on similar assumptions about consumption and investment decisions (Section 2.2). Sections 2.3.1–6 explain the methodology and provide five stability analyses of the papers by Berg et al. (2015), Cahen-Fourot et al. (2016), Jackson and Victor (2015), and, for comparison, chapters 4 and 10 of the textbook 'Monetary Economics' (Godley and Lavoie, 2012). The results are jointly discussed in Section 2.4.

2.2. Introductory Thoughts on Consumption and Investment Decisions

In all the dynamical models of this chapter, consumption C is composed of not more than three components, the first being a fixed autonomous spending c_0 (sometimes set to 0), the second being proportional to disposable income Y_d ($c_y Y_d$) or disposable wage income W_d ($c_w W_d$), and the third being proportional to the net wealth of households of the previous period $V_{(t-1)}$ (with parameter 'consumption out of wealth' c_v):

$$C_{(t)} = c_0 + c_y Y_{d(t)} (\text{resp. } c_w W_{d(t)}) + c_v V_{(t-1)}. \quad (1)$$

The papers may use different notations (α_2 for c_y ; α_1 for c_y or c_w), but we harmonized them for increased readability. The old Keynesian

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