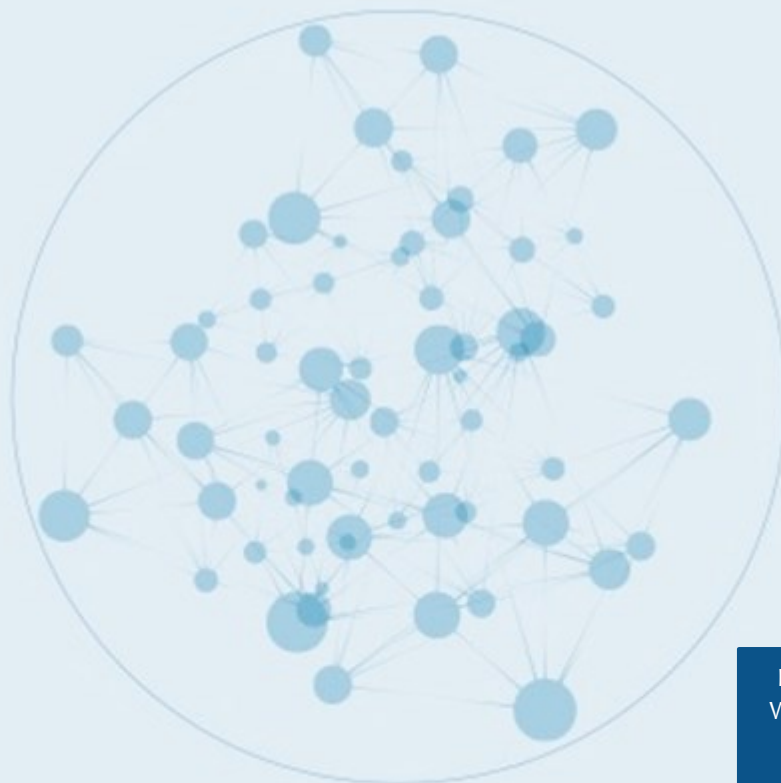




TOWARDS A STOCK-FLOW CONSISTENT ECOLOGICAL MACROECONOMICS

An overview of the FALSTAFF
framework with some
illustrative results



INQUIRY
WORKING
PAPER

15/04

August
2015

The UNEP Inquiry

The Inquiry into the Design of a Sustainable Financial System has been initiated by the United Nations Environment Programme to advance policy options to improve the financial system's effectiveness in mobilizing capital towards a green and inclusive economy—in other words, sustainable development. Established in January 2014, it will publish its final report in October 2015.

More information on the Inquiry is at: www.unep.org/inquiry or from: Ms. Mahenau Agha, Director of Outreach mahenau.gha@unep.org.

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About this report

This working paper results from a workshop which the UNEP Inquiry and CIGI held on 2-3 December 2014 in Waterloo, Canada to discuss options for a sustainable global financial system. The workshop included participants from a range of academic and research institutions from the Waterloo region and abroad, including the University of Waterloo, the University of London, the University of Surrey, York University, Harvard University, and the University of Gothenburg. This working paper draws from an ongoing program of work at the University of Surrey in collaboration with York University on Prosperity and Sustainability in the Green Economy (PASSAGE). The work is partly supported by the UK Economic and Social Research Council. The version of FALSTAFF model presented in this paper is a beta version for discussion purposes only and is currently subject to ongoing refinement and calibration. Further details of the ongoing work are available at: www.prosperitas.org.uk.

Comments are welcome and should be sent to t.jackson@surrey.ac.uk, pvictor@yorku.ca and simon.zadek@unep.org.

Author(s): Tim Jackson (t.jackson@surrey.ac.uk) and Peter A. Victor (pvictor@yorku.ca)

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Abstract

This paper describes briefly the challenge of modelling combined economic, ecological and financial systems and sets out a series of objectives for modelling the socio-economic transition towards sustainability. It highlights the modelling needs in relation to full employment, financial stability, and social equity under conditions of constrained resource consumption and ecological limits. We outline the development of a dedicated system-dynamics model for describing Financial Assets and Liabilities in a Stock-Flow consistent Framework (FALSTAFF) and present some hypothetical results calibrated for the Canadian economy. The selected scenarios illustrate the complex relationships between real and financial aspects of the macroeconomy and allow us to carry out some initial tests on the financial viability of green investment.

Introduction

The broad aim of this paper is to address the challenge of developing an “ecological macroeconomics”: that is to say a macroeconomics consistent with the need to remain within environmental and resource limits. The work addresses in particular the following question raised by the UNEP Inquiry into the Design of a Sustainable Financial System:

“What are the relative merits of deploying financial over real economy¹ policies and regulations to address environmental and equity issues and outcomes?”

Our broad answer to this question is that financial policies are essential for several reasons. In the first place, the transition to a green economy depends crucially on new patterns of investment and the viability of these investments depends in turn on the financial landscape. Secondly, performance in the real economy is linked in complex ways to the health and stability of the financial economy – even if these links are largely invisible within headline real economy indicators. Assessments of economic performance which neglect shifts in the financial landscape are at best incomplete and at worst misleading. Finally, the pattern and distribution of financial assets and liabilities is an essential component of economic and social sustainability.

If these points are to be taken seriously, we argue that there are two immediate requirements in terms of understanding the transition to sustainable investment. The first is a “stock-flow consistent” account of the relationship between real and financial economies, without which the implications of a shift in investment patterns cannot be assessed or influenced. The second is a systematic attention to the institutional architecture of the financial system and its interactions with the real economy, particularly in the context of green investment goals and requirements for social equity.

A full response to both these requirements lies beyond the scope of this paper. We address primarily the first concern. In fact our main aim in this paper is to outline the development of a dedicated system dynamics model to explore Financial Assets and Liabilities in Stock-Flow consistent Framework (FALSTAFF) and to illustrate the use of this model, in particular in the context of shifts in the pattern of investment. We are able to illustrate both real and financial implications of this shift and identify danger signals for existing financial architectures in the context of shifting investment patterns.

FALSTAFF also offers the possibility of modelling explicit policy interventions and developing alternative financial architectures. A full elaboration of such interventions lies beyond the scope of the current paper, but we offer some qualitative suggestions for future work using the same framework. We also discuss briefly the implications of this exercise for the question of “growth-based” economics.

¹ We use the term *real economy* here to describe the set of relationships that describe the production, distribution and consumption of goods.

1 Background and Motivation

One of the clearest lessons from the financial crisis is that a narrow focus on real economy indicators and policies was insufficient to avert the potentially disastrous consequences triggered by weaknesses in the US housing market and the subsequent collapse of Lehman Brothers in September 2008. The fragility instilled within the financial system as a result of overheated asset markets, over-leveraged balance sheets, and over-complex financial instruments went largely unnoticed in a policy environment focussed primarily on aggregate indicators such as the GDP, employment rates, inflation and consumer spending.

The failure of almost all mainstream economists to foresee the global financial crisis of 2008/9 represents a remarkable failure of financial governance (Bezemer, 2010). Just a year before the onset of the great recession the then chairman of the US Federal Reserve Ben Bernanke reported to the US House of Representatives (Bernanke, 2007) that “the US economy appears likely to expand at a moderate pace over the second half of 2007, with growth then strengthening a bit in 2008 to a rate close to the economy's underlying trend.” Global financial institutions were also taken unawares. In August 2007, the IMF was able to argue that “notwithstanding recent financial market nervousness, the global economy remains on track for continued robust growth in 2007 and 2008, although at a somewhat more moderate pace than 2006. Moreover, downside risks to the economic outlook seem less threatening than at the time of the September 2006 World Economic Outlook.” (IMF, 2007).

These oversights amount to a systematic failure to integrate a coherent description of the financial economy into models and policy prescriptions for the real economy (Keen, 2011). The crisis revealed painfully that the apparent economic success of the “great moderation”² was largely built on a growing fragility in the balance sheets of firms, households and nation States (Barwell and Burrows, 2011; Koo, 2011). But these risks remained invisible to most economists and unpredicted by the majority of economic models. In the wake of the crisis, economists have therefore placed a renewed importance on the task of understanding the behaviour (and in particular the stability or instability) of the financial economy and integrating this understanding into the workings of the real economy. A host of new research initiatives and the re-emergence of some earlier schools of thought bear witness to this new turn in economics (Keen, 2011; Minsky, 1994; Turner, 2013; Wray, 2012).

Perhaps the most notable shortcoming of traditional economic models is the failure to account properly for the stocks and flows of natural resources on which economic activity ultimately depends. The period of the great moderation also witnessed a progressive decline in environmental quality across the world: in particular, in relation to global climate change, biodiversity loss, the deforestation and desertification of semi-arid regions, the eutrophication of water supplies and the overexploitation of mineral resources (MEA, 2005; MGI, 2013; Rockström et al., 2009; TEEB, 2010; IPCC, 2014; Wiedmann et al., 2013). This limitation is well rehearsed in the literature from ecological economics (Daly, 1972; Meadows et al., 1972; Costanza, 1989; Daly, 1996; Costanza et al., 1997). But attempts to redress it have been partial at best.

One of the reasons for this is a fundamental dilemma which haunts debates about a sustainable economy. Conventional formulations for achieving prosperity rely on a continual expansion of consumer demand. More is deemed better in the received wisdom, even when the well-being outcomes from increasingly material lives are tenuous. Expanding consumer demand increases the global throughput of

² The “great moderation” refers to a period of economic history in which the volatility of business cycles decreased, recessionary pressures were largely averted and inflation was deemed to be tamed.

materials and threatens the sustainability of the ecosystems on which prosperity depends. Continued growth of the kind seen hitherto is patently unsustainable.

On the other hand, slowing down, or reversing economic growth appears unpalatable too. Income growth is clearly still needed in the poorest countries at least, where it is highly correlated with real well-being outcomes. Even in the richest economies, growth in GDP is regarded as the single most important policy indicator of progress. When growth falters, as it did in the crisis of 2008/9, incomes fall, high-street spending is reduced and production output falls. Businesses have less to invest, governments have lower tax revenues, social investment is withdrawn, people lose their jobs and the economy begins to fall into a spiral of recession. In short, growth may be unsustainable, but de-growth appears to be unstable.³

Responding to the dilemma of remaining within ecological limits in a growth-based society has often been construed primarily as a microeconomic task — one that governments can address with conventional fiscal instruments of tax and subsidy. The “external” costs associated with environmental and social factors should be “internalized” in market prices, according to familiar axioms (Pigou, 1920; Pearce et al., 1989; Pearce and Turner, 1990; Ekins, 1992). Incorporating “shadow prices” for environmental goods into market prices will send a clear signal to consumers and investors about the real costs of resource consumption and ecological damage, and incentivize investment in alternatives, according to this conventional wisdom.

But this prescription has been hard to implement over the last decades. This was in part due to the theoretical and practical problems of estimating shadow prices and implementing shadow markets (Victor, 2008). Even before the crisis, it proved difficult either to forge agreement on fiscal measures to internalize environmental costs or indeed to stimulate appropriate levels of private investment in alternative technologies. The financial crisis has certainly made both of these tasks harder. Despite an early focus on “green stimulus” as a way of invigorating the global economy (DB, 2008; GND, 2008), subsequent policy responses have consistently failed to address the ecological challenges.

Fears of damaging economic growth have led politicians to shy away from both ecological taxation and green investment. Recent attempts to overcome this fear have largely focused on arguing that the impacts of green investment will be either negligible or even positive in terms of stimulating growth (NCE, 2014). But it remains an uncomfortable fact that fragile private and public sector balance sheets have slowed down investment in the real economy generally, let alone the additional (and less familiar) investment needed to make a transition to a low-carbon economy. Conventional responses have focussed instead on cutting public spending (austerity) and stimulating consumption growth (consumer spending) as the basis for economic recovery. Unfortunately, these responses tend to ignore the structural problems of the conventional paradigm and delay further the investment needed in the green economy.

The scale and nature of this dilemma suggest that the combined challenges of climate change and resource scarcity require macroeconomic as well as microeconomic responses. In fact, as we have argued elsewhere, there is a need to develop a fully consistent ecological macroeconomics in which it is possible

³ The growth dilemma is described in more detail in Jackson, 2009, Chapter 3.

to maintain financial stability, ensure high levels of employment, improve the distribution of income and wealth and yet remain within the ecological constraints and resource limits of a finite planet.⁴

In short, it is clear that an approach to macroeconomics configured only by “real economy” aggregates such as output, productivity, employment, consumption and public spending, is insufficient to ensure economic sustainability, let alone social or ecological sustainability. Nor is it sufficient for monetary policy to consist largely in laissez-faire regulation of financial markets combined with central bank interest rate policy aimed solely at inflation targeting. These forms of monetary policy were plainly deficient in averting the crisis and insufficient to provide recovery from it. For two decades before the crisis, this same architecture had signally failed to provide a financial landscape amenable to the investment needs of a low carbon economy. Building a more appropriate financial system needs to start from a clear understanding of the investment needs associated with the transition to sustainable economy.

This transition demands a quite specific investment portfolio which is quantitatively and qualitatively different from the investment portfolio that has characterised the prevailing economic system. Existing investment portfolios are dominated by speculation in asset prices and by the extraction and depletion of natural capital resources. Easy returns in the first category are gained at the cost of unstable asset prices and rising inequality. Easy returns in the second are achieved only at the expense of resource depletion and environmental degradation. As these easy returns begin to dissipate, the dominance of extractive investments leads to portfolios weakened by stranded assets (HSBC, 2012) with potentially destabilising effects on future financial markets.

By contrast, the investment portfolio for a sustainable economy consists in building long-term assets in low carbon technology and infrastructure, in resource-efficient manufacturing, in service provision, in health care, in education, in public spaces and social goods, and in the protection and restoration of habitats, forests, wetlands, soils and other natural capital assets. Some of these asset types may offer very conventional benefits with rates of return comparable to existing portfolios. Others however will impose considerable challenges on existing institutional structures and financial architectures.

Numerous questions emerge as a result of this analysis. These include questions: about the organisation and structure of asset portfolios; about the balance between public and private finance; about the balance between equity and debt; about the structure and distribution of asset ownership; about the impacts of elevated investments on prices, on wages and on consumer demand; and about the appropriate forms of horizontal and vertical money supply. In short, addressing these questions demands attention to both the real and the financial economy. Explicitly, it also requires a framework that integrates both of these aspects of the economy – in the context of ecological and resource

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