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Back to a General Theory

An Essay in Persuasion

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Abstract

Many Western countries experience failing monetary policy after the 2008 financial crisis. The lack of alternatives to established rules, even when they appear to fail, motivates a close look at the economic ideas John Maynard Keynes developed in his crisis-ridden lifetime, to answer the question: What can Keynes' writings contribute to the contemporary macroeconomic discussion?

We trace from the publication of the *General Theory* (1936) until our time how macroeconomics has narrowed down into theoretical consensus, elevating policy recommendations developed in moderate times to an exclusive status of optimality. Building on the tacit assumption of ergodic (time-homogenous) behavior of economic agents, theory and its application have relied increasingly on the tools of positive economics.

Rejecting the ergodic axiom, Keynes' conception of economics required an ethical and logical basis, which is neglected in the contemporary interpretation of his economic theory and offers an alternative to the current methodology of economics as a whole. Keynes' logical theory provides a frame for aspects of decision-making that lie outside the grasp of models that currently frame economic policy: uncertainty, qualitative information and fragmented quantitative information. Irreducible uncertainty and its influence on reasoning are at the core of key concepts Keynes developed to understand the genesis and nature of economic crises. The current economic framework is not logically compatible with Keynes', therefore his *General Theory* is fertile ground to develop an alternative theory to enrich macroeconomic understanding of crises and devise remedial policies.

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“The ideas of economists and political philosophers, both when they are right and when they are wrong are more powerful than is commonly understood. Indeed, the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually slaves of some defunct economist.”

J. M. Keynes, *The General Theory of Employment, Interest and Money* (1936)

1 INTRODUCTION

In the wake of the U.S. financial crisis and during the European debt crisis, a large discussion emerged concerning the state of the macroeconomic discipline. Consensus formed that the crises erupted due to mispricing of risk. Still, the debate struggles to identify the *underlying* flaws in the macroeconomic framework, which directly or indirectly caused the crises.¹ Despite its deficiencies, the seemingly anemic macroeconomic framework remains largely intact. The “cacophony of voices” failed to offer any useful guidance after the crisis struck (Krugman, 2011, p. 307). Without proper identification of the underlying problem(s), no permanent solutions can be crafted.

In discussions, a name keeps reoccurring – the Cambridge economist John Maynard Keynes. It appears that when economists are perplexed, they often look back to Keynes to seek answers. Strikingly, the current situation has many similarities to the environment in 1929, when the Great Depression erupted and massive unemployment followed suit. Then, as now, economists could not adequately address the flaws within the economic superstructure, resulting in sub-optimal economic conditions. It was not until Keynes published his magnum opus *The General Theory of Employment, Interest and Money* (1936, hereafter GT) that the Great Depression ended, largely helped by his economic doctrine. Keynes’ main critique against the hegemony of the Classical² doctrine was its lack of generality, “with the result that its teaching is misleading and disastrous if we attempt to apply it to the facts of experience” (VII, p. 1).

This leads us to our research question: What can Keynes’ writings contribute to the contemporary macroeconomic discussion?

Keynes’ legacy is vast and a large literature already discusses his economic theories, but few economists transcend into his philosophical foundation. We believe that in order to comprehend Keynes’ economic theories, a complete understanding of Keynes’ underlying epistemology³ is necessary, especially in regards to the notions of uncertainty, expectations and rational belief. Our point of departure will be *A Treatise on Probability* (1921), which provides an extensive discussion that encircles the boundaries of attainable

¹ See for example Blanchard et al. (2012) and Riksbank (2016).

² The label of the Classical doctrine draws on Keynes’ evocative contrast between his own economic theories and that of his intellectual forebearers. Keynes lumped his contemporaries, A.C. Pigou and Alfred Marshall, in with the older classical political economists, such as David Ricardo. He believed all of them relied on the same assumptions – creating theories suitable for special rather than general circumstances – calling them all “classical.”

³ Epistemology: The theory of knowledge, especially with regard to its methods, validity, and scope, and the distinction between justified belief and opinion. (Oxford dictionary)

knowledge, upon which economic agents form reasonable beliefs to act in cognitive conditions of partial rather than complete knowledge. Thus, we will follow the Post-Keynesian tradition, aligned with Hyman Minsky (1976), Paul Davidson (1972) and Robert Skidelsky (2009). Moreover, Roderick O'Donnell (1989) has been a valuable guide as to demonstrate the continuity in Keynes' ideas from philosophy to the economic and political realm.

To our knowledge, this more fundamental understanding of Keynes' economic theories has never been used to rigorously scrutinize the underpinnings and assumptions of contemporary Orthodox⁴ economic theory in general. In particular, the dominant Dynamic Stochastic General Equilibrium (DSGE) model has not been discussed and dissected through this approach. Consequently, we will shed light on an alternative way of *thinking* in economics, pursued in earnest by Keynes. If successful, we hope that this thesis can provide insight to enrich the current macroeconomic debate and better understand crisis environments.

This paper is divided in three parts. Part I (divided in two Chapters) explores macroeconomic theory in a fashion that helps highlighting crucial contrasts with Keynes' in Part II and beyond. Chapter 2 reiterates the history of macroeconomic theory from the Keynesian revolution up to the present. Its focus is on the assumptions and components that evolved into the contemporary Orthodox economic framework. Chapter 3 describes the economic discourse before and after the last crisis, and draws on the theoretical components laid out in Chapter 2 to discuss the economic environment that provides us with problems that are still not well understood.

Part II consists of three chapters, which aim at providing what we call *the remedy*⁵ and jointly seek to illustrate Keynes' distinct way of thinking in economics.

Chapter 4 discusses the nature of economics, which provides a contrast to Orthodox reasoning laid out in Chapter 2. The chapter builds on the idea that if the scope of positive economics⁶ is reduced by logical argument, its weight will diminish and leave a void to be filled. In order to fill that void we re-introduce the conception of economics as tripartite, where normative economics and applied economics build a complete framework together with positive economics. This serves as a frame to fit Keynes' conception of economics as a moral science.⁷

Chapter 5 focuses on Keynes' often overlooked epistemology, laying out the foundation on which his economic theories rest upon. The chapter is designed to introduce concepts that Keynes used for the logical

⁴ Orthodoxy: Authorized or generally accepted theory, doctrine, or practice. (Oxford dictionary). We use the term economic Orthodoxy as to refer to the currently dominant macroeconomic school. Orthodoxy should be perceived in contrast to Heterodox, which refers the plethora of schools *outside* the mainstream thinking.

⁵ We refer to the remedy Keynes proposed 80 years ago: namely, the *GT*'s successful removal of the Classical doctrine as hegemony, which ended the Great Depression by reviving the economy and restoring employment numbers.

⁶ Positivism: A philosophical system recognizing only that which can be scientifically verified or which is capable of logical or mathematical proof, and therefore rejecting metaphysics and theism (Oxford dictionary). "Positive economics is in principle independent of any particular ethical position or normative judgments. As Keynes says, it deals with 'what is,' not with 'what ought to be'" (Friedman, 1953, p. 4).

⁷ The moral sciences are branches of knowledge dealing with *mind and conduct*, while the natural are occupied with *matter and life*. The former is thus concerned with humans as thinkers and actors, the latter with inanimate matter and non-conscious life. On the one side stands logic, ethics, metaphysics, psychology, economics, politics, history, anthropology, law and statistics, while on the other is physics, chemistry, geology, astronomy, biology and so on (O'Donnell, 1989, p. 159).

description of real reasoning and decision-making, highlighting to what extent they lie outside the scope of Orthodox economics. The chapter is divided in five subsections: probability and rational belief, uncertainty, weight of argument and confidence, numerical and non-numerical probabilities, and organic unity.

Chapter 6 builds on chapter 4 and 5 establishing the fundamentally distinct nature of Keynes' economics. In this chapter, we discuss economic concepts from the General theory that seek to understand the mechanisms relating to investment and demand, especially in an environment characterized by greater uncertainty, as experienced after 2008. Arguing for the relevance of Keynes' concepts and their explanatory power in regards to inefficient monetary policy, the point of departure to develop Keynes' approach to economics into modern theory is laid out.

In Part III we try to answer our research question through a discussion by drawing on Part I and II.

PART I – THE PROBLEM

Part I will not provide any insight into Keynes' theories. His philosophical, epistemological foundation, as well as his economic doctrine will be dealt with in Part II and onwards. Instead, Part I tries to come to grips with what contemporary macroeconomic policies are, and highlight crucial components of the theoretical structure that motivates them. This endeavor is carried out to lift the tacit assumptions that underpin Orthodox doctrine, as well as to later identify the problems that result from the Orthodox approach put into practice. Chapter 2 explains how, and why, macroeconomics looks like it does today. It tries to facilitate an understanding of the anemic state current Orthodoxy finds itself in. Chapter 3 argues that this framework does not adequately fulfill its own goals, and that maintaining status quo is potentially dangerous and counter-productive.

2 BACKGROUND

In order to appreciate Keynes' *GT* in the necessary context, we trace the development of economic Orthodoxy from the Keynesian revolution that occurred in the post-war period up to the New Neoclassical Synthesis that currently dominates macroeconomic policy. This chapter follows the theoretical evolution of building blocks and assumptions that came to be the foundation of the modern DSGE-model. The current understanding of their most basic component – rational agents – was established under the Neoclassical Synthesis.

Firstly, we want to state that a large literature deals with Keynes' and Keynesian⁸ economic theory. Keynes' economic doctrine is believed by the Post-Keynesian school to have been distorted by the Keynesian revolution (Minsky, 1976; Davidson, 1972; Skidelsky, 2009).⁹ As the neoclassical name suggests, the Classical postulates – that Keynes so viciously tried to overcome – carried over to the Keynesian economic doctrine. In essence, *Keynes was not a Keynesian*.¹⁰

⁸ Throughout our paper, the terms *Keynesian* and *Neoclassical synthesis* refers to the same school and are used interchangeably.

⁹ The main advocate of the Keynesian revolution, Paul Samuelson (1968), admitted that he perceived Keynes' General Theory to be unpalatable and incomprehensible. Historians of economic thought generally agree that Keynes' economic work cannot be reduced to Samuelson's Keynesianism and the IS-LM model sketched out by Hicks in 1937 (Laidler, 2008). "Samuelson's neoclassical synthesis brand of 'Keynesianism' was not analytically compatible with the theoretical framework laid out by Keynes in *The General Theory of Employment Interest and Money*" (Davidson, 2009, p. 2; see also Davidson, 1972; Minsky, 1976; Skidelsky, 2010).

¹⁰ Hicks' IS/LM model, with improvements by Hansen (1949), was the seed that would eventually grow into the *Neoclassical synthesis*. This doctrine sought to formalize Keynes' macroeconomic theory in order to synthesize it with classical microeconomic theory – the same that Keynes tried to escape from in the first place. In particular, the model neglected the importance of time, a necessary condition for expectations to be formed (Laidler, 2008). "Ideas, including those that had lain at the heart of Keynes' intended revolution, about the crucial role played by expectations and uncertainty in inter-temporal coordination mechanisms, and the essential differences between the ways in which money and barter economies coped with such matters, were pushed into the background" (Laidler, 2008, p. 7).

In essence, the revolution Keynes' sought through his *GT* never occurred and the "Keynesian" revolution that occurred in its place is essentially a distorted methodical and epistemological caricature. The essence of the Keynesian revolution, manifest in Hick's early IS-LM curve and more coherently in Samuelson's neoclassical synthesis of Keynes' theory with Classical theory, does not even remotely capture Keynes' desired revolution. Especially since the neoclassical doctrine kept the essence of the Classical postulates, which only provided an economic theory that was applicable to special economic circumstances. It was not general, as the one Keynes sought to implement.

2.1 THE NEOCLASSICAL SYNTHESIS - RATIONAL AGENTS AND ERGODICITY

Important tacit assumptions that govern contemporary macroeconomic theory carried over from the Neoclassical synthesis.¹¹ In the following section, we disentangle those critical roots that were to play a pivotal role in succeeding economic theory.

What are individuals and firms (agents) striving to achieve with their decisions? Since Adam Smith's *Invisible Hand* (1776), economists have assumed that agents are rational in their decision-making, maximizing individual utility. Still, what utility is or should be is in principle open to debate. The implicit ethical foundation of all Orthodox theory – before and after Keynes – is utilitarianism. Utilitarianism posits that all agents strive to maximize utility in a rather hedonistic fashion. 'Utility' could have a range of connotations, but in Orthodoxy it rests on the idea that households maximize their consumption, savings and investments patterns over their life-time, according to their utility function. This is mathematically executed by 'smoothening' strictly convex utility functions, given budget restrictions and preferences.

In order to allow agents to realize their rational pursuits, economists needed a method that *enabled* the agents to optimize their decision-making. By assuming that households were *rational* in their behavior, the Keynesians incorporated optimization techniques used in microeconomics into the discipline of macroeconomics, enabling the agents to maximize their utility through a mathematical/statistical framework. Rationality is here to be understood in the sense of agents striving to maximize their utility by their decision-making behavior. This led to the modern assumption of maximizing agents relying on well-defined mathematical probabilities, given predetermined constraints and preferences. Since its introduction, the assumption has become a dogma in economic theory (King, 2008).

The *rational agent* was a significant undertaking in economic theory and enabled far-reaching modelling opportunities, but the notion had to rest on the assumption that agents *actually are* consistent in their pursuit of maximized utility through optimized decision-making. The assumption is reflected in Paul Samuelson's argument that if economists wish to move macroeconomics from "the realm of history" into "the realm of science" they must impose the "ergodic hypothesis" in their theory (Samuelson, 1969, p. 12; see also Davidson, 2012). In probability theory, an ergodic system exhibits the same behavior over time – it is stochastically stationary – making predictions about future outcomes reliably inferable from past probability distributions. Ergodicity is a general assumption in natural sciences such as physics or chemistry. Logically speaking, to make statistically reliable predictions about future economic events, one needs to obtain and analyze sample data from the future. Since that is impossible, the assumption of an ergodic stochastic process permits the analyst to assert that samples drawn from past and current data are equivalent to a

¹¹ Paul Samuelson coined the term "neoclassical synthesis" in the 1950's underlining the already emerging consensus in macroeconomics. Samuelson popularized the synthesis, and disseminated its doctrine, through the leeway given as the main author of the canonical textbook *Economics: An Introductory Analysis*, "with the aim of introducing undergraduates to the Keynesian revolution, [where] the world's teachers rapidly and heartily embraced the new approach (Mankiw, 2006, p. 44; see also Skousen, 1997). The latter book's ambition was to derive "a general theory of economic theories", with the usage of mathematics as the language of economics (Samuelson, 1983, p. xxvi).

sample drawn from the future. Assuming ergodicity legitimized and enabled the usage of aggregated data of optimizing agents into the macroeconomic framework.

Under ergodicity, the statistical causal relationships agents exhibit are homogenous over time and can thus be readily used to form probabilities for the benefit of practitioners when they are to understand what effects policies will generate. The assumption of rational agents made it possible to analyze aggregated microeconomic data for macroeconomic purposes. The implicit assumption of the ergodic axiom was needed to make inferences valid for all policy-regimes and different non-economical mechanisms, such as changing expectations. The Keynesians thus provided the theoretical framework for all forthcoming Orthodox economic schools, namely rational agents as persistent utility maximizers.

2.2 THE NEW CLASSICAL SCHOOL

The New Classical school furthered the ambition to have a microeconomic core in macroeconomics and built on the Neoclassical assumption of agents as rational decision makers maximizing utility. Current Orthodox economic thinking relies on many ideas that were formulated in the New Classical paradigm. We strive to convey the roots of these ideas in the following subsections.

The New Classical paradigm came in three “waves,” building on Mankiw’s (2006) categorization: Monetarism, rational expectations and the Real Business Cycle theory (RBC). We will holistically refer to all three as the New Classical revolution.

2.2.1 Monetarism

The first wave of New Classical theory was Monetarism, which emphasized the Classical notion of optimally self-regulating markets; all the pertinent information concerning financial assets is contained in the prices of those assets. If all individual agents optimize continuously, arbitrage profits cannot exist. This assumption was coined the *efficient-market hypothesis* (EMH). The idea that all individuals act simultaneously and identically was modelled as a representative agent whose aggregated actions clear the markets. Consequently, there could be no excess demand nor involuntary unemployment; no coordination failure could exist. Governmental interference in the pursuit of economic stabilization was to be avoided, being considered as causing only harmful distortions (Skidelsky, 2010).

Milton Friedman (1968) and Michael Phelps (1967) reformulated the Keynesian Phillips curve by adding the expected rate of inflation, reflecting agents as capable of learning from experience. This created the ‘Expectations-augmented Phillips curve’ conventional until today; a modified version of it is a cornerstone in the DSGE-model.

Distrustful of discretionary and activist policy interventions, and wary of monetary shocks, scholars sought to formulate simple fixed rules for monetary policy to avoid the usage of fiscal policy. This idea has been carried over to the present. Friedman (1960) thus suggested a *k-percent rule* in which the level of money supply should be increased at a fixed rate. The idea was that the central bank (or any monetary authority)

was to follow an acyclical monetary policy captured in a rule where the money supply mechanically adjusts to be equivalent to the rate of real GDP growth. This would result in the nominal interest rate being zero when the economy runs at its natural rate.

Providing price stability was considered the main function of monetary policy, partly since it was incapable of having any direct real effects, and partly because it was incapable of delivering anything else in the long-run (Goodfriend and King, 1997, pp. 240-241). In summary, fiscal policy was to be avoided completely and monetary policy only function were only to seek price stability; the efficient markets took care of the rest.

It was soon discovered to be difficult to measure the real growth rate in GDP, and when Paul Volcker commenced as Chair of the Board of the Federal Reserve System in 1979, he wanted to curb the high inflation rates in the US by tightening money supply, which caused a severe recession in the process. The recession dampened Monetarisms' popularity but simultaneously demonstrated the importance of the money supply in the economy, which would come to play a key part in the forthcoming macroeconomic theories.

2.2.2 The New Classical school of rational expectations

The New Classical school of rational expectations emerged from Monetarism and ultimately replaced it as economic Orthodoxy. The macroeconomic discourse shifted from trying to identify causes of short-run fluctuations to methodological explorations of microeconomic optimization approaches (Woodford, 2008; Mankiw, 2006, p. 5). Robert Lucas and Thomas Sargent (1979) were fierce in their critique against the Neoclassical synthesis: their “first and most important point is that existing Keynesian macroeconomic models cannot provide reliable guidance in the formulation of monetary, fiscal, or other types of policy. This conclusion is based in part on the spectacular recent failures of these models and in part on their *lack of a sound theoretical or econometric basis*” (p. 14; emphasis added).

The missing sound basis they referred to was due to negligence in modelling agents as receptive to microeconomic optimization methods. The Keynesian treatment of consumers and firms as highly rational intertemporal-decision makers and that of markets as “sticky” was perceived as inherently contradictory. The logical inconsistency between the two beliefs made the Neoclassical synthesis suffer from what Olivier Blanchard (2008) called “schizophrenia in its relation to microeconomics” (p. 1). The inconsistency hindered the Keynesian ambition from having a micro-core, i.e. to be able to use aggregated individual data as a basis for macroeconomic analysis.

Lucas (1972; 1976) stressed that Keynesian large-scale macroeconomic models were not structural, i.e. policy-invariant; they were bound to require alteration whenever economic policy – the ‘rules of the game’ – changed.¹² The parameters of Keynesian models – established through microeconomic data-estimation – were considered unsuitable for modelling since they could not absorb shifts in policy-regimes. The

¹² We follow Hurwicz's (1966) definition, where ‘structural’ means that it is invariant to a class of policy interventions the researcher is interested in analyzing.

theoretical incoherency rendered models unstable; when the prevailing policy regime changed, the economic relationships valid under a particular policy-regime became invalid when the regime changed (Hoover, 2008). Policy guidance based on outdated economic relationships/parameters was perceived invalid and risked to be misleading and counterproductive.

The essence of the so-called *Lucas critique* was summarized by Lucas (1976): "Given that the structure of an econometric model consists of optimal decision rules of economic agents, and that optimal decision rules vary systematically with changes in the structure of series relevant to the decision maker, it follows that any change in policy will systematically alter the structure of econometric models" (p. 41).

Since rational agents optimize, their decision-making is partly formed by the policies currently in place and partly by their expectations of future policy-regimes. The aggregated data that the Keynesians used could thus not be treated as homogenous over time, since it was contingent on the policy regime in place at a given point in time. Essentially, Lucas rejected the Keynesians' use of ergodicity, since it did not resonate with their contradictory beliefs. Lucas and Sargent (1979) argued that the Keynesian way of reasoning was "only a matter of analytical convenience and not of necessity that equilibrium models have used the assumption of stochastically stationary shocks and the assumption that agents have already learned the probability distributions they face" (p. 14).

The New Classical school thus continued the Keynesian struggle to incorporate a sound microeconomic statistical foundation for macroeconomic relationships, with the objective of making the estimated parameters applicable to all policy-regimes, and thus perceived to be *general*. "Nobody was satisfied with IS-LM as the end of macroeconomic theorizing. The idea was we were going to tie it together with microeconomics and that was the job of our generation" (Lucas, 2003, p. 20).¹³ The remedy to create policy-invariant models, as Lucas saw fit, was to establish *deep parameters*, which are consistent over time. Such structural parameters would relate to underlying preferences, technology and resource constraints, which he assumed to govern individual behavior. Since deep parameters were considered policy-invariant they were tacitly treated as time-homogenous, which enabled macroeconomics to have a *proper* microeconomic foundation.

The estimated parameters would be consistently valid under ever-changing policy-regimes. The crux was to identify the "stable features of underlying preferences" (Lucas, 1986, p. 218). If deep parameters were obtained, given optimizing agents, the models would be able to rely on previous statistical relationships in

¹³ In 1937, a year after the GT was published, John Hicks presented his mathematical formalization of Keynes' aggregate demand analysis in the famous IS/LM-curve. It illustrated the relationship between interest rates and asset markets through a general equilibrium framework. It was *general*, but only in the sense that all variables were determined in the model. Hicks' later agreed that his reductionist model had overlooked crucial parts of Keynes' theory and could not serve "anything more **than** as a classroom gadget" (Hicks, 1980, p. 152). Firstly, the model treated the real and the monetary sectors separately, a division Keynes himself went to great lengths trying to transcend. Secondly, static general equilibrium models ignore uncertainty, and without the presence of uncertainty, Keynes notion of liquidity preference becomes superfluous, "for there is no sense in liquidity, unless expectations are uncertain" (Hicks, 1980, p. 152). Between the 1940's and the 1970's it was the core model of macroeconomic theory (Bentolila, 2005).

order to predict how agents would act regardless of the prevailing policy. This enabled aggregation of individual decisions in order to create *structural* models able to analyze policy changes' macroeconomic effects (Lucas, 1976).

In summary, a paradigmatic shift had occurred in macroeconomics. No more were models nor theories supposed to base their aggregated relationships on reduced-form estimation. By obtaining deep parameters, models became structural which enabled them to be valid under any policy-regime. Since the New Classical economists believed policy-invariance could be perceived as equal in merits to time-homogeneity, the statistical causal relationships the agents exhibited could be treated as ergodic.

2.2.3 Rational expectations

The following section will have a closer look at how agents expect – and learn from – changes in macroeconomic policy. Lucas (1972) reformulated Friedman's notion that agents learned from experience by incorporating *rational expectations* into a dynamic general equilibrium framework. They became forward looking rather than backward looking (adaptive expectations), as was previously conventional. 'Adaptive expectations' means that agents revise their expectations ex-post of a shift in the policy-regime, and only gradually as their backward-looking expectations period by period were adjusted to the new economic environment. Consequently, equilibrium in the economy would be converged upon, but never really reached since the adjustment process was slower than the changes in policy. This increased the incentives for the government to overshoot targets in order to create quicker responses.

The Royal Swedish Academy (1995, p. 4) stated that Lucas' general approach has "become a prototype for practically all modern researchers in macroeconomics." The methodological introduction of rational expectations is arguably the most central – and crucial – property of contemporary Orthodoxy, due to its treatment of expectational behavior, which underpins all economic activity. The results were elegant and mathematically coherent models in which economists could pinpoint optimal policy guidance through a hypothetical trial-and-error reciprocal process (Lucas, 1986).

By incorporating rational expectations, agents were led to adjust their expectations to preannounced fiscal or monetary policy changes. Agent's expectations – on average – coincided with the optimal outcomes predicted by the models (Lucas, 1972). Lucas and Sargent (1979) explain:

"Because they do not have all of the information necessary to compute perfectly the relative prices they care about, agents make errors in estimating the pertinent relative prices, errors that are unavoidable given their limited information. [...] Since on average everyone is making the same mistake, aggregate output rises above what it would have been. This increase of output above what it would have been occurs whenever this period's average economy-wide price level is above what agents had expected it to be on the basis of previous information. Symmetrically, aggregate output decreases whenever the aggregate price turns out to be lower than agents had expected. The hypothesis of rational

expectations is being imposed here: agents are assumed to make the best possible use of the limited information they have and to know the pertinent objective probability distributions. This hypothesis is imposed by way of adhering to the tenets of equilibrium theory” (p. 8).

On top of the Neoclassical assumption that agents are rational in the sense that they optimize their decisions, by assuming rational expectations they were also given perfect understanding of the economic models and their outcomes. Thus, rational expectations, initially conceived by Muth in 1961, introduce ‘synthetic’ additional information that the agents normally would not obtain. However, Muth applied the hypothesis only to a single market in partial equilibrium. Lucas popularized and expanded the hypothesis to a general notion; fitting all markets simultaneously, which made them suitable for macroeconomic general equilibrium modelling. “The key elements of these models are that agents are rational, reacting to policy changes in a way which is in their best interests privately [optimization], and that the impulses which trigger business fluctuations are mainly unanticipated shocks” (Lucas and Sargent, 1979, p. 14). Fiscal policy was considered a source of distortion in the equilibrium, and should be avoided if possible. “The central idea [...] is that economic fluctuations arise as agents react to *unanticipated* changes in variables which impinge on their decisions” (Lucas and Sargent, 1979, p. 10; emphasis added). Thus, to stabilize agents’ expectations about future changes all macroeconomic policy should optimally be anticipated.

The concept of rational expectations proclaims that outcomes do not differ systematically (i.e., regularly or predictably) from what people expect them to be. If the underlying structure of the models would alter, the appropriate policy would change accordingly, and expectations would adjust in turn. Hence, the agent’s actions depended upon expected policies under a reciprocal process; the influences between expectations and outcomes flowed both ways.

With deep parameters in place the assumption of homogenous relationships over time was justified, which restored the ergodic axiom as a plausible foundation for probabilistic macroeconomic estimations. By incorporating rational expectations, the New Classical economists created a stationary general equilibrium framework. However, this time the framework incorporated *intertemporal* utility maximizers rather than static ones. This meant that Lucas, and his contemporaries, carried the torch onwards in accepting the ergodic axiom that Samuelson had introduced. Economic activity tomorrow could simply be broken down to objective probabilities deduced from past activity.

The practical implication was that if agents’ expectations were anchored e.g. through a promise of a predetermined general increase in price levels (inflation), then their expectations would coincide with that predetermined target. The idea was revolutionary and paved way for a new macroeconomic framework, which will be discussed in the following sections.

2.2.4 Policy-ineffective proposition and time-inconsistency

The concept of rational expectations had an enormous impact on macroeconomic reasoning. Through its implications and by the establishment of deep parameters, models were considered structural, thus accommodating the Lucas Critique. Furthermore, Lucas (1972) argued that the effectiveness of a policy regime is dependent on its credibility and the manner in which policies altered agents' expectations. As a response, Sargent and Wallace (1975) proposed a macroeconomic framework based on rational expectations. They showed that the government could not successfully manipulate the economy to pursue e.g. higher growth or lower unemployment. Rational expectations undermined the idea that policymakers can manipulate the economy for short-term gains by systematically fooling the agents to have erroneous expectations. In such a case, agents would foresee the effects and adjust price and wage expectations accordingly, offsetting the short-term gains by future losses. This was called the *policy-ineffectiveness proposition*.

Building on this proposition, Kydland and Prescott (1977) published a seminal article where they described the concept of *time inconsistency*. *Consistent* policies over time would not cause altering expectations; *inconsistent* policies could improve welfare by announcing one thing and then acting differently, but the expectations would be skewed and the policies unreliable. Providing a time consistent framework rejected the ambition of monetary authorities to create an artificial *boom* in the economy. In such a case, agents expected higher inflation, which would *cause* higher inflation in a reciprocal process, forcing the authority to choose between higher inflation and an economic *bust* (to bring inflation down again).

The set-up was modelled in a game-theoretical manner: fooling agents would yield desired results in the short-term, but the agents would learn and adapt from experience and correct their expectations accordingly. The learning effect was reciprocal. The spirit of the idea can be summarized by Abraham Lincoln's old adage: *You can fool some of the people all the time, and all of the people some of the time, but you cannot fool all of the people all of the time*. Thus, as long as policy changes were predictable minimal economic fluctuations would result in theory.

Building upon Sargent and Wallace's (1975) policy-ineffectiveness proposition, Barro and Gordon (1983) formalized a model where the manipulation of employment and output by the government would inevitably lead to inflationary bias. If governments fooled agents initially and artificially pushed unemployment numbers below their natural levels, credibility would be lost. This mechanism clarified that governments should exhibit restraint and reliability to stabilize output growth and inflation.

The monetary authority relied on high trustworthiness – good reputation – if agents were to believe their rational expectations about future inflation. This idea was the seed that would grow into central bank independence, (in theory) permanently stopping politicians from employing populist agendas through the means of monetary policy. Given agents' rational expectations, and their reluctance to getting “fooled” by monetary policy, Barro and Gordon (1983) mathematically proved that rule-based monetary policy yielded

more effective outcomes than a discretionary monetary policy. Again, one should keep in mind that these proposals were motivated by curbing *too high* inflation, which plagued the US economy during the 1970's.

When intentions are transparent and predictable, agents are able to form more reliable forecasts of future policy actions and economic developments. Since central banks can only *directly* influence the short-term interest rate, they must influence the longer rates by signaling movements in future policy to anchor inflation expectations. Indeed, the logical interpretation of rational expectations incentivizes central bank transparency. Central banks therefore try to communicate their actions and intentions to the market, thereby reducing the public's uncertainty about future decisions (Faust and Svensson, 2001). Transparency, 'forward guidance', and good communication are thus key components of effective monetary policy.¹⁴

In summary, Barro and Gordon (1983) built on Kydland and Prescott's (1977) ideas, and introduced the original notion of inflation targeting-regimes. The regime is built on agents' rational expectations of future changes in policy regimes to coincide with the explicit goals and outcomes of models, leading to predictable agent-decision-making. This stipulates a self-reinforcing need for the policy regime to be credible as well as transparent. It is built on the monetarist belief that fiscal policy should be avoided altogether and if monetary policy excessively expanded money supply, it would inevitably be inflationary. Since economic fluctuations are explained by random shocks to productivity, the sole macroeconomic ambition for monetary policy should be to focus on price stability, through the means of a rule-based framework.

2.3 REAL BUSINESS CYCLE THEORY

The New Classical school culminated in the third wave of Real Business Cycle (RBC) theory, initiated by Kydland and Prescott's (1982) parsimonious general equilibrium models based on microfoundations (Mankiw, 2006). RBC models continued the tradition of an aggregated microeconomic basis, built on the same assumptions that Lucas and his contemporaries used: agents optimized intertemporally under rational expectations and prices adjust instantly to clear markets. Based on these assumptions, business cycles were perceived as an equilibrium phenomenon; the level of national output necessarily maximized expected utility. Business cycles were considered *real*, representing the most efficient allocation of market resources given the structure of the economy at present day (Laidler, 2015). Governments should therefore not intervene by discretionary fiscal policy (as Keynesians believed) or monetary policy (as Monetarists believed), in an attempt to smoothen the economic short-term fluctuations.

An RBC model consists of two intertemporal optimization equations. Both equations build on rational expectations, the first deals with households' consumption and labor supply, the other deals with firms' investment and labor demand. By combining the two equations into a general equilibrium, quantities and

¹⁴ In stark contrast to preceding Central Banking behavior where "Paul Volcker championed mystique as the essence of central banking" (as the previous Governor of Bank of England Mervyn King explained it).

prices are simultaneously determined. Employment levels change because shocks in technology and productivity shift people's desire to work (Mankiw, 1990).

RBC theorists, as well as Lucas and other New Classical economists, adhered to the principle that models should be explicit and complete in the sense that important variables should always be “determined endogenously through interaction between rational agents with rational expectations in a specified environment” (Royal Swedish Academy, 1995, p. 4). If all variables are determined in the framework, the models are considered general. This persists today as the ‘G’ in the DSGE model. The insistence on rigorous model-completeness was a difficult endeavor to achieve in practice, especially since “macroeconomic problems require analysis of dynamic situations with explicit uncertainty” (Royal Swedish Academy, 1995, p. 4). However, the perceived advantage of RBC models lies within their construction as a fully specified system that allows comparison of different policies to one another. This dynamic structural system constitutes the core framework in contemporary DGSE models.

The theories that emerged under the New Classical era comprise the core framework of contemporary theories. Although, their belief in markets as clearing had to give way to the New Keynesian belief in sticky prices.

2.4 THE NEW KEYNESIAN SCHOOL

The New Keynesian school evolved as a response, and as an alternative, to the New Classical flexible-price RBC models. It revived the Keynesian beliefs of sticky prices and wages. The stickiness meant that markets did not clear instantly and were thus not ‘effective.’ Therefore, the new classical market-clearing models were considered inadequate to explain short-run economic fluctuations. Still, the New Keynesian models were largely based on RBC-assumptions: rational actors with rational expectations formed intertemporal decisions, which enabled a microeconomic statistical foundation (Laidler, 2015; Goodfriend and King, 1997).

A seminal New Keynesian model was Fishers’ (1977) response to Sargent and Wallace’s (1975) policy-ineffectiveness proposition. Fishers’ model showed that monetary policy was not only desirable as to guide the economy, it was also coherent with rational expectations and microeconomic foundations. The model assumed that workers sign nominal wage contracts that last more than a period, which makes wages sticky since they do not continuously adjust to underlying economic conditions. The contracts forced agents to be ‘locked’ in their rational expectations at the time they signed the contract, which gave leeway for monetary policy to generate desirable countercyclical effects (Mankiw, 2006). This was theoretically warranted as the continuous process of contract and wage negotiations was costly. In addition, there were also costs for firms to acquire information needed to set the right prices – so-called menu costs.

John Taylor (1979; 1980) expanded on Fisher’s theories and introduced a ‘staggered contract model.’ It contained staggered contract negotiations that fixed nominal prices and wages for prolonged periods of

time – which manifest in monetary policy’s real long-lasting effects. Since the monetary authority controlled money supply, given fixed nominal wages, they could regulate the real wages (inflation-adjusted nominal wages) and ultimately the employment rate (Mankiw, 1990). Fischer (1977) and Taylor’s (1979; 1980) work showed that one could overthrow the old Philip’s curve and still maintain the results through nominal price- and wage settings. The New Keynesian Phillips (NKP) curve thus became the last key component in the forthcoming DSGE-model, concluding the historical narrative.

2.5 THE NEW NEOCLASSICAL SYNTHESIS

The following section will describe what the contemporary Orthodox economic framework looks like, and draws on all previous sections in the background.

After several acrimonious debates during the 1980’s and beginning of the 1990’s, the previously rival schools of New Keynesianism and New Classical synthesized their theories in what Goodfriend and King (1997) labelled the *New Neoclassical Synthesis*. This synthesis is manifest in the DSGE model, which has become increasingly dominant within monetary policy since the 1990’s. The model builds on the New Classical RBC framework, but incorporates New Keynesian sticky prices as to explain economic fluctuations.

Just before the financial crisis erupted in 2008, Woodford (2008) listed four previously contended issues that had turned to widespread agreement:

1. *Macroeconomic analysis should employ models with coherent intertemporal general-equilibrium foundations*, which enable analysis of short-run fluctuations together with long-run growth. This is based on the notion that micro- and macroeconomic analysis are treated on the same principles, reconciling household and firm behavior with the aggregate economy. This underlines the fact that the methodological stance of the New Classical school and the RBC theorists has become mainstream through the DSGE models. The DSGE models incorporate varieties of adjustment frictions in response to economic disturbances. Instead, the requirement that all equations in models are derived from mutually consistent microeconomic foundations is stressed.
2. *Quantitative policy analysis should be based on econometrically validated structural models*, i.e. models that have deep parameters, invariant to changes in monetary and fiscal policy-regimes. In essence, the objective of DSGE models is to “provide a quantitative description of the joint stochastic processes by which a set of aggregate variables evolve, the parameters of which can then be *estimated by direct comparison with the relevant time series*” (Woodford, 2008, p. 5, emphasis added). The structural relationships are derived from explicit decision problems of optimizing agents, given resource- and budget constraints.
3. *Expectations should be modeled as endogenous*. In policy analysis, it is particularly crucial to take into account that expectations ought to vary for different potentially forthcoming policy implementations – hence accommodating the *Lucas critique* (1976). It is therefore routine to assume

rational expectations on the part of economic decision-makers, according to the methodology introduced by the New Classical theory in the 1970's.

4. “*Monetary policy is now widely agreed to be effective*, especially as a means of inflation control. The fact that central banks can control inflation if they want to (and are allowed to) can no longer be debated, after the worldwide success of disinflationary policies in the 1980's and 1990's; and it is now widely accepted as well that it is reasonable to charge central banks with responsibility for keeping the inflation rate within reasonable bounds” (Woodford, 2008, p. 11, emphasis in original).

Blanchard (2012, p. 7) summarized the state of macroeconomic Orthodoxy before the crises ex-post:

“There was one target, stable inflation, and there was one instrument, the policy rate or more precisely the policy-rate rule, and that was basically enough. If you had the right rule for the policy rate, you would achieve low and stable inflation. The use of a rule, implicit or explicit, gave the central bank credibility and delivered a stable economy. The implicit assumption was that stable inflation would deliver economic stability in the sense of a stable output gap. This was the case in many formal academic models, particularly in the benchmark new Keynesian [DSGE] model, which displayed a property that Jordi Galí and I have called the ‘divine coincidence’. In these models, if you maintained stable inflation, you would also maintain a stable output gap. The two went together, so there was no reason to look at the output gap separately” (Blanchard et al., 2012, p. 7).

The markets were deemed adequate in regulating and maintaining financial stability in the economic system. Given financial stability, it gave monetary policy leeway to pursue the inflation targets undisturbed. This fitted the macroeconomic framework of credible and independent central banks, following a rule-based monetary policy, which mechanically adjusted the nominal interest rate¹⁵ according to the monetary policy-rule. Price stability was thus the only goal macroeconomics strived to accomplish. As Blanchard argues above, although implicitly an intermediary goal, achieving price stability was the same thing as minimizing output gaps, which made the economy to run at its natural level.

2.5.1 The DSGE Model

In the following section, we illustrate how monetary policy was put into practice before, as well as after the crises. The nexus of the pre- and post-crisis frameworks is the DSGE model, which most key policy institutions still use as their core policy-tool (Lindé et al., 2016). The DSGE model builds on all other notions and ideas that we have purveyed in the background section: utility maximizing agents with rational expectations, which are to coincide with the models' outcomes, under a framework of credible central banks with a clear mandate and an explicit monetary policy-rule on which agents in the economy can base their intertemporal optimizing decisions on. The monetary policy-rule is given by the DSGE model, as well as

¹⁵ Which are also known as bank rates, or discount rates, such as the Federal Reserve Bank's *Federal Funds Rate* (FFR), Bank of England's *Official bank rate* and The Riksbank's *Reporate*.

the generated changes in nominal interest rates. The model we use as representative tries to capture the basic characteristics from seminal papers such as Smets and Wouters (2003, 2007) and Christiano et al. (2005).

We begin by introducing the basic components of a canonical DSGE model through a stylized figure we have constructed, see Figure 1. The DSGE model in exposition is meant to illustrate the underlying mechanisms at play in contemporary Orthodox theory, where expectations play the lead-role.

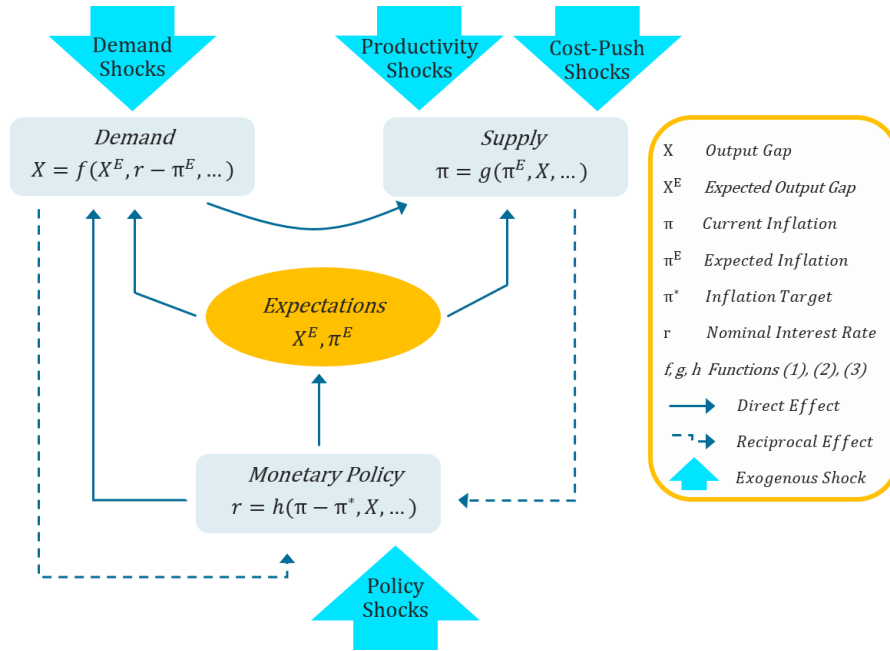


Figure 1 - The dynamics of the DSGE model

A canonical DSGE model is represented by three equations: an aggregate demand equation, an aggregate supply equation and an interest rate-rule (such as a Taylor rule¹⁶). These three equations determine the optimal nominal interest rate through a loss function minimization, either by a flexible or strict inflation-targeting regime.¹⁷ All three equations are derived from microfoundations (Woodford, 2003; Calí and Gertler, 2007; Sbordone et al., 2010). All variables are determined simultaneously and endogenously within the model, making the model *general*, by Orthodoxy's definition.

The demand equation – the Expectation-augmented IS-curve – stems from a goods market-clearing condition as well as an *Euler Equation* of a representative household and determines aggregate household demand:

$$X_t = E_t X_{t+1} - \sigma(r_t - E_t \pi_{t+1} - r_t^n) \quad (1)$$

¹⁶ John Taylor (1993) introduced an interest rate forecasting model, called the *Taylor rule*, which is a monetary policy-rule. It determines the appropriate level of nominal interest rates in order to bring inflation levels closer to its target as well as stabilizing the real economy by minimizing the output gap.

¹⁷ Strict inflation targeting means that the central bank solely focuses on minimizing inflation's deviation from its target. Flexible inflation targeting was introduced by Svensson (1999; see also 2010), and focuses on minimizing the output gap (or unemployment gap) in addition to staying close to the inflation target. See Appendix 1.

The equation determines the output gap today (X_t , i.e. the percentage gap between actual and potential output), through agents' expectations of the output gap and the inflation rate tomorrow (X_{t+1} and π_{t+1}). E_t is the (rational) expectation operator, i.e. agents' expected future values (of inflation and output gap). In Figure 1, the superscript E on variables means that it is the expected value of that variable. σ is the intertemporal elasticity of substitution of consumption. The subscript t is the time-marker.

An Euler equation is an intertemporal version of a first-order condition characterizing an optimal choice as equating (expected) marginal costs and marginal benefits. It assumes that agents want to 'smoothen' consumption over their lifetime, as to maximize utility. The central bank can only directly adjust the nominal interest rate, (r_t), to offset any potential shocks in the natural interest rate, (r_t^n).¹⁸ Although, more importantly, the central bank can manipulate expectations through its actions, mandate, credibility and authority, which determines how agents act, and is ultimately reflected in the state of the economy.

The supply equation – the NKP curve – combines monopolistic competition¹⁹ with Calvo's (1983) model of staggered prices.²⁰ The NKP curve is not an empirical relation between unemployment and inflation, as the previous Phillips curves. Instead, the equation describes how firms set prices as a function of aggregated demand (since a large output gap means excessive aggregated demand in the economy). It determines the inflation level through firms' staggered price-adjustments that determines the supply of goods and services. This allows firms to adjust prices as a weighted average of current and expected future nominal marginal cost as to decide supply:

$$\pi_t = \beta E_t \pi_{t+1} + \kappa X_t + u_t \quad (2)$$

In economic booms, when demand is high and the economic activity is encouraging, firms increase wages to induce employees to work longer hours. Higher wages increase marginal costs and put pressure on prices, which ultimately generates inflation. Furthermore, the higher inflation is expected to be in the future, the more prices will increase, which contributes to a rise in inflation today. The equation measures agents' predictions' *distance from capacity* of the rate of inflation through a microeconomic optimization framework, in which people have rational expectations and no 'money illusion'.²¹ The κ depends both on the elasticity of marginal cost with respect to output and on the sensitivity of price adjustment to marginal cost fluctuations. The term u is a cost-push shock, since the potential level of output may not coincide with the

¹⁸ As defined by Williams (2003) as "the real interest rate consistent with real GDP equaling its potential level (potential GDP) in the absence of transitory shocks to demand" (p. 1). Which mean that the natural rate of interest is the interest rate consistent with maintaining economic growth at its [trend rate](#) and stable inflation.

¹⁹ Monopolistic competition is that firms offer goods or services that are similar, but not perfect substitutes, to other firms' goods or services. This give the firms some market power as to determine the price of their products.

²⁰ Guillermo Calvo's (1983) *staggered price model* has become the most common way in New Keynesian models to facilitate nominal rigidities. It states that a firm "resets" its price in any period by a predetermined probability – h , also called the Calvo probability. Correspondingly, $1 - h$ is the probability that the firm's price will remain unchanged throughout the period, also called the survival rate.

²¹ Money illusion, or price illusion, refers to people's tendency to consider the nominal value of a currency, rather than the real value, to constitute its purchasing power.

socially optimal output because of real imperfections such as monopolistic competition or labor market rigidities.

The monetary policy rule closes the model and sets the anchor for the agents' decision making within the model, and thus has no expectational component itself. A simple monetary policy-rule could take the form of a Taylor rule:

$$r_t^T = r_t^n + \phi_\pi(\pi_t - \pi_t^*) + \phi_X X_t \quad (3)$$

The r_t^T is the nominal interest rate target by the central bank. It is explained by the 'natural' interest rate r_t^n , the inflation gap $(\pi_t - \pi_t^*)$, where π_t is the inflation rate, π_t^* is the inflation target, and the output gap X_t . The two ϕ -symbols are the weights on the two objectives (the inflation- and the output gap), where $\phi_\pi > 1$ and $\phi_X > 0$. The monetary policy-rule serves as a feedback-rule; discrepancies in the inflation $(\pi_t - \pi_t^*)$ and the output gap (X_t) stipulate monetary policy responses that strive to reduce these divergences according to predetermined weights of the two objectives. Before the crisis, the objectives were perceived as synonymous according to the 'divine coincidence.'

Except the monetary policy-rule itself, the nominal interest rate is the only (conventional) instrument the central bank uses to stabilize the economy. Every period the central bank decides, within the model, a target for the short-term interest rate as a function of the economic conditions given by the model. If the economy is 'overheating,' exhibited as a positive output gap and/or positive inflation gap, the rule stipulates for the central bank to raise nominal rates to 'cool' the economy. Since the feedback coefficient on inflation (ϕ_π) exceeds unity, it implies that the nominal interest rate needs to be increased by more than one percent to offset a one percent inflation increase – the so-called Taylor principle.

Within the model, infinitely-lived representative households are assumed to maximize utility over the life cycle, and a representative firm is assumed to maximize the discounted present value of all future profits, given budget or resource constraints. This rational behavior also means that individuals and firms base their conduct on the best possible forward-looking decisions they can make based on their forecast of future uncertainty. Their expectations are rational, and the uncertainty which they face when forming their expectations is reduced by a monetary policy-rule, under the assumption that it is credible (Adolfson et al., 2007).

The model anchors both firms' and households' expectations by giving them additional information, *ceteris paribus*. By endowing them with the future inflation rate and by actively pursuing this target rate, and by promising not to fool them in the process, the additional information reduces uncertainty, which stabilizes their expectations about future rates informing their pursuit of utility maximization. The future inflation rate is indeed crucial for current decision-making, since agents need to base decisions taken today on the price levels and on the state of the economy at future points in time.

In every period, random exogenous shocks perturb the equilibrium conditions in each equation. The shocks are represented as large arrows in Figure 1. The shocks inject uncertainty in the evolution of the economy and generate economic fluctuations, which the model tries to overcome by adjusting the nominal policy rate. Without these shocks, the economy would evolve along a perfectly predictable path devoid of booms or recessions.

By inducing stochastic shocks in the different equations, the shocks' transmission mechanisms in the economy can be traced, to the benefit of policy makers. Although the model is constructed so that it always reverts to equilibrium within a few periods, disequilibria are not a property of the model (Buiter, 2009). When the economy is hit by an unexpected exogenous shock, monetary policy can offset the resulting macroeconomic consequences by adjusting the nominal interest rate.

The choices of all unique agents are reduced to one representative agent's utility optimizing behavior, which is believed to represent the aggregate behavior of all unique agents. This assumption is based on the notion of rational expectations, which assures "equality between agents' subjective probabilities and the probabilities emerging from the economic model containing those agents" (Hansen and Sargent, 2010, p.4). Although, there are continuous efforts to incorporate heterogeneous agents in the model, as well as financial intermediaries. Still, these efforts do not affect the fundamental mechanisms of the model.

The dependency of current optimal choices on future uncertain outcomes makes the model dynamic and assigns a central role to agents' expectations in the determination of current macroeconomic outcomes. In fact, expectations are conventionally posited by Orthodoxy to be the main channel through which policy affects the economy at large (Goodfriend and King, 2007; Galí and Gertler, 2007). The importance of expectations should not be underestimated since the "Monetary transmission depends critically on private sector expectations of the future path of the central bank's policy instrument, the short-term [nominal] interest rate. Ever since the rational expectations revolution, it has been well understood that the effects of monetary policy depend on private sector expectations" (Galí and Gertler, 2007, p. 27). Expectations feed from the monetary policy-rule into the new Keynesian Philips (demand) curve as well as into the expectation-augmented IS-curve (supply). This is illustrated in Figure 1 by (small) arrows from monetary policy into expectations in the center, which feeds into supply and demand directly, but also indirectly via demand to supply, ultimately determining the output gap and inflation. Finally, the demand and supply equations reciprocally feed back into the monetary policy equation.

Consequently, the current values of aggregate output and inflation depend not only on the central bank's current choice of the nominal interest rate, but also on agents' anticipated future path of this instrument. The assumption of rational expectations and ergodicity is indispensable for the model, and should agents for any reason not optimize their expected utility over the time-horizon, the model would yield suboptimal responses (Galí and Gertler, 2007; Sbordone et al., 2010). "That market actors and policymakers behave as if they are maximizing utility with respect to subjective probability estimates – in other words, that they are

rational agents living in the world of calculable risks – is by now a bedrock assumption” (Nelson and Katzenstein, 2011, p. 10).

In summary: inflation targeting is theoretically coherent with *rational agents* as well as *rational expectations* and gives the central bank credibility to overcome the *time-inconsistency* problems that arise when central banks use discretionary policy implementations. Committing to a monetary rule rather than using discretionary monetary decisions would eliminate the inflationary bias and remove the temptation for central banks to push output above its natural level. The expectational reciprocity is at the heart of the New Neoclassical Synthesis, manifest as *the* critical determinant of DSGE models. To find the nominal interest rate, when determining the model itself, ergodicity is a necessary condition for the econometric calculations. We believe that the model we describe, and the mechanisms that underpin it, give account of how the New Neoclassical Synthesis theorizes and guides the general economy, motivating the exclusive usage of monetary policy.

3 THE PROBLEM

In this chapter we will give a brief account of the macroeconomic discourse before as well as after the crisis, related to the discipline’s evolution laid out in the previous chapter. Then, we lay out our perception of what is currently wrong with the Orthodox economic doctrine, and how it can be mended.

“Before the economic crisis began in 2008, mainstream economists and policymakers had converged on a beautiful construction for monetary policy. To caricature just a bit: we had convinced ourselves that there was one target, inflation, and one instrument, the policy rate. And that was basically enough to get things done” (Blanchard et al., 2012, p. 7).

Before the financial crisis erupted in 2008, there was a consensus that we had understood the fundamental mechanisms of macroeconomic relationships. DSGE models were deemed a good representation of economic activities, especially since they were based on a microeconomic foundation (Kirman, 2010). Macroeconomic policy became synonymous with monetary policy, while fiscal policy was to be avoided. The consensus within the discipline is to some extent understandable; during the mid-1990’s, when the first countries adapted inflation targeting, until the eruption of the financial crisis in 2007 – the so-called Great Moderation – economies with inflation target-regimes grew steadier, inflation targets were met and unemployment numbers were low. The monetary policy rule was deemed credible, which increased its legitimacy. “The general consensus in mainstream economics was that there were no longer any substantial methodological controversies left in macroeconomics” (McCombie and Pike, 2013, p. 2).

Fiscal policy was considered effective in manipulating aggregate demand, but since it relied on discretionary decisions, and discretion was considered archaic, exclusive monetary policy was deemed superior. The macroeconomic discipline was limited to the use of monetary policy governed by independent banks with defined mandates and clear objectives to stabilize inflation rates on pre-targeted levels through an almost mechanical use of nominal interest rates. The guiding idea was monetary policy being the only tool needed

to minimize business cycles (Blanchard et al., 2012). Financial and economic stability was disregarded due to the belief that any potential frictions would be absorbed by self-regulating markets, according to the efficient-market hypothesis (Arestis, 2008). There were no incentives to embark on a different route since there was nothing to remonstrate. Instead, emphasis was laid on ‘improving’ the DSGE models in regards to elegance and internal logic, at the cost of external validity (Wren-Lewis, 2016).

After the financial crisis in the US in 2008 and the European debt crisis in 2009, the change of tone was dramatic.²² The consensus that previously governed the discipline of macroeconomics was nowhere to be seen in the crises’ wake. A number of prominent economists that contributed in establishing the prevailing macroeconomic framework even turned to criticize it.²³ Strikingly, Orthodox economists seem to recognize that there is a problem, but fall short in explaining what the *underlying* problem actually is. However, some economists have identified the inability to facilitate future uncertainty as the main deficiency within the current macroeconomic framework (see for example Blanchard et al., 2012; Krugman, 2011; Leijonhufvud, 2009, 2014; Skidelsky, 2010).

Conventional knowledge identifies the source of the financial crises as the incapacity of financial markets to assess the financial markets’ underlying assets correctly. The initial problem was mortgage-credits being lent too easily to uncreditworthy households. When the financial crisis erupted in 2008, it caused a rush to liquidity, which led to a collapse in investment and consumption.²⁴ The acute phase of the crisis is now over, but the financial havoc that rippled and crippled the global economy after it left an altered economic landscape.

Orthodoxy posits that cheap credits spur consumption and investments, which should cause the inflation to rise. However, despite the availability of cheap credits provided by the ultralow interest rates, *inflation targets have not been met* in inflation targeting regimes after the crisis. Nonetheless, the theoretical core of the

²² Naturally, there was a large discussion trying to understand the new economic environment in the brave new world of the post-crisis global economy. For example, the International Monetary Fund invited prominent economists in order to capture the collective reasoning during the transformational period after the crisis in the book *In the Wake of The Crisis* (Blanchard et al., 2012). “I begin with a simple observation,” Nobel Laureate Joseph Stiglitz writes in it, “the current global economic crisis was man-made [...] and not inevitable” (p. 31). This conclusion is symptomatic by the authors of the book where “the implication is that policies, particularly the policies of the U.S. monetary and regulatory authorities, led to the crisis” (2012, p. 3).

²³ Nobel Laureate Joseph Stiglitz (2011) argued, “The standard macroeconomic models have failed, by all the most important tests of scientific theory” (p. 1).

“The workhorse new Keynesian dynamic stochastic general equilibrium [DSGE] models on which we were concentrating so much of our attention have been of minimal value in addressing the greatest macroeconomic crisis in three-quarters of a century” (Romer, in Blanchard et al., 2012, p. 47).

Willem Buiter (2009), “Standard macroeconomic theory did not help foresee the crisis, nor has it helped understand it or craft solutions. [...] both the New Classical and New Keynesian complete markets macroeconomic theories not only did not allow the key questions about insolvency and illiquidity to be answered. They did not allow such questions to be asked. A new paradigm is needed” (p. 1).

Nobel Laureate Paul Krugman (2011), “macroeconomics is, above all, about understanding and preventing or at least mitigating economic downturns. This crisis was the time for the economics profession to justify its existence [...] We have not, to put it mildly, delivered.” Krugman identified three main complaints about Orthodox economics. Firstly, it failed in foreseeing the crisis. Secondly, it failed “even to see the possibility of this kind of crisis,” and lastly it “failed to offer useful advice on what to do after the crisis struck” (p. 307).

Axel Leijonhufvud (2009), “Today’s problem is the financial crisis and the resulting great recession. Neither the standard Keynesian policies of decades past *nor the monetary policy doctrine of recent years provides useful solutions*. Dynamic stochastic general equilibrium theory is part of the crisis wreckage, but turning to old or to New Keynesian theory will be of little use” (p. 741, emphasis added).

²⁴ Furthermore, a number of discretionary unconventional measures was enacted in order to cage the escalating developments (such as Quantitative Easing (QE), and Large Scale Asset Purchases (LSAPs)), pushing The Federal Reserve to “the very edge” of its legal authority, where the large amounts of direct credit to markets “contradicts all the traditions and laws that have governed central banking behavior for a hundred years” (Volcker, 2009, p.3). As Leijonhufvud (2014) argues, “is that our conventional macroeconomic policies are not adequate to deal with the aftermath of a financial crisis. [...] being unconventional, when conventional will not do, does not guarantee being right” (p. 772).

macroeconomic framework is still intact; the dual objectives of price level stability and financial stability remain separated. Financial stability is now sought through macroprudential instruments, related regulation and resolution mechanisms are currently implemented.²⁵ The DSGE-model persists as the dominant policy-tool coupled with the monetary policy rule, implicitly ignoring the possibility of the current monetary policy-framework endangering financial stability.²⁶

Inflation is usually measured by the consumer price index (CPI). The CPI is largely based on the price levels of consumption goods and services.²⁷ One explanation for the anemic inflation-levels could be that the cheap credits *trickle down* to non-consumption activities, which does not affect the CPI. The DSGE model assumes that lower interest rates spur consumption, but it begs the question: how much of the credits are actually used for consumption purposes? It is evident that the monetary transmission mechanism is not functioning properly. Arguably, the real estate and stock markets could be outlets where the cheap credits have been seeking higher yields instead.

Given consistency in the policy-regime – referring to the monetary policy rule, not the generated nominal interest rate – agents’ rational expectations should remain consistent. Theoretically, the DSGE model should in such a case advocate exactly the same responses as previously – by mechanically following the monetary policy-rule – despite the seemingly altered economic fundamentals that the post-crisis environment suggests. The current framework does not allow for alternatives, despite the fact that expectations play a crucial part in agents’ decision-making and sequentially the state of the economy at large.

The DSGE model cannot capture exogenous shifts in expectations since by construction the rational agents are to pursue their utility maximizing decisions by *not diverging* from the models’ predictions, which by assumption should render optimal outcomes. The model rejects the idea that expectations can be altered by exogenous forces, i.e. the possibility of changed expectations *ceteris paribus*; expectations are modelled solely endogenously. Agents’ rational expectations by definition should coincide – on average – with the models’ predictions; the expectations are *rational* in the sense that the inflation targets always are to be reached, given sufficient time.²⁸ How long should it take before the inflation target is deemed unrealistic?

If we assume that agents have rational expectations, agents should not make non-optimizing or capricious decisions. Nevertheless, if models’ predictions would not generate optimal outcomes *ex post*, by its own logic the agents should learn, adapt, and alter their expectations as to expect that the forthcoming economic

²⁵ E.g. the accelerated efforts in the Basel Committee on Banking Supervision (BCBS), as well as the European initiative EU Bank Recovery and Resolution mechanism (BRRD), to mention a few.

²⁶ The rule is more than the inflation target itself; it refers to equation (3) in the background section. The rule determines how the central bank should adjust their nominal interest rate, but also serves as a signaling device for agents to anchor their expectations.

²⁷ Although there has been a discussion of substituting the CPI to variations of it. E.g. including energy prices, or with a fixed interest rate, or harmonized indexes over countries, such as the Harmonised Index of Consumer Prices (HICP).

²⁸ Otmar Issing explains the discussion of time horizons in inflation targeting, “At a 2003 conference at the Bank for International Settlements (BIS), inflation targeters discussed the time horizon for the inflation forecast. Initially, it was one and a half years, and then it was extended to two years. Lars Svensson asked, ‘Why not six or seven years?’” Issing sees Svensson’s definition of flexible inflation targeting as a “Nirvana approach” (Blanchard et al., 2012, p. 26).

reality will not coincide with the monetary policy rule. In such instances *it would not be rational anymore to have rational expectations*, since they would not provide the most accurate information for agents to base their intertemporal utility maximizing decisions on. By its own reciprocal mechanism, the expectations – evident in agents’ decisions – would then reinforce a different outcome than what the monetary policy rule ordains. I.e. if agents would not expect the inflation target to be reached, it is less likely to be realized. This is a problem since Orthodoxy “views expectations as critical to the inflation process, but sees expectations as amenable to management by a monetary policy rule” (Goodfriend and King, 1997, p. 279).

Clearly, even hypothetically, there are instances where these fundamentally important relationships do *not* hold. Orthodoxy cannot comprehend scenarios where the inflation target *itself* is not credible, despite the central bank being credible in *their pursuit* of the inflation target.²⁹ By assuming that economic activity is ergodic, the DSGE-generated nominal interest rates are based on previous economic relationships – what *has been* – and *what is*. Since the previous data suggests that monetary responses are effective, the model ordains responses that do not truly capture the current environment, especially concerning agents altered expectations, which do not resonate with the models’ assumptions.

Rational expectations stem from rational behavior, in the sense that a representative agent maximizes utility by making decisions to smoothen a strictly convex utility function, given budget restrictions and preferences. This endeavor is built on agents knowing future probabilities, readily deduced from previous statistical relationships. This maneuver can only be performed under ergodicity, where the future is assumed to be homogenously stochastic; future alternative economic scenarios are identical with past ones, in the sense that they can be reduced to probabilities through mathematical exercises. In essence, by assuming that economic subject matter is homogenous, stochastic, time-invariant, the future is predetermined as a probability distribution of possible states. Orthodoxy believes that ergodicity is plausible if the models incorporate deep parameters, which are deemed policy-invariant, but often confused as being time-invariant also.

Through these probability distributions, agents can predict which future will render them the highest utility, and form their consumption patterns accordingly.³⁰ Although, all agents are bundled up into *one* representative agent in the form of an aggregated utility maximizer. When rational agents operate in a world of predetermined probabilities, the possibility of error is not allowed.³¹

All future events are measured as risks, numerical probabilities, where all future uncertainty can be compressed into these stochastic probability distributions. Our first and foremost objection against this

²⁹ “[W]e have to tackle one old key-challenge in macro modeling, namely the failure of the [rational] expectations hypothesis, in favor of environments where the [rational] expectations hypothesis does not necessarily hold” (Lindé et al., 2016, p. 62).

³⁰ Most, arguably, of our decisions does not come “as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities” (Keynes, VII, p. 103).

³¹ As Gordon Clark (2011, p. 7) argues, “The Fed board was transfixed by quantitative models of expected market performance that implied a low probability of crisis. [...] Myopia was justified by a panoptic theory of market behaviour and efficiency where any market distortions would be automatically ‘corrected’ by self-interest principals and agents.”

reasoning can be summarized by Keynes: “The future never resembles the past - as we well know” (XIV, p. 124). In fact, ergodicity as a means to remove uncertainty was one of the Classical assumptions Keynes fought to overcome in his time (Shackle, 1967; Minsky, 1976).

By assuming ergodicity, Orthodoxy by assumption removes the truly uncertain elements of the future. We argue that this not in the macroeconomic disciplines’ best interest, since its superstructure can only be viable under certain circumstances; it is **not** general. A framework that is viable under *certain* circumstances could at best be applicable to *most* economic situations, but not all. This might be well and good when the economy is situated within such *certain* boundaries, e.g., when economic times are roughly homogenous, as during the Great Moderation.

The flipside is that during those circumstances the theories are *perceived* as general, which increases their legitimacy. Nevertheless, when a crisis emerges they are quickly out of sync with reality.³² In financial distress, or during any other economic irregularity, the models simply “do not fit the problem” anymore, as Leijonhufvud (2014, p. 772) argues.

The current macroeconomic discussion is analogous to the discussion during the Great Depression in the 1930’s. Then, as now, we find ourselves in a situation where the prevailing macroeconomic Orthodoxy has been hegemony for many decades. Moreover, then as now, the economic environment has undergone rapid and drastic changes in economic activity. Lastly, then, as now, Orthodoxy is inadequate to explain and guide the heterogeneous and capricious economic environment. Without proper identification of the underlying problems, solutions are hard to craft.

In the 1930’s, the remedy came as Keynes published the *GT* (1936), which is largely accredited to have ended the Great Depression (Skidelsky, 2009).³³ The *GT*’s *immediate* ambition was to escape the hegemony of the Classical doctrine, whose postulates “are applicable to a special case only and not to the general case [...] with the result that its teaching is misleading and disastrous if we attempt to apply it to the facts of experience” (VII, p. 3). The *GT*’s *fundamental* ambition was to “largely revolutionise [...] the way the world thinks about economic problems” (XXVIII, p. 42). As its title suggests, the book’s purpose was to expound a *general* theory that could encompass *all* economic environments, not just circumstantial *special* environments.

³² In heterogeneous conditions, the DSGE model struggle to cope with the economic reality. “To account for the depth of the recession, the [DSGE] model needs a *cocktail of extremely unlikely shocks* that mainly affect the intertemporal decision of households and firms to consume or invest such as risk-premium and investment-specific technology shocks” (Lindé et al., 2016; emphasis added).

³³ Keynes was puzzled how the Classical theory could have lived in such an oblivious state for such a long time: “The completeness of the [Classical] victory is something of a curiosity and a mystery. It must have been due to a complex of suitabilities in the doctrine to the environment into which it was projected. That it reached conclusions quite different from what the ordinary uninstructed person would expect, added, I suppose, to its intellectual prestige. That its teaching, translated into practice, was austere and often unpalatable, lent it virtue. That it was adapted to carry a vast and consistent logical superstructure, gave it beauty. That it could explain much social injustice and apparent cruelty as an inevitable incident in the scheme of progress, and the attempt to change such things as likely on the whole to do more harm than good, commended it to authority. That it afforded a measure of justification to the free activities of the individual capitalist, attracted to it the support of the dominant social force behind authority” (VII, pp. 32-33).

In analogy to Keynes, we paraphrase him that current Orthodoxy is *trying to solve the problem of uncertainty with a theory which is based on the assumption that there is no uncertainty*.³⁴

We argue, similar to Keynes' remedy in the 1930's, that we need a more general theory, which seeks to embrace the complex and heterogeneous nature that economic subject matter fundamentally consists of.

A theory's assumptions represent its foundations, where its characteristics carry through into the analytical superstructure and ultimately into its policy implications. "Our criticism of the accepted classical theory of economics has consisted not so much in finding logical flaws in its analysis as in pointing out that its tacit assumptions are seldom or never satisfied, with the result that it cannot solve the economic problems of the actual world" (VII, p. 378; see also p. 371). The generality of a theory is decided on which assumptions it rests upon. Indeed, the crucial question for Keynes was always "is this assumption justified?" (VII, p. 229). If not, it would deduce theories unnecessarily detached from reality.³⁵

³⁴ Originally: "Many people are trying to solve the problem of unemployment with a theory which is based on the assumption that there is no unemployment" (Keynes, IX, p. 350).

³⁵ This reasoning is however in stark contrast to Orthodox reasoning, symptomatically exemplified by Lucas "progress in economic thinking means getting better and better abstract, analogue models, not better verbal observations about the real world" (Lucas, 1980, p. 700), where the assumptions need to "necessarily be artificial, abstract, patently 'unreal'" (Lucas, 1980, p. 696).

PART II – THE REMEDY

In Part I we have focused on macroeconomics from the Orthodox perspective. In Part II we put Keynes' perspective on crucial methodological issues of economics in general and theoretical issues of macroeconomics in particular, center stage. Since Keynes is incompatible with Orthodox theory on the most fundamental levels, we begin by exploring his conception of economics, which can provide a wider frame for economics if ergodicity is dropped. Then, we thematize the key concepts of Keynes' epistemology and logic, as they are the essence of his critique against Classical economics and indispensable for the economic theory he developed. Having thus reiterated the correct sequencing in Keynes' eyes, laying out the ground for economics through philosophy first, we move into the *GT* to lay out how 'effective' demand and the related concepts Keynes developed, are relevant today. Jointly, Keynes' concepts can inform a more general economic framework to address and explain outcomes (e.g. crises) which are too complex and ambiguous for the Orthodox framework to capture.

4 WHAT IS ECONOMICS?

The current answer: a social science.

The subject matter of all *social* sciences is coming from different aspects of social human life. As a discipline of social science, economics is home to a category of questions that focus on direct and indirect interaction between human beings as economic agents. The term *science* imposes the need for a methodology that allows the testing of hypotheses, so that knowledge can be formed. Thus, the conflict about methodology between Keynes and Orthodoxy is fundamental to economics.

The ergodic axiom is central to this conflict, as its assumption within positive economics is a logical necessity to make the (often tacit) step from statistical description to inference. It builds a bridge to the methodology of the natural sciences whose subject matter is time-invariant, in contrast to "economic material, which we know to be non-homogeneous through time" (XIV, p. 285). The ergodic axiom allows for conclusions from positive economics to be externalized to the real world, thus Orthodox theory and its models frame applied economic policy.

If Keynes' logical arguments (Chapter 5) against the ergodic axiom in economics are successful by causing its removal as a tacit assumption, the consequences need to be pondered. Drawing statistical inferences about the future from statistical description of the economic past would require explicit justification and limit the application of mathematical methods to economic material. Economic data that was previously fed into Orthodox models would to a large extent be deemed unsuitable for such treatment. The scope and weight of positive economics would be reduced so much that a void in economic inquiry would appear: how to address all questions that were previously informed by positive economic science?

The answer to this question is concealed by the passage of time and can be found implicitly in an almost forgotten framework for economics. Young economists are unlikely to know what Keynes' answer to the headline question was. To Keynes, "economics is essentially a *moral science*" (XIV, p. 297, emphasis added). Nowadays, this distinction requires elaboration; its implications are fundamental.

In Keynes' conception, philosophy laid the ground for economics. This was not unusual at the time: Cambridge economics was taught for many years in the moral sciences department. Specifically, Keynes considered economics a branch of ethics (O'Donnell, 1989, p. 159) and of logic (XIV, p. 296), insisting that, "the moral sciences could not be reduced to, or modelled upon natural sciences" (O'Donnell, 1989, p. 160). Instead, economic inquiry should be guided by goals derived from ethics. Given a normative consensus that inequality should be limited for instance, the question of how to redistribute economic assets becomes central. In an Orthodox problem formulation that ignores moral considerations while assuming efficient markets, taxation for redistribution will simply be discarded as inefficient.

Next, we re-introduce a wider framework for economics, building on the above and providing a home for considerations that are bound to fall outside the scope of positive economics.

4.1 TRIPARTITE ECONOMICS

We move on to describe how John Maynard Keynes' views on economics would fit into a tripartite framework. By laying out the cornerstones of Keynes' ethical basis in regards to economics, we demonstrate a dimension of economics that is neglected nowadays – both in studying the history of the discipline as in its present practice.

In *The Scope and Method of Political Economy* (1891), John Neville Keynes – the father of John Maynard – laid out the concept of tripartite economics. The three parts are normative economics, positive economics and applied economics (or 'the art of economics'). Normative economics addresses the question of ideal outcomes / what ought to be / what ought to be done, drawing from ethics and morals. It sets over-arching goals and inspires guidelines for the two other parts. Positive economics ask questions of the form *what is*, as in 'what is the relationship of the interest rate to the rate of investment?' (*ceteris paribus*). Applied economics is informed by both normative and positive economics and must formulate advice for action and policy. Following Keynes' father, the methodology appropriate for positive economics is fundamentally different from the appropriate methodology for applied economics: "Few practical problems admit of complete solution on economic grounds alone. [...] Account must also be taken of ethical, social, and political considerations that lie outside the sphere of political economy regarded as a science" (J.N. Keynes, 1999 [1890], p. 55).

Normative economics can provide the *raison d'être* for re-allocation of resources through government. If the goal of a society is to provide the possibility of a good life for as many citizens as possible (as Keynes believed), there is room for policies that have no connection to economic utility maximization. Invariably

one must wrestle with fundamental questions such as ‘what constitutes a good life?’ and ‘can it be measured?’ Early on in his studies the foundation for Keynes’ ethical view was laid out. Leading Keynes-scholars O’Donnell (1989, p. 133) and Skidelsky (1983, p. 119) agree that Moore’s *Principia Ethica*, “was the most important book in [Keynes's] life.”

Following Moore, “The two greatest (intrinsic) goods that humans know are the mental states of (a) personal affection, or the love of good persons; and (b) aesthetic enjoyment, or the appreciation of beauty” (O’Donnell, 1989, p. 134). Freedom, virtue and knowledge, among others, are considered means to goodness.

For Keynes, solving the ‘economic problem’ meant to create the *material precondition for goodness only*. Capitalism, being the most efficient economic regime, was a necessary (and ideally transitory) evil in Keynes’ eyes, to move through “the tunnel of economic necessity” (IX, p. 331). When a decent level of consumption would be secured for everyone, “economic practices, affecting the distribution of wealth and of economic rewards and penalties, which we now maintain at all costs, however distasteful and unjust they may be in themselves, [...] we shall then be free, at last, to discard” (IX, p. 329). Keynes opposed the Benthamite³⁶ tradition, perceiving it as the “worm” gnawing at the insides of modern civilization, responsible for its moral decay. He considered the enemy being the utility calculus, “based on an over-valuation of the economic criterion, which was destroying the quality of the popular Ideal” (X, pp. 445-6). Reducing the goal of economics to a utility function that had no direct connection to *goodness* was directly opposed to Keynes conception of economics.

Furthermore, it should be mentioned that two other notions were critical to Keynes, the principles of pacifism and of population “not as furnishing in themselves a good life, but as absolutely necessary prerequisites of any good life at all being possible for the mass of men” (XVII, p. 450 and XIX, p. 639). The runaway population growth since then may be the single biggest obstacle to satisfying basic economic needs globally. It is hard to say what Keynes would offer in terms of solution for such a problem, since he hoped such proportions would never be reached.

Keynes’ view on the appropriate subordinate role of positive economics contrasts with the central role it has assumed over time. The pursuit of theory was useful to him in as far as it would be logically relevant to policy (O’Donnell, 1989, pp. 180-181). Therefore, he highlighted the paramount importance of understanding the conditions under which one could move from statistical description to inference. He contended that only in special cases this step would be warranted, as most of the time the importance of the non-measurable limited the applicability of statistical techniques (O’Donnell, 1989, p.193). In Keynes’ words: “What place is allowed for non-numerical factors, such as inventions, politics, labour troubles, wars,

³⁶ The utilitarian philosophy of Jeremy Bentham, holding that pleasure is the only good and that the greatest happiness for the greatest number should be the ultimate goal of humans (Oxford dictionary).

earthquakes, financial crisis? One feels a suspicion that the choice of factors is influenced (as is indeed only natural) by what statistics are available, and that many vital factors are ignored because they are statistically intractable or unprocurable” (XIV, p. 287).

The concept of tripartite economics implies the argument that there are three distinct areas in economics that are all important to develop good policy in the changing contexts of the real world. Normative consensus is a guide, the findings of positive economics help forming an intuition about the scale of economic variables in their interplay, and applied economics is an art that can never be perfected, because it needs to deal with the complexity and ever-changing characteristics of the real world. In this view, the recent financial crisis was fueled by a confusion in regards to these dimensions. Positive economics, as we traced throughout the background, has sought perfection within its restricted domain. The belief in having truly found general rules that allow efficient markets to always revert to equilibrium has created an illusion of certainty – as we may conclude after 2008 – that has for a long time masked the necessity to cultivate normative and applied economics distinctly. Why and how Orthodoxy moved towards such a narrow consensus throughout the decades is potentially a subject for wide interdisciplinary research. In retrospect, the genesis of a concept like trickle-down economics becomes worthwhile to explore because it implicitly countered Keynes’ argument for government intervention to create more social justice.

A foundational notion that bridges normative, positive and applied economics in Keynes’ conception is the diminishing marginal utility of money, “on which many important arguments are founded relating to taxation and the ideal distribution of wealth” (VIII, p. 351). This points back to the need of a different methodology for applied economics and positive economics. Colander (1992, p. 5) diagnoses that, “most current applied work in economics initially employs a formalistic method of argumentation and exposition which leads to exact results.” The results are then modified by political and sociological dimensions. But since those added dimensions are very imprecise, this sequencing only provides an illusion of precision (Colander, 1992).

To illustrate the ‘art of economics’ we offer an example of Keynes in action as an economist. In 1919, Keynes famously left the Versailles peace conference (being member of the English delegation), stating that the insistence of the victorious countries to exert unmanageable reparation payments from Germany would lead to another war. Subsequently he wrote *The Economic Consequences of the Peace* and *A Revision of the Treaty* in 1922 to explore not only what reparation payments were manageable for Germany, but also which countries were in need of resources to rebuild their economy. He insisted that Germany’s industry was important to the whole European continent and crippling it could only reduce European welfare over time. In 1921, he wrote a chapter on the *Change of Opinion* (IX, p. 33-36), where he explained in terms of psychology and political necessity that the leaders of the Allies had no alternative to their insistence on draconic – and economically counterproductive – punishments right after the war. He argued that with two years passed, popular acceptance for a prudent approach towards Germany in concert with a plan for the reconstruction

of Europe was possible. Thus, politicians could revert from a populist approach to an objectively constructive one without alienating the electorate.

History shows that Keynes was not successful in his efforts at *persuasion*. It was only after the Second World War that the spirit of his arguments was truly appreciated and the building blocks for European integration with Germany and France at its heart were laid. We should note two more points in regards to the above episode: firstly, positive economics played a very limited role in informing Keynes' arguments, limited to showing numerically how much debt may be manageable for Germany. All else was part of the 'art of economics' informed by normative considerations and all relevant knowledge he had across disciplines. Secondly, the history after the conference in Versailles illustrates the shortsightedness of the Orthodox belief in efficient markets in the extreme. The popular idea of *creative destruction*³⁷ through market forces reasons that – given enough time – a superior market environment emerges after a crisis, without government interference. Instead, record unemployment in Germany and a bleak economic outlook led to the election of Hitler, which later caused *real* destruction and death on unimaginable scale.

This episode demonstrates how Keynes bridged his understanding of different aspects of society and psychology to argue soundly for economic measures. In the next chapter, we lay out key aspects of Keynes epistemology as they form the basis for his economic theory and provide a nuanced insight as to why mathematics can only play a supporting role in economic thinking.

5 KEYNES EPISTEMOLOGY – LOGICAL REASONING WITH INCOMPLETE INFORMATION

Keynes spent the first ten years of his academic career on philosophy, leading to the publication of *A Treatise on Probability* (hereafter *TP*), which grew out of his dissertation. The “treatise is concerned with the general theory of argument from premises leading to conclusions which are reasonable but not certain” (O'Donnell, 1989, p. 106).

The General Theory of Employment, Interest and Money (1936) stands on the shoulders of the *TP* when it comes to logical reasoning facing uncertainty. Before we can delve into the economic concepts he developed (Chapter 6) and their relevance for current problems (Chapter 7) we must take the same route as Keynes first, since “The object of our analysis is, not to provide a machine, or method of blind manipulation, which will furnish an infallible answer, but to provide ourselves with an organized and orderly method of thinking out particular problems” (VII, p. 297).

³⁷ The process by which something is replaced, and thus effectively destroyed, by something newly created; (Economics) the process by which emerging technologies, industries, and ideas in capitalist economies continuously supplant existing ones, identified by Joseph Schumpeter in 1942; frequently in "gale of creative destruction" (Oxford dictionary).

That is, Keynes (VIII, p. 20) refuted the Classical assumption that probability is “in the full and literal sense of the word, measurable,” believing he “shall have to limit, not extend, the popular doctrine.” Essentially, to form beliefs guiding our economic decisions in the present we need to form beliefs about future relationships, whose clouded nature often renders their representation by a series of numerical probabilities inappropriate. This marks a clear watershed between Keynes and Orthodoxy. Although difficult, Keynes embraces uncertainty and tries to explain its role the best of his ability. In contrast, Orthodoxy tries to suppress uncertainty by giving additional, but synthetic, information to the agents.

5.1 PROBABILITY AND RATIONAL BELIEF

We employ a taxonomy borrowed from O'Donnell (1989, p. 42) for the following exposition:

- h_{ti} All relevant premises known at time t by individual i . That is the knowledge-base from which an individual can understand logical relations about a proposition (p).
- q The known secondary proposition expressing the probability-relation between (h_{ti}) and (p).
 (q) is the knowledge about a proposition p (e.g. ‘the interest rate will remain the same for twelve months’) and translates into the degree of rational belief in (p), given (h_{ti}).
 When q is between 0 and 1, an individual knows something *about* the related proposition.
 When q is either 0 or 1, (=certain); one knows *of* a proposition, by knowing the logical truth.

Given a knowledge-base (h_{ti}) relevant to a proposition (p) (e.g. ‘my sales will increase next month’) there is most likely relevant information in (h_{ti}) both in favor and against the proposition, and the individual knows that the available information is incomplete, thus he cannot determine the outcome through calculation. Weighing the available information, the individual will arrive at a rational degree of belief in proposition (p). At another time the individual may have more relevant information which leads to a different degree of rational belief, or (q) – the probability that p is true given the individual state of knowledge. The highest degree of rational belief, which is termed certain rational belief, is what science perceives as knowledge.

To Keynes, the individual is a rational decision-maker who differs from others in his ability for logical insight. Being limited in perceiving logical relations between propositions leads to a state of knowledge particular to an individual. If two persons are provided the exact same information, the difference in their logical insight will lead to two different states of knowledge. This opposes Orthodoxy’s “portrayal of individuals as perfect beings endowed with logical omniscience, rather than as human beings with some, but limited, logical powers” (O'Donnell, 1989, p.65).

Collectively, human insight is limited as many logical relations lie outside the grasp of human minds and are clouded by ignorance of their true relationship (VIII, pp. 18-19). Then, most of human reasoning is based

on degrees of rational belief. This is an important concept for economic decision making, since humans are dependent on rational beliefs about future conditions.

In contrast, it is necessary for optimization in Orthodox economics that agents are – at least in the aggregate – endowed with all necessary knowledge (known and complete probabilities) and all necessary abilities to perform massive computations. The path of logic is left if we assume conditions to apply to the aggregate of human beings without any proof. The mistake is compounded in the other direction if the conclusions of a model based on such assumptions are applied to human society, as if they were generally true.

5.2 UNCERTAINTY

An individual forms expectations about future events based on relevant information, but at the same time her/his behavior is influenced by the extent of uncertainty perceived. Uncertainty eludes formal treatment, because it cannot be related to numerical probabilities from a continuous series. By taking on the complexity of real reasoning Keynes attempts to build a theory that is generally applicable, but due to the uncertainty faced, precision is always limited. Keynes distinguished between two categories of uncertainty about a proposition:

Weak uncertainty: some relevant information is available to hold a degree of rational belief. For example, regarding human life expectancy or the weather tomorrow, there exists information on which probabilities at least to *some degree* could be formed.

Radical (or irreducible) uncertainty: “The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, the obsolescence of a new invention, or the position of private wealth holders in the social system in 1970. *About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know* (VIII, pp. 113-14, emphasis added; see also VII, p. 148).”

Orthodoxy does not recognize irreducible uncertainty, instead treating all uncertainty as the ‘weak’ type. As Keynes (1932) put it, “. . . unluckily, it is the characteristic of unpredictable events that they cannot be predicted.” In essence, Orthodoxy does not claim to know what the future will bring, but it rests assured that unforeseen events will be drawn from previously estimated probability distributions “with fixed mean and variance” (Meltzer, 1982, p. 3). Keynes went to great lengths to distinguish weak uncertainty, under which probabilities or frequencies could be established, from radical uncertainty, which leaves no scientific basis on which to form any probability estimates. “I think [...] you have put your finger on the spot in saying that they [Classical economists] are trying to describe a world in which risk exists without uncertainty” (XIV, p. 8).

For Keynes, weak uncertainty is typical in regards to short-term expectations, while radical uncertainty cannot be escaped and is typical for the long-term. (O'Donnell, 1989, p. 259). Weak uncertainty is typical for situations in which we believe to know enough to make an informed decision, although there is

uncertainty involved – for instance, taking an umbrella for a walk when the clouds are dark, but it isn't raining yet. When we know very little or nothing about a future we contemplate for decision-making and action is favored over inaction, it is *rational* to fall back on an instinctive or 'capricious' decision (O'Donnell, 1989, p. 32).

5.3 WEIGHT OF ARGUMENT AND CONFIDENCE

Using the earlier example with proposition (*p*): 'My sales will increase next month,' an increase in the information set (h_{ti}) would mean that more of the relevant information is known, which increases the 'weight of the argument.' That is, the rational belief we hold in *p* being true weighs more heavily, no matter in which *direction* the additional information changes the degree of rational belief. Figure 2 illustrates how a probability *q* can fluctuate until all relevant information is known and certainty established.

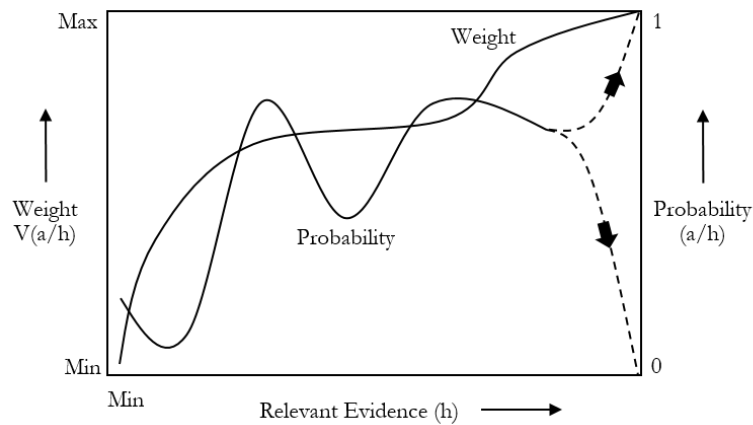


Figure 2 - Rational belief (O'Donnell, 1989, p. 72)

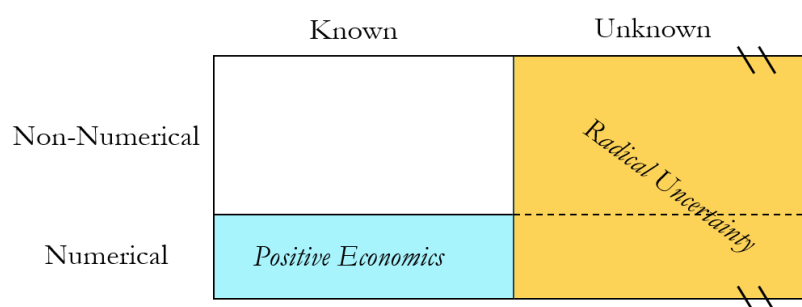
Correlated with the concept of the weight of an argument is 'confidence.' An individual will act with greater confidence if the arguments he is basing his action on are formed on a more complete set of relevant information. Being very confident about the sales increase will most likely impact related behaviors.

Previous experience and the statistical analysis of empirical data add knowledge, which will alter probabilities and increase the weight of arguments, but unless it can be proven that statistical inference is warranted, they will not determine the degree of rational belief by themselves.

When all relevant information is assumed to be known, weight of argument reaches the maximum level and we know of a proposition that it is certain (probability 1) or impossible (probability 0). By the Orthodox assumption of ergodicity – removing uncertainty – the concept of weight of argument is redundant and confidence cannot play any role; everything is reduced to 'true' probabilities. Coining an event uncertain in an Orthodox context is expressing that it is unlikely to occur. A low weight of argument, the consequence of a large extent of perceived uncertainty and/or ignorance, has an important practical implication. If the basis of the probability judgment is the knowledge-base of an individual, a low weight of argument is an implicit judgment of this knowledge-base likely being insufficient for a good decision, and thus misleading.

Another typical explanation for the disappointment of predictions from an Orthodox perspective would be distortionary government interference in markets, for instance through regulation or fiscal policy. From Keynes' perspective, the prediction of an economic model may have weight, but it informs individual judgment together with all other available relevant information. The explanation for a disappointed prediction in this context is that the model is not capturing relevant aspects of reality – omitting unknown (and possibly unknowable) relevant variables. The individual judgment of the weight of a model prediction in a related argument then implies the judgment of the model being a relatively good or bad match for the real relationships influencing its dependent variable.

According to Keynes, the probabilities that form the basis for degrees of rational belief about a proposition feature in most cases only limited suitability for mathematical treatment or are not numerical at all. He distinguishes between known and unknown, as well as numerical and non-numerical probabilities, as schematized in Figure 3. Unknown probabilities arise when our logical ability, reasoning power, or intuitive insight is not strong enough to comprehend the logical relation between the premises and conclusion/proposition of an argument. In the logical realm outside of our grasp, a degree of knowledge would be justified by the available evidence (VIII, pp. 33-34; also pp. 405-9).



The distinction between numerical and non-numerical probabilities rests largely on the distinction between cardinal and ordinal features of different probabilities about the same proposition.

Often our knowledge is only sufficient to know about a proposition if it is true with a probability greater or smaller than 50 percent (q greater or smaller than 0.5). Keynes illustrates the implications when contemplating to take an umbrella to walk, given that the clouds are dark and the barometer is high. Any of these factors alone will clearly inform a decision, but since we only have an imprecise knowledge about how each information relates to the proposition ‘is it about to rain?’, we cannot logically compare them. Therefore, if action is favored, it is rational to take an instinctive decision and not lose time on further contemplation.

To Keynes, mathematics can only be precise when treating a type of probability that is rarely available to human logical reasoning processes, an additive probability that is part of a continuous series of probabilities about a proposition. Such knowledge is typically available when dealing with propositions that are treated by mathematics outside economics, such as in gambling or in natural sciences, where we do not face economic material that is influenced by capricious human actions. This class of known numerical probabilities is suitable for positive economics (as in Figure 3), but through the tacit assumption of ergodicity it operates far beyond this boundary.

In real decision-making, the probabilities are often not precise enough for numerical representation and comparison because h_{ti} is composed of a lot of qualitative information and some quantitative information. Therefore, we are often restricted to probabilities that can be ordered to some extent, but not compared in magnitude.

5.5 ORGANIC UNITY

“The presence of organicism in Keynes's economics is striking because of its contrast with the Neoclassical presupposition that wholes are simply aggregates of individual components” (O’Donnell, 1989, p. 178).

Organicism complicates theorizing, since it precludes breaking down an object into its parts and causes errors when “extending to the system as a whole conclusions which have been correctly arrived at in respect of a part of it taken in isolation” (VII, p. xxxii). No general rules appear applicable to be able to judge when organicism or atomism are present. Keynes would oppose the notion in economics that wholes are *always* aggregates of individual parts or that rational action in individual circumstances *always* generates rational outcomes from the society’s perspective (O’Donnell, 1989, p. 178, emphasis added). Aggregating micro agents to a representative macro agent thus bears potential to mislead in regards to the real behavior of a society.

In our view, the above concepts provide a good case in arguing for limitation of mathematical treatment of the economic subject matter. If accepted, they provide a logical explanation outside typical Orthodox discourse as to why attempts to find generally applicable rules by creating mathematical economic models must always be frustrated. Irreducible uncertainty not only makes it impossible to know the state of economic variables in the distant future, but also clouds relationships within economic material that change

over time, are beyond the grasp of collective logical insight, or misrepresented by numerical representation without sufficient basis.

Keynes epistemology around the existence of uncertainty is indispensable for the economic theory he developed subsequently. The major contributions of his *GT*, as laid out in the next chapter, have uncertainty at their core – they exist because of it and reflect its influence on the economy.

6 The General Theory

The General Theory introduces a set of coherent ideas that form the concept of ‘effective demand’ – central to understanding the mechanisms that lead into a recession and out of it. In Keynes’ theory a recession is plausibly accompanied by an increased relevance of psychological factors that are related to the perception of uncertainty about the future. During a recession, models built on the ergodic axiom and informed by economic data from more stable times are prone to be farther from reality than before, as the variables they cannot describe gain in relevance.

6.1 EFFECTIVE DEMAND AND THE MARGINAL EFFICIENCY OF CAPITAL

Effective demand is the centerpiece of the *GT* around which Keynes groups other concepts. Effective demand is not to be confused with aggregated demand since “effective demand always reflects the current expectation of actual demand” (XIII, p. 603). “The amount of labour N which the entrepreneurs decide to employ depends on the sum (D) of *two* quantities, namely D_1 , the amount which the community is expected to spend on consumption, and D_2 , the amount which it is expected to devote to new investment. D is what we have called above the effective demand.[...] [T]he volume of employment in equilibrium depends on (i) the aggregate supply function, (ii) the propensity to consume, and (iii) the volume of investment, D_2 . This is the essence of the General Theory of Employment” (VII, p. 29). An entrepreneur will set his demand for employment, according to his expectation of sales proceeds from the output associated with a level of employment. He would increase the level of employment as long as the expected marginal proceeds are greater than the marginal costs. This demand is ‘effective because it co-determines employment and output, through expected profit maximization by entrepreneurs.

When assessing investment opportunities, the marginal efficiency of capital needs to be matched to the prevailing interest rate and the expected interest rates in the future. Given very low interest rates as in our current environment, an investment needs to produce only a small yield to be profitable in the short-run, but if during the life of the investment asset the marginal efficiency of capital rises, the early investment will compete with more modern assets that are expected to generate a greater yield in their useful life.

An expected increase in demand would increase the yield of productive assets and thus the marginal efficiency of capital. The entrepreneur would increase employment and inflation would take off if expectations are roughly realized. In this scenario, the interest rises as demand for money/investment

increases. “The mistake lies in supposing that it is the rate of interest on which prospective changes in the value of money will directly react, instead of the marginal efficiency of a given stock of capital” (VII, p. 142). In this line of reasoning, the interest rate does not have a direct effect on investment and inflation. The influence of the interest rate is derived from its relative position to the marginal efficiency of capital in the present and expected future.

Effective demand cannot be modelled into Orthodox theory, because it is based on expectations about an uncertain future. The transmission mechanism of effective demand into the real economy and back into effective demand is influenced by psychological factors, which makes research in psychology a necessary complement to further economic understanding.

6.2 SHORT-TERM AND LONG-TERM EXPECTATIONS

In this subsection Keynes’ understanding of expectations is spelled out. It is directly informed by his epistemology. The role of expectations should not be underestimated as they form the central tenet in the DSGE model and directly determine the state of the economy.

Short-term expectations (STE) are concerned with decisions to produce goods using existing capital equipment (VII, p. 46, 148). Long-term expectations (LTE) are concerned with investment. LTE are concerned with the income expected from production with new capital equipment, covering the whole expected useful life. They largely determine the marginal efficiency of capital (VII, pp. 147-8, 246; XIV, p. 118).

STE are continuously revised as expected and realized results have a joint influence on them. LTE extend into the uncertain future, but since we can only form vague ideas about the future and with low confidence, we attach disproportionally great importance to present facts. “Our usual practice being to take the existing situation and to project it into the future, modified only to the extent that we have more or less definite reasons for expecting a change” (VII, p. 148).

Weight of argument and confidence, as introduced in the previous section, are key concepts in understanding LTE. Having experienced a long time without crisis, one may project the present into the future with greater confidence. After a crisis, the marginal efficiency of capital tends to suffer a prolonged slump, because confidence in LTE is weak and uncertainty becomes a major factor. Thus, a crisis event can change the common practice to treat radical uncertainty like weak uncertainty, as happens when the present is projected into the future. “Later on, a decline in the rate of interest will be a great aid to recovery and, probably, a necessary condition of it. But, for the moment, the collapse in the marginal efficiency of capital may be so complete that no practicable reduction in the rate of interest will be enough” (VII, p. 316).

The stability of LTE rests on a hollow foundation, as probable knowledge of the future is inferred from present conditions for lack of anything better. Logically, one can never rule out an unexpected drastic change

in LTE, precipitating a related change in effective demand. A sudden negative change in beliefs about the future on a grand scale can set in motion psychological factors causing a recession.

6.3 LIQUIDITY PREMIUM

“... our desire to hold money as a store of wealth is a barometer of the degree of our distrust of our own calculations and conventions concerning the future” (XIV, p. 116).

Given the currently low interest rates and low inflation in the Western hemisphere, the price of being liquid appears low. Psychology supports the notion that in the face of significant perceived uncertainty, there is a bias towards inaction (Bachmann et al., 2010, p. 6). Remembering the popular idea of the Great Moderation from the 90's and contrasting it with events of the last 10 years – the financial crisis, the European sovereign debt crisis, Brexit, the Trump presidency and current fears of a breakup of the European Monetary Union and possibly even the European Union – while experiencing historically low central bank interest rates without precedent is a strong basis for a weak confidence in LTE. When unexpected events pile up, one can hardly project knowledge of the present into the future. In such circumstances, waiting and staying liquid until prospects become clearer has value to the individual and this value is expressed in the liquidity premium. If the opportunity cost of hoarding money is low at the same time (due to low interest rates), it is conceivable that the liquidity preference becomes a major factor in an economy, since inaction may be the sensible option. As the liquidity premium is strongly linked to confidence and the weight of arguments, and thus the extent of perceived uncertainty, it is inaccessible to mathematical modelling.

Effective demand and contributors to it, like the liquidity premium, the marginal efficiency of capital and the propensity to consume (illustrated in Figure 4) can be understood and are subject to logical argument, but they cannot be reduced to mathematical variables, because the economic mechanisms they are a part of are – as highlighted above – also driven by psychological factors. A small change may have no effect, while a change that exceeds an invisible threshold, may set economic mechanisms in motion. The neglect of psychology by Orthodox economic theory was self-imposed as Keynes observed: “The hypothesis of a calculable future leads to a wrong interpretation of the principles of behavior which the need for action compels us to adopt, and to an underestimation of the concealed factors of utter doubt, precariousness, hope and fear” (VII, p. 222).

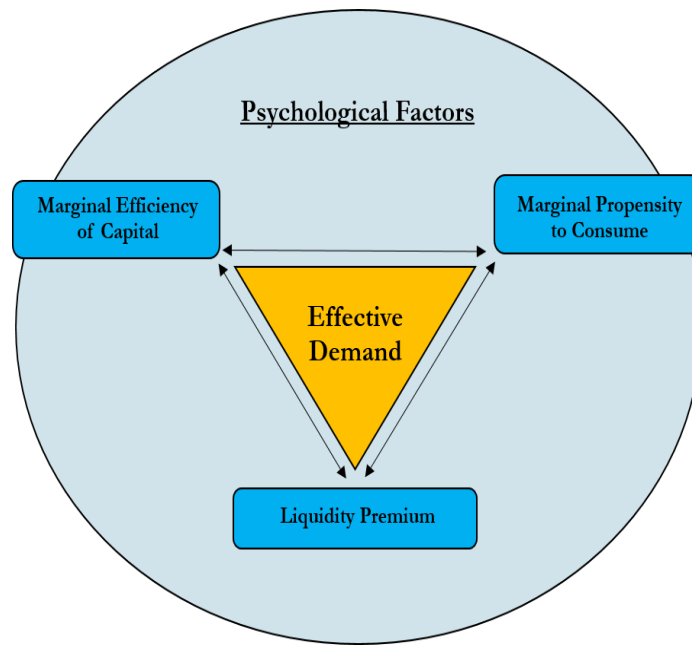


Figure 4 – Effective Demand

PART III – DISCUSSION AND ANALYSIS

7 DISCUSSION

Our research question may have appeared innocuous at first sight. Have not many economists before taken an idea from Keynes and re-introduced it to discourse? Yes and no. Orthodox theory has exhibited a strong degree of path-dependency. When an idea of Keynes was adopted, as in the IS-LM model by Hicks, it was taken out from its original domain – logic – and introduced to the restricted domain of Orthodoxy, where in principle everything was made measurable through the tacit assumption of ergodicity and the concepts of rational agents and rational expectations. This step has not only been tacit, but was also overlooked in the dominant discourse – throughout decades. The incompatibility of Keynes’ concepts – that are built on consideration for all relevant qualitative and quantitative elements – with Orthodox methodology, makes their representation in a mathematical model often a misrepresentation by default. Therefore, giving Keynes approach to economics full attention in the theoretical discourse is long overdue.

The strongest argument to revisit Keynes thoroughly lies in a basic goal of science: to understand its subject matter. In logic Keynes had a domain larger than the measurable one at his disposal to build an understanding of economic mechanisms. Therein he described the reasoning of a rational subject, based on all information available to it, regardless of its nature being qualitative or quantitative. In contrast to Keynes’ *generality*, Orthodox theory is characterized by a self-imposed boundary. Through Keynes we can explain mechanisms, where Orthodoxy remains silent. For instance, with the liquidity premium that gains in importance with perceived uncertainty and whose mechanism is influenced by psychological factors. Keynes shows that there is a choice to make for macroeconomics: seek perfection in a restricted theoretical domain or seek understanding in the wide domain of reality, through logic.

An easily overlooked aspect of Keynes is that his use of economic vocabulary often does not coincide with modern use. Confidence in Keynes’ use is a measure of the strength of belief in a proposition, while in modern use confidence is associated with positive outcomes. Similarly, ‘effective’ is often omitted when Keynes is portrayed as a demand-side economist, losing out on the crucial nuance that he focused on the expectation of demand and not realized demand. Old texts are increasingly neglected, but in Keynes’ case there is no substitute to his original writings to fully gauge the nuances of his theory.

So far we argue for the superiority of Keynes approach to economics relative to Orthodoxy mostly on a general level - but how can economics be guided in practice by looking back at Keynes?

We take as a point of departure three quotes from the Sveriges Riksbank Economic Review (2016, p. 13, emphasis added). A working group from *Morgan Stanley* concerned itself with ineffective monetary policy, manifest in a weak monetary policy transmission mechanism, coming to the following conclusions:

“...a great deal of monetary policy analysis is based on a *simplified* assumption that there is a *direct* connection between central bank interest rate decisions and the real economy [...] Generally low interest rates, small deviations between short and long rates (flat yield curve) and major *uncertainty* have led to the banking system preferring to hold large *liquidity* reserves at the central bank. [...] If transmission mechanisms do not work properly, monetary policy risks running out of ammunition and further stimulus would instead have to be provided by fiscal policy, if need be” (Riksbank, 2016, p. 13).

Since a return of confidence and thus a rise in the marginal efficiency of capital is outside the direct control of monetary policy, Keynes advocated fiscal policy in times of crisis just like the *Morgan Stanley* working group above. He proposed government-ownership in industries that were relevant to infrastructure for instance, so that during booms a portfolio of pre-approved projects could be build up, ready to be implemented at the next downturn to counteract an increase in unemployment and thus bolster effective demand (O'Donnell, 1989, p. 323).

Diagnosing the influence of ‘major uncertainty’ is peculiar, because it is a notion that lies outside the grasp of Orthodox economics, but is used as an explanation for why expectations of Orthodox monetary policy are not realized. How to deal with this subject when no tools are available? One approach, characteristic of modern monetary policy is to consider ‘uncertainty’ sort of an enemy that needs to be reduced, by ‘forward guidance,’ credible policy promises and other initiatives.

Uncertainty is being avoided in theory and fought against in practice. Uncertainty’s importance is admitted through statements like ‘confidence in the markets needs to be restored’ when markets are in turmoil. Still, little effort goes into understanding what role uncertainty plays in economic decision-making. Most likely it is due to being outside the scope of Orthodoxy’s mathematical modelling. Giving weight to uncertainty in theory would necessarily diminish the weight that positive economics has gained. It is not due to intellectual difficulties in grasping the role of uncertainty logically and verbally, as Keynes has demonstrated not least with the *GT*. The continuity of Keynes’ arguments from logic to economics makes it quasi impossible to only accept his explanations regarding uncertainty, because his general criticism of Orthodoxy comes in logical connection to it.

Currently, monetary policy pursues price stability, which is perceived as a proxy for the economy to run at its natural rate. Fiscal policy is neglected, since it is inherently discretionary and would thus undermine the rule-based monetary policy. The monetary policy framework postulates mechanical responses to shocks experienced by the economy and relies on the assumption that they do not erode financial stability. Still, as a complement considered necessary after the financial crisis, macroprudential tools are developed to promote financial stability. The perceived need for macroprudential tools is to some extent a defeat of the theory postulating exclusive rule-based monetary policy. But these tools and regulations are designed to

keep this very same Orthodox theory alive, hoping to constrain reality into model-satisfying behavior. We argue that this is an ill-suited basis to govern modern macroeconomics.

Agents need to form expectations to cope with uncertainty in decision-making. Orthodoxy has ‘solved’ this problem altogether by providing agents with synthetic information that removes uncertainty in the model environment of a rule-based framework, and by econometrically estimating future economic behavior given the assumption of ergodicity. These are strong assumptions, and if they were not to hold true, they would fail to generate optimal policy responses. Sub-optimal policy responses are difficult to spot, since within the model itself, they would still look optimal. An economic model is internally consistent; it is not the failure of the model when it is out of sync with reality. When a model’s forecasts become worse it is merely a reflection that the model does not strive to understand the complexity of the economic reality in the first place. The mistake can only lie in putting too much trust on the model’s output, when devising policy for the real world.

By accepting that uncertainty has at least two distinct categories – weak and radical – and appreciating the different – at times concealed – natures of STE and LTE, significant steps can be taken to improve the understanding of the contemporary economic environment. Usually, uncertainty is a minor issue – like under the Great Moderation – but in current times, we argue that it is the key component to improve macroeconomic understanding, which ultimately feeds into policy-guidance.

Orthodox economics cannot explain its own failures – the occurrence of a financial crisis or a failing monetary policy transmission mechanism, because they do not fit the framework. Currently, effort and time is put in explaining the last crisis through the DSGE model. We believe this is characteristic for Orthodoxy, to always be one step behind. The solution lies not in improving the model, but in transcending its boundaries by developing a more general theory in Keynes’ spirit, where models only play a supporting role.

The scope of positive economics, the extent to which its findings should have ‘weight’ in an argument is a topic to be explored in the philosophy of science, in logic. Keynes’ observation that economic subject matter is inhomogeneous over time appears plain and obvious, but its implications are neglected. A tripartite framework for economics would allow a place for these considerations within economics to co-exist with positive economics. Without a tripartite framework, politics, public opinion, philosophy and moral remain outside economics and inform it to a much lesser extent. Would economics be less objective in an open framework? This depends on the object. If the object is to understand the relationships between economic variables in a vacuum only, everything else would just be a disturbance, but the object is to improve the life in human society through an understanding of economic behavior and processes. Therefore, it is unclear why a separation of the above subjects from economics should continue any longer.

A NEW THEORY FOR BUSINESS CYCLES – AND FURTHER RESEARCH

Keynes' concepts of confidence, long-term expectation and marginal efficiency of capital, among others, all relate to the trade cycle (as he calls the business cycle) and thus the genesis and development of crises as well. Given the unusually long slump that Europe has experienced since the financial crisis in 2008, it is worthwhile to take the *GT* as point of departure and develop his theory further in relation to the current environment. Keynes himself suggested that developing his thesis regarding the different relevant factors and mechanism in the trade cycle "would occupy a book rather than a chapter, and would require a close examination of facts" (p. 196). This book still waits to be written and is a future endeavor we want to motivate with our thesis.

The three concepts above have in common that their reason of existence is uncertainty and they are interrelated. Most noteworthy is that the marginal efficiency of capital is at the beginning of Keynes' logical chain to explain investment by an entrepreneur and the level of employment he chooses. The realized demand for his output then becomes part of the entrepreneur's decision-making in anticipation of future demand again. This is different from the current representation of so-called demand-oriented Keynesian policy. Keynes advocated public works to boost employment in a recession, but this would not *directly* boost demand in his theory. Only a pre-condition for demand is created – income. It is the expectation of future demand by the entrepreneur that can be positively affected by public works, which then boosts investment and further employment. Inflation is a result of this process, when the positive expectations of the entrepreneur are roughly met by actual demand.

A theory of expectation-formation, developed together with what Keynes called 'business psychology' appears to be called for. Orthodox economics cannot incorporate Keynes' concept of long-term expectations, because true uncertainty is assumed away when treating the economic material as homogenous (ergodicity). On the other hand, Keynes theory requires updating as well. The composition of a Western economy has changed since Keynes' lifetime, the proportion of the service sector has increased significantly, in contrast to his focus on the manufacturing entrepreneur. Obviously, the internet represents a drastic change too, but globalization has certainly been anticipated by him, since he already had an analytic eye for international trade-networks in his time and described the interconnectedness of the European continent quasi in the spirit of the European Union. Keynes thought of a zero percent interest rate mainly as a hypothetical case in theoretical argument, therefore he could hardly anticipate the current situation in Europe. It is likely that the high growth of real-estate prices (relative to salaries/inflation) in some major European cities would draw his attention, since it appears to endanger the very goal of current monetary policy: increasing inflation, driven by consumption. The question to answer may be: how can consumption be expected to rise if an increasing proportion of income goes into housing? A logical understanding of the situation, rather than a dogmatic one, could help policy. Furthermore, his theory supported fiscal stimulus as a joint instrument with monetary policy to support macroeconomic stability. Currently, Orthodox theory shuns fiscal stimulus as a distortion of the necessary path and considers monetary policy to be the only

appropriate tool. Given the failing monetary transmission mechanism in Europe it is time to develop a more general theory, where monetary policy is placed alongside other relevant factors that are currently in its shadow.

8 CONCLUSION

In 2010, Nobel Laureate Robert Solow summarized the macroeconomic state, “Here we are, still near the bottom of a deep and prolonged recession, with the immediate future uncertain, desperately short of jobs, and the approach to macroeconomics that dominates serious thinking, certainly in our elite universities and in many central banks and other influential policy circles, seems to have absolutely nothing to say about the problem. Not only does it offer no guidance or insight, it really seems to have nothing useful to say” (p. 1).

Current economic theory is suitable only for *special* economic circumstances. It is a *general* theory only within its mathematical domain, not relative to the real world. When economists are arguably needed the most, in a crisis, Orthodoxy does not offer guidance. Its theory is always a step behind, incorporating the last crisis event into the operating framework, but blind to the next crisis that invariably turns out to be different. Instead of accepting the inevitability of crises, and thus the limitation of models, markets are constrained through regulation, attempting to squeeze behavior into a frame that does not ‘disappoint’ models.

We have pursued a revival of Keynes’ intended revolution of economic *thinking*, founded on agents’ decision-making under conditions of uncertainty based on *rational belief* to act in cognitive conditions of partial rather than complete knowledge. The approach gravitates around the notion that expectations and belief-formation inherently deal with irreducible future uncertainty (which most decisions do). Keynes’ observation about economic theory in the 1930’s is applicable in our day as well: “It may well be that the classical theory represents the way in which we should like our economy to behave. But to assume that it actually does so is to assume our difficulties away” (VII, p. 34). A long path is behind us in economic theory, carried by implicit and explicit assumptions that keep theory at a distance from reality, making the economists’ job ‘easier’ but limiting the scope of his work.

Our ambition has been to highlight a way to move economic theory closer to reality. Keynes had provided an epistemological foundation to enhance the scope of economic theorizing, deserving of the label ‘general.’ We have added a fundamental layer to the contrast between Keynes approach to economics and Orthodoxy by exploring his conception of economics, demonstrating to what extent it has narrowed down in the direction of positive economics, and how a tripartite conception of economics can provide a frame to widen it again.

In 1936, Keynes offered the world a general macroeconomic theory. It embraced uncertainty and explained how an economy could be stuck with heightened unemployment. Perhaps the strongest argument in Keynes’ favor is the general scope of his approach to economics – it provides a meaningful logical frame to think about an economy that is complex and always subject to potential change. Consequently, he considered it

crucial for a 'master-economist' not to be blind to the bigger picture around economics – “He must be mathematician, historian, statesman, philosopher - in some degree. [...] No part of man's nature or his institutions must lie entirely outside his regard” (X, pp. 173-4). Limiting an economist to a single domain would limit what he can understand and describe in his work. A voice like Keynes' would be complement and corrective to established theory, invariably enriching economic discourse. To increase the weight of economics, its relevance and reach, Keynes' ideas can still point us in the right direction.

9 REFERENCE LIST

THE COLLECTED WRITINGS OF JOHN MAYNARD KEYNES

Volumes I to XXX, published for the Royal Economic Society by Macmillan. Print Publication 1978.

Volume	Title
I	Indian Currency and Finance
II	The Economic Consequences of the Peace
III	A Revision of the Treaty
IV	A Tract on Monetary Reform
V	A Treatise on Money, 1 The Pure Theory of Money
VI	A Treatise on Money, 2 The Applied Theory of Money
VII	The General Theory of Employment, Interest and Money
VIII	Treatise on Probability
IX	Essays in Persuasion
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XI	Economic Articles and Correspondence: Academic
XII	Economic Articles and Correspondence: Investment and Editorial
XIII	The General Theory and After: Part I, Preparation
XIV	The General Theory and After: Part II, Defence and Development
XV	Activities 1906-14: India and Cambridge
XVI	Activities 1914-19: The Treasury and Versailles
XVII	Activities 1920-2: Treaty Revision and Reconstruction
XVIII	Activities 1922-32: The End of Reparations
XIX	Activities 1922-9: 2 Vols., The Return to Gold and Industrial Policy, I and II
XX	Activities 1929-31: Rethinking Employment and Unemployment Policies
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XXVIII	Social, Political and Literary Writings
XXIX	The General Theory and After: A Supplement
XXX	Bibliography and Index

WORKS BY OTHER AUTHORS

- Adolfson, M. & Laséen, S., 2007. RAMSES-a New General Equilibrium Model for Monetary Policy Analysis. *Sveriges Riksbank*, pp.5–40.
- Arestis, P., 2009. New Consensus Macroeconomics: A Critical Appraisal. *The Levy Economics Institute*, Working Paper No.564, pp.1–25.
- Barro, R. & Gordon, D., 1983. A Positive Theory of Monetary Policy in a Natural Rate Model. *Journal of Political Economy*, 91(4), pp.589–610.
- Bentolila, S., 2005. Hicks-Hansen model. *An Eponymous Dictionary of Economics*.
- Blanchard, O. & Galí, J., 2005. Real Wage Rigidities and the New Keynesian Model. *National Bureau of Economic Research*, Working Paper No.11806.
- Blanchard, O., 2008. Neoclassical synthesis. In *The New Palgrave: Dictionary of Economics*. pp. 1–8.
- Blanchard et al., 2012. *In the Wake of the Crisis: Leading Economists reassess Economic Policy*. pp. 31–42.
- Buiter, W., 2009. The Unfortunate Uselessness of Most “State of the Art” Academic Monetary Economics. *Financial Times*.
- Calvo, G., 1983. Staggered Prices in a Utility-Maximizing Framework. *Journal of Monetary Economics*, pp.383–98.
- Christiano, L.J., Eichenbaum, M. & Evans, C.L., 2005. Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy. *Journal of Political Economy*, 113(1), pp.1–45.
- Clark, G.L., 2011. Myopia and the Global Financial Crisis: Context-specific Reasoning, Market Structure, and Institutional Governance. *Dialogues in Human Geography*, 1(1), pp.4–25.
- Colander, D., 1992. Retrospectives - The Lost Art of Economics David Colander. *Journal of Economic Perspectives*, 6(3), pp.191–198.
- Davidson, P., 1972. Money and the Real World. *Economic Journal*, 82(325), pp.101–115.
- Davidson, P., 2012. Is Economics a Science? Should Economics be Rigorous? *Real-World Economics Review*, (59), pp.58–66.
- Faust, J. & Svensson, L.E.O., 2001. Transparency and Credibility: Monetary Policy with Unobservable Goals. *International Economic Review*, 42(2), pp.369–297.
- Fischer, S., 1977. Long-Term Contracts, Rational Expectations, and the Optimal Money Supply Rule. *Journal of Political Economy*, 85(1), p.191.
- Friedman, M., 1953. The Methodology of Positive Economics. *Essays in Positive Economics*, II, pp.3–43.
- Friedman, M., 1960. *A Program for Monetary Stability*, Fordham University Press.
- Friedman, M., 1968. The Role of Monetary Policy. *The American Economic Review*, 58(March), pp.269–295.
- Galí, J. & Gertler, M., 2007. Macroeconomic Modeling for Monetary Policy Evaluation. *Journal of Economic Perspectives*, 21(4), pp.25–45.
- Goodfriend, M. & King, R.G., 1997. *The New Neoclassical Synthesis and the Role of Monetary Policy*.
- Goodfriend, M., 2007. Understanding the Transmission of Monetary Policy.
- Hansen, L.P. & Sargent, T.J., 2010. Fragile Beliefs and the Price of Uncertainty. *Quantitative Economics*, 1(1), pp.129–162.
- Hoover, G.E., 2008. The Present State of Economic Science. *Social Forces*.
- Hurwicz, L., 1966. *On the Structural Form of Interdependent Systems*, Board of Trustees of the Leland Stanford Junior University.
- Keynes, J.N., ([1890]1999). *The Scope and Method of Political Economy*.
- Kirman, A., 2010. The Economic Crisis is a Crisis for Economic Theory.
- Krugman, P., 2011. The Profession and the Crisis. *Eastern Economic Journal*, 37(3), pp.307–312.
- Kydland, F.E. & Prescott, E.C., 1977. Rules Rather than Discretion: The Inconsistency of Optimal Plans. *Journal of Political Economy*, 85(3), pp.473–491.
- Kydland, F. & Prescott, E., 1982. Time to Build and Aggregate Fluctuations, 50(6), pp.1345–1370.
- Laidler, D., 2008. Keynesian Revolution. In S. N. D. and L. E. Blume, ed. *The New Palgrave Dictionary of Economics*. pp. 1–21.
- Laidler, D., 2015. Three Revolutions in Macroeconomics: Their Nature and Influence. *European Journal of the History of Economic Thought*, Volume 22, pp.1–25.
- Leijonhufvud, A., 2009. Out of the Corridor: Keynes and the Crisis. *Cambridge Journal of Economics*, 33, pp.741–757.

- Leijonhufvud, A., 2014. Economics of the Crisis and the Crisis of Economics. *European Journal of the History of Economic Thought*, 21(5), pp.760–774.
- Lindé et al., 2016. Challenges for Central Banks' Macro Models.
- Lucas, R., 1972. Expectations and the Neutrality of Money. *Journal of Economic Theory*, 4(2), pp.103–124.
- Lucas, R., 1976. Economic Policy Evaluation: A Critique. *Carnegie-Rochester Conference Series on Public Policy*, pp.19–46.
- Lucas, R. & Sargent, T., 1979. After Keynesian Macroeconomics. *Federal Reserve Bank of Minneapolis' Quarterly Review*, 3(2), pp.1–16.
- Lucas, R., 1980. Methods and Problems in Business Cycle Theory. , 12(4).
- Lucas, R., 2003. Keynote Address to the 2003 HOPE Conference: My Keynesian Education. *History of Political Economy*, 36, pp.12–24.
- Mankiw, G., 1990. Course Refresher Quick in Macroeconomics. *Journal of Economic Literature*, 28(4), pp.1645–1660.
- Mankiw, G., 2006. The Macroeconomist as Scientist and Engineer. *Journal of Economic Perspectives*, 20(4), pp.29–46.
- McCombie, J. & Pike, M., 2013. No End to the Consensus in Macroeconomic Theory? A Methodological Inquiry. *American Journal of Economics and Sociology*, 72(2), pp.497–528.
- Meltzer, A., 1982. Rational Expectations, Risk, Uncertainty, and Market Responses. *Crises in the Economic and Financial Structure*, pp.5–8.
- Minsky, H., 1975. *John Maynard Keynes*.
- Muth, J.F., 1961. Rational Expectations and the Theory of Price Movements. *Econometrica*, 29(3).
- Nelson, S. & Katzenstein, P.J., 2011. Uncertainty, Risk, and the Financial Crisis of 2008, pp.1–55.
- O'Donnell, R.M., 1989. *Keynes: Philosophy, Economics and Politics: The Philosophical Foundations of Keynes' Thought and Their Influence on his Economics and Politics*. Palgrave Macmillan.
- Phelps, E.S., 1967. Phillips Curves, Expectations of Inflation and Optimal Unemployment over Time. *Economica*, 34(135), pp.254–281.
- Riksbank, 2016. Sveriges Riksbank Economic Review 2016:3.
- Samuelson, P.A., 1947, Enlarged ed., 1983. *Foundations of Economic Analysis*, Harvard University Press.
- Samuelson, P.A., 1968. What Classical and Neoclassical Monetary Theory Really Was. *Canadian Journal of Economics*, 1(1), pp.1–15.
- Samuelson, P.A., 1969. Classical and Neoclassical Theory. In *Monetary Theory*.
- Sargent, T.J. & Wallace, N., 1975. “Rational” Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule. *Journal of Political Economy*, 83(2), pp.241–254.
- Sarwat, J., 2012. Inflation Targeting: Holding the Line. Available at: <http://www.imf.org/external/pubs/ft/fandd/basics/target.htm> [Accessed April 29, 2017].
- Sbordone, A.M. et al., 2010. Policy Analysis Using DSGE Models: an Introduction. *FRBNY Economic Policy Review*, (October), pp.23–43.
- Shackle, G.L., 1967. *The Years of High Theory*, Cambridge University Press.
- Skidelsky, R., 2009. *Keynes: The Return of the Master*.
- Skidelsky, R., 2010. The Relevance of Keynes. *Cambridge Journal of Economics*.
- Skousen, M., 1997. The Perseverance of Paul Samuelson's Economics. *Journal of Economic Perspectives—Volume*, 11, pp.137–152.
- Smets, F. & Wouters, R., 2003. An Estimated Stochastic Dynamic General Equilibrium Model of The Euro Area. *Journal of the European economic association*, 1(171), pp.1123–1175.
- Smets, F. & Wouters, R., 2007. Shocks and Frictions in US Business Cycles (ECB). *ECB Working Paper Series*, February (No 722).
- Stiglitz, J.E., 2011. Rethinking Macroeconomics. *Journal of the European Economic Association*, 9(4), pp.591–645.
- Svensson, L.E.O., 1999. Price Stability as a Target for Monetary Policy: Defining and Maintaining Price Stability.
- Svensson, L.E.O., 2010. Inflation Targeting.
- Taylor, J.B., 1979. Estimation and Control of a Macroeconomic Model with Rational Expectations, 47(5), pp.1267–1286.
- Taylor, J.B., 1980. The University of Chicago Press. *The Journal of Political Economy*, 88(1), pp.1–23.
- Taylor, J.B., 1993. Discretion Practice Versus Policy Rules in *Carnegie-Rochester Conference Series on Public Policy*, 39, pp.195–214.

- The Royal Swedish Academy of Sciences, 1995. The Scientific Contributions of Robert E. Lucas Jr.
- Williams, J.C., 2003. The Natural Rate of Interest. *FRBSF Economic Letter*, pp.1–4.
- Woodford, M., 2002. Financial Market Efficiency and the Effectiveness of Monetary Policy, pp.85–94.
- Woodford, M., 2003. Inflation Targeting and Optimal Monetary Policy. *Federal Reserve Bank of St. Louis Review*, 86(4), pp.15–41.
- Woodford, M., 2008. Convergence in Macroeconomics: Elements of the New Synthesis. *American Economic Journal: Macroeconomics*, 1(1), pp.267–279.
- Wren-Lewis, S., 2016. Unravelling the New Classical Counter Revolution. *Review of Keynesian Economics*, 4(1), pp.20–35.

APPENDIX – DSGE MODEL ADDITIONAL INFORMATION

This following section goes further into the mechanisms of the DSGE model. Although this section it is not necessary for the main narrative of our paper, it provides further insight for the interested reader.

STRICT AND FLEXIBLE INFLATION TARGETING

The New Synthesis believed that price stability could be accomplished by monetary policy through the means of – either *strict* or *flexible* – inflation targeting. Strict inflation targeting means that the central bank solely focuses on minimizing inflation’s deviation from its target. Flexible inflation targeting was introduced by Svensson (1999; see also 2010), and focuses on minimizing the output gap (or unemployment gap) in addition to staying close to the inflation target, through a *quadratic loss function*, where relative *weights* on the output gap and inflation gap could be decided:³⁸

$$L_t = E_t \sum_{s=0}^{\infty} \beta^s \frac{1}{2} [\phi_{\pi}(\pi_t - \pi_t^*)^2 + \phi_X(X_t)^2] \quad (4)$$

The objective, and often the mandate, for central banks are thus to minimize the economic losses according to the quadratic loss function, given the weights ϕ_X and ϕ_{π} . Where $(\pi_t - \pi_t^*)^2$ is the squared difference between the actual inflation and the inflation target. $(X_t)^2$ is the square output gap. The E_t is the expected value at time t . The β is the subjective discount factor of the representative household, which states how much agents care about tomorrow as compared to today. The loss function anchors expectations, which reduces uncertainty of households and firms about prices and interest rate. Furthermore, Woodford (2002, 2003) showed that minimizing the loss function is equivalent to maximizing households’ utility, under the condition that the weights are set adequately. The loss function could also serve as the monetary policy-rule, and vice-versa (see for example Woodford, 2002, 2003).

A positive output gap indicates an excess demand for goods and services and thus creates inflationary pressure since wages and prices increase in response to the increased demand. A negative output gap indicates a general spare capacity, which creates deflationary pressures as the economy become sluggish due to a lack of demand; if no one wants to buy goods, price levels fall (deflation). In this context, *the gap* specifies the forces of demand and supply in the economy. As such, it measures the pressure on price levels (inflation) and links the real factors of the economy – workers and firms – with the inflation (which is nominal). When inflation is stable, the output gap is minimized; this favorable outcome permitted economists to pursue stable inflation instead of minimizing economic fluctuations, since they essentially were the same thing – truly a “divine coincidence” (Blanchard and Galí, 2005).

³⁸ In a quadratic loss function, if the weight on the output gap (or the unemployment gap) would be zero; it would be the same as strict inflation targeting.

Similar to the output gap, policy makers also use the *unemployment gap*, which is a deviation from the nonaccelerating inflation rate of unemployment. Fiscal policy was seen as useful in manipulating aggregate demand, but since it relied on discretionary decisions, monetary policy was deemed superior. The idea was that monetary policy - particularly the monetary rule for the interest rate - was all that was needed to maintain the economy in an equilibrium path.

In theory, inflation-targeting is straightforward: the central bank forecasts the future path of inflation and compares it with the target inflation rate. The difference between the forecast and the target determines how much monetary policy is to be adjusted. An inflation target of zero is not recommended because it would not allow real interest rates to fall sufficiently to stimulate overall demand when a central bank is trying to boost the economy. Although in practice, discretion could be used to tackle sudden exogenous shocks to the economy. Inflation targeting is to be pursued over medium term (normally 2-3 years), facilitating shocks can discretionary be dealt with short term. Because of inflation targeting's medium-term focus, policymakers need not feel obliged to enforce draconic measures to meet targets on a period-by-period basis (Sarwat, 2012).

SHOCKS

A change in nominal interest rates does not straightforwardly feed into inflation; it also creates a number of endogenous effects between different economic variables. The DSGE-models strives to disentangle how the economic relationships interrelate when the instrument – the nominal interest rate – is altered. Understanding the economic relationships allows the Central Bank to set the optimal nominal rate in order to minimize the loss function at hand.

Supply shocks – productivity and cost-push shocks – is captured in the u_t -term in equation (3) and alters firms' costs, which affects their pricing and production decisions. For example, if there is an increase in the cost of production, firms decrease the aggregated supply of goods and services while the demand is consistent, which increases prices and causes a *cost-push inflation*. Prices are “pushed up” due to a cost-increase in a factor of production, which stipulates the firms to respond in increasing prices to maximize profits since they already are running at full production capacity (since the economy is in a general equilibrium; which is assumed). The increased cost in production factors are thus passed to the consumers of their goods and services, causing an increase in inflation levels. One example is the oil-price shocks in the 1970s that gave rise to the stagflationary economic developments (Galí and Gertler, 2007).

Cost-push shocks have been of particular theoretical interest since they create a policy dilemma for the monetary authorities. To offset a cost-push shock, one encounters a trade-off between stabilizing the output gap and minimizing the distance between inflation and the inflation target. This could be seen in Equation (3) in the model: when the shock enters, the u_t -term increases, which either is absorbed as higher inflation

(π_t) or by adjusting κ_t downward to offset the shock. Then, the “divine coincidence” thus not hold, and the monetary authority are forced to choose between the two objectives.

Furthermore, the presence of cost-push shocks made *strict* inflation targeting potentially draconic. Cost-push shocks imply that optimal monetary policy should, to facilitate this dilemma, allow some flexibility in the pursuit of the inflation target to the benefit of output gap-stabilization, which in essence is *flexible* inflation targeting.

In contrast, productivity shocks also affect the supply equation, but the disturbance influences the equilibrium *levels* of output and real interest rates. It does not, like cost-push shocks, increase the output gap per se; rather, it increases the *level* of the output gap while the gap itself remains closed. Because the gap remains closed, neither inflationary nor deflationary pressures arise. Movements in equilibrium levels – i.e. natural rates – are adjusted by the policy rule; inflation remains stabilized.

Demand shocks, captured in the r_t^n -term in equation (2), capture changes in the willingness/reluctance (demand) of households to buy the produced supply. When a positive demand-shock is fed into the model, production cannot increase without firms over-utilizing their human and physical capital which reflects in increasing marginal costs and increase wages, creating what is called *demand-pull inflation*. Although it can quite easily be neutralized by adjusting the nominal interest rate (r_t) accordingly, and does not imply a trade-off – the “divine coincidence” holds.

Monetary policy shocks are perceived as the residual from an estimated policy rule, i.e. the difference between the model estimation and actual outcome. The residual determines how the monetary policy should be adjusted in order for the economy to reach equilibrium again (Galí and Gertler, 2007; Smets and Wouters, 2007).

HOW THE EQUATIONS INTERRELATE

Due to gradual adjustment of individual prices and the general price level, monetary policy can affect real activity in the short run purely by altering nominal interest rates. Since the central banks controlled nominal interest rates, coupled with the monetary policy-rule, they can determine if credit are to be less expensive and therefore incentivize people to be more willing to borrow money. Borrowing money preconditions consumption of goods and services, which in turn determines aggregate demand in the economy. If aggregate demand decreases, less money would chase the same amount of goods and services, making the prices decrease in tandem with a cooling economy, and thus cause deflationary pressure. A vice-versa reasoning applies if credits were to become more expensive. (Adolfson et al., 2007; Galí and Gertler, 2007)

The demand equation determines the output gap (X) through a function of ex ante real interest rates, depicted as the nominal interest rate minus the expected inflation, as well as through expectations about future output gaps. The relationship between the real interest rate and desired spending is negative: when

real interest rates are high, household and firms rather save than invest or consume. Analogously, they demand and invest more when expected output is large, since the outlook is promising.

The aggregate supply equation describes how firms set prices as a function of the aggregated demand (X ; since a large output gap means excessive aggregated demand in the economy), coupled with expectations of future inflation (π^E). In economic booms, when demand is high and the economic activity is encouraging, firms increase wages to induce employees to work longer hours. The higher wages increase marginal costs, which puts pressure on prices and generates inflation. In the aggregate, it yields a positive relationship between real activity and inflation. Furthermore, the higher inflation is expected to be in the future, the more prices will increase, which contributes to a rise in inflation today.

The assessment of the output gap from the demand equation and inflation from the supply equation, feeds into the monetary policy equation, as illustrated by the dashed lines in Figure 1.

The central bank decides the nominal interest rate as a function of the output gap and inflation (as the discrepancy from the inflation target). Sequentially, when economic activity is overheating (manifest in a high output gap), or inflation is above target, the central bank increases the nominal interest rate in order to decrease aggregate demand by making credit more expensive. Simply put, when the nominal interest rate – both current and expected – is low, households demand more goods and services. When demand is high, the circular reasoning stipulates that firms' marginal costs increase and prices with it. The idea is that by adjusting the nominal interest rate, the central bank affects real economic activity and through it – inflation, as seen by the line that originates from 'Monetary Policy' to 'Demand' and lastly to 'Supply.' The monetary policy rule closes the circle and provides a framework where the economic relationships between the three key variables – inflation (π), the output gap (X) and the nominal interest rate (r) – can be disentangled, estimated and used to pursue the macroeconomic objectives.