



Expectations, learning and macroeconomic persistence[☆]

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Abstract

Monetary DGSE models under rational expectations typically require large degrees of features as habit formation in consumption and inflation indexation to match the inertia of macroeconomic variables.

This paper presents an estimated model that departs from rational expectations and nests learning by economic agents, habits, and indexation. Bayesian methods facilitate the joint estimation of the learning gain coefficient together with the ‘deep’ parameters of the economy.

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The empirical results show that when learning replaces rational expectations, the estimated degrees of habits and indexation drop closer to zero, suggesting that persistence arises in the model economy mainly from expectations and learning.

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1. Introduction

Dynamic stochastic general equilibrium (DSGE) models have become a popular tool for the analysis of the monetary transmission mechanism.¹ These models are built under the hypothesis of *rational expectations* and assume intertemporal optimizing behavior by economic agents. Being derived from explicit microeconomic foundations, they facilitate policy evaluation in terms of the welfare of private agents. Unfortunately, the canonical monetary models with rational expectations often cannot match the observed behavior of macroeconomic variables, and, in particular, they fail to match the *persistence* of aggregate output and inflation.

Economists have therefore proposed a number of extensions to the standard framework by embedding potential sources of endogenous persistence. They have incorporated features such as habit formation in consumption, indexation to lagged inflation in price-setting, rule-of-thumb behavior, or various adjustment costs. Christiano et al. (2005) incorporate several of these extensions and can account for the inertia in the data. Smets and Wouters (2003, 2005) estimate similar models by Bayesian methods, incorporating a mix of frictions and persistent structural shocks, and obtain a remarkable fit of the data. Also, Boivin and Giannoni (2006) and Giannoni and Woodford (2003), in smaller models, but which still incorporate additional sources of persistence, derive impulse responses that approximate those derived from VARs.

The cited extensions essentially improve the empirical fit by adding lags in the model equations. Researchers estimating these rich models under the assumption of rational expectations typically find that substantial degrees of habit persistence and inflation indexation are supported by the data. Those additional sources of persistence appear, therefore, necessary to match the inertia of macroeconomic variables.

1.1. Contribution of the paper

This paper suggests a different direction, by revisiting the expectations formation of the agents. The paper departs from the conventional rational expectations assumption. Agents in the model form expectations using correctly specified economic models, but they do not have knowledge about the model parameters. They use historical data to learn those parameters over time, updating their beliefs through constant-gain learning (CGL). The paper then evaluates the potential for *learning* as a mechanism that can endogenously

¹Clarida et al. (1999), Goodfriend and King (1997); McCallum and Nelson(1999) and Woodford (2003) are standard examples describing dynamic general equilibrium models for monetary policy analysis.

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