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Are the representative agent's beliefs based on efficient econometric models?

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ABSTRACT

No, they are not; at least not in the UK. By examining GDP dynamics we find that, over a time-span of two decades, an easy-to-perform adaptive expectations model systematically outperforms other standard predictors in terms of squared forecasting errors. This should reduce model uncertainty and thereby lead to increased homogeneity in expectations. However, data collected in surveys show that great variety in expectations persists even in this situation. Moreover, Granger tests indicate that the forecasting fitness of the best predictor can be further enhanced by the use of information provided by survey expectations. These results, based on real-time data and robust to both several predictors and nonlinearities, weaken the general validity of approaches assuming predictions based on efficient econometric models.

1. Introduction

Economics is a behavioral science and expectations play a crucial role in it. Yet little is known about how individuals actually form expectations. A typical assumption of important strands of research is that agents' expectations are grounded in efficient econometric models. According to the rational expectations hypothesis all agents use the "true" model and homogeneous expectations naturally arise. In an attempt to step back from the difficult-to-defend omniscience of Muthian agents, the adaptive learning literature (see Evans and Honkapohja, 2001, for a survey) assumes that agents are boundedly rational but as smart as econometricians. This is the cognitive consistency principle (Evans and Honkapohja, 2011). In this setting, agents form their expectations by *relentlessly* estimating econometric models. Though this approach allows for the presence of different predictors and discord expectations, most of the research that uses adaptive learning has been carried out in models with representative agents and homogeneous beliefs. In any case, all agents should tend to use the best forecasting model because, acting as econometricians, they re-estimate and possibly reformulate their models as new data become available. According to the cognitive consistency principle, then, agents are aware of the likelihood of

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structural changes and take measures to deal with it. The predictor choice approach (Brock and Hommes, 1997) addresses more explicitly the presence of different competing models. It points out that individuals could be uncertain about the correct model for the economy, so in each period they must select the optimal predictor. The selection mechanism consists of choosing the best model according to its relative accuracy as quantified by mean-squared-errors (MSE), net of its computational costs. Somewhat alike the bounded rationality assumed by the adaptive learning literature, in this approach individuals are boundedly rational in the sense that agents use the forecasting rule that has the highest fitness. Within this setting, Branch (2004, 2007) analyzes survey data and reports evidence that model uncertainty[2] *and* computational costs may generate rationally heterogeneous expectations because some agent may not fully respond to changes in relative net benefits. Persistent heterogeneity in beliefs may emerge even abstracting from computational costs. This may happen, for instance, when the kind of optimal[3] predictor changes frequently: There could be a tendency to gradually switch to better performing models, but agents might not jump immediately to the most accurate model because of idiosyncratic errors, noise, *etc.* (Brock and Hommes, 1997). Some agent could also prefer to maintain always the same model. Yet this is not the typical behavior of econometricians. Sticking with inefficient models is costly and the representative econometrician should relentlessly act to reduce these costs. Similarly, as argued by the predictor choice theory, strategies that have been more successful in the recent past are selected more often than less successful strategies. In sum, most people – and hence the representative agent – should tend to use the same (best) model and, accordingly, to have the same expectations.

To the extent that the representative agent's beliefs (i) are based on efficient models, and (ii) can be captured by *ad hoc* surveys, two basic facts emerge, motivating this paper. First, in the absence of model uncertainty for a sufficient span of time survey expectations should tend to converge: More and more individuals should uncover or consider to use the sole and enduring efficient model. Second, the forecasting fitness of efficient econometric models cannot be further enhanced by the use of information provided by survey expectations. If agents act as if they were statisticians in the sense that they use efficient forecasting rules, then survey-based beliefs must reflect this and cannot contain any significant information that helps reduce the MSE relative to the best econometric predictor. In other words, survey expectations cannot Granger-cause optimal model-based MSE. Yet several authors have suggested that agents may not behave as statisticians and that opposite information flows are also plausible (Section 2). Keynes' animal spirits or the heuristics studied by Kahneman et al. (1982) may impinge on individuals' expectations which, in turn, may affect realizations. Katona (1958) has suggested that household surveys could capture precisely these mood-driven, and potentially disperse, expectations. Having said this, there could be some value in examining the dispersion in survey beliefs to understand (i) whether these latter derive from optimal econometric models and (ii) the time connections between survey-declared and efficient model-grounded expectations. Our main goal and desired contribution is to shed some light on this topic by examining empirically the peculiar situation existing in the UK.

Borrowing from both the adaptive learning and the predictor choice approaches, we estimate a list of well-known econometric models which could potentially be examined by lay consumers under the assumption that they act as econometricians (Section 3). For robustness we estimate, both recursively and *via* MSE-minimizing rolling windows, several univariate and multivariate econometric models of the GDP growth rate. We re-estimate all models in each period, and we use real-time data so there is no assumption that people form their expectations based on data unavailable at the time (Croushore, 2011). It is in line both with the assumption that people act as econometricians and with the actual forecasting exercise elicited from survey respondents. This connection is important with regard to our goal. Lastly, we perform relative forecasting ability exercises to identify the most accurate predictor(s).

We then turn our attention to survey data (Section 4), computing some indicators of the differences across respondents' replies. These statistics are signal/noise ratios (SNR) and are natural survey counterparts of model-based MSE, which, in fact, can be thought of as a measure of dispersion. Indeed, several authors have examined the links between the second order moments of expectations revealed in surveys and of macroeconomic dynamics (*e.g.*, Mankiw et al., 2003). To the best of our knowledge this is the first attempt to examine the proposed SNR. A useful feature of SNR is that they reduce the impact of some important issues affecting the basis of widespread methods of quantification of qualitative survey observations (Pesaran and Weale, 2006).

After having studied separately econometric forecasts and survey expectations, we perform bivariate VAR analyses – involving the fitness of the best econometric predictor and the degree of dispersion across survey responses – to address the significance, the direction and the sign of their statistical links (Section 5). As mentioned the idea is that, under the assumption that representative agents select and use optimal forecasting models, SNR cannot Granger-cause best model-based MSE. *Mutatis mutandis* the logic is somewhat similar to that behind Carroll's epidemiological approach (Carroll, 2003) where the information flow runs from econometric models to survey data and not *vice versa* (Section 2). It is also worth recalling that according to a stylized fact dispersion in beliefs across forecasters and macroeconomic uncertainty are positively correlated. For instance, Capistran and Timmermann (2009) have argued that macroeconomic uncertainty may lead to disagreement among (professional) forecasters. Thus, viewing MSE as an indicator of volatility, the proposed analysis can also shed some light on the relationship between the degree of heterogeneity across (non-professional) forecasters' expectations and the second order moments of GDP growth.

[2] As in Branch (2004, 2007), here model uncertainty refers to the presence of different forecasting rules.
[3] Henceforth optimal, best, efficient, etc, models are in the sense of *minimum*-MSE predictors.