The Euler equation approach and utility functions: a critical view

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The modern literature on consumption is based on the Life Cycle - Permanent Income Hypothesis developed by Modigliani and Brumberg (1954) and Friedman (1957). According to this model, consumers allocate resources over time in order to maximize lifetime utility subject to a budget constraint. Hall (1978) extended the model to the case of uncertainty with the introduction of the rational expectations assumption, and proposed to use the first order conditions of the intertemporal optimization problem faced by the consumer to derive a set of orthogonality conditions. This approach, known as the Euler equation approach, allows to both test the validity of the model and to estimate some of the structural parameters of the utility function. Although it has been challenged several times, the Euler equation approach has become the standard approach to consumer behavior.

In its more general formulation, the standard framework encompasses many types of consumption behavior and has almost no testable implications. It is therefore necessary to construct a specific model which forces to make a number of strong assumptions and modelling choices. In particular, taking the model to the data requires to specify individual preferences.

Hall adopted a quadratic utility function and found that consumption is a martingale, but his result, highly influential on subsequent research, is due to the linearity of marginal utility associated with quadratic preferences. Hall's contribution proves that the choice of the utility function is crucial for the implications of the model in terms of consumer behavior.

The purpose of our analysis is to study the mathematical properties of the utility functions commonly used in the literature on the Euler equation, and to discuss the implications of those properties in terms of individual preferences. We therefore consider the most relevant parameters characterizing utility functions, i.e. the coefficients of relative and absolute risk aversion, the intertemporal elasticity of substitution, the coefficients of relative and absolute prudence and the rate of time preference. After discussing the meaning of each structural preference parameter, we highlight the relations between them. We thus show that while measuring different

aspects of preferences, the main parameters have close mathematical relationships between each other, which impose strict constraints on preferences.

In addition, we critically evaluate the evidence on the size of those parameters, in order to show that, despite the great abundance of empirical research, the Euler equation approach has not fulfilled its early promise to reliably estimate preference parameters.

We conclude with a survey of the most popular utility functions adopted in the literature, emphasizing their main features, the properties that make their use appealing, and the role they played in the theoretical and empirical research. The analysis suggests that the choice of a specific functional form, which is crucial for the implications of the model, is often due to its mathematical tractability rather than to features which make that function a plausible representation of individual preferences.