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A life-cycle approach to the intertemporal elasticity of substitution

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Abstract

We construct a three-period model spanning 30 years of an optimizing consumer's life. Exploiting the first-order conditions, we derive expressions for the intertemporal elasticity of substitution (IES) that allow for different utility specifications; the case of isoelastic utility is a special case. We fit US household data on income, consumption, and net worth to the IES expressions to obtain point estimates of the IES. We also construct 95 percent confidence intervals, based on 10,000 simulated observations. Our evidence suggests that the value of the IES is likely between 0.2 and 0.8.

JEL classification: E21

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1. Introduction

The intertemporal elasticity of substitution (IES) measures the extent to which an increase in the interest rate induces consumers to substitute future consumption for present consumption. The emergence in recent years of an extensive IES literature reflects the widespread recognition that the magnitude of this elasticity is fundamental to many important issues in macroeconomics. In large part, contributions to that literature have followed Hall's (1988) approach, in which (a) the representative consumer's utility func-

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tion is assumed to be of the isoelastic type and (b) aggregate consumption data are used in estimating the value of the IES. In this paper we take a different approach. In particular, we develop a framework that is not dependent upon the assumption of isoelastic utility. Furthermore, as an alternative to aggregate consumption data, we use survey data on consumption, income, and net worth.

Hall's approach, in which the growth rate of aggregate real consumption of nondurable goods is regressed on the expected real interest rate, typifies attempts, to date, to estimate the IES. Employing various techniques and data sets, Hall produced several estimates of the IES, all of which were small in absolute value and not significantly different from zero. On the basis of his findings, Hall concluded that consumption growth remains close to its average value, irrespective of the level of interest rates. The IES, he asserts, "may even be zero and is probably not above 0.2" (350). Using a model similar to Hall's, but incorporating estimation methods that are widely regarded as superior to those used by Hall, Hansen and Singleton (1996) produced negative estimates of the IES.

Several challenges to Hall's basic approach have been mounted, with varying degrees of success. One challenge stems from the notion that, rather than strictly conforming to the outcome of intertemporal optimization problems, consumption spending reflects the behavior of liquidity-constrained and "rule-of-thumb" consumers. Campbell and Mankiw (1989), for example, modified the standard Euler equation by allowing a fraction of consumers to follow a rule-of-thumb that calls for them to consume all of their income in each period.[1] Nevertheless, Campbell and Mankiw's findings corroborate Hall's (1988), as they are unable to reject the hypothesis of an IES value of zero.

Patterson and Pesaran (1992) examined the robustness of Hall (1988) and Campbell and Mankiw's (1989) findings to their assumption of a first-order moving average. Estimating the moving average term using an instrumental variable method and allowing for rule-of-thumb consumers, Patterson and Pesaran found continued support for the proposition that the IES is not significantly different from zero. However, Beaudry and Van Wincoop (1996) argued that estimates of the IES become imprecise when rule-of-thumb consumers are accounted for. They found (1996, 496) that for aggregate US data on consumption of nondurable goods, "almost any value between 0 and 1.5 cannot be rejected." Using a panel of state-level data they found the IES to be significantly different from zero and close to 1. Furthermore, Runkle (1991) found no evidence that consumers face liquidity constraints, and he estimated the IES to be 0.45 and statistically different from zero.[2]

A second challenge to Hall's approach pertains to its emphasis on consumption of nondurable goods. Ogaki and Reinhart (1998) argue that the exclusion of spending on durable goods – as is the case in Hall (1988) and Hansen and Singleton (1996) – biases the estimates of the IES. Noting that the real interest rate influences the user cost of the purchase of a durable good, Ogaki and Reinhart maintain that an increase in the interest rate causes consumers to substitute current consumption away from durable goods, toward nondurable goods. The effect, they argue, is to reduce future growth in nondurable consumption, relative to the case of no change in the user cost. Allowing for non-separable preferences in consumption of durable and nondurable goods, the authors estimated the value of the IES

[1] Campbell and Mankiw (1989) find that 45% of consumers follow the "rule-of-thumb."

[2] In contrast to Runkle's findings, Jappelli (1990) found that 19% of US consumers are liquidity-constrained.