



Euler equations and money market interest rates: A challenge for monetary policy models[☆]

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Abstract

Standard macroeconomic models equate the money market rate targeted by the central bank with the interest rate implied by a consumption Euler equation. We use U.S. data to calculate the interest rates implied by Euler equations derived from a number of specifications of household preferences. Correlations between these Euler equation rates and the Federal Funds rate are generally negative. Regression results and impulse response functions imply that the spreads between the Euler equation rates and the Federal Funds rate are systematically linked to the stance of monetary policy. Our findings pose a fundamental challenge for models that equate the two.

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1. Introduction

The consumption Euler equation of a representative household is a fundamental building block of many macroeconomic models, including the new neoclassical synthesis

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(NNS) models that are now a standard framework for the analysis of monetary policy.¹ NNS models typically equate the money market rate targeted by the central bank with the interest rate in the Euler equation; thus the Euler equation provides a direct link between monetary policy and consumption demand. In this paper, we use U.S. data to calculate the interest rate implied by the Euler equation, and we compare this Euler equation rate with a money market rate. We find the behavior of the money market rate differs significantly from the implied Euler equation rate. This poses a fundamental challenge for models that equate the two rates.

The fact that the two interest rate series do not coincide—and that the spread between the Euler equation rate and the money market rate is generally positive—comes as no surprise; these anomalies have been well documented in the literature on the “equity premium puzzle” and the “risk free rate puzzle”.² And the failure of consumption Euler equation models should come as no surprise; there is a sizable literature that tries to fit Euler equations, and generally finds that the data on returns and aggregate consumption are not consistent with the model.³

If the spread between the two rates were simply a constant, or a constant plus a little statistical noise, then the problem might not be thought to be very serious. The purpose of this paper is to document something more fundamental—and more problematic—in the relationship between the Euler equation rate and observed money market rates. In Section 2, we compute the implied Euler equation rates for a number of specifications of preferences and find that they are strongly negatively correlated with money market rates.⁴ This suggests that something, or some things, are systematically moving the two rates in opposite directions. One possible explanation is apparent in the figures we present in Section 2. During the Volcker tightening in the early 1980s, the Euler equation rates fell while the money market rates rose, and during the Greenspan easing in the early 2000s, just the opposite occurred. These easily identified episodes suggest that the spread may be systematically linked to the stance of monetary policy.

In Section 3, we document the statistical link between the interest rate spread and the stance of monetary policy. We do this in two ways. First, we regress the spread on standard measures of the stance of monetary policy, and then we generate impulse response functions for monetary policy shocks. The regressions imply that a monetary tightening

¹The NNS adds monopolistic competition and nominal inertia to the real business cycle paradigm. Woodford (2003) provides a masterful introduction to NNS models. Christiano et al. (2005) provide an estimated NNS model that explains the effects of a monetary policy shock well. Influential monetary policy analyses include King and Wolman (1999) and Erceg et al. (2000). Many central banks are now developing large scale NNS models.

²Giovannini and Labadie (1991) showed that the spread between Euler equation rates and money market rates was about as large as the equity premium. Weil (1989) illustrated what he called the “risk free rate puzzle”: combining consumption growth with the Euler equation of a representative consumer with standard, additively separable utility implies a real interest rate that is much greater than observed money market rates. In addition, Rose (1988) and others show that standard consumption Euler equations cannot explain the persistence of real short term interest rates.

³One contribution of this paper is that it provides a potentially useful way of characterizing the extent to which the data and the models are inconsistent.

⁴We consider standard additively separable CRRA preferences, four models of preferences with habit persistence, and recursive preferences like those proposed by Epstein and Zin (1989, 1991) and Weil (1990). The negative correlation appears to be quite robust to changes in preferences. The only exception is that some specifications of preferences with habit persistence yield interest rates that are so excessively volatile as to reduce the correlation nearly to zero.

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