Evidence of persistence in U.S. short and long-term interest rates[☆]

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Abstract

   This study examines the time series behavior of U.S. short- and long-run real ex-post interest rates within a long memory approach with non-linear trends using a long span of monthly and annual data. Overall, our results suggest that U.S. real interest rates are not as persistent as suggested in the literature. The implications of this result are relevant to evaluate both the effectiveness of policy interventions and the theoretical implications of different macroeconomic and financial models. For example, our results are consistent with the main implications of the consumption-based asset pricing models and the Fisher effect. Furthermore, the results point out to the difficulties of the monetary policy to influence interest rates, mainly in the long-run, and thus, highlighting varied interest rate policies across short and long-runs when it comes to affecting the real economy.
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1. Introduction

The real interest rate is a key variable in many macroeconomic and financial models, such as consumption-based asset pricing models (Hansen & Singleton, 1982, 1983; Lucas, 1978; Rose, 1988), neoclassical growth models (Cass, 1965), Fisher equation (Fisher, 1896, 1930), investment decisions (Tobin, 1965) or the term structure of interest rates (Modigliani & Shiller, 1973), and this justifies the great interest in understanding the time series properties of this variable.

The time series properties of long and short-run real interest rates will shed some light on the degree of stationarity and persistence of these variables. For instance, if these variables are stationary, shocks have transitory effects and monetary policy intervention will only have transitory effects on these variables. Furthermore, the degree of persistence of this variable could help us to evaluate the theoretical implications of different macroeconomic and financial models. The relevant monetary policy implications of the time series properties of real interest rates explains the ample literature on the econometric modeling of this variable using different methodologies, such as unit root tests (Galí, 1992; King, Plosser, Stock, & Watson, 1991; Mishkin, 1992; Rose, 1988), cointegration tests (Bierens, 2000; Wallace & Warner, 1993), or fractional integration models (Lai, 1997; Tsay, 2000). However, despite the vast literature on the integration order or persistence of this variable, the results are not yet conclusive.[1]

The historical U.S. real interest rate data reveals that this variable has varied a lot since the beginning of the 19th century, and has been affected by several shocks, such as the Civil War (1861), World War I (1914), the Great Depression (1929), World War II (1939), oil price crises (1973 and 1978), or the most recent financial crisis (2007), several episodes that may have caused several disruptions, and thus, potential non-linearities in the temporal evolution of this variable. The non-linear behavior of this variable has been mostly modeled in the literature by the inclusion of structural breaks (see, for example, Bai & Perron, 2003; Caporale & Grier, 2000; Garcia and Perron, 1996, among others), while only a few attempts have been made modelling non-linearities (see, for example, Kapetanios, Shin, & Snell, 2003; Lanne, 2006; Maki, 2005).

The contribution of this paper is three-folded. First, we provide evidence of the long memory properties of the real short- and long-run ex-post interest rates for a long span of data allowing for non-linear deterministic trends in the form of Chebyshev polynomials in time. Second, including in the analysis both short- and long-run interest rates will allow us to compare time series properties of this variable at different maturities, allowing us to determine whether monetary policy intervention will be more or less effective when directed to interest rates at different maturities. Third, analyzing both monthly and yearly data will shed some light on the different degree of persistence of interest rates data at different time frequencies.

The remainder of the paper is structured as follows: Section 2 revises the literature on the econometric modeling on the interest rates. Section 3 describes the methodology and justifies its application in the context of interest rates. Section 4 presents the data and the main empirical results, while Section 5 contains some concluding comments and policy implications.

2. Literature review

Modeling the dynamic behavior of interest rates series has become a relevant research area based on the relevance of this variable on many macroeconomic and financial models. Thus,

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[1] See Section 2 in this paper for the literature review on interest rate modeling.