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# Fluctuation dynamics in US interest rates and the role of monetary policy

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ABSTRACT

This paper presents empirical evidence suggesting that the degree of long-range dependence in interest rates depends on the conduct of monetary policy. We study the term structure of interest rates for the US and find evidence that global Hurst exponents change dramatically according to Chairman Tenure in the Federal Reserve Board and also with changes in the conduct of monetary policy. In the period from 1960s until the monetarist experiment in the beginning of the 1980s interest rates had a significant long-range dependence behavior. However, in the recent period, in the second part of the Volcker tenure and in the Greenspan tenure, interest rates do not present long-range dependence behavior. These empirical findings cast some light on the origins of long-range dependence behavior in financial assets.



## 1. Introduction

In the past decades the US economy has experienced low inflation and little variation in real activity if compared to the 1970s. These improvements have been largely attributed to a change in the way the Federal Reserve conducts monetary policy. A number of research papers have suggested that a structural break in the conduct of monetary policy has occurred since Paul Volcker became Chairman of the Federal Reserve in August 1979 (see Clarida et al., 2000). However, there is little consensus as whether a change in the conduct of monetary policy has indeed occurred and if it has what would be the dates of these changes (Boivin, 2006).

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This paper has three main contributions. First, we present evidence of a structural break in long-range dependence for long-term interest rates. The break seems to be related to the conduct of monetary policy. Second, we employ a non-parametric technique to analyze long-range dependence, which is robust to short-term dynamics misspecification. Third, we also test for long-range dependence for inflation and find that the degree of long-range dependence has decreased substantially in the post-1982 period.

We contribute to the debate on monetary policy by studying changes in persistence in interest rates for different maturities for the US. We investigate 1-, 3-, 5- and 10-year maturity interest rates and present overwhelming evidence that a structural break has occurred in the dynamics of these interest rates. We employ methods recently developed in statistical physics and show that interest rates' persistence has decreased substantially in the post-1982 period, while there is evidence of strong long-range dependence in the pre-1982 period. Therefore, the evidence in this paper is in line with the reasoning that a structural break has occurred in the conduct of monetary policy in the early 1980s.

This paper proceeds as follows: In Section 2, a brief review of the literature is presented. In Section 3, the methodology to estimate generalized Hurst exponents is reviewed. In Section 4, the data used in this work is described. Section 5 presents the empirical results. Finally, in Section 6, this paper is concluded.

## 2. Brief literature review

Researchers have documented a substantial change in macroeconomic variables for the US in the past decades. From the late 1960s through the early 1980s, the United States economy experienced high and volatile inflation along with several severe recessions. Since the early 1980s, however, inflation has remained steadily low, while output growth has been relatively stable.[1]

An important question that recent literature has been trying to answer is why in the recent decades monetary policy in the US has been successful in controlling inflation whereas in the mid-1970s inflation was high. Several papers have documented that major changes occurred in the way monetary policy is conducted by the Federal Reserve (Clarida et al., 2000; Duffy and Engle-Warnick, 2006; Boivin, 2006; Boivin and Giannoni, 2006; Sims and Zha, 2006) following changes in the Federal Reserve Chairman. These papers in general use parametric models and estimate reaction functions. They test for changes in the reaction function (Taylor rule) of the Federal Reserve to inflation expectations. There seems to be a consensus that major changes have taken place, although that the precise timing of when these changes have occurred is not consensual.

Another strand of the literature has studied long-range dependence in interest rates and has found evidence of it in different periods (Backus and Zin, 1993; Tsay, 2000; Barkoulas and Baum, 1998; McCarthy et al., 2004; Cajueiro and Tabak, 2005a). The study of long-range dependence in interest rates is important for three main reasons: (1) If there is long-range dependence in interest rates then there is some degree of predictability. (2) It is crucial to assess the persistence in interest rates as it has important implications for the evaluation of economic models. For example, if we wish to evaluate whether covered interest rate parity holds we have to take long-range dependence into account employing an ARFIMA model rather than the usual ARMA. (3) It is not clear what the cause of persistence in interest rates is. Although a few papers have documented this stylized fact, so far it is difficult to ascertain its causes. Therefore, if the persistence of interest rates changes due to changes in the conduct of monetary policy we have identified that policy making can be an important cause of long-range dependence.

In this paper, we fill the gap between these two literatures and examine whether there is a structural break in the long-range dependence of interest rates for different maturities according to Federal Reserve Chairman tenure. Therefore, we are able to test whether changes in the conduct of monetary policy are related to changes in the persistence of interest rates. Furthermore, most of the literature so

[1] See Romer and Romer (2004) for a discussion on why monetary policy has been so much successful under some Federal Reserve chairmen than others.