



Information Technology and Quantitative Management (ITQM 2017)

# How does economic policy uncertainty interact with sovereign bond yield? Evidence from the US

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## Abstract

This paper proposed a multi-scale correlations perspective to explore the relationship between economic policy uncertainty and sovereign bond yield in the United States, using the Ensemble EMD decomposition algorithm and Pearson correlation coefficient. Results show that these two variables exhibit a completely opposite linear relationship in the long-term trend before and after 27 April 2009, indicating that there is obvious conversion of stage characteristics and the relationship between these two variables is complex. Therefore, further study to investigate this complex relationship using nonlinear correlation measurement is necessary, and all these research will contribute to the policy making of regulators and trading behaviors of investors in the sovereign bond market.

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Peer-review under responsibility of the scientific committee of the 5th International Conference on Information Technology and Quantitative Management, ITQM 2017.

Key words: Economic Policy Uncertainty; Sovereign Bond Yield; Empirical Mode Decomposition

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## 1. Introduction

Sovereign debt crisis and policy uncertainty have been the most important issues in economics and finance recently, and the increase in economic policy uncertainty has accompanied the continuous decline in sovereign debt yield among major developed countries. However, there is little research on this issue. In this regard, this paper complements previous studies, as it focuses on the relationship between economic policy uncertainty and sovereign bond yield.

Previous studies mainly focused on the impact of macroeconomic variables on sovereign bond prices or yields, concerning that Debt to GDP ratio, potential growth, deficit, inflation and unemployment play a significant role as determinants of the 10-year sovereign bond yield [1-2], and a few researchers emphasize fiscal variables

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particularly [3-4]. Obviously, economic announcements are an important source of uncertainty information; they can affect yields by offering market participants insight into economic fundamentals and shaping their expectations of central banks' future monetary policy decisions [5-6]. EPU index as a measure of economic policy uncertainty captures information from newspapers that contain economic terms, such as 'economy', 'deficit', 'Federal Reserve [7], of course, it can affect sovereign bond yield.

In order to further explore the relationship between sovereign bond yield and economic policy uncertainty, this paper is organized as follows. Section 2 introduces the methodology. Section 3 gives a brief data description of EPU index and sovereign bond yield of US and then explores the relationship between sovereign bond yield and economic policy uncertainty from a multi-scale perspective. Section 4 concludes this research.

## 2. Methodology

As an efficient tool for identifying multi-scale properties, Empirical Mode Decomposition (EMD) and Ensemble EMD have been widely used to extract intrinsic modes from complex objects in reality [8-10]. In this section, Ensemble EMD model is used to explore the relationship between sovereign bond yield and economic policy uncertainty from a multi-scale perspective. First, intrinsic modes are extracted from the original series. Second, multi-scale components are constructed in term of low frequency, high frequency and the residual. Third, the Pearson correlation coefficients between different scales of these two variables are calculated. As a result, the multi-scale properties of sovereign bond yield and economic policy uncertainty are found.

### *Step1: Extracting IMFs*

In this step, Ensemble EMD model decomposes the original series  $x(t)$ , ( $t = 1, 2, \dots, T$ ) into a series of IMFs and  $residuer(t)$ , and all IMFs must satisfy the following two conditions: (1)The number of extrema and zero crossings must be equal or differ at most by one, (2) the IMFs must be symmetric with respect to the local zero mean [11-12].

### *Step2: Constructing Multi-scale components*

In this step, multi-scale components are constructed in term of low frequency, high frequency and the residual, and accordingly, the economic meanings can be explored in three scales: short-term fluctuation, medium-term pattern and long-term trend.

Generally speaking, the high-frequency component refers to a fluctuating process in the short run and the low-frequency component implies a slowly varying trend. Additionally, the residual is treated separately as it reflects the long-term trend. These three components corresponding to different time-frequency trends reveal some underlying features of original data.

### *Step3: Measuring multi-scale correlations*

In this step, by calculating the Pearson correlation coefficient between different scales of these two variables, the relationship between sovereign bond yield and economic policy uncertainty is explored. Moreover, the multi-scale properties of these two variables are found.

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