Wavelet-based monetary and fiscal policy in the Euro area

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\textbf{Abstract}. This paper first applies the MODWT (Maximal Overlap Discrete Wavelet Transform) to Euro area quarterly GDP data from 1995 – 2014 to obtain the underlying cyclical structure of the GDP components. We then design optimal fiscal and monetary policy within a large state-space LQ-tracking wavelet decomposition model. Our study builds a MATLAB program that simulates optimal policy thrusts at each frequency range where: (1) both fiscal and monetary policy are emphasized, (2) only fiscal policy is relatively active, and (3) when only monetary policy is relatively active. The results show that the monetary authorities should utilize a strategy that influences the short-term market interest rate to undulate based on the cyclical wavelet decomposition in order to compute the optimal timing and levels for the aggregate interest rate adjustments. Given that central bank rates are adjusted in discrete steps, this implies that central bank monetary policy adjustments will be sub-optimal. We also find that modest emphasis on active interest rate movements can alleviate much of the volatility in optimal government spending, while rendering similarly favorable levels of aggregate consumption and investment. This research is the first to construct joint fiscal and monetary policies in an applied optimal control model based on the short and long cyclical lag structures obtained from wavelet analysis.

\textit{Keywords}: Discrete Wavelet Analysis, Euro area, Fiscal Policy, LQ Tracking, Monetary Policy, Optimal Control

\textbf{1. Introduction}

This study combines discrete wavelet analysis, the macroeconomic accelerator model, and optimal control theory to generate fiscal and monetary policy interactions in an LQ tracking econometric model. The accelerator model has proved to be a useful theoretical and empirical tool over many decades since Samuelson (1939), Chow (1967),
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