Measurement Error and Policy Evaluation in the Frequency Domain

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Summary

Measurement error pervades macroeconomic data. Monetary policy must be made in real time and necessarily uses noisy data. Standard monetary policy rules describe how policy instruments (e.g., interest rates) respond to current and past economic conditions in a systematic way. This paper evaluates the implications of measurement error for the design of policy rules. In particular, I examine whether such information constraints justify conservatism in policymaking and how, if they do.

The focus of this paper is on the frequency-specific effects of measurement error. The variance of a stochastic variable, as a standard measure of volatility, can be decomposed into components specific to different frequencies. Monetary policy alters variance frequency by frequency to stabilize the economy. Policy evaluation in the frequency domain is interesting because the characterization of frequency-specific policy effects gives additional information about the effects of a given policy. Some important aspects of policy analysis can be better understood in the frequency domain than in the time domain.

In a simple linear model with noisy observations, I show that measurement error seriously distorts the performance of the policy rule that is optimal for the noise-free system. Adjusting the policy to appropriately account for measurement error means that the policymaker becomes less responsive to the raw data. For a parameterized example, I show that an additive white noise process of measurement error has little impact at low frequencies but induces less active control at high frequencies, and even may lead to more aggressive policy actions at medium frequencies. Measurement error also reduces the policymaker's reaction to model uncertainty, especially at medium and high frequencies.