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Structural shocks and the comovements between output and interest rates ☆

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ABSTRACT

Stylized facts on U.S. output and interest rates have so far proved hard to match with simple DSGE models. I estimate covariances between output, nominal and real interest rate conditional on structural shocks, since such evidence has largely been lacking in previous discussions of the output-interest rate puzzle.

Conditional on shocks to technology and monetary policy, the results square with simple models. Moreover, permanent inflation shocks accounted for the counter-cyclical and inversely leading behavior of the real rate during the Great Inflation (1959–1979). Over the Great Moderation (1982–2006), technology shocks were more dominant and the real rate has been pro-cyclical.

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1. Introduction

Understanding the relationship between output and interest rates is important to macro-economists and policymakers alike. But basic stylized facts on their comovements in U.S. data have proved difficult to match within a variety of simple DSGE models. For instance, King and Watson (1996) study three models: a real business cycle model, a sticky price model, and a portfolio adjustment cost model. They report that this battery of modern dynamic models fails to match the business cycle comovements of real and nominal interest rates with output:

> While the models have diverse successes and failures, none can account for the fact that real and nominal interest rates are "inverted leading indicators" of real economic activity.[1]

☆ The views in this paper do not necessarily represent the views of the Federal Reserve Board, or any other person in the Federal Reserve System or the Federal Open Market Committee. Any errors or omissions should be regarded as solely those of the author.

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[1] King and Watson (1996, p. 35). The inverted leading indicator property has been the subject of various empirical studies, for example Sims (1992) and Bernanke and Blinder (1992). The expression "negative leading indicator" is synonymous.

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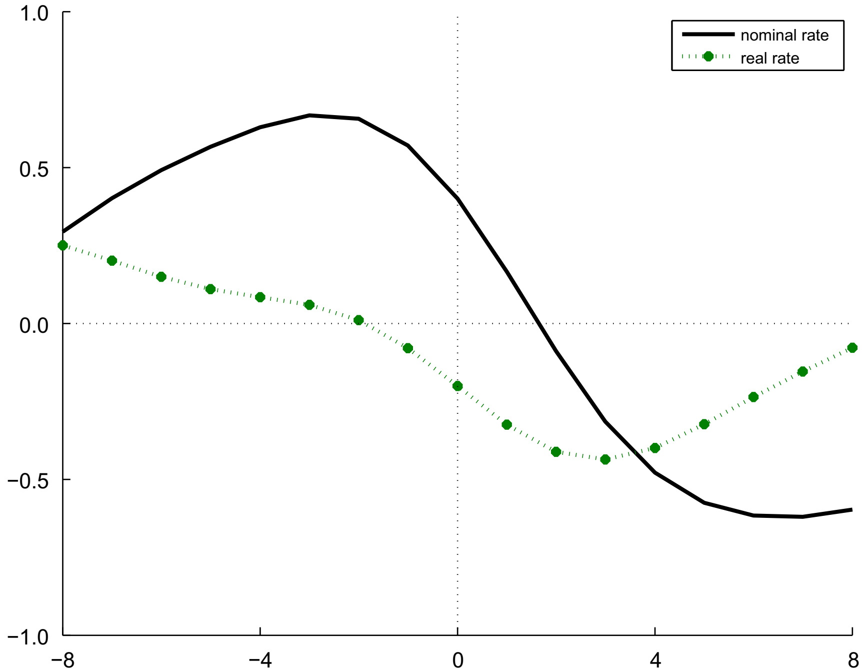

Fig. 1. Lead-lag correlations for output and interest rates. Note: $\text{cor}(\tilde{y}_t, \tilde{x}_{t-k})$ where $\tilde{y}_t$ is bandpass-filtered per-capita output and $\tilde{x}_t$ is bandpass-filtered nominal, respectively, real rate. This ex-ante real rate is constructed from the VAR described in Section 3 as $r_t = i_t - E_t\pi_{t+1}$. Quarterly lags on the x-axis. U.S. data 1959–2006.

Calling interest rates inverted leading indicators refers to their negative correlation with future output. These correlations are typically measured once the series have been passed through a business cycle filter.[2] Amongst the diverse failures mentioned by King and Watson (1996), RBC models generate mostly a pro-cyclical real rate.

But in the data, the real rate is clearly counter-cyclical, it is negatively correlated with current output. As mentioned already, it is also a negative leading indicator. This commonly found pattern of correlation between bc-filtered output and short-term interest rates is depicted in Fig. 1.[3]

What is the correct conclusion from a mismatch between implications from a dynamic model and stylized facts? Modern dynamic models always involve a joint specification of fundamental economic structure and driving processes. Model outcomes, such as the output-interest rate correlation, involve the compound effect of these two features. Yet, when "puzzling" findings are taken as evidence against a particular structural feature—such as sticky prices or portfolio adjustment costs—it is typically not acknowledged that the economy might alternatively be driven by different types of shocks that yield different effects within the given structure. Yet, more carefully, it is simply unclear whether dynamic models fail (or succeed) because of their transmission mechanisms or because of the nature of their driving forces.

To shed more light on this important issue, I provide empirical evidence about output-interest rate comovement conditional on various types of shocks: neutral technology shocks, monetary shocks, investment specific shocks and news about future productivity and permanent inflation shocks. The first two of these also drive the models of King and Watson (1996). The decomposition is applied both to a continuous sample of postwar data ranging from 1959 to 2006 as well as to two sub-samples, commonly associated with the Great Inflation (1959–1979) and the Great Moderation (1982–2006),[4] extending the original dataset of King and Watson (1996) by more than ten years.[5] There are striking results of my decomposition, which are reported in Section 4 using plots analogous to Fig. 1:

- After conditioning on neutral technology shocks, the real rate is pro-cyclical and a positive leading indicator—just the opposite of its unconditional behavior. In response to such permanent growth shocks, this is a common outcome for

[2] When it can be applied without confusion, I use the phrase "business cycle filter", or short "bc-filter", to describe the bandpass filters developed and applied in Baxter and King (1999) and Stock and Watson (1999) or the filter of Hodrick and Prescott (1997, "HP") since each eliminates nonstationary and other low frequency components from a time series. These filters differ mainly in that the typical bandpass filters eliminates not only cycles longer than 32 quarters but also those shorter than 6 quarters, while this latter high-frequency component is retained in the HP filter.

[3] This evidence is broadly in line with previous studies, see for instance the stylized facts collected by Stock and Watson (1999, Table 2) for bandpass-filtered U.S. data. The facts are also significant as can be seen from the confidence intervals plotted in Panel (b) of Fig. 3.

[4] Neither sample includes more data for 2007 and later, since the disruptions in financial markets introduce numerous issues which are beyond the scope of this paper.

[5] King and Watson (1996) use data from 1959 to 1992.