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Fiscal policy and asset markets: A semiparametric analysis☆

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ABSTRACT

Using a flexible semiparametric varying coefficient model specification, this paper examines the role of fiscal policy on the US asset markets (stocks, corporate and treasury bonds). We consider two possible roles of fiscal deficits (or surpluses): as a separate direct information variable and as a (indirect) conditioning information variable indicating binding constraints on monetary policy actions. The results show that the impact of monetary policy on the stock market varies, depending on fiscal expansion or contraction. The impact of fiscal policy on corporate and treasury bond yields follow similar patterns as in the equity market. The results are consistent with the notion of strong interdependence between monetary and fiscal policies.

1. Introduction

It is well known that monetary policy actions (such as changes in the federal funds rate) exert substantial influence on financial markets. Indeed, the role of monetary policy in explaining stock returns has been extensively investigated (e.g., Jensen et al. (1996), Patelis (1997), Thorbecke (1997) and Bernanke and Kuttner (2005)). In general, most recent studies have confirmed the impact of monetary policy on US asset markets.

Interestingly, while researchers have been primarily concerned with the impact of monetary policy on the stock market, little attention, if any, has been devoted to exploring the informational role of fiscal policy on the stock market.[1] Yet, on purely theoretical grounds, even the early literature (e.g., Blanchard (1981)) has demonstrated that both monetary and fiscal policies can have substantial effects on asset returns. While the recent literature continues to suggest a significant role for fiscal policy to affect key macroeconomic variables (e.g., Canzoneri et al. (2001)),[2] it has particularly underscored the potentially complex interaction between monetary and fiscal policies (Sargent, 1999; Kutsoati, 2002; Linnemann and Schabert, 2003; Schabert, 2004). As clearly pointed out in Sargent (1999), the administrative independence of central banks does not by itself imply that monetary policy is independent of the fiscal decisions of governments. In the US, "the force of US economic policy institutions is to leave that interdependence implicit" ((Sargent, 1999), p.1465). Hence, it is natural to explore a different role of fiscal policy as a conditioning information variable, which is based on its interaction with monetary policy.

Such an investigation also contributes to the ongoing debate on fiscal discipline. Since the 1980s, balanced budgets have become increasingly uncommon in many developed countries. Instead, bond-financed deficits have become the fiscal policy tool of choice and tend to be persistent in developed countries. In the US, the federal budget surpluses during the 1990s have turned into one of the largest peacetime budget deficits in the 2000s. The debate thus has gained momentum recently on mechanisms or institutional changes designed to improve policy outcomes. However, although

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[1] A notable exception is Darrat (1990) who considers fiscal deficits in a simple linear regression framework. As we will show below, a linear regression model is likely to be a misspecified model.

[2] In particular, the fiscal theory of the price levels argues that fiscal policy, rather than monetary policy, determines the general price level and inflation. Specifically, it views the government intertemporal budget constraint as an equilibrium condition where the price level adjusts to accommodate changes in fiscal conditions. See Canzoneri et al. (2001) for more references.

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some recent studies (e.g., Fatas and Mihov (2003) and Catao and Terrones (2005)) have documented a negative impact of fiscal deficits on output, inflation and other macroeconomic variables, little empirical work has been conducted to investigate how fiscal deficits impact financial markets in general and the stock market in particular. Our study should shed more light on this important policy issue.

This paper contributes to the literature in two important aspects. We first examine the role of fiscal policy on the US stock and bond markets, and we document the conditioning information role of fiscal policy via interactions with monetary policy, a feature that has been forcefully emphasized in the recent theoretical literature but not yet thoroughly investigated empirically. The few existing empirical works only consider the role of fiscal policy as a direct information variable separate from monetary policy. Second, we employ a flexible varying coefficient specification in our econometric analysis, which has not been commonly used in this line of research. We find that a semiparametric varying coefficient model and its variants (Cai et al., 2000) appear to be particularly suitable for capturing the potentially complex interactions between fiscal and monetary policies. Essentially, "monetary policy can be constrained by fiscal policy if fiscal deficits grow large enough to require monetization of government debt" (Sargent, 1999, p. 1463). However, when and how such a fiscal policy works as a binding constraint on monetary policy would be difficult to model with a parametric (e.g., linear) model, as no theory has made an explicit suggestion about functional forms. The semiparametric varying coefficient model has the advantage that it allows more flexibility in functional forms than either a linear model or many parametric nonlinear models, and at the same time it avoids much of the 'curse of dimensionality' problem that occurs in fully nonparametric analysis.

The rest of this paper is organized as follows: Section 2 presents econometric methodology; Section 3 proposes a test for a varying coefficient model; Section 4 describes the data and empirical results; and finally, Section 5 concludes the paper.

2. Econometric methodology

We start with a simple linear regression model:

$$Y_t = X_t'\alpha + Z_t'\gamma + u_t, \quad (t = 1, \ldots, n), \tag{1}$$

where X_t is a $p \times 1$ vector with its first component being 1, Z_t is a $q \times 1$ vector, and α and γ are $p \times 1$ and $q \times 1$ vectors of (constant) parameters, respectively. In this paper we will first consider the case that the dependent variable Y_t is the US stock return at period t. We will also consider the cases that Y_t is the US treasury bond yield and that Y_t is the US corporate bond yield. The explanatory variables X_t and Z_t contain lagged values of Y_t, lagged values of the growth rate, of industry production, the first difference of the federal fund rate, and changes in the fiscal deficit.

One way that the linear regression model (1) may be misspecified is when fiscal policy variables affect asset markets in a nonlinear way. To allow for a flexible functional form and also to avoid the 'curse of dimensionality', we consider a semiparametric varying coefficient model given by

$$Y_t = X_t'\beta(Z_t) + u_t, \tag{2}$$

where the coefficient function $\beta(z)$ is a $p \times 1$ vector of unspecified smooth functions of z. Under the assumption that model (2) is the correct specification, $E(u_t|X_t, Z_t) = 0$. Pre-multiplying both sides of (2) by X_t and taking conditional expectation ($E(\cdot|Z_t = z)$), then solving for $\beta(z)$ yields

$$\beta(z) = \left[E(X_t X_t'|Z_t = z)\right]^{-1} E(X_t Y_t|Z_t = z). \tag{3}$$

Replacing the conditional mean functions in (3) by some nonparametric estimators, say by the local constant or local linear kernel estimators, one obtains a feasible estimator of $\beta(z)$.

The varying coefficient model (2) is simple yet rather flexible. Note we have assumed that the first component of X_t is 1. If we further assume that $\beta(z)$ depends on z only in its first component, i.e., $\beta(z) = (\beta_1(z), \beta_{20}, \ldots, \beta_{p0})'$, where β_{j0} is a constant ($j = 2, \ldots, p$), then the varying coefficient model reduces to the popular semiparametric partially linear model as considered by Robinson (1988) and others. If one further imposes that $\beta_1(z) = \alpha_0 + z'\alpha_1$, then the partially linear model collapses to the linear model (1). Estimation methods as well as the asymptotic distributions of various kernel-based estimators for varying coefficient models have been considered by Cai et al. (2000) and Li et al. (2002), among others.

Even though the varying coefficient model is more flexible than the parametric linear model, it is still possible that the varying coefficient model is misspecified. To guard against this possibility, we will test model adequacy for the varying coefficient model against the following general nonparametric regression model:

$$Y_t = g(X_t, Z_t) + u_t. \tag{4}$$

The fully nonparametric model (4) is robust against functional form misspecifications. However, it also has a major disadvantage, namely, it has the 'curse of dimensionality' problem. We discuss model specification testing in the next section.

3. Model specification testing

In applied work it is important to check the adequacy of a given model specification. For example, if a simple linear model is the correct specification, then there is no need in searching for more complex semiparametric/nonparametric specifications. On the other hand, if a given (parametric or semiparametric) model specification is believed to be inadequate, one should search for other more flexible specifications. There exists a rich literature on testing a linear model either against a more flexible semiparametric model or against a fully nonparametric model. However, to the best of our knowledge, there is no formal theoretical work on testing a semiparametric varying coefficient model against a fully nonparametric alternative model. In the next subsection we propose such a test and derive the asymptotic distribution of our proposed test.

3.1. A test for a varying coefficient model

Testing semiparametric regression models against more general nonparametric alternative models is considered by Fan and Li (1996) and Chen and Fan (1999), among others. In this subsection we propose a new test statistic for testing the null model of a varying coefficient model against a general nonparametric alternative model. That is, under H_0 we have $E(Y_t|X_t, Z_t) = X_t'\beta(Z_t)$ almost surely, and the alternative is that $E(Y_t|X_t, Z_t) \neq X_t\beta(Z_t)$ on a set (X_t, Z_t) with positive measure. The null model is therefore given by:

$$Y_t = X_t'\beta(Z_t) + u_t, \tag{5}$$

with $E(u_t|X_t, Z_t) = 0$, where Y_t and u_t are scalars, $X_t \in R^p$ and $Z_t \in R^q$. Replacing the conditional expectation functions in (3) by kernel estimators, we obtain an estimate of $\beta(Z_t)$ given by

$$\hat{\beta}(Z_t) = \left[\frac{1}{na_1 \ldots a_q}\sum_{s=1}^{n} X_s X_s' L_{t,s}\right]^{-1} \frac{1}{na_1 \ldots a_q}\sum_{s=1}^{n} X_s Y_s L_{t,s},$$

where $L_{t,s} = \prod_{j=1}^{q} l((Z_{tj} - Z_{sj})/a_j)$ is the product kernel function and a_j is the smoothing parameter associated with X_{tj}