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Macroeconomic uncertainty, inflation and growth: Regime-dependent effects in the G7

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ABSTRACT

We analyze the causal effects of real and nominal macroeconomic uncertainty on inflation and output growth by considering whether these effects are cycle phase specific. Employing a bivariate Smooth Transition EGARCH-M model for the G7 countries during 1957–2009, we find strong nonlinearities. First, uncertainty regarding the output growth rate is related with a higher average growth rate mostly in a low-growth regime, supporting the theory of "creative destruction". Second, higher inflation uncertainty diminishes growth rates, mainly at a high-inflation regime. Finally, real uncertainty has mixed effects on average inflation, while the effect of nominal uncertainty is typically positive, especially so during inflationary periods. Our findings suggest that these relationships are sufficiently complex to require treatment with nonlinear models.

1. Introduction

Considerable research has been devoted in recent years in examining the effects of macroeconomic (nominal and real) uncertainty on the rates of inflation and output growth. The literature offers many competing theories as to the sign of these effects, while empirical support for these theories is just as varied, offering an inconclusive outcome. For this reason, a few studies have attempted to investigate whether these effects depend on the *rates* of inflation and output growth, thus stressing the importance of the state of the economy.[1] Amongst them, Baillie et al. (1996) and Chang and He (2010) examine the effect of inflation uncertainty on inflation and output growth, respectively, as a function of the rate of inflation, while Henry and Olekalns (2002) focus on the effect of recessions on the relationship between output variability and growth. The current study combines the above considerations and examines the presence of regime-dependent effects by *jointly* considering the impact of real and nominal uncertainty on inflation and output growth outcomes within a simultaneous estimation model. An

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[1] Other variables examined include the level of economic and financial development, institutional development, and trade openness (see Hnatkovska and Loayza 2004).

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advantage of the model is that the regime-switching thresholds of inflation and output growth are determined endogenously, thus avoiding issues of potential misspecification bias.

The theoretical literature that examines the effects of macroeconomic uncertainty on inflation and growth is rich in offering competing explanations.[2] In particular, there are theories that support an effect of inflation uncertainty on output growth that takes up a negative sign (Friedman, 1977; Pindyck, 1991; Huizinga, 1993) while some others support a positive sign (Abel, 1983; Dotsey and Sarte, 2000).[3] Similarly, the influence of nominal uncertainty on the rates of inflation has been deemed to be either positive, by Cukierman and Meltzer (1986) and Cukierman (1992), or negative by Holland (1995). In a similar fashion, output growth uncertainty has had supporters of a positive (Deveraux, 1989) but also of a negative (Taylor effect jointly with the Cukierman–Meltzer hypothesis) influence on inflation. Finally, the impact of real uncertainty on output growth has been theorized to go in all possible directions covering positive (Black, 1987), zero (Friedman, 1968), and negative (Bernanke, 1983; Pindyck, 1991) effects.

All these theoretical contributions assume that the influence of macroeconomic uncertainty on the rates of inflation and growth is linear, or constant. An implication of this is that when the theories are brought into the test, between each pair of suggestive explanations, one theory should prevail as being correct. One, however, cannot dismiss the possibility that the impact of uncertainty on inflation and growth may vary so that all theories are relevant to an extent. This possibility is corroborated by the mixed and often contradictory findings of the empirical literature. It can also be supported by a few recent studies that examine the conditional, or regime-dependent, impact of real and nominal uncertainties.

There exists a sizable literature investigating the above relationships with the use of time series Generalized Autoregressive Conditional Heteroskedasticity (GARCH) techniques.[4] The findings of the studies that utilize bivariate GARCH-M models, in particular, are found to vary considerably. For example, in the case of the USA which is the most studied of the countries, three of the most well-known studies in the literature agree only on the negative impact of inflation uncertainty on output growth (Grier and Perry, 2000; Grier et al., 2004; Bredin and Fountas, 2005). The significance of the remaining three estimates varies across studies. This situation, however, is not limited to the United States. For Japan, Bredin and Fountas (2005) and Wilson (2006) agree only on the sign and significance of the impact of real uncertainty on inflation, while the same is also true for the United Kingdom between the studies of Bredin and Fountas (2005) and Bredin et al. (2009). Between these last two studies, one can also observe differences as to the impact of macroeconomic uncertainty for France and Germany. One, therefore, can conclude that the empirical evidence is mixed, even for studies that use similar estimation techniques.[5]

More recently, some studies have considered the presence of nonlinearities, or regime shifts in the examination of these effects. Henry and Olekalns (2002) examine the nonlinear impact of real volatility on economic growth and provide evidence that recessions result in increased output uncertainty, which dampens subsequent growth. As the economy expands, the impact of real uncertainty on growth vanishes. Other studies consider the nonlinear impact of nominal uncertainty. Baillie et al. (1996) show that higher uncertainty about the rate of inflation leads to higher inflation rates only in high-inflation countries. Chen et al. (2008), on the other hand, in an examination of the four little dragons, show that inflation uncertainty induces a "Laffer curve" effect on inflation in the case of Taiwan. Finally, Chang and He (2010) employ a bivariate Markov regime switching model for the US economy and demonstrate that nominal uncertainty inhibits growth in both low-and high-inflation regimes. The size of the effect, however, is greater (by threefold) in the high-inflation regime. Importantly, when there is no distinction between regimes, the use of a single-regime GARCH model shows the effect of inflation uncertainty to be negligible, pointing to a misspecification bias.[6]

These GARCH-related studies imply non-monotonic effects of real uncertainty on output growth and of nominal uncertainty on both output growth and inflation. The findings of this set of papers is the starting point of the current paper, where we consider the impact of nominal and real uncertainty as being dependent on the rates of inflation and output growth respectively. Our choice to anchor parameter instability on inflation and growth regime switches is in line with the literature. As described above, the use of the rate of inflation as the measure by which inflation uncertainty influences inflation and growth outcomes is adopted by Baillie et al. (1996) and Chang and He (2010). The use of the growth rate of output as the transition variable in estimating the impact of output growth uncertainty on inflation and output growth, in turn, draws from a long literature that uses this variable to distinguish between periods of economic expansions and contractions (see, among others, Teräsvirta and Anderson, 1992; Teräsvirta, 1994; Van Dijk et al., 2002). These considerations may offer a compromise between the conflicting views of the existing theoretical hypotheses.

[2] A detailed description of these theories is presented in our Working Paper version.

[3] To be precise, the so-called Friedman (1977) hypothesis is comprised of two coherent relationships that articulate a positive effect of inflation on inflation uncertainty together with a negative effect of inflation uncertainty on output growth. The current study makes no assessment of the former relationship given the focus on the regime-dependent impact of uncertainty on inflation and growth. Thus, we do not fully assess Friedman's (1977) hypothesis.

[4] The studies use either univariate or multivariate GARCH models. The univariate GARCH method requires two steps, which is subject to the problem of a "generated regressor" (see Pagan 1984) that leads to biased estimates of the standard errors and problems in inference. For this reason, a lot of studies adopt a simultaneous approach where a bivariate GARCH-in-mean (GARCH-M) model is estimated to provide estimates of the conditional variances and at the same time test for the impact of uncertainty on macroeconomic performance (Grier and Perry 2000; Grier et al. 2004; Fountas and Karanasos 2007).

[5] The variation in results could be explained by the use of different measures for output (real GDP vs. industrial production index) and inflation (CPI vs. PPI), or by a different period coverage.

[6] A related study by Bredin and Fountas (2009) investigates regime switching in the conditional variance of inflation and output growth in 14 European Union countries via the estimation of Switching ARCH in-mean (SWARCH-M) models. In spite of the presence of significant regime switching in both the volatilities of inflation and growth, they do not find any significant effects of macroeconomic uncertainty on performance. They state, however, that these findings could be misleading as they test for regime switching in a univariate setting rather than (the most appropriate) multivariate.