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## Inflation, output and uncertainty in the era of inflation targeting – A multi-economy view on causal linkages



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This study provides cross country robust evidence on interdependencies among inflation, output growth and respective uncertainties for the current era of low inflation policies. We attribute the extant empirical disagreement on these relations to the fact that long sampling periods and single economies are typically considered for analysis. In this study, VARX-MGARCH-M models are estimated for 34 developed and emerging economies and the time period of 1990–2010. We study average (Granger) causal effects by aggregating parameter estimates over economies. The cross sectional variation of estimates serves as a means to assess the robustness of empirical findings. Over the entire cross section, we find that both inflation and inflation uncertainty significantly reduce output growth. Economies with low inflation rates are particularly at risk to incur output losses from increasing inflation. We also find spillover effects among uncertainty variables, where the causal impact, if present, seems to point from the uncertainty in output to inflation uncertainty.

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### 1. Introduction

Most economists would agree that an environment of low and well anchored inflation expectations is beneficial for economic growth and stability. However, there is an ongoing dispute if it is sensible to insist on price stability in a stricter sense or rather to target inflation at moderate levels, around 4%, say

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(Blanchard et al., 2010). A popular standpoint is that the negative impacts that inflation or its uncertainty exert on economic growth and stability are of small magnitude if inflation is not overly high. In this respect, it is important to understand the dynamic interactions among inflation, inflation uncertainty (IU), output growth and output uncertainty (OU) that typically arise in modern-world economies with low to moderate inflation rates. However, empirical and theoretical contributions especially disagree with regard to the influence of uncertainty on the joint determination of inflation and output. Inflation uncertainty is generally believed to result from excess inflation or lack of central bank credibility (Ball, 1992; Friedman, 1977). According to Greenspan (2004), uncertainty is both a result and a defining characteristic of the monetary policy landscape. However, its potential effects on monetary policy (and, thus, inflation), economic growth or volatility are subject to theoretical debates (e.g. Cukierman and Meltzer, 1986; Devereux, 1989; Dotsey and Sarte, 2000; Fuhrer, 1997; Orphanides and Williams, 2005; Taylor, 1994). Likewise, the impact of real economic uncertainty on growth, inflation or inflation uncertainty is also unclear (e.g. Black, 1987; Cukierman and Gerlach, 2003; Devereux, 1989; Fuhrer, 1997; Pindyck, 1991). Respective empirical examinations of (Granger) causal relations are numerous. However, findings strongly differ across distinct countries and sampling periods (e.g. Bredin and Fountas, 2009; Caporale and Kontonikas, 2009; Fountas and Karanasos, 2007; Grier and Perry, 1998).

Based on the argument of Greenspan (2004), one might attribute this lack of empirical unanimity to two sources: Firstly, it might reflect a high degree of cross country heterogeneity in the systemic framework of monetary policy. In fact, most of the aforementioned theoretical contributions formalize sources or effects of uncertainty to arise as a matter of (expected) monetary policy intervention (Ball, 1992; Cukierman and Meltzer, 1986; Devereux, 1989; Fuhrer, 1997; Holland, 1995). This view also receives empirical support in Caporale and Kontonikas (2009), Fountas et al. (2004) or Kontonikas (2004) who underpin that respective interactions might be influenced by aspects related to monetary transparency, credibility and performance. Secondly, during recent decades, policymakers have been confronted with era specific challenges giving rise to fundamental changes in the conduct of monetary policy. If time series undergo structural change, deviations regarding the time period under investigation among studies might give rise to opposite findings. Proceeding from the assumption of structural stability, moreover, has unclear implications for the informative value of estimates and hypothesis testing. Bredin and Fountas (2009), Caporale and Kontonikas (2009), Evans and Wachtel (1993) and Kontonikas (2004) document for distinct economies that the dynamics among inflation, output and uncertainty might be subject to structural change.

Empirical models which explicitly acknowledge uncertainty typically require a plentitude of time series observations (40–50 years of monthly data, say). Hence it is not surprising that findings strongly disagree across time and countries. During the past two decades, however, the hegemony of inflation targeting strategies has led a large share of central banks to conduct monetary policy in a similar way (Greenspan, 2004). During this time, idiosyncratic characteristics of Granger causalities among inflation, output and respective uncertainties should have been reduced across economies around the world. Therefore, evidence on the overall (i.e. multi economy) relevance of particular causalities is more likely to be decisive if the focus of the investigation centers on this time period.

The aim of this study is to empirically identify common features in the interaction among inflation, output growth and respective uncertainties across a large range of distinct economies and the recent policy era. Arguing that empirical investigations on the prevalence of particular linkages might be conducted as tests on whether these exist reliably across distinct types of economies, we estimate uniform bivariate VARX-MGARCH-in-mean models (GARCH-M for short)<sup>1</sup> for 34 industrialized and emerging economies. Individual estimates are aggregated across economies by employing the so-called mean-group (MG) estimator (Pesaran and Smith, 1995). Inference on the cross country significance of causal effects is based on the cross-sectional variation in respective economy-specific estimates. Such a framework helps to reduce a number of influences that might have induced

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<sup>1</sup> Such specifications are a widely used means of quantifying and testing respective causal effects (Bredin and Fountas, 2009; Grier and Perry, 2000).

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