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Global macroeconomic uncertainty

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ABSTRACT

We empirically identify global macroeconomic uncertainty using a dynamic factor model, where the conditional variances of all factors are modeled as stochastic volatility processes. Applying this methodology to OECD data, we find the early 1970s and early 1980s recessions as well as the recent Great Recession of the late 2000s to be associated with increases in uncertainty at the global level, but heightened uncertainty during the early 1990s and 2000s slowdowns to be mostly confined to the national levels. We also find that global uncertainty unambiguously lowers national growth rates and raises national inflation rates, and that key macroeconomic variables like oil, commodity and stock prices as well as global liquidity act as drivers of the global dimension of uncertainty.

1. Introduction

There is a growing literature on measuring economic uncertainty and assessing its impact on the real economy. So far, this literature is mostly confined to the national level, with only little attention directed to the global dimension of uncertainty. This paper sets out to empirically identify global macroeconomic uncertainty. Our approach consists of setting up a bivariate dynamic factor model to decompose inflation and output growth into common and country-specific components. The conditional factor variances are modeled as stochastic volatility processes and interpreted as reflecting uncertainty in the underlying factor. The contribution of this paper is threefold. First, we apply our measure for identifying global output growth and inflation uncertainty to a large OECD country sample. Second, we analyze the impact of global uncertainty on individual countries' performance in terms of output growth and inflation. Third, we assess whether key macroeconomic variables like oil, commodity and stock prices as well as measures of global liquidity act as drivers of the global dimension of uncertainty.

A growing literature investigates the potential links between uncertainty and macroeconomic performance based on rigorous theoretic and empirical modeling. One recent strand of that literature uses firm-level data, with a focus on analyzing the impact of exogenous changes in volatility (or second moment shocks) on the real economy (see e.g. Bloom, 2009; Arellano et al., 2012; Bloom et al., 2012; Christiano et al., 2014). Some studies also allow for reverse causation, in which uncertainty is endogenously influenced by first-moment business cycle shocks (see e.g. Van Nieuwerburgh and Veldkamp, 2006; Bachmann and Moscarini, 2012; D'Erasmo and Moscoso-Boedo, 2013).

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A different strand of the uncertainty literature obtains measures of macroeconomic uncertainty from aggregate time-series data on inflation and output growth rates. Whereas a number of these studies focuses exclusively on the effects of inflation uncertainty (see e.g. Grier and Perry, 1996; Caporale and Kontonikas, 2009), other authors analyze both inflation and output growth uncertainty simultaneously (see e.g. Grier et al., 2004; Shields et al., 2005; Fountas and Karanasos, 2007). All of these papers provide strong evidence of one-way or two-way causal relationships between many of the possible bilateral combinations of inflation, output growth and their respective second moments. This evidence is in line with an older theoretic literature outlining a number of different transmission channels connecting the first and second moments of macroeconomic variables (see in particular Friedman, 1977; Cukierman and Meltzer, 1986; Cukierman and Gerlach, 2003).

The literature on firm-level and aggregate macroeconomic uncertainty referred to above exclusively focuses on the national incidence of uncertainty in individual countries. So far, almost no attempt has been made to differentiate between its national and global dimensions.[1] However, global uncertainty may constitute an independent and important determinant of the international reach of financial and economic crises. Potential drivers of global uncertainty can be thought of as including all factors with a simultaneous impact on national levels of uncertainty, like oil, commodity and asset price shocks, concurrent changes in national economic policies, or synchronous shifts of investor sentiment possibly associated with changes in global perceptions about financial, economic or political risk.[2]

In order to identify global macroeconomic uncertainty, we draw on the literature on the international comovement of macroeconomic variables using dynamic factor models (DFMs). These models have been utilized to detect international business cycles (Kose et al., 2003, 2012; Crucini et al., 2011) or global inflation dynamics (Ciccarelli and Mojon, 2010; Mumtaz and Surico, 2012). In this literature, comovement is defined as common shocks to the mean. No attempt has yet been made to analyze global macroeconomic uncertainty in terms of the second moments of common shocks.

As uncertainty is a latent variable which cannot be observed directly, a range of proxies or indicators of (micro or macro) uncertainty are used in empirical work. These include the volatility of stock returns, the dispersion of shocks to firm profits or TFP growth, forecaster disagreements, or the appearance of uncertainty-related keywords in news publications. An alternative is to apply time series models to obtain uncertainty proxies. The two approaches most frequently utilized are stochastic volatility and GARCH models. Although there appears to be a proliferation of the latter, both approaches have been shown to yield comparable results relative to survey-based measures of inflation and output growth uncertainty (see Chua et al., 2011; Grimme et al., 2011). However, whereas the volatility process in GARCH models is explained solely in terms of level changes, stochastic volatility models are more flexible as they allow for a separate innovation impinging on volatility (Fernandez-Villaverde and Rubio-Ramrez, 2010).

In this paper we set up a DFM that decomposes inflation and output growth into country-specific and global components. The conditional variances of all factors are modeled as stochastic volatility processes and interpreted as reflecting uncertainty in the underlying factor. Applying this methodology to OECD data, we find the early 1970s recession as well as the recent Great Recession of the late 2000s to be associated with a dramatic increase in both inflation and output growth uncertainty on a global level. Apart from these major uncertainty events, levels of global uncertainty also rise during the economic recession of the early 1980s. Moreover, the Great Moderation beginning in the mid-1980s is characterized by a discernible slowdown of global uncertainty which is generally not matched by a comparable reduction in the incidence of national uncertainty. In contrast, the increase in uncertainty during the early 1990s and 2000s slowdowns is mostly confined to the national levels.

The remainder of the paper is structured as follows: Section 2 introduces the empirical methodology to identify global inflation and output growth uncertainty, and Section 3 reports our empirical results on the macroeconomic uncertainty measures at both the global and national levels. Section 4 investigates the influence of global uncertainty on individual countries' growth and inflation performance, and Section 5 tests whether key macroeconomic variables like oil, commodity and stock prices as well as measures of global liquidity Granger-cause the global dimension of uncertainty. A final section concludes.

2. Empirical specification and methodology

2.1. A bivariate dynamic factor model

The bivariate dynamic factor model outlined in this section decomposes the output growth and inflation series in each country into a common (or global) factor and into country-specific factors. The country-specific factors in inflation and output growth are allowed to be correlated within each country whereas the common factors are assumed to be mutually orthogonal. We allow for time variation in the log standard deviations of the error terms pertaining to the common

[1] To the best of our knowledge, there are only two exceptions. Nakamura et al. (2012) identify a world stochastic volatility process using over 100 years of consumption data across a large sample of countries. Unlike our approach they use a univariate factor model and their focus is not so much on macroeconomic performance, but rather on explaining a number of asset pricing anomalies. The other paper is Gourio et al. (2013) who analyze various aspects related to international risk cycles, and also whether global uncertainty has a significant effect on macroeconomic aggregates, but their measure is exclusively based on global equity market volatility across G7 countries.

[2] An example of such synchronous shifts in investor sentiment has recently been provided by Bacchetta et al. (2012) who develop the concept of self-fulfilling risk panics. A weak fundamental like the health of financial institutions in the US or the scale of debt in Greece suddenly becomes a focal point of fear everywhere. This fundamental then takes on the role of a coordination device for a self-fulfilling shift in risk perceptions.