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Threshold effects of financial stress on monetary policy rules: A panel data analysis☆

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ABSTRACT

This study tests for the state-dependent response of monetary policy to increases in overall financial stress and financial sector-specific stress across a panel of advanced and emerging economy countries. We use a factor-augmented dynamic panel threshold regression model with (estimated) common error components to deal with cross-sectional dependence. We find strong evidence of advanced economy countries' aggressive monetary policy loosening in response to stock market and banking stress but only in times of high financial market volatility. By comparison, evidence of threshold effects of financial stress is generally weak for emerging market countries' interest rate decisions.

1. Motivation

Recent empirical evidence shows that the monetary policy response to episodes of financial turmoil have not been always the same and is generally asymmetric (see Bean, Paustian, Penalver, & Taylor, 2010). The global financial crisis is one such example. The financial crisis of 2007–2008 solicited more aggressive and unprecedented interest rate cuts in advanced economies (AEs) as well as emerging market economies (EMEs) compared to the bursting of the dotcom bubble in 2001 or the Asian financial crisis in 1997. Given that financial stress events occur infrequently and the intensity and sources of these events are not the same, it is thus natural to consider a possible nonlinear relationship between monetary policy and financial stress.

This study tests for a state-dependent monetary policy reaction function of the central bank,–by investigating whether there exists a threshold point for financial stress beyond which monetary policy's response changes significantly, and more specifically, whether there also exists different thresholds for various types of financial sector-specific stress. The conventional view is that monetary policy reacts to movements in and volatility of financial market variables (e.g., exchange rate or stock market volatilities) in a systematic manner through a decrease in interest rates (see Bean et al., 2010; Bernanke & Gertler, 2001). However, the monetary policy-financial stability relationship may exhibit some form of nonlinearity especially when the level of financial stress reaches a certain tipping point, beyond

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which monetary policy may or may not be more aggressive. Existing evidence however, is mostly obtained in the single country case. Panel data methods, by taking into account country-specific characteristics, i.e., political, economic and trade institutions, have the better advantage in addressing the noise coming from individual countries. This allows one to come up with an average (possibly) nonlinear causal relation between monetary policy and financial instability.

Using a unique panel dataset, we estimate the average reaction function of 10 AEs and 11 EMEs between 1994:Q1 and 2013:Q3 and between 1996:Q2 and 2013:Q3 respectively. We employ an off-the-shelf dynamic panel threshold (DPT) regression model to estimate the (possibly) nonlinear impact of financial instability on simple interest rate rules augmented with a financial stress indicator (FSI). In particular, we consider the potential existence of threshold values of the FSI that could account for the time variability of the estimated effects of financial stress (and its subcomponents) on policy interest-rate settings. We relax the assumption of both linearity and the existence of a functional form and allow the interest rate reaction function to switch according to an observable signal in a panel of AE and EMEs.

This paper complements previous studies on the effect of financial variables on the interest rate reaction function of central banks (see Baxa, Horváth, & Vašíček, 2013; Bernanke & Gertler, 2001; Lubik & Schorfheide, 2007; Martin & Milas, 2013) and on papers that employ dynamic panel threshold regressions, an econometric method that has been gaining much attention from applied researchers in recent years (see for example, Chao, Hu, Munir, & Li, 2017; Kremer, Bick, & Nautz, 2013; Kurul, 2017; Proaño, Schoder, & Semmler, 2014). We highlight three main contributions to the literature that are both empirical and methodological. First, we employ the FSI of Dovern and van Roye (2014), as well as its subcomponents, i.e. banking sector, foreign exchange, stock market and government bond market stress for a wider set of countries around the world.[1] To the best of our knowledge, this is the first study to use a comprehensive set of disaggregated financial stress indicators for advanced and emerging market countries in a panel data setup. In addition, we account for the most recent period characterized by unconventional monetary policy measures by employing the shadow policy interest rates of Wu and Xia (2016) and Krippner (2015) for countries that were in the zero lower bound.

Second, we robustify econometric inference by extending the DPT model proposed by Kremer et al. (2013) into a factor-augmented version thereof (FA-DPT). A substantial shortcoming of the dynamic panel threshold regression literature is that error cross-sectional dependencies across countries due from for example, global shocks or global spillovers are largely ignored. Abstracting from these dependencies has grave consequences in terms of the coefficient estimates (Bai, 2009; Pesaran, 2006; Phillips & Sul, 2003). The presence of error cross-sectional dependence may induce biasedness and consistency problems and spurious inference in standard panel data estimators and could minimize the efficiency gains of conducting panel data over single-unit estimation (Phillips & Sul, 2003). In our proposed FA-DPT model, we set up a factor structure of the panel error disturbances. In this way, we account for the potential distortive effects of cross-sectional dependence that could arise due to omitted common effects, which are possibly correlated with the regressors. The common unobserved components that we generate from the regression residuals allow us to capture general forms of unobserved heterogeneity, i.e., global interest rates, global liquidity, cross-country capital flows and commodity price movements. Given that global shocks account for much of the propagation of financial crises across economies, assuming independence in the resultant series could give the illusion of threshold effects or nonlinear effects of financial stress on monetary policy settings.

Third, we lay out the central finding that AE and EME central banks' monetary policy responses to the FSI subcomponents are highly dependent on the state of overall financial market stress.[2] On the one hand, AE central bank interest rate policies most of the time do not respond to stock market and banking sector stress, but react in an aggressively accommodative manner when financial markets are in a state of high volatility. On the other hand, evidence of threshold effects in EMEs are generally weak in the sense that they are not robust to structural change. In particular, EME central banks raise policy interest rates in response to stock market and foreign exchange stress only for levels of the FSI below the threshold, but this evidence does not hold when considering only the post-2000 period. An equally important finding is that when we account for cross-sectional dependence, the size of the interest rate response of AEs and EMEs is generally reduced (or even become statistically insignificant) in some specifications and increased in others.

The paper is organized as follows: Section 2 provides a literature review on previous work done on this subject, Section 3 lays out the econometric methodology employed, Section 4 presents the data, Section 5 discusses the estimation results, and Section 6 concludes.

2. Monetary policy and financial instability: what have we learned so far?

There are more facets to detecting systemic risks as opposed to inflationary risk, which is why financial stability as a monetary policy goal is still widely debated among policymakers and academics. Some advocate a preemptive tightening of monetary policy to address risk-taking behavior in all markets, i.e., the so-called leaning against the wind. Others are cautious about the tradeoffs of using monetary policy to achieve two targets. Indeed, empirical evidence confirms that central banks' interest setting behavior does behave differently in the face of heightened financial stress. Baxa et al. (2013) analyze the interest-rate setting behavior of four major AE central banks in the face of financial stress using time-varying parameter estimations and find a substantial easing of monetary policy settings during periods of "high" financial stress. In the case of the U.K., Martin and Milas (2013) show the tendency of the Bank of England (BoE) to react to financial stress in a nonlinear way. They show that the BoE reacted more strongly to financial stress during the 2007 financial crisis relative to previous financial stress periods. They also find a breakdown of the Taylor (1993) rule starting in 2007. By contrast, Fouejieu (2014) conducts single-unit and panel regressions for EMEs and finds that inflation targeting countries are more responsive to

[1] Balakrishnan, Danninger, Elekdag, and Tytell (2011) and Cardarelli et al. (2011) were the first ones to construct an FSI for a group of AEs and EMEs and FSI subcomponents for AEs, respectively.

[2] Throughout the paper, we will use the terms stress and volatility interchangeably.