Regime-switching monetary policy in Canada

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ABSTRACT

This study captures regime-switching, monetary policy responses to financial market disturbances in Canada. Monetary policy is identified within a nonlinear, structural VAR framework with a regime-switching policy block that allows for contemporaneous policy reactions in a small open economy. The key finding is that monetary policy in Canada has undergone important changes in monetary policy regimes since the early 1970s that correspond to changes in operating procedures and medium-term inflation targets. Overall, the Bank of Canada is found to use a "hybrid" operating procedure in different monetary policy regimes, where it sets a monetary policy rate, while "leaning against the wind" to smooth exchange-rate fluctuations and to offset unexpected increases in long-term yields in order to maintain monetary conditions. Although the magnitude of the contemporaneous monetary policy responses are regime-dependent, the transmission of the responses through financial markets are regime independent. The study also constructs regime-switching measures of the overall level and relative volatility of monetary conditions that captures both the endogenous and exogenous components of the monetary policy response function.

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1. Introduction

Vector autoregression (VAR) models have been widely used to recover monetary policy innovations and policy responses to economic and financial disturbances. However, the VAR reaction functions generally rely on the strong assumptions of the linearity properties of moving average representations, and the time invariance of estimated coefficients and variance–covariance structures.[1] These assumptions are particularly problematic in light of the growing literature documenting that the stochastic behaviour of interest rates varies over time.[2] The important policy issue is the stability of the reaction function because central bank behaviour may change with different operating procedures or medium-term operating targets.

Another common criticism of the VAR approach to the study of monetary policy is that it mainly captures policy innovations and not the important endogenous or systematic responses that rely on the central bank's information set. The criticism implies that VAR response functions may generate monetary policy choices that are uncorrelated with current economic and financial surprises. An overall measure of monetary conditions should also include endogenous responses to important policy variables or indicators.

This study overcomes some of the limitations of VAR models using the Bernanke and Mihov (1998) methodology that identifies monetary policy responses within a nonlinear, structural VAR framework with a regime-switching policy block.

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[1] See Rudebusch (1998) for a useful discussion of these limitations.
[2] A recent sample of this research includes Gray (1996), Bekaert et al. (2001), Chen (2001), Ang and Bekaert (2002a,b), Bansal and Zhou (2002), Sarno et al. (2005), Clarida et al. (2006), Ang et al. (2007), Lange (2010).

The structural VAR approach has the advantage of specifying an explicit monetary policy response function using non-recursive contemporaneous restrictions, rather than relying solely on reduced-form equations and a Choleski factorization that mechanically imposes a "semi-structural" interpretation. Instead, the methodology in this study allows for contemporaneous policy reactions in a small open economy. In addition, the regime-switching framework has the advantage of allowing parameters of the policy response function to vary over time in response to changes in operating procedures and targets.[3] The regime-switching approach allows inferences about changes in central bank behaviour that are based entirely on the data.

The empirical framework in this study extends the Bernanke and Mihov methodology by allowing the variances of the orthogonal shocks in the endogenous policy block of the model to vary between the states in order to provide for a more interesting shift in the structure of the policy block. Sims and Zha (2009) and Valente (2003) find that shifts in the variances of regime-switching VAR models are very important for improving fit. This study also constructs measures of the overall level and relative volatility of monetary conditions that captures the time-varying endogenous responses of monetary policy to important economic and financial disturbances, as well as exogenous innovations in macroeconomic variables.

The key finding is that monetary policy in Canada has undergone significant changes in monetary policy regimes since the early 1970s that correspond to changes in operating procedures and medium-term inflation targets. In particular, the data choose two distinct high-variance, large-response regimes, both coinciding with changes in monetary policy operating procedures or targets and with sharp drops in the trend rate of inflation. The first regime occurs mainly during the first half of the 1980s, when the trend rate of inflation dropped from the double-digit range to slightly above 4%, and the Bank of Canada abandoned its policy of monetary gradualism tied to targets for M1 growth. The second regime occurs mainly during the first half of the 1990s, when the trend rate of inflation declined another step to around 2% and explicit inflation-control targets were adopted by the Bank and the Government of Canada. In short, the two high-variance, large-response regimes coincide with changes in monetary policy operating procedure and with shifts to lower inflation regimes.

The data also choose two distinct low-variance, small-response regimes. The first regime spans the period between the two high-variance regimes during the latter half of the 1980s when the Bank of Canada maintained trend inflation around 4% and set the level of the overnight rate to achieve overall monetary conditions across the interest rate, exchange rate, and credit channels of the monetary transmission mechanism. The second regime occurs from the late 1990s to the present when the Bank explicitly targeted a 2% rate of inflation and continued to use the overnight rate to achieve an overall level of monetary conditions.

Overall, the Bank of Canada is found to use what is often referred to as a "hybrid" operating procedure in both regimes, where it targets the overnight rate, while "leaning against the wind" to smooth exchange rate fluctuations and to offset unexpected increases in long-term yields in order to maintain monetary conditions. In particular, the estimated coefficients indicate that contemporaneous monetary policy responses to shocks to either the exchange rate or the long-term yield are about three times larger during volatile interest-rate periods than during the more "normal" periods. However, the contemporaneous responses of credit and exchange markets to monetary policy responses and shocks are found to be relatively similar across the different regimes. Thus, although the contemporaneous financial component of the monetary response function changes with regime switches, the transmission of monetary policy through financial markets does not change with regimes.

The following section briefly reviews some previous research on regime-switching VAR approaches to monetary policy. Sections 3 and 4 outline the empirical methodology and the monetary policy model. Section 5 discusses the data. The estimated impulse responses for the structural VAR are presented in Section 6 and the regime-switching policy responses in Section 7. The monetary policy regimes and regime-switching measures of monetary conditions are discussed in Section 8. The final section outlines some limitations of the study and issues for further research.

2. Previous research

The methodology used in this study is closely related to the structural VAR model with a regime-switching monetary policy block proposed by Bernanke and Mihov (1998). The monetary policy block in their model includes all the policy variables needed to construct a simple model of the market for bank reserves in the United Sates. They rely on statistical tests of over-identifying restrictions to identify the different operating procedures available to the Fed, which identifies monetary policy in their VAR model.

Bernanke and Mihov apply the Hamilton (1990) regime-switching approach to a (just-identified) model of the market for bank reserves to allow for regime-switching Fed responses to shocks to the demand for total reserves and nonborrowed reserves. Their regime switches correspond closely to the well-known "Volcker experiment" with nonborrowed reserve targeting during the 1979–82 period, and an operating regime focused on interest rates with minor attention to reserve aggregate smoothing outside of the 1979–82 window. Their finding is also consistent with Hamilton's (1988) earlier regime-switching, interest-rate model that finds the behaviour of interest rates during the volatile 1979–82 period to be a structural break due to the adoption of a policy of targeting nonborrowed reserves. Bernanke and Mihov also use the restrictions for the just-identified model to construct a regime-switching stance measure of monetary policy.

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[3] Markov-switching equations and VAR models have been used by Dueker and Fischer (1996), Sims (1999), Valente (2003), Sims and Zha (2009) to estimate implicit monetary policy rules.