Business cycles and monetary policy asymmetry: An investigation using Markov-switching models

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Abstract

This study assesses empirically the effects of monetary policy on four ASEAN economies in different states. The idea of asymmetry is being examined by using the relatively popular technique of non-linear modeling—Hamilton’s Markov regime-switching model. The findings confirmed the existence of two-regimes in all economies under study. Additionally, the null hypothesis of symmetry had been rejected in the case of the four economies and to a great extent, monetary policy was confirmed to have had larger effects during recessions. These findings, thus, may imply the important role that credit market imperfections have on a firm’s investment behavior, which in turn suggests that the financial accelerator is a relevant mechanism underscoring the observed asymmetry.

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1. Introduction

It has long been proposed by theorists such as Mitchell \cite{1} and Keynes \cite{2}, that the movement of certain macroeconomic variables across business cycles may be asymmetric. Nevertheless, most empirical and theoretical modeling in macroeconomics has incorporated explicitly linear adjustment mechanisms, which imply that responses to shocks are both continuous and symmetric.

Various sorts of non-linear models have been receiving increased attention in literature focusing on the econometric time series. Linear models, with their implied symmetry, have been shown to be deficient in dealing with certain traits of some economic series. They are unable, for instance, to fully capture the high volatility of certain financial variables \cite{3} or the asymmetrical behavior of business cycles \cite{4–8}.

As mentioned in Hamilton \cite{5}, there is “accumulated evidence that departures from linearity are an important feature of many key macro series”. Hamilton introduced a two-regime Markov-switching model with endogenous structural breaks to analyze the behavior of gross domestic product (GDP) data. His results...
matched the turning points (between recessions and booms) as shown in the data by the National Bureau of Economic Research.


In this study, the Markov regime-switching model developed by Hamilton [5], which shares the principle that the generating process of a series is a function of some states of nature, has been utilized to analyze the asymmetric effects of monetary policy in four ASEAN economies—Indonesia, Malaysia, the Philippines and Thailand. Having validated the existence of two-regimes in these economies, the model was extended as suggested by Garcia and Schaller [17] to include a measure of monetary policy shocks in order to examine if monetary policy has the same effect during a recessionary period as it does during an expansionary period.

By way of summary, the overall findings provided substantial evidence of the existence of two-regimes in all the economies over the sample period that ended in 2003:4. Most importantly, the results generated from this analysis lent credence to the asymmetric effects of monetary policy over business cycles for all the four economies. In particular, by looking at the monetary policy coefficients, the real impact on a recession period appeared greater than on an expansion period for all model specifications. Section 2 of this study is meant to offer a concise review of the Markov regime-switching approach, followed by Section 3 which discusses the methodology. Section 4 is centered on the empirical results and the relevant insights, while the closing Section 5 presents key conclusions and suggestions.

2. Markov regime-switching approach

2.1. Markov regime-switching model

The Markov regime-switching model explicitly takes into account the probabilistic nature of business cycle dating by treating the state of the economy (expansion/recession) as an unobserved latent variable. This is made clear the Hamilton [5] model:

\[ \Delta y_t - x_0 - x_1 S_t = \phi_1 (\Delta y_{t-1} - x_0 - x_1 S_{t-1}) + \cdots + \phi_r (\Delta y_{t-r} - x_0 - x_1 S_{t-r}) + \epsilon_t \]  

(1)

where \( S_t \) is the state variable, \( \Delta y_t \) is the growth rate of output, and \( x_1 \) and \( x_0 + x_1 \) are the mean growth rate conditional in state \( S_t \), the parameters being \( \phi_1, \ldots, \phi_r \) capture the autoregressive component of output growth and \( \epsilon_t \) is distributed \( \mathcal{N}(0,1) \). In the case of only one state, the model reduces to a standard linear reduced-form equation. Through this study, two states (\( S_t = 0 \) and \( 1 \)) are allowed with the probabilities of changing from one regime to the other expressed by the following transition matrix:

\[
\begin{bmatrix}
    p_{00} & p_{01} \\
    p_{10} & p_{11}
\end{bmatrix},
\]

(2)

where

\[ p_{ij} = \Pr[S_t = j \mid S_{t-1} = i] \]  

with \( \sum_{j=0}^{1} p_{ij} = 1 \) for all \( i \).  

(3)

The element of the \( i \)th row and \( j \)th column describes the transitional probability \( p_{ij} \). The individual \( p_{ij} \)'s represent the likelihood that the economy would switch from the \( i \)th state to the \( j \)th state. For instance, the value of \( p_{01} \) represents the probability that the economy will move from state 0 to state 1, given that the economy is in state 0.

In the case of a two-state model, the transition probabilities can be represented by a \( (2 \times 1) \) vector, \( \begin{bmatrix} c_0 & c_1 \end{bmatrix} \), whose first element is \( \Pr(s_t = 1 | Y_t) \) where \( Y_t = (Y_{t-1}, y_t) \) and \( Y_{t-1} \) contains past values of \( y_t \). Given the value
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