

Markov Switching Models for Time Series Data with Dramatic Jumps (Model Peralihan Markov untuk Data Siri Masa dengan Lompatan Drastik)

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ABSTRACT

In this research, the Markov switching autoregressive (MS-AR) model and six different time series modeling approaches are considered. These models are compared according to their performance for capturing the Iranian exchange rate series. The series has dramatic jump in early 2002 which coincides with the change in policy of the exchange rate regime. Our criteria are based on the AIC and BIC values. The results indicate that the MS-AR model can be considered as useful model, with the best fit, to evaluate the behaviors of Iran's exchange rate.

Keywords: Fluctuations of exchange rate; Markov Switching Autoregressive model; nonlinear times series models

ABSTRAK

Dalam penyelidikan ini model autoregresi Markov (MS-AR) dan enam pendekatan model siri masa dipertimbangkan. Model-model ini dibandingkan mengikut keupayaan mendapatkan siri kadar pertukaran wang Iran. Siri ini mempunyai lompatan drastik pada awal 2002 yang berlaku serentak dengan perubahan polisi kadar regim pertukaran wang. Kriteria yang telah kami gunakan adalah berasaskan kepada nilai AIC dan BIC. Keputusan menunjukkan bahawa model MS-AR boleh dikatakan berguna.

Kata kunci: Model autoregrasi peralihan Markov; model siri masa tak linear; naik-turun kadar pertukaran

INTRODUCTION

Many economic time series associated with events such as financial crises, war or change in government money policy exhibit dramatic jumps in their behavior. When jumps arise in time series data, a powerful tool that update themselves using a change in their regime is the Markov switching models. This model offers a better statistical fit to the data than the other models.

The ARCH model that was presented by Engle (1982) could be used in a large variety of modeling of the fluctuation of exchange rate (Kang, 1999; Kroner & Lastrapes, 1993; Wang & Wong, 1997). Engle and Hamilton (1990) used Markov switching (MS) model for survey fluctuations of dollar and showed that this model is better than the random walk model to forecast the fluctuation of dollars rate. Hamilton and Susmel (1994) pioneering work provides the evidence that a Markov switching autoregressive conditional heteroskedasticity (MS-ARCH) of exchange rates outperforms the ARCH and GARCH models for the New York stock exchange. Bollen et al. (2000) showed that the Markov switching model captures the dynamics of exchange rates better than the alternative time series models. Lee and Chen (2006) discussed the Markov switching model in exchange rate prediction. Ismail and Isa (2006) showed that the MS-AR

model is the best-fitted model for modeling fluctuations of exchange rates for three Asian countries.

To control their currencies many developed countries have used the managed floating of exchange rates regime since the mid-1980s. In early 2002, the Iranian government adopted a managed floating for administering of the fluctuations of the exchange rate. This change in policy for exchange rate regime in Iran caused dramatic increase in exchange rate of the Rial per dollar (Figure 1). To find the best-fitted model for the behaviors of Iran's exchange rate after introducing the data, two stages were taken. In the first stage, the comparison of the AR, ARMA, ARCH and GARCH models using the model selection criteria (AIC) will be given. In the second stage, after introducing the nonlinear additive AR, self-exciting threshold AR, logistic smooth transition AR, and Markov switching AR models briefly, they will be compared for analysis of our data using AIC, BIC values.

DATA AND MODEL SELECTION

In this study, we employed the Iran's Rial per the U.S. dollar collected monthly for the period 1995-2009 by the International Monetary Fund (IMF) and could be obtained from <http://www.imf.org>. The variable under investigation