Application Markov Switching Regression (AR)

Ahmad Subagyo
Lecturer Management of STIE GICI Depok, Indonesia.
E-mail: bgy2000@yahoo.com

Teguh Sugiarto
Lecturer at Budi Luhur and AAJ Jayabaya University,
Jakarta, 12260, Indonesia.
E-mail: teguh_cpconsulting@yahoo.com

Abstract

In this study the author will use the model of switching markoc regresion (AR) in the estimated variable of the GDP of indonesia. Data analysis methods in use by this author is based on the model in initiated by Hamilton (1989) [1], in which the approximate Markov regime-switching regression which relies on the assumption that latent state variables control the exogenous regime change. This study assumed that by developing a model of endogenous parsimonious Markov regime-switching will be able to make a conclusion through maximum likelihood estimation is possible with relatively minor modifications to existing recursive filters. In Turner, Nelson and Startz (1989)[2] Monte Carlo experiment test is considered accurate enough, even in the presence of a certain model misspecifications. Thus, we can expand the volatility feedback model equity returns are given to allow the switch to endogenous ones.

Keywords: Endogeneity, Regime-Switching, GDP, Switching regression

JEL Classification: C13, C22, G12

1. INTRODUCTION

In linear regression analysis and the model is one of the main tools for econometric and statistical analysis. However, there is some evidence that the model of nonlinear is sometimes right and sometimes less precise in karenakan analysis tools are in use, especially in the analysis of macroeconomic relations depends on a regime change. In this study will explain how a tool-assisted analysis software that is in use, it can be to

move the model regression linear regression model with — the nonlinearities that arise from a discrete regime change. The name of the tool that is used by the author here is the Eviews.

Later in this study will be doing some consideration on setting the subject that concerns with independent and a Markov switching where the separation of the sample to a regime that is often not observed. Process Dynamics specifications were allowed through the use of the dependent variable is left behind as other variable description and through the presence of auto-correlated errors. For more details we can see the theory of analysis used in this study.

2. THEORY OF SWITCHING REGRESSION
Background

The following discussion describes only the basic features of switching models. Switching models have a long history in economics that is detailed in numerous surveys (Goldfeld and Quandt, 1973[3], 1976[4]; Maddala, 1986[5]; Hamilton, 1994[6]; Frühwirth-Schnatter, 2006[7]), and we encourage you to explore these resources for additional discussion.

Literature Review Marcov Switching Regression

In a study performed by Hamilton (1989)[1] gives an overview of how the life cycle of a business using Markov switching autoregressive process model, which can be used in various studies the empirical and theoretical basic in finance or economics. Studies Quandt (1958)[8], Goldfeld and Quandt (1973)[9] Is one of the famous sets for modeling with regime-switching regression, or better known by the name of Markov-switching model. This model of latent variables with mark as the country that controls the regime shifts follow the chain of Markov, and successive series. Still in Hamilton (1989)[1], Sims and Zha (2006)[10] and Owyang (2002)[11], and Turner et al. (1989)[12] presence of exogenous regime shifts towards the realization of all disorders of the regression. And in the development of Gaussian Markov model endogenous switching regime based on probit specification, considered too stingy as restrictions of the simple parameters. Some model applications in economics, which investigate the Markov-switching regression has been moved to the bow of the endogenous model. Too many application models in macroeconomics and financial Sciences where it is natural to consider the State of the endogenous in the something of the situation. The existence of the application of several models and the latest science in the regime-switching models, in terms of monetary identified VARs for example. They assume the existence of or the incidence of shocks can create a problem in the regression equation that has been created. Like the case of the occurrence of the correlation or relationship between macroeconomic variables of shocks that are correlated with kedaan a business in a country, that when we make a possibility if there is a dealer does not observe the nation, but rather fascinating conclusion contents unknown to econometrician, based on several sets of information. The proxy can produce in in a State for a user that can lead to a regression in describes the variables used in the model that is in shape.

To evaluate the sensitivity of maximum likelihood estimation based on Gaussian model misspecification for endogenous switching models, we had a battery of Monte Carlo experiments in which the process of generating the correct data is endogenous switching models are non-Gaussian. These experiments suggest that the maximum likelihood estimation of quasi-producing an accurate estimate of the parameter switching endogenous model, at least for certain model misspecifications is considered. We did an additional Monte Carlo experiment for evaluating the performance of finite sample test for endogenous switching, and the study of probability ratio test had been close to the correct size for all cases considered. Still in Hamilton (1989)[1], Maddala and Nelson (1975)[13] lots of studies that has been switch using endogenous variable term, such as the main application in the context of the dependent variable are limited to such as setting options and market imbalances. In order to expand a model then he made " the volatility feedback " as a form of equity return given in allowing to switch to endogenous. Markov-switching models provide some atmosphere that may make a marginal in the statistical proof. In some writings that do use of endogenous switching models, has much in common with the previous one. Where endogenous switching models allow for endogeneity has an effect that is greater than the estimated parameters.

If the view in the study performed by Chen, Diebold and Schorfheide (2013)[14], Andersen, Dobrevb, and Schaumburg (2012)[15] increase over data availability open other applications against Markov switching regression model high frequency. Empirically, there is intraday volatility U-shaped around the day of the results of their analysis. Intraday volatility this is a regime that considered easily imagine different, depending on the intensity of trade on the market. In the modeling of Markov-switching regression model the occurrence of a high frequency data in complex problems considered, due to the use of assumptions log prices con-tinuous observed and free from errors of measurement and process log prices in a continuous latent dimengamati time just around the process of discrete time intervals. Another case of Barndorff-Nielsen and Shephard (2001)[16], Barndorff-Nielsen and Shephard (2002)[17], Protter (2004)[18], Fang (1996)[19], Dreou and Ghysels (2002)[20] and Bai X. (2004)[21] which performs standard to measure in an econometric integrated science using the volatility that would be imposed on certain examples in karenakan existence of errors in the measurement error. Those last three considered that possibility to be in the clear, in doing the calculations on the variance contaminated by micro-market excitement. In the add by using analysis models the assumption of common classes of volatility, they are able to create a specificity theory asymp-totic distributed over a volatility. And they were aware of the existence of a fault and there there was a similarity between the volatility in proposing with volatility "in fact", which is of course the integrated volatility discretized with volatility. The results of their study indicate that the variations of the theory kuadra in show, will be able to measure and realized volatility which converges uniformly, so that the possibility of the emergence of volatility along like bring up the sampling frequency prone infinity over a sample. The existence of studies on the nature of the stochastic, back open discourse and realize the importance of the functions of a volatility. Volatility is considered one of the model works that incorporate science and discusses the nature of Econometrics.

With the finding of an increase in the frequency of the sampling results top daily, open to further empirical research can show the market there is indeed a micro distortion and noise in the estimation of efficient over a distance the refractive volatility.

Amihud and Mendelson in see (1987) [22], Andersen, Bollerslev, Diebold, and Ebens (2001)[23], Hansen and Lunde (2003)[24] Maheu and McCurdy (2002)[25], Ebens (1999)[26], Zhang, Mykland, Ait-Sahalia and (2005)[27], (2004)[28], Zhang, Zhou (1996)[29], Barndorff-Nielsen, Hansen, Lunde and Shephard (2004)[30], Andersen and Bollerslev (1997)[31], Harris (1990)[32], Harris (1991)[33] , Wasserfallen and Zimmermann (1985)[34], Hansen and Lunde (2006)[35], are some of the many articles that discuss about the relationship between micro, noise, market volatility, stock prices using the study Econometrics. In one of the study they have concluded about the effects of the micro-market frictions in the view by using model estimation in tegrated volatility. The existence of an event bid-ask a bounce in view of price reporting errors tend to be the occurrence of a serial correlation occurs at the level of the sampling frequency is higher. Records argues that one of the causes of the emergence of micro market noise that is by looking at how the nature of trading mechanism of micro-markets. A number of causes, one of which, namely the appearance of noise in the marketplace, in the presence of a stock's price causes karenakan series time discretely. Findings that generally back the exhibit a greater dispersion, occurrence of a diversion which is normality there are kemenonjolan as well as the nature of the nega-tive of an Autocorrelation which occurred in the wake of the closure of the returns. There is a difference that shows that stock prices can lead to the occurrence of noise, then a series of prices on the price of the stock will increase in the back can induce the occurrence of a variance as well as renders the serial value negatively to stock series. Some argues that with the price mechanism is effects that traded significantly, can lead to the onset of the effects of stock price behavior.

3. RESEARCH METHOD
3.1 DATA AND TIME RESEARCH
The author uses a span of data in the research starting from the years 1967-2014 for Indonesia GNP variable. The data can be by the author how to download it from the website of the World Bank. The authors conducted research at the time of the February 2016.

3.2 RESEARCH DATA ANALISYS
In this study the author will use a model Switching Regression in analyzing variable GNP in Indonesia. In this study the author uses markov switching regression (AR) model as in the illustration of the MSAR Hamilton's (1989)[1], example GNP Kim and Nelson's (1999)[36], an example of a time-varying transition probability model of industrial production, and Kim and Nelson's (1999)[36].

4. RESULT AND DISCUSSION

A study done by the author of this macro-economic variables using data GDP country Indonesia starting from 1967-2014, a model study was similar to that done by Hamilton (1989)[1], in which Hamilton determine Markov switching models are two countries in which the growth rate of GNP means regulated regime switching, and where the error following a process AR (4) regime-invariant.

The existence of the model specification the equation consists of two State Markov switching models in modeling with a single regressor means switching C and four non-AR switching requirements. The error variance is assumed to be common throughout the regime. Regressor constant C is probably only because we have the time-invariant regime transition probability. The existence of a process of convergence tolerance exemptions that have specified 1e-8, making the rest of the settings at their default values. For that we can see the results of the appearance of the following estimation, where the top of the output explains about setting estimate [Table : 1]:

Table 1: Result display marcov switching model

Dependent Variable: GDP		
Method: Switching Regression (Markov Switching)		
Date: 01/14/16 Time: 03:03		
Sample (adjusted): 5 48		
Included observations: 44 after adjustments		
Number of states: 2		
Initial probabilities obtained from ergodic solution		
Ordinary standard errors & covariance using numeric Hessian		
Random search: 25 starting values with 10 iterations using 1 standard		
deviation (rng=kn, seed=70471180)		
Failure to improve objective (non-zero gradients) after 252 iterations		

Sorces : Proceed by autor

In this study the author tried to replicate estimates as performed by Hamilton (1989)[1], in which Hamilton uses the default settings on the analysis tools are in use. We can see the results in a gain that experience the difference due to the different set of initial values are random [Table : 1]. Thus in the later we will be able to use a random number generator seed setting to get the initial values are the same. In the middle of this model showing the specific regime for coefficient of mean and distribution coefficients of invariant errors. We can see how the existence of differences in the way a particular regime, what term Hamilton fast and slow to Indonesia'S GDP variables apply [Table : 2].

Table 2 : Result GDP for Indonesia

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	3.16E+11	3.18E+11	0.994406	0.3200
Regime 2				
C	3.16E+11	3.18E+11	0.994449	0.3200
Common				
AR(1)	1.406175	0.170401	8.252176	0.0000
AR(2)	-0.340528	0.297930	-1.142980	0.2530
AR(3)	0.081269	0.300618	0.270339	0.7869
AR(4)	-0.175045	0.186601	-0.938067	0.3482
LOG(SIGMA)	24.45067	0.121232	201.6854	0.0000

Sorces : Proceed by autor

The remaining results show the parameters of the transition matrix and summary statistics for the estimated equation [Table : 3].

Table 3 : Result matrx parameter statistik

Transition Matrix Parameters

P11-C	0.061352	0.873589	0.070230	0.9440
P21-C	-0.076140	0.766607	-0.099321	0.9209

Mean dependent var	2.34E+11	S.D. dependent var	2.62E+11
S.E. of regression	4.53E+10	Sum squared resid	7.60E+22
Durbin-Watson stat	1.900000	Log likelihood	-1138.258
Akaike info criterion	52.14810	Schwarz criterion	52.51305
Hannan-Quinn criter.	52.28344		

Inverted AR Roots	.89+.08i	.89-.08i	-.19+.43i	-.19-.43i

Sorces : Proceed by autor

By not focusing on the transition matrix of the parameter [Table : 3], then we will be able to examine the probability transition matrix directly and are visible to display the default appearance of the summary below [Table : 4] :

Table 4 : Result matrix probabilities summary view

Equation: UNTITLED
Date: 01/14/16 Time: 03:08
Transition summary: Constant Markov transition
 probabilities and expected durations
Sample (adjusted): 5 48
Included observations: 44 after adjustments

Constant transition probabilities:
P(i, k) = P(s(t) = k | s(t-1) = i)
(row = i / column = j)

	1	2
1	0.515333	0.484667
2	0.480974	0.519026

Constant expected durations:

	1	2
	2.063273	2.079114

Sorces : Proceed by autor

If we are going to do or see the matrix of transition probabilities and duration would be expected [Table : 4], having regard to that there is a dependency on the State level of several marine transition probability enough with relatively higher probability of remaining in the origin of the regime, we can see on the chart when the results of the out put value matrix is 0.90 marks to state that the value of the output is high, while for the value of 0.75 to state that the value of the output is low.

The corresponding expected duration in a regime which is approximately (4) and (1) distance between them, respectively. Thus this study can display the filtered sample estimates and probabilities are in full command of estimation. By displaying results only for the orders estimation. Then repeat the procedure of vote results will be in the get output like below, to estimate the equation:

Estimation Command:
=========================
SWITCHREG(TYPE=MARKOV,RNG=KN,SEED=230719159) GDP C @NV AR(1) AR(2) AR(3) AR(4)

Estimation Equation:
==========================
1: GDP = C(1) + [AR(1)=C(3),AR(2)=C(4),AR(3)=C(5),AR(4)=C(6)]

2: GDP = C(2) + [AR(1)=C(3),AR(2)=C(4),AR(3)=C(5),AR(4)=C(6)]

SIGMA = @EXP(C(7))

Substituted Coefficients:
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1: GDP = 466652311476 + [AR(1)=1.25946728243,AR(2)=-0.140926304636,AR(3)=0.0617408806296,AR(4)=-0.202944975988]

2: GDP = 466612661859 + [AR(1)=1.25946728243,AR(2)=-0.140926304636,AR(3)=0.0617408806296,AR(4)=-0.202944975988]

CONCLUSION

From the research that has been done by authors by using variable GDP, have developed a Markov-switching model where the latent variable in a country can control the shift regime endogenously determined. The model in this form by the author a little parsimonious, and acknowledge the test for endogenous switching as a simple parameter restrictions. As in the quotation by the author in Hamilton (1989)[1] and in the Turner, Nelson and Startz (1989)[1] explained that the parameters of the model that will be in the measure can be estimated via maximum likelihood with relatively minor modification of a recursive filter. Process the presence of Monte Carlo experiments suggested that maximum likelihood estimation of endogenous switching models and tests the ratio of chances for endogeneity performed well enough for a process that produces the data considered. But in this study applies the model to test the switch to an endogenous model in model equity returns volatility feedback given.

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