IDENTIFICATION OF REGIME SWITCHING IN NON MANUFACTURE SECTOR IN INDONESIA STOCK EXCHANGE

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ABSTRACT: *The purpose of this study is to explain the regime switching of shares sectorally in non-manufacturing sector shares consisting of property sector, infrastructure sector, financial sector, and trade sector at Indonesia Stock Exchange. This study uses parametric models of markov switching to identify market regimes that occur in the non-manufacturing sector. This study uses monthly data from the Indonesian Stock Exchange of 251 observations, the period 1996 to 2016. The results of this study indicate that regime switching occurs in non-manufacturing sector shares in the Indonesia Stock Exchange. Regime differences are mainly due to differences in stock return volatility of each sector. In relative terms, the shares of the infrastructure sector experienced the longest bearish condition, during the 1997-1998 monetary crisis, while in the financial crisis of 2008 stocks in the financial sector experienced the longest bearish conditions.*

Key Words : Markov Switching Model, Sector Non Manufacturing , Stock Exchange, bullish Conditions, bearish conditions.

1. INTRODUCTION

The identification of stock market conditions is an important input for investment decision making and economic analysis [1]. Predicting stock market condition is something that is important in the financial world. The prediction of stock market conditions is a key element in analyzing and predicting financial markets, it is particularly relevant for investors in applying market timing strategies in their trading practices. They seek to invest in assets with an uptrend position and release assets with a downtrend position; the successful execution of such strategies requires accurate identification and prediction of uptrend and downtrend periods.

In relation to investment in common stock, investors will be exposed to a wide selection of industrial sectors. Sectoral investment analysis is important because it will make easier for investors to determine their investment options [2]. Therefore, the identification of market regime by sector should also be done to know the condition of stock market sectorally.

All companies listed on the Indonesia Stock Exchange can be grouped into Companies incorporated in the extractive sector (consisting of agriculture and mining sectors), Manufacturing Sector (consisting of Basic Industrial Sector, Various Industries Sector, and Consumer Goods Industry sector), Non Sector Manufacturing (consisting of Property and Real Estate Sector, Infrastructure Sector, Finance Sector and Trade and Service Sector). In this paper we will discuss the non-manufacturing sector which consists of four sectors namely: Property and Real Estate Sector, Infrastructure Sector, Finance Sector, and Trade and Service Sector.

2. THEORETICAL FRAMEWORK

Many studies have been conducted by researchers related to stock market conditions. Based on the belief that the behavior of stock prices will vary according to the conditions. Stock market conditions are latent. Many of the existing studies using the realization of *return* to determine the difference in stock market conditions whether the market is in an uptrend or downtrend at a certain time. The uptrend stock market conditions is often termed as the condition of bullish and the downtrend market conditions are termed as the bearish conditions. [3] provides an econometric model for analyzing *bullish* and *bearish* conditions and *switching* between the two conditions. Based on this framework, [4] and [5] conducted research on regime change and market volatility in both, while [6] found that the S & P 500 index could have different mean

and variance across all bullish and bearish conditions. [7] and [8] examine the portfolio decisions associated with asset *return* on *regime-switching* that provide insight into investment in *bullish* and *bearish* conditions.

Stock markets are also considered to have cyclical patterns that can be captured by regime-switching models. For example, [9] connected business cycles and stock market regimes, [10, 11] used Markov-switching parameterization to analyze the bullish and bearish regime nature extracted from aggregate stock market returns.

Financial time series data, especially stock prices, always experienced a period of changes quite drastically at a certain time. This kind of phenomenon can not be modeled with linear time series model of single equations. Usually the regime shift will occur due to economic and financial crisis. This causes changes in the nature of the time series which motivates the use of regime switching model [12,. 13] uses a markov regime switching model to identify the conditions of the Indonesian Stock Exchange.

Some examples of financial economic crisis are the economic crisis that occurred between 1997 - 1998 in East Asian countries causing massive currency devaluation; the 2008 subprime mortgage crisis in the United States; Europe's debt crisis in 2010. This incident has an impact on stock market conditions around the world including the Indonesian stock market.

3. METHODOLOGY

Identification of bearish and bullish market condition by using Markov Switching Model hereinafter will be seen whether there is switching on stock market sectorally for each sector in Indonesia Stock Exchange. At this stage, we will describe stock market conditions on the Indonesia Stock Exchange during the observation period and will be determined the periods of bullish and bearish for each sector in the Indonesia Stock Exchange.

The Parametric Method based on the Markov Switching Model (MSM) was introduced in finance by [1, 3, 6; 9, 10, 11, 13, 14] to identify the bullish and bearish regimes on the stock market.

r_t = Sectoral stoks *return* of sector i at time t, calculated from logarithm of change of stocks price index from sector i, at time t (Y_{it})

$$r_t = 100 \cdot \ln(Y_{it}/Y_{it-1}) \qquad (1)$$

$S_t = i$, is the market condition variable, i = 1; 2

$S_t = 1$, *bullish* condition

$S_t = 2$, *bearish* condition

Then a two-state Markov-Switching Model, which describes the evolution of data $r_t = \{r_1, r_2, r_3, ... r_t\}$ is as follows:

$$R_t = \mu_1 S_t + \mu_2(1-S_t) + [\sigma_1 S_t + \sigma_2(1-S_t)]\varepsilon_t \qquad (2)$$

Where ε_t is *error term*, and $\varepsilon_t \sim$ i.i.d. $N(0, \sigma_{st})$
The Condition Variable of S_t is assumed to be governed by the first sequence of the Markov chain process with the transition probability, p_{ij}, given by

$$P\{ S_t = j \mid S_{t-1} = i \} = p_{ij} \qquad \forall\ i,j = 1,2 \qquad (3)$$

Specifically, $p_{11} = P\{ S_t = 1 \mid S_{t-1} = 1 \}$ indicates the possibility of starting in bullish condition and ending in the same condition and $p_{22} = P\{ S_t = 2 \mid S_{t-1} = 2 \}$ is the probability of *bearish* condition given that previous conditions are also *bearish*. Parameters and probabilities are estimated through *maximum likelihood*.

Table 1. Variable Operationalization

Variable	Variable Concept	Indicator	Unit
Stock return of property sector (r_property)	General returns from stocks of the property sector in Indonesia Stock Exchange	$r_i = (\ln IHSP_{it} - \ln IHSP_{it-1})*100$ $IHSP_i$ = the stock price index of the Property sector at time t	%
Stock return of Infrastructure Sector (r_infrastructure)	General returns from stock of the infrastructure sector in Indonesia Stock Exchange	$r_i = (\ln IHSI_{it} - \ln IHSI_{it-1})*100$ $IHSI_i$ = the stock price index of the Infrastructure sector at time t	%
Stock return of financial sector (r_finance)	General returns from stocks of the financial sector in Indonesia Stock Exchange	$r_i = (\ln IHSF_{it} - \ln IHSF_{it-1})*100$ $IHSF_i$ = the stock price index of the financial sector at time t	%
Stock return of trade sector (r_trading)	General returns from stocks of the trading sector in Indonesia Stock Exchange	$r_i = (\ln IHST_{it} - \ln IHST_{it-1})*100$ $IHST_i$ = the stock price index of the trading sector stock price index at time t	%

The stationerity test of non-manufacturing sector stock return data using *Augmented Dickey Fuller (ADF) test*.

Table 2. Stasionerity Test Results

Variable	ADF *Test*	
	t-stat	Prob
R_Property	-13.00557	0.0000
R_Infrastructure	-13.24418	0.0000
R_Finance	-12.55357	0.0000
R_Trading	-14.71874	0.0000

Table 2 shows that *Augmented Dickey Fuller test* is significant at the 1 percent level for non-manufacturing sector stock returns. This means that the stock return data of these sectors are as research variables in *stationary* conditions.

4. RESULT AND DISCUSSION
Identification of switching regime period
Identification of sectoral switching regime to non-manufacturing sector shares consisting of property sector, infrastructure sector, financial sector, and trade sector based on return of each sector by using Markov Switching Model obtained by model parameter values as follows:

Tabel 3. Parameter of *Markov Switching Model* Return Property Sector, Infrastructure Sector, Financial Sector dan Trade Sector Periods of February 1996 – December 2016

Parameter	Properti	Infrastruktur	Keuangan	Perdagangan
μ_1	1.852***	1.255***	1.706***	1.494***
μ_2	-4.779	0.111	-2.945	-2.247
S_1	8,158***	5,403***	6,534***	5,995***
S_2	18,120***	16,281***	15,029***	17,514***
P_{11}	0,9866***	0,9871***	0,9876***	0,9892***
P_{22}	0,9343***	0,9670***	0,9429***	0,9465***
ED1	74,84	77,45	80,95	92,32
ED2	15,23	30,34	17,52	18,68

***) significant at level 1%,   **) significant at level 5%   Source: Results of data processing

Tabel 4a. Regime Switching From State 1 to State 2 and ViceVersa For Property Sector

State 1		State2	
1996:02 – 1997:07	18	1997:08 – 2000:09	38
2000:10 – 2016:12	195		
84,9%	213	18,6%	38

Tabel 4b.Regime Switching From State 1 to State 2 and Vice Versa For Infrastructure Sector

State 1		State2	
1996:02 – 1997:05	16	1997:06 – 2003:09	76
2003:10 – 2016:12	159		
69,7%	175	30,3%	76

Tabel 4c.Regime Switching From State 1 to State 2 and Vice Versa For Finance Sector

State 1		State2	
1996:02 – 1997:06	17	1997:07 – 2000:06	36

2000:07 – 2008:07	97	2008:08 – 2009:04	9
2009:05 – 2016:12	92		
82,1%	206	17,9%	45

Tabel 4d.Regime Switching From State 1 to State 2 and Vice Versa For Trade Sector

State 1		State2	
1996:02 – 1997:07	18	1997:08 – 2000:09	38
2000:10 – 2008:06	93	2008:07 – 2008:11	5
2008:12 – 2016:12	97		
82,9%	208	17,1%	43

Based on regime probabilities it can be identified the period of each state and switching from state 1 to state 2 and vice versa as shown in Table 4a up to 4d.

Based on the results of the data in Table 3, it can be seen that almost all from 6 parameters estimated are significant at the level of 1 percent, only $\mu2$ is not significant either at the level of 1 percent or 5 percent. Although there is one of these model parameters that is not significant, but the interpretation of this model remains interesting. The existence of significant volatility differences that occur in each sector, identified as a difference state at certain times. Based on this condition it is concluded that regime switching occurs in Indonesian stock market. Furthermore state 1 is characterized by high return ($\mu1$) with low volatility (S1), and state 2 is characterized by low return ($\mu2$) with high volatility (S2). We refer to earlier studies such as [1, 6, 11, 12, 13]. Then state 1 is identified as a bullish state, and state 2 is identified as a bearish condition.

Bullish Condition:
Based on Table 3, throughout the observation period Property Sector is the sector with the highest average return ($\mu1$) in the bullish market condition of 1.85 percent per month, followed by financial sector (1.78 percent per month), trade sector (1, 49 percent per month), and the infrastructure sector (1.26 percent per month). The amount of standard deviation of return (S_1) or volatility, which is also a measure of risk level in bullish condition in line with the average return of shares of property sector has the highest risk level of 8.16 percent, followed by financial sector (6, 50 percent), trade sector (6.00 percent), and infrastructure sector (5.4 percent). This condition indicates that the rate of return is in line with the level of risk, the higher the return, the higher the risk that occurs.

Transition probability of bullish condition (P_{11}) is defined at present as a condition in state position 1 (bullish), then in the period to come remain in state 1 (bullish). Table 3 shows that stocks in the trade sector are relatively the highest level of probability P_{11}, which means the stocks of the sector when experiencing bullish conditions, then it is likely that the next period will remain bullish at 98.92 percent. It means that in bullish condition stocks in the trading sector will be switching to bearish conditions only by 1.08 percent chance. After the trade sector, the highest transition probability sequence is the financial sector, infrastructure sector, and property sector.

Expected Duration in bullish condition (ED1) is the average duration of a bullish period taking place on stocks of a particular sector. Trading sector shares had the longest bullish period of 92.32 months during the observation period. After that, the highest expected duration is the financial sector, infrastructure sector, and property sector.

Bearish Condition:
The results of data processing in Table 3 shows that property stocks are the sectors with the highest negative return ($\mu2$) in bearish market condition of -4.78 percent per month, followed by financial sector (-2.95 percent per month), trade sector (-2.25 percent per month), and infrastructure sector (0.11 percent per month). The standard deviation of return (S_1) or volatility, which is also a measure of risk level in bearish condition, is not in line with the average return of stocks of the property sector that remains relatively high at 18.12 percent, followed by the trade sector (17,51 percent), infrastructure sector (16, 28 percent) and financial sector (15,01 percent). This condition indicates that the mean return state 2 ($\mu2$) which is not significant causes the rate of return not in line with the level of risk.

Table 3 shows that the Infrastructure sector shares are relatively the highest level of probability P_{22}. This means that the shares of the sector at the time of bearish condition is likely that the next period will remain bearish at 96.70 percent. It means that in bearish condition the shares of the infrastructure sector will be switching to a bullish state of only 3.30 percent chance. After the infrastructure sector, sequentially the highest transition probability is the trade sector, the financial sector, and the property sector.

Expected Duration in bearish condition (ED2) is the average duration of a bearish period taking place on certain sector stocks. The infrastructure sector shares had the longest bearish period of 30.34 months during the observation period. After the trading sector in sequence, the highest expected duration is the trade sector, the financial sector, and the property sector.

Table 4a to Table 4d shows that the shares of infrastructure sector first experienced switching from state 1 (bullish condition) to state 2 (bearish condition), i.e. in June 1997, followed by financial sector in July 1997, property, and trade sector in August 1997. The financial events that led to the shift in this condition were the economic crisis that hit East Asian countries that caused massive currency devaluation or in Indonesia known as the monetary crisis. Infrastructure sector was the longest sector for switching back from bearish to bullish condition, that was in October 2003 (76 months), followed by property sector, and trade sector in October 2000 (38 months), and financial sector in July 2000 (36 month).

The monetary crisis caused the exchange rate of the rupiah against foreign currencies, especially the US dollar to be very weak. This has led to sectors such as infrastructure, property, and trade sectors that are heavily using imported goods to be hit hard and take longer to return to state 1 (bullish).

Switching from bullish to bearish condition occurred again in 2008, but in only two sectors, financial sector and trade sector. This is due to the supreme mortgage crisis event in the United States, which also affects the Indonesian stock market. The trading sector first experienced switching from bullish to bearish, i.e. in July 2008, while the financial sector in August 2008. Furthermore, the switching back to bullish conditions did not last long, stocks trading sector in December 2008 (5 months) has returned in bullish conditions, while stocks of the financial sector in May 2009 (9 months).

The crisis in 2008 had an impact on public confidence in financial institutions, plus at that time the Indonesian government conducted a bailout of one of the domestic banks. This condition causes the financial sector to experience bearish condition relatively longer than the trade sector.

5. CONCLUSION

The results of this study indicate that regime switching occurs in non-manufacturing sector shares in the Indonesia Stock Exchange. Regime differences are mainly due to differences in stock return volatility of each sector. The market regime that happens can be divided into two conditions namely the bullish and bearish conditions.

The regime switching that occurs is related to the crisis events occurring in the economy. The impact of the 1997 monetary crisis was experienced by all sectors while the longest impact was experienced by infrastructure sector stocks. The impact of the financial crisis of 2008 was experienced only by stocks in the financial sector and trade sector while the longest impact experienced by financial sector stocks.

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