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Turn-off-the-Month Effect on Stocks in LQ45 Index and Various Sectors in the Indonesia Stock Exchange using GARCH (p,q)

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There are few types of anomalies that occur in the Indonesia Stock Exchange, for example monthly effect, day-of-the-week effect, January effect, holiday effect, and turn-of-the-month effect. The existence of these anomalies is in contrast to the efficient market hypothesis theory, due to a significant difference in returns during certain periods. By using time-series analysis and the GARCH(p,q) method, the existence of the turn-of-the-month effect has been found in the Jakarta Composite Index, sectoral indexes, and stocks in LQ45. The turn-of-the-month effect seems to be seen in the last two days and the four previous days of each month. The January effect does not incite the turn-of-the-month effect. The turn-of-the-month effect appears due to an increasing volume of stocks acquired by investment managers who want to see their portfolio performance better.

Keywords: *Turn-of-the-month effect, individual stock, sectoral index, IDXI, GARCH (p,q)*

Introduction

Capital markets in various countries have shown the inefficiency of information. One form of the capital market inefficiency is the difference in returns at certain times. Whereas financial theory often assumes that the capital market is efficient (the efficient market hypothesis). However, various studies have found that at certain times the capital market will have different returns. The difference in returns at certain times is an anomaly. Researchers have found various anomalies in the capital market, including the January effect (anomaly in January), monthly effect (monthly anomaly), holiday effect, turn-of-the-month effect, and day-of-the-week effect.

Ariel (1987) found in the US capital market that the tendency of stock returns is positive at the beginning of the month. Jaffe and Westerfeld (1989) found a similar trend in the stock markets in Australia, the United Kingdom, and Canada. Boudreaux (1995), who developed the findings of Jaffe and Westerfeld, found that the capital markets in Denmark, Norway, and Germany have a tendency of positive stock returns at the beginning of the month. The turn-of-the-month effect also appears in the capital markets in Japan (Jaffe and Westerfeld, 1989) and Singapore/Malaysia (Boudreaux, 1995), but the returns, in contrast, are negative.

In addition to the research conducted in foreign countries, some researchers in Indonesia have discovered the existence of these anomalies on the Indonesia Stock Exchange (IDX). Pangaribuan (2003) and Wibowo (2004) found an anomalous pattern of daily returns (day-of-the-week effect), and weekend effect on the return and volatility of the Jakarta Composite Index (JCI) and the LQ45 index. Then Wibowo and Wahyudi (2005) found the turn-of-the-month effect, the monthly effect, and the holiday effect on JCI returns.

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However, all of these studies were conducted by researchers using the data sample of JCI. There are drawbacks in using JCI as a sample. The main drawback is that JCI is classified as a value-weighted index, which is greatly affected by the market capitalization of its constituents. Thus, the difference in returns seen in JCI is due to the difference in returns on certain stocks with large market capitalization. Therefore, the use of JCI as a sample could produce biased results.

Studies on the turn-of-the-month effect in the Indonesia Stock Exchange have not been widely done by researchers in the country. Though the studies related to various calendar anomalies have been done using stock returns in overseas stock exchanges, even not only using stock returns but also have evolved in relation to IPO. This is why research on the phenomenon of anomalies, particularly turn-of-the-month effect (TOM) in Indonesia still needs to be further developed. This study will focus on TOM by using different data and different periods of time. Meneu and Pardo (2001), who used a sample of the five stocks with the largest market capitalization on the stock exchanges in Spain, found no effect of the holiday. Therefore, this study also refers to Meneu and Pardo (2001) using the data of individual stocks. Research on the phenomenon of the TOM effect in Indonesia is still very little done. Maybe even the capital market players do not understand the TOM effect. Researchers in the developed countries are already aware of its existence. This research also finds the existence of the TOM effect in JCI.

Literature Review

Efficient capital market hypothesis is challenged by various researchers. Because of the presence of this theory, it is extremely difficult for investors to earn profits (abnormal positive return). In other words, if an investor has information about conditions in the future, and therefore wishes to gain profits, then it is very difficult to occur because other investor is, of course, also thinking the same thing.

There are various studies conducted to test the strength of this theory of efficient capital markets. Conrad and Kaul (1988) and Lo and McKinlay (1988) tested the efficient market theory to investigate the existence of past trends in prices that allow investors to earn abnormal profits. Conrad and Kaul (1988) and Lo and McKinlay (1988) found a positive correlation trend with stock returns in the short term. The existence of trend suggests that investors can still earn abnormal profits in the stock market. The presence of abnormal returns shows that capital markets are inefficient. The existence of this trend on the stock market later on refers to as anomalies. The existence of anomalies in capital markets, as opposed to the theory of efficient capital markets since the discovery of anomalies, means allowing investors to earn abnormal profits in the stock market.

The existence of calendar anomalies in the stock market was initially investigated in 1931 by Fields (1931), who by using the DJIA data from 1915-1930 found that the average prices of stocks on Saturdays tended to be higher by USD 0.1 compared to the average share price on Monday to Friday. Research on calendar anomalies then appeared again 42 years later by Cross (1973). Using return data from the S&P 500 in 1953-1970, he found differences in returns on Friday and Monday. Stock returns on Fridays tended to be higher and returns on Monday tended to be lower. This study found daily anomalies (day-of-the-week effect) on the capital market. Research on the daily day-of-the-week effect committed by French (1980), Gibbons and Hess (1981), and Keim and Stambaugh (1984) found similar results with Cross (1973). Jaffe and Westerfeld (1985) support the existence of day-of-the-week effect by conducting research in the capital markets of other countries such as Japan, Australia, Canada, and England. Jaffe and Westerfeld (1985) daily revealed the existence of anomalies in the capital markets in these countries.

Holiday effect then also found its existence. Research initiated by Lakonishok and Smith (1988) and Ariel (1990) detected the presence of holiday effect on some capital markets. Barone (1990) found holiday effect on the Italian stock market. Research by Cadsby and Ratner (1992) in contrast found the existence of stock

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return differences in the days before holiday in Japan, Australia, Canada, and Hong Kong, but there was no holiday effect seen in Europe. Finding by Cadsby and Ratner (1992) is in contrast to studies conducted by Mills and Coutts (1995), Arsad and Coutts (1997), and Meneu and Pardo (2001), who found no effect on the capital market holidays in the UK and Spain.

Furthermore, Rozeff and Kinney (1976) found the tendency of positive returns in January. Positive returns in January were recorded not only in the US capital markets, but also in other countries. Keim (1983) found that the January effect is due to the effects of transactions of small company stocks. Branch (1977) proposed a new hypothesis that the January effect is due to tax issues that must be paid at the end of the year. Roll (1983), Reinganum (1983), and Ritter (1988) support the hypothesis that the January effect occurs because of tax-loss selling. However, Constatinides (1984), Pettengill (1986), Chan (1986), and Jones et al. (1987) argued that the anomalies in January did not occur because of tax factor. Ogden (1990) observed that the anomaly in January was due to high liquidity at the end of the month and year-end. Liquidity is high in the presence of payment of salaries, dividends, interest and other obligations at the end of the month. Ogden (1990) also found that the January effect was due to the monetary policy of introduced by central banks.

The turn-of-the-month effect is the difference in return anomalies in the last few days of each month and the first few days of next month. Studies conducted by Ogden (1990) and Ziemba (1994), also found the TOM effect on the US stock exchanges. Booth et al. (2001) found that the anomalous change also occurred in the Helsinki stock exchange. Similar to Ogden (1990), Booth et al. (2001) found that high liquidity at the end of the month led to positive returns on the Helsinki stock exchange. Kunkel et al. (2004) found a significant difference in returns on every turn of the month in 16 countries in Europe, Africa, Asia, Australia, and North America. Mookerje and Yu (1999), who conducted research on the stock exchanges in China, found a positive return at the end of each month at the Shanghai stock exchange and a positive return at the beginning of each month at the Shenzhen stock exchange.

Research on the TOM effect was not only on the stock or stock index alone but also on various capital market instruments. Compton et al. (2006) examined the existence of the TOM effect on Real Estate Investment Trust (REIT) in the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX). The TOM effect found its existence in various types of REIT such as equity REIT, mortgage REIT, and hybrid REIT. Jalonen et al. (2010) examined the existence of the TOM effect on 2-year and 10-year government bonds issued by the German and US governments. The TOM effect appeared in government bonds but it was not due to the announcement of macroeconomic information by the government. In Indonesia, research on the turn-month anomaly has not been conducted that far.

Research Method

Quantitative data sources

The data used in this study is the data of the natural logarithm of the daily excess return in JCI, the sectoral indices, and stocks that are consistent in LQ45. The data used in this study is obtained from the IDX Statistics 2009, Fact Book 2009 Capital Market Reference Center, and the Yahoo finance site. This study uses data from the period of January 1st 2002 to August 31st 2010. Sectoral index data is a daily index of the nine industrial sectors listed on the Indonesia Stock Exchange that can be seen in Table 1.

From the data it can be seen that the financial sector (JakFin), mining sector (JakMine) and infrastructure sector (JakInfr) are the three sectors that have large percentage in JCI. Changes in these three sectors must have major impact in influencing the rise and fall of JCI.

As for the stock data, only consistent LQ45 stocks throughout the study period are taken into account. The LQ45 index is used primarily because it is a collection of stocks that have high transaction activity and a relatively large capitalization value in JCI. Shares of LQ45 mean consistent high transaction activity and

Table 1. Weighted sectoral indices

Ticker JCI	Name	% Weight in the index
JAKAGRI Index	JAKARTA AGRICULTURAL IDX	6.49
JAKBIND Index	JAKARTA BASIC IND & CHEM	7.30
JAKPROP Index	JAKARTA CNSTR PRP RL EST	4.76
JAKCONS Index	JAKARTA CONSUMER GOODS	6.95
JAKFIN Index	JAKARTA FINANCE INDEX	22.11
JAKINFR Index	JAKARTA INFRA UTIL TRANS	18.18
JAKMINE Index	JAKARTA MINING INDEX	20.07
JAKMIND Index	JAKARTA MISC INDUSTRIES	6.37
JAKTRAD Index	JAKARTA TRADE & SERVICE	7.78
		100.00

Sources: Capital Market Reference Center (2010)

Table 2. Consistent weighted stocks in LQ 45 index

Ticker JCI	Name	% Weight in the index
TLKM IJ Equity	Telekomunikasi Indonesia Tbk	9.32
ASII IJ Equity	Astra International Tbk	4.82
BBCA IJ Equity	Bank Central Asia Tbk	4.10
INCO IJ Equity	International Nickel Indonesia Tbk	3.13
AALI IJ Equity	Astra Agro Lestari Tbk	2.57
ISAT IJ Equity	Indosat Tbk	2.12
PTBA IJ Equity	Tambang Batubara Bukit Asam Tbk	2.02
UNTR IJ Equity	United Tractors Tbk	1.88
ANTM IJ Equity	Aneka Tambang Tbk	1.72
INDF IJ Equity	Indofood Sukses Makmur Tbk	1.27
SMCB IJ Equity	Holcim Indonesia Tbk	0.53
	Total	33.48

Sources: Capital Market Reference Center (2010)

the condition is necessary to know the difference in excess return at the end of the month and the beginning of the month. Table 2 shows stocks that are consistent in LQ45 during the study period.

Calculation of the first few days of the month is conducted on the 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, and 8th day per month in absolute terms. If, for example, day 2 and 3 are Saturday and Sunday respectively, then those days will be excluded in the calculation of the excess returns. The calculation of the final days of the end of the month is a little more complicated as the number of days in a month is different. For the months having 31 days then the last eight days start from 24th, 25th, 26th, 27th, 28th, 29th, 30th to 31st, while for the months with 30 days start from the last day on 23rd, 24th, 25th, 26th, 27th, 28th, 29th to 30th.

Excess returns

This study will use excess returns as data. Excess returns are obtained by subtracting the actual returns with the risk free daily rate (McConnel and Xu, 2006). The risk free rate is obtained by dividing the one month BI rate by the number of days in a month.

The Generalized Autoregressive Conditional Heteroscedasticity (GARCH) is an econometric model invented by Bollerslev (1986) and Taylor (1987). The GARCH model is used in quantitative analysis using time-series data. Econometric time series models prior to the GARCH model have often suffered from heteroscedasticity in the model. Heteroscedasticity of the variance of the error is changing at a constant or linear regression model. The presence of heteroscedasticity in the classical lin-

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Table 3. Results for dummy regression using sectoral composite index

Variable	IHSG	Jakagri Index	Jakbind	Jakcons	Jakfin	Jakinfr	Jakmind	Jaktrad	Jakprop	Jaktrad
D(-8)	-0.0017	-0.0014	-0.0006	-0.0014	-0.0015	-0.0036	-0.0036	-0.0034	-0.0026	-0.0028
	(0.2274)	(0.6082)	(0.7208)	(0.3904)	(0.4090)	(0.1110)	(0.1528)	(0.1289)	(0.1204)	(0.1825)
D(-7)	-0.0007	0.0003	-0.0011	-0.0018	-0.0013	-0.0010	-0.0001	-0.0024	0.0010	0.0005
	(0.6521)	(0.8819)	(0.5670)	(0.2890)	(0.5305)	(0.6519)	(0.9765)	(0.4390)	(0.6312)	(0.7797)
D(-6)	-0.0003	0.0017	0.0000	-0.0001	-0.0004	-0.0028	-0.0018	0.0000	0.0000	-0.0001
	(0.8129)	(0.5049)	(0.9895)	(0.9561)	(0.8562)	(0.2706)	(0.4313)	(0.9944)	(0.9955)	(0.9420)
D(-5)	-0.0003	-0.0034	-0.0007	0.0001	-0.0007	-0.0019	0.0001	-0.0010	0.0010	-0.0017
	(0.7758)	(0.0956)*	(0.6555)	(0.9389)	(0.7148)	(0.3537)	(0.9525)	(0.7056)	(0.5562)	(0.2087)
D(-4)	-0.0005	-0.0003	-0.0004	0.0006	-0.0010	0.0000	-0.0011	0.0006	-0.0013	0.0007
	(0.7330)	(0.8845)	(0.8445)	(0.6869)	(0.6329)	(0.9835)	(0.6263)	(0.7924)	(0.3364)	(0.6635)
D(-3)	-0.0033	-0.0028	-0.0028	-0.0007	-0.0025	-0.0020	-0.0042	-0.0029	-0.0013	-0.0012
	(0.0205)**	(0.2874)	(0.1132)	(0.6341)	(0.2032)	(0.4204)	(0.0449)**	(0.2055)	(0.4925)	(0.4545)
D(-2)	0.0066	0.0039	0.0010	0.0011	0.0015	0.0001	-0.0002	0.0031	0.0001	0.0090
	(0.0000)***	(0.0960)*	(0.5540)	(0.4727)	(0.4176)	(0.9705)	(0.9307)	(0.1567)	(0.9304)	(0.0000)***
D(-1)	0.0022	0.0050	0.0009	0.0025	0.0019	0.0021	0.0026	0.0005	0.0019	0.0023
	(0.0875)*	(0.0281)**	(0.6340)	(0.0834)*	(0.3550)	(0.3091)	(0.2318)	(0.8750)	(0.2287)	(0.1933)
D(+1)	0.00219	-0.00114	0.00115	0.00367	0.00289	0.00805	0.00413	0.00218	0.00276	0.00248
	(0.0660)*	(0.5757)	(0.4724)	(0.0017)***	(0.0773)	(0.0000)***	(0.0341)**	(0.3144)	(0.0208)**	(0.0456)**
D(+2)	0.0018	0.0054	0.0018	0.0019	0.0041	0.0024	0.0042	0.0662	0.0032	0.0003
	(0.0858)*	(0.0040)***	(0.2483)	(0.2126)	(0.0142)**	(0.1953)	(0.0333)**	(0.1894)	(0.0234)**	(0.8546)
D(+3)	-0.0007	0.0019	-0.0008	-0.0006	-0.0011	-0.0013	0.0004	-0.0006	-0.0009	-0.0006
	(0.5181)	(0.4190)	(0.5875)	(0.6479)	(0.5211)	(0.4718)	(0.8393)	(0.7926)	(0.5004)	(0.6728)
D(+4)	0.0038	0.0039	0.0030	0.0024	0.0040	0.0042	0.0042	0.0545	0.0038	0.0035
	(0.00379)***	(0.003947)*	(0.002991) **	(0.002368)*	(0.004006)**	(0.004173)**	(0.00422)**	(0.0545)*	(0.003802)**	(0.003464)**
D(+5)	0.0000	(0.0020)	(0.0001)	(0.0007)	(0.0009)	0.0010	0.0012	0.0012	(0.0025)	(0.0005)
	(0.9997)	(0.4147)	(0.9539)	(0.6472)	(0.5517)	(0.5612)	(0.4928)	(0.5426)	(0.0364)**	(0.6519)
D(+6)	0.0015	-0.0020	0.0000	0.0011	0.0008	0.0047	-0.0006	0.0034	0.0008	-0.0001
	(0.1660)	(0.3694)	(0.9827)	(0.4474)	(0.6295)	(0.0024)***	(0.7724)	(0.1293)	(0.5714)	(0.9673)
D(+7)	0.0005	0.0026	-0.0004	0.0013	-0.0003	-0.0007	0.0024	-0.0003	0.0006	0.0014
	(0.7226)	(0.3152)	(0.8000)	(0.3501)	(0.8953)	(0.7507)	(0.2168)	(0.9167)	(0.7231)	(0.3429)
D(+8)	-0.0017	0.0004	0.0006	-0.0036	-0.0046	-0.0054	-0.0039	-0.0043	-0.0009	-0.0016
	(0.0004)***	(0.8519)	(0.7042)	(0.0029)***	(0.0020)***	(0.0037)***	(0.0152)**	(0.0166)**	(0.5976)	(0.3528)

* = Significant at 10%
** = Significant at 5%
*** = Significant at 1%

ear model would make the existing model not "best" to explain the phenomenon in the study. Therefore, GARCH will be used in this study. GARCH (p,q) explains that the variance of the error depends not only on the quadratic error in the previous period but also depends on its own error variance in the previous period. The GARCH (p,q) model is as follows:

$$R_t = \alpha_1 D_{nt} + \sum_{i=0}^{n} \beta_1 R_{t-1} + \varepsilon_t \quad (1)$$

$$\sigma_t^2 = \gamma_0 + \sum_{i=0}^{q} V_{qi} \varepsilon_{t-1}^2 + \sum_{j=0}^{p} V_{pi} \sigma_{t-1}^2 \quad (2)$$

where R_t = rate error from stock t, D_{nt} = dummy variable for n-day for t stock, α_1 = dummy variable coefficients, $\sum_{i=0}^{n} \beta_1 R_{t-1}$ = autoregression variables with lag, ε_t = error, σ_t^2 = conditional variance, γ_0 = long-run mean value of conditional variance, $\sum_{i=0}^{q} V_{qi} \varepsilon_{t-1}^2$ = the ARCH(q) with coefficients V_{qi}, and $\sum_{j=0}^{p} V_{pi} \sigma_{t-1}^2$ = the GARCH(p) with a coefficient of V_{pi}.

Result and Discussion

Sectoral indices

The GARCH (p,q) model gives significant results about the existence of the TOM effect. From Table 3, the regression model with a GARCH (p,q) TOM effect generally appears in D(-3), D(-2), D(-1), D(+1), D(+2), D(+4), and D(+8).

Table 3 also shows that D(+1) and D(+4) are the days significantly experiencing the difference in excess returns in most of the industrial sectors. The difference in excess returns on the first day of the month (D(+1)) is seen in the consumer goods sector, finance, infrastructure, various industries, property, and commercial sectors. While on the fourth day of the month (D(+4)) the differences in excess returns are also found in all industrial sectors.

Table 4 shows that the differences are scattered on different days and at different stocks. The TOM effect exists starting on the last four days until the first four days next month. The differences in excess returns persist and are

Table 4. Results for dummy regression using stocks of LQ45

Variable	AALI	ANTM	ASII	BBCA	INCO	INDF	ISAT	PTBA	SMCB	TLKM	UNTR
D(-8)	0.0012	-0.0059	-0.0053	-0.0032	0.0004	0.0054	-0.0050	0.0001	0.0020	-0.0038	-0.0013
	(0.6783)	(0.1370)	(0.1341)	(0.2751)	(0.8904)	(0.1644)	(0.0870)*	(0.9606)	(0.6634)	(0.1294)	(0.7210)
D(-7)	-0.0022	-0.0012	0.0004	0.0020	-0.0049	-0.0024	0.0010	0.0020	-0.0023	-0.0010	0.0002
	(0.4965)	(0.8064)	(0.9182)	(0.4840)	(0.1621)	(0.5278)	(0.7837)	(0.4813)	(0.5272)	(0.6865)	(0.9646)
D(-6)	0.0044	-0.0029	-0.0021	-0.0016	0.0009	0.0004	-0.0004	0.0060	-0.0001	-0.0043	-0.0013
	(0.1481)	(0.4588)	(0.4563)	(0.5444)	(0.7649)	(0.8856)	(0.9024)	(0.0191)**	(0.9787)	(0.1406)	(0.6929)
D(-5)	-0.0038	0.0012	0.0020	0.0001	0.0003	0.0017	0.0004	0.0067	-0.0086	-0.0020	0.0005
	(0.1783)	(0.8243)	(0.5105)	(0.9832)	(0.9301)	(0.5142)	(0.8765)	(0.0134)**	(0.0127)**	(0.4030)	(0.8753)
D(-4)	-0.0018	-0.0010	-0.0015	-0.0050	-0.0016	-0.0002	0.0001	0.0006	-0.0014	-0.0004	0.0003
	(0.5473)	(0.8475)	(0.6416)	(0.0753)*	(0.7088)	(0.9270)	(0.9674)	(0.8127)	(0.7064)	(0.8882)	(0.9238)
D(-3)	-0.0030	-0.0037	-0.0069	-0.0069	-0.0013	-0.0025	-0.0004	-0.0027	-0.0063	-0.0003	-0.0028
	(0.3785)	(0.3079)	(0.0067)***	(0.0112)**	(0.6733)	(0.3798)	(0.8570)	(0.3494)	(0.1906)	(0.9157)	(0.4348)
D(-2)	0.0041	0.0048	0.0005	0.0018	0.0018	0.0018	-0.0026	0.0033	-0.0041	0.0002	0.0070
	(0.1422)	(0.1323)	(0.8612)	(0.4985)	(0.5314)	(0.6321)	(0.3563)	(0.2064)	(0.2769)	(0.9432)	(0.0153)**
D(-1)	0.0064	0.0013	0.0031	0.0048	-0.0018	-0.0014	-0.0020	0.0044	0.0049	0.0011	0.0035
	(0.0226)**	(0.7690)	(0.3038)	(0.1065)	(0.5402)	(0.6560)	(0.4103)	(0.1594)	(0.0928)*	(0.6250)	(0.2978)
D(+1)	-0.0013	0.0036	0.0028	0.0001	0.0040	0.0016	0.0056	-0.0013	-0.0018	0.0072	-0.0003
	(0.6068)	(0.3498)	(0.3316)	(0.9727)	(0.1634)	(0.6324)	(0.0245)**	(0.6004)	(0.6610)	(0.0027)	(0.9355)
D(+2)	0.0056	0.0107	0.0048	0.0038	0.0005	0.0021	0.0033	0.0021	-0.0019	0.0021	-0.0049
	(0.0453)**	(0.0011)***	(0.0595)*	(0.1216)	(0.8770)	(0.5190)	(0.1781)	(0.3449)	(0.5583)	(0.2908)	(0.1582)
D(+3)	0.0025	-0.0049	0.0004	0.0017	0.0051	-0.0003	0.0011	-0.0002	0.0002	-0.0020	0.0032
	(0.4164)	(0.2558)	(0.8969)	(0.4421)	(0.0405)**	(0.9186)	(0.6540)	(0.9183)	(0.9391)	(0.3581)	(0.2665)
D(+4)	0.0048	0.0056	0.0073	0.0070	0.0032	0.0056	0.0036	0.0049	0.0067	0.0044	0.0045
	(0.0860)*	(0.1045)	(0.0050)***	(0.0018)***	(0.2700)	(0.0173)**	(0.1393)	(0.0473)**	(0.0338)**	(0.0265)**	(0.1425)
D(+5)	-0.0023	-0.0017	0.0010	0.0011	-0.0005	-0.0021	-0.0042	0.0009	-0.0005	0.0014	-0.0012
	(0.4958)	(0.6260)	(0.6693)	(0.6564)	(0.8563)	(0.4487)	(0.0434)**	(0.7347)	(0.8759)	(0.5067)	(0.6481)
D(+6)	-0.0040	0.0030	-0.0003	0.0000	0.0028	0.0019	-0.0018	0.0031	-0.0018	0.0028	-0.0002
	(0.2016)	(0.3854)	(0.9066)	(0.9935)	(0.4007)	(0.5754)	(0.3469)	(0.1397)	(0.5782)	(0.1529)	(0.9427)
D(+7)	0.0004	-0.0028	0.0020	-0.0034	-0.0001	-0.0033	0.0004	-0.0010	-0.0006	-0.0005	0.0004
	(0.9073)	(0.4898)	(0.4452)	(0.2019)	(0.9711)	(0.2381)	(0.8909)	(0.8006)	(0.8197)	(0.8410)	(0.8895)
D(+8)	0.0006	0.0011	-0.0050	-0.0040	0.0002	-0.0027	0.0017	-0.0051	0.0062	-0.0060	-0.0038
	(0.7918)	(0.7677)	(0.0224)**	(0.0823)	(0.9284)	(0.3444)	(0.4810)	(0.2016)	(0.0315)**	(0.0132)**	(0.1668)

* = Significant at 10%
** = Significant at 5%
*** = Significant at 1%

Table 5. Dummy regression model results GARCH (p,q) in (ln) volume JCI

Variable	Ln vol JCI	P-value
D(-8)	0.0123	(0.7783)
D(-7)	0.0060	(0.8374)
D(-6)	-0.0315	(0.2353)
D(-5)	-0.0672	(0.0517)**
D(-4)	0.0331	(0.2270)
D(-3)	0.0042	(0.8980)
D(-2)	0.0254	(0.5535)
D(-1)	-0.0073	(0.8643)
D(+1)	-0.0306	(0.4278)
D(+2)	-0.0376	(0.2764)
D(+3)	0.0352	(0.4261)
D(+4)	-0.0298	(0.4202)
D(+5)	0.0572	(0.0734)**
D(+6)	-0.0201	(0.5815)
D(+7)	-0.0161	(0.6099)
D(+8)	0.0301	(0.3612)

* = Significant at 10%
** = Significant at 5%
*** = Significant at 1%

seen in stocks like AALI, ASII, BBCA, INDF, PTBA, SMCB, and TLKM. In addition, the differences also occur on the other days of next month, especially D(-5) to D(+8) and spread on various stocks.

Still there is curiosity whether the January effect triggers the TOM effect. So, this study makes recalculation once again, but this time it excludes data from December and January. Also this study tries to test the existence of the TOM effect using daily data of transaction volume in JCI. We conduct this test as a robustness test that the TOM effect really exists in IDX.

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Table 6. Dummy regression model results GARCH (p,q) on the sectoral composite index (excluding December and January)

Variable	IHSG	Jakagri Index	Jakbind	Jakcons	Jakfin	Jakinfr	Jakmind	Jaktrad	Jakprop	Jaktrad
D(-8)	-0.0020	-0.0018	-0.0014	-0.0025	-0.0015	-0.0031	-0.0049	-0.0028	-0.0037	-0.0028
	(0.2575)	(0.5500)	(0.4409)	(0.1757)	(0.4563)	(0.1754)	(0.0781)*	(0.1715)	(0.0318)**	(0.1715)
D(-7)	-0.0007	0.0015	0.0009	-0.0004	-0.0001	0.0005	0.0029	0.0004	0.0010	0.0004
	(0.6588)	(0.5461)	(0.5962)	(0.8078)	(0.9530)	(0.8247)	(0.2003)	(0.8157)	(0.6074)	(0.8157)
D(-6)	-0.0008	0.0013	0.0005	-0.0010	0.0001	-0.0028	-0.0015	0.0000	-0.0013	0.0000
	(0.6526)	(0.6631)	(0.7927)	(0.5476)	(0.9507)	(0.2694)	(0.5333)	(0.9753)	(0.5002)	(0.9783)
D(-5)	-0.0009	-0.0015	-0.0010	-0.0017	-0.0002	-0.0010	0.0010	-0.0010	0.0013	-0.0010
	(0.5369)	(0.5069)	(0.5782)	(0.2101)	(0.9045)	(0.6547)	(0.6726)	(0.4374)	(0.4088)	(0.4374)
D(-4)	-0.0017	-0.0011	-0.0016	-0.0003	-0.0016	-0.0006	-0.0033	-0.0008	-0.0028	-0.0008
	(0.2773)	(0.6921)	(0.4841)	(0.8689)	(0.4384)	(0.7644)	(0.0843)*	(0.6173)	(0.0368)**	(0.6173)
D(-3)	-0.0024	-0.0024	-0.0035	-0.0008	-0.0031	-0.0024	-0.0048	-0.0013	0.0006	-0.0013
	(0.1888)	(0.4507)	(0.0652)*	(0.6163)	(0.1462)	(0.3513)	(0.0603)*	(0.4973)	(0.7675)	(0.4973)
D(-2)	0.0027	0.0027	-0.0002	0.0028	0.0015	-0.0007	-0.0009	0.0001	-0.0013	0.0001
	(0.0116)**	(0.2712)	(0.8964)	(0.0309)	(0.3866)	(0.7405)	(0.6560)	(0.9363)	(0.3773)	(0.9363)
D(-1)	0.0027	0.0068	0.0015	0.0021	0.0017	0.0022	0.0023	0.0036	0.0038	0.0036
	(0.0669)*	(0.0036)**	(0.4110)	(0.1410)	(0.3909)	(0.2749)	(0.2825)	(0.0214)**	(0.0126)**	(0.0214)**
D(+1)	0.0013	-0.0026	0.0016	0.0026	0.0003	0.0088	0.0025	0.0010	0.0014	0.0010
	(0.3571)	(0.2898)	(0.3865)	(0.1091)	(0.8611)	(0.0001)	(0.3081)	(0.4702)	(0.3067)	(0.4702)
D(+2)	0.0025	0.0032	0.0019	0.0025	0.0041	0.0008	0.0045	0.0004	0.0038	0.0004
	(0.1346)	(0.1701)	(0.3399)	(0.1913)	(0.0354)**	(0.7596)	(0.0623)*	(0.8108)	(0.0342)**	(0.8108)
D(+3)	-0.0010	0.0018	-0.0012	-0.0015	-0.0010	-0.0032	0.0012	-0.0001	-0.0013	-0.0001
	(0.4183)	(0.5445)	(0.4597)	(0.3075)	(0.6223)	(0.0866)**	(0.6156)	(0.9522)	(0.3721)	(0.9522)
D(+4)	0.0035	0.0022	0.0041	0.0008	0.0028	0.0056	0.0029	0.0024	0.0032	0.0024
	(0.0139)**	(0.3711)	(0.0025)***	(0.5670)	(0.1655)	(0.0018)***	(0.2198)	(0.1305)	(0.0499)**	(0.1305)
D(+5)	-0.0024	-0.0014	-0.0006	-0.0019	-0.0025	-0.0012	-0.0005	-0.0018	-0.0042	-0.0018
	(0.0776)*	(0.6092)	(0.7042)	(0.3130)	(0.1342)	(0.5341)	(0.8138)	(0.1826)	(0.0016)***	(0.1826)
D(+6)	0.0004	-0.0041	0.0009	0.0012	0.0002	0.0034	-0.0014	0.0002	0.0009	0.0002
	(0.8127)	(0.1115)	(0.6435)	(0.4568)	(0.9293)	(0.0534)**	(0.5902)	(0.9179)	(0.6148)	(0.9179)
D(+7)	0.0002	0.0021	-0.0009	0.0049	0.0006	-0.0006	0.0006	0.0009	-0.0004	0.0009
	(0.9073)	(0.4579)	(0.5854)	(0.0001)***	(0.8009)	(0.7787)	(0.7784)	(0.5419)	(0.8052)	(0.5419)
D(+8)	-0.0045	0.0000	-0.0005	-0.0055	-0.0062	-0.0070	-0.0043	-0.0028	-0.0001	-0.0028
	(0.0088)***	(0.9949)	(0.7807)	(0.0002)***	(0.0002)	(0.0037)***	(0.0346)**	(1300.0000)	(0.9613)	(0.1300)

* = Significant at 10%
** = Significant at 5%
*** = Significant at 1%

Table 7. Dummy regression model results GARCH (p,q) on shares LQ45 without December and January

Variable	AALI	ANTM	ASII	BBCA	INCO	INDF	ISAT	PTBA	SMCB	TLKM	UNTR
D(-8)	0.0005	-0.0044	-0.0064	-0.0047	0.0015	0.0084	-0.0059	-0.0011	0.0004	-0.0031	-0.0024
	(0.8799)	(0.3196)	(0.1062)	(0.0869)	(0.6070)	(0.0468)**	(0.1133)	(0.7184)	(0.9277)	(0.2286)	(0.5829)
D(-7)	0.0004	-0.0032	0.0029	0.0016	-0.0054	-0.0039	0.0015	0.0017	-0.0018	-0.0003	0.0013
	(0.9131)	(0.5114)	(0.5148)	(0.6159)	(0.1570)	(0.3068)	(0.7008)	(0.6122)	(0.6462)	(0.9045)	(0.7677)
D(-6)	0.0042	-0.0014	-0.0004	-0.0017	0.0018	0.0022	-0.0010	0.0049	0.0006	-0.0043	-0.0023
	(0.2260)	(0.7368)	(0.9054)	(0.5400)	(0.5703)	(0.4830)	(0.7914)	(0.1435)	(0.8866)	(0.1590)	(0.4582)
D(-5)	-0.0021	0.0003	0.0060	0.0020	-0.0026	0.0004	-0.0013	0.0065	-0.0058	-0.0012	-0.0028
	(0.5376)	(0.9616)	(0.0113)**	(0.5249)	(0.3708)	(0.8899)	(0.6486)	(0.0547)*	(0.1093)	(0.6443)	(0.3329)
D(-4)	-0.0019	-0.0017	-0.0056	-0.0059	0.0016	-0.0015	-0.0019	-0.0030	-0.0017	-0.0008	-0.0001
	(0.5862)	(0.7193)	(0.0509)**	(0.0575)*	(0.7333)	(0.5983)	(0.4628)	(0.2985)	(0.6784)	(0.7621)	(0.9858)
D(-3)	-0.0041	-0.0053	-0.0078	-0.0093	-0.0011	-0.0045	0.0010	-0.0027	-0.0085	-0.0012	0.0013
	(0.3310)	(0.1537)	(0.0223)**	(0.0014)***	(0.7080)	(0.1664)	(0.6807)	(0.3449)	(0.1256)	(0.6932)	(0.7096)
D(-2)	0.0060	0.0061	0.0018	0.0016	0.0002	0.0038	-0.0020	0.0069	-0.0092	0.0000	0.0143
	(0.0203)**	(0.1006)	(0.5293)	(0.5772)	(0.9386)	(0.3364)	(0.4785)	(0.0062)***	(0.0004)***	(0.9981)	(0.0000)***
D(-1)	0.0096	0.0008	0.0017	0.0052	-0.0027	-0.0016	-0.0017	0.0073	0.0069	0.0020	-0.0025
	(0.0012)***	(0.8665)	(0.5740)	(0.1034)	(0.3023)	(0.6153)	(0.4997)	(0.0328)**	(0.0166)**	(0.4188)	(0.4824)
D(+1)	-0.0050	0.0037	0.0031	-0.0019	0.0048	0.0021	0.0039	0.0001	0.0010	0.0086	0.0022
	(0.1392)	(0.3522)	(0.3262)	(0.4908)	(0.1125)	(0.5343)	(0.1740)	(0.9748)	(0.8533)	(0.0011)***	(0.5475)
D(+2)	0.0024	0.0105	0.0038	0.0044	-0.0005	0.0014	0.0042	0.0023	-0.0018	0.0016	-0.0059
	(0.4743)	(0.0030)	(0.2442)	(0.1103)	(0.9011)	(0.6889)	(0.1259)	(0.4571)	(0.6217)	(0.5355)	(0.0848)*
D(+3)	0.0006	-0.0058	0.0009	0.0013	0.0055	-0.0010	0.0012	0.0043	-0.0059	-0.0027	0.0015
	(0.8796)	(0.1981)	(0.8057)	(0.6432)	(0.0821)*	(0.7544)	(0.6483)	(0.0604)*	(0.0939)*	(0.2785)	(0.6718)
D(+4)	0.0030	0.0054	0.0053	0.0537	-0.0012	0.0023	0.0043	0.0053	0.0055	0.0057	0.0033
	(0.3730)	(0.1598)	(0.0993)*	(0.0354)**	(0.6999)	(0.3729)	(0.1055)	(0.0549)*	(0.1053)	(0.0076)***	(0.3824)
D(+5)	-0.0013	-0.0044	-0.0021	0.0019	-0.0036	-0.0039	-0.0065	-0.0035	-0.0005	-0.0008	-0.0023
	(0.7398)	(0.2353)	(0.4903)	(0.4504)	(0.3042)	(0.1982)	(0.0085)***	(0.2601)	(0.8514)	(0.7652)	(0.5018)
D(+6)	-0.0072	0.0013	-0.0007	-0.0020	0.0028	0.0013	-0.0027	0.0059	-0.0010	0.0032	-0.0010
	(0.0305)**	(0.7052)	(0.8454)	(0.5545)	(0.4652)	(0.7357)	(0.2444)	(0.0463)**	(0.7678)	(0.1328)	(0.7123)
D(+7)	0.0004	0.0004	0.0023	-0.0006	-0.0021	-0.0023	0.0005	0.0006	0.0017	-0.0010	-0.0036
	(0.9198)	(0.9213)	(0.3875)	(0.8545)	(0.4572)	(0.4541)	(0.8532)	(0.8809)	(0.6154)	(0.6858)	(0.0624)*
D(+8)	0.0014	0.0021	-0.0098	-0.0040	-0.0010	-0.0049	-0.0006	-0.0057	0.0018	-0.0099	-0.0058
	(0.6368)	(0.6488)	(0.0002)***	(0.0767)*	(0.7248)	(0.1355)	(0.8369)	(0.1987)	(0.6208)	(0.0001)***	(0.0350)**

* = Significant at 10%
** = Significant at 5%
*** = Significant at 1%

Robustness test

To test the strength of the calculation, results of robustness tests are also shown in this study. Robustness test is conducted using the JCI data. JCI is considered representative enough to be used to detect the presence of the TOM effect. We perform this test in two ways: first using GARCH models in daily transaction volume data. For the daily transaction volume data, the natural logarithm of daily JCI trading volume is used. Table 5 shows that there are significant differences in transaction volume in the D(-5) and D(+5). These results provide the conclusion that there are differences in transaction volume on the days around the turn-of-the-month period.

The second robustness test is performed by removing data for December and January. Removing the December and January data is to eliminate the possibility that the January effect would influence the calculation. The results of the calculation are shown in Table 6.

Table 6 shows that there are significant differences in excess returns on the D(-2), D(-1), D(+4), D(+5), and D(+8) at JCI. This finding proves that the TOM effect still persists even though the December and January data is excluded. Table 7 also supports that the TOM effect still exists on individual stocks.

Conclusion

We found that the TOM effect does exist in the Indonesia Stock Exchange. With respect to the sectoral indices, the TOM effect also exists although the sectors that primarily affect JCI still cannot be identified. From interview with brokers at IDX, it is found that the finance, consumer goods, and property sectors seem to contribute most TOM effect to JCI. This finding is still in line with the findings by this study. But further research still needs to be conducted to support the theory.

The TOM effect tends to be seen from D(-4) or the last four transaction days until D(+8) or the first eight days of the next month. However, regarding of the excess returns on D(+7), the TOM effect is less likely to appear. In general, the TOM effect also occurs in stocks that are consistent in LQ45. These stocks are AALI, ASII, ANTM, BBCA, INDF, ISAT, INCO, PTBA, SMCB, TLKM and UNTR.

We also found that the TOM effect is not induced by the January effect. The TOM effect also does not occur due the date of salary payment neither at the end of the month nor at the beginning of the month. The TOM effect is more likely to occur due to an increase in the purchase of stocks by investment managers to improve the performance of its stock portfolio.

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