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Turn of the Month Effect in the South African Equity Market: A GARCH analysis

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Abstract: Understanding calendar trends may aid in the identification of stock market return drivers and the making of smarter investment selections. The study's goal was to see if there is a turn of the month influence on the South African equity market. We analyse Johannesburg Stock Exchange (JSE) indices covering the period 1995 to 2018. The Generalized Auto Regressive Conditional Heteroskedasticity Model (GARCH), exponential GARCH (EGARCH) and threshold GARCH (TGARCH) models are used to model turn of the month anomaly. The mean equation results of the turn of the month displayed a positive effect for the aggregate and sectorial indices. The variance equation showed no turn of the month effect in the Top 40 and All Shares indices, though the Basic materials sector indicated a positive turn of the month effect. Investing in the telecommunications industry provides the best returns for the turn of the month method. Basic materials should be avoided by investors since it increases their exposure. In the South African equities market, the occurrence of the turn of the month impact invalidates the efficient market theory. We offer value by analysing turn of the month influence sectorial indices for Africa's largest stock market, in contrast to earlier research.

Keywords: Seasonal effects; Investors; EGARCH; TGARCH; JSE

JEL Classification: C12; C23; D53; G12; G14

1. Introduction

The idea behind turn of the month (TOM) is that some investors will hold substantial amounts of cash at the TOM resulting in increased equity demand thereby pushing the price up. Inverse relationship between strict monetary policy and expected liquid profits also helps explain the surge in TOM returns (Odgen, 1990). Days surrounding

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the turn of the month period play a crucial role in the strength of the TOM. Investors should be actively understanding the market so as to establish opportunities that provide abnormal returns. Oguzsoy and Guven (2006) studied the TOM in the Turkish equity market, a highly volatile, emerging and dynamic, which made it not easy to be followed reactively hence financial decisions made about it lack efficiency because of the level of adequacy and accuracy of the data used in decision-making.

Furthermore, Kumar (2015) investigated the TOM in the Indian foreign exchange market. The Indian currency was compared with the US dollar, UK pound, Euro, and Japanese Yen currencies. The TOM was analysed for the pre-crisis and post-crisis periods. Negative TOM was found in both the pre-crisis and post-crisis phases. All currencies displayed the existence of TOM effects for the sub-period before 2008, and post-2008, only the US and Indian currencies continued to display TOM effects. The disappearance of TOM effects post-2008 supports the hypothesis that the market efficiency increases with time. The Indian foreign market has become efficient after the 2008 crisis. It was recommended that increased market efficiency with time makes it difficult for investors to make abnormal returns by taking advantage of TOM effect through timing their positions in some currencies.

However, Aziz and Ansari (2017) examined TOM on Asian-Pacific equity markets from Taiwan, Singapore, South Korea, The Philippines, Pakistan, Malaysia, Japan, Indonesia, India, Hong Kong, China and Australia. A positive TOM effect on returns was found in the Asian-Pacific equity markets for a 14-day TOM period. Further TOM analysis was conducted for the pre-crisis period 2000–2007, during the crisis period 2008–2009 and the post-crisis period 2009–2015. Pre-crisis revealed positive TOM effects for the majority of equity markets. During the crisis period, only 2 stock markets displayed existence of a positive TOM, with the rest showing no TOM effect. However, in the post-crisis period, the positive TOM effect re-emerged in those equity markets which had registered an absence of TOM during the crisis. The findings suggested that crisis times affect the TOM anomaly in equity markets. The study highlighted that there was an empirical gap in the TOM anomaly and its sources.

Arbitrage opportunities found in equity markets require objective investment decisions (Weigand, 2014). Unsound decisions will be costly to an investment portfolio (Pompian, 2012). The study is motivated by the need to have an objective investment decision tool for days surrounding the TOM. Therefore, the present study assesses existence of TOM in the South African equity market. Section 2 of this article looks at the literature review for turn of the month, the methodology is highlighted in section 3. Section 4 and 5 provides the findings and conclusions respectively.

2. Literature Review

Kunkel *et al*. (2003) analysed the effect of a 4-day turn of the month period on returns. The study covered 19 countries; 8 were from Europe, 6 were from the Far East, 2 from North America, 2 from Latin America, and South Africa. The OLS model was employed on a data sample covering the period 1988–2000. A positive turn of the month effect was found. TOM patterns were observed in 16 out of 19 countries. Half of the countries were European countries, a quarter from the Far East, also South Africa, Mexico and the United States. The stock markets studied were in a bullish state, with the exception of Japan which was in a bearish phase. The Japanese stock market exhibited a TOM effect. The TOM effect was observed as a phenomenon existing globally.

Sar (2003) examined the impact of turn of the month on returns in the Netherlands equity market. The study covered data for the period 1980–1998. An autoregressive conditional heteroscedasticity (ARCH) model was employed. The turn of the month dummy variable was modelled in the mean equation with a return dependent variable. The results revealed a positive turn of the month effect on returns. The study recommended that there was an opportunity to make abnormal profits. The existence of a turn of the month anomaly depicted that the Netherlands stock market was inefficient.

Tonchev and Kim (2004) analysed the relationship between returns and TOM in Slovenia, Slovakia and the Czech Republic equity markets. The sample from 1999–2003 was examined. The study utilised a 6-day TOM period for the analysis. The methods employed were the OLS and GARCH models. The findings showed that there was no TOM effect in the mean and variance equations for the three countries studied.

Rosenberg (2004) evaluated the turn of the month effect in the US equity market. A GARCH model was applied to the data covering the period 1962–1993. The determinants for the return equation were first half of the month and second half of the month dummies. The variance equation had no TOM seasonality variables. There was a negative last half of the month effect on returns. During the last half of the month, investors in stocks experience a lower return than in the first half of the month. A consideration of the economic business cycle was made when analysing stock returns, and it was observed that the last 50% of the days of the month showed low equity returns only in an expansionary business cycle. The results suggested that the TOM effect is affected by economic business cycles.

Zhao *et al*. (2004) examined the link between the presidential election cycle and the TOM effect in influencing US equity returns. Data for the period 1960–2001 was analysed using Wilcoxon and t-tests. The TOM and rest of the month variables were compared. The average TOM return is positive. Towards the end of a presidential

term, the TOM effect was found to have a more substantial impact than in the first half of a presidential term. This observation supports the presidential cycle hypothesis, and it holds for all kinds of government administrations. The study recommended that increased personal incomes because of improved economic, administrative and fiscal policies towards the end of presidential terms result in an increase in demand for stocks, which in turn leads to higher returns. To enhance re-election chances, politicians introduce administrative polices that have a direct influence on household income and give a perception of better economic conditions.

Compton *et al*. (2006) tested the TOM effect in real estate investment trust (REIT) indices traded in the US equity market. The OLS and Wilcoxon test were applied to the sample period 1999–2003 to assess whether the REIT indices present a TOM anomaly. The dependent and independent variables were returns and TOM respectively. Findings showed a positive TOM effect on returns for a 6-day period. TOM is both a local and international phenomenon. The TOM anomaly is globally experienced on different investment classes including the domestic non-mortgage REIT.

McConnell and Xu (2008) investigated the TOM in US and non-US equities for the period 1926–2005. The GARCH model was employed with TOM being incorporated in the mean equation only. A positive TOM effect was found in both US and non-US stocks. Investment return is the reward investors get for taking risks; however, no reward was received for the other trading days that do not fall under the TOM period, and only during TOM period is when investors received an average positive return. The TOM effect was observed to be a general phenomenon which applies to all kinds of stocks, is not influenced by high volatile returns at TOM or the increase in risk free rate, and it is not only applicable in the US, since it was observed to hold in more than 88% of the 34 other countries considered under the study. Equity mutual funds was found to have a uniform net flows of funds throughout the whole month, opposing the payday effect, which says that there is a concentration of share buying at TOM. The authors acknowledged that the TOM remained an unsolved mystery.

Depenchuk *et al.* (2010) studied the market returns in the Ukraine's equity and bond markets to examine the presence of the TOM anomaly. A regression model was used to examine the link between returns and TOM for period 2003–2007. Results displayed that there was a positive TOM in the Ukraine's financial markets. The authors indicated that the US financial market influences the Ukrainian market, thereby resulting in a TOM effect. The study recommended that investors have the potential to benefit from the abnormal returns during the TOM period.

Silva (2010) examined the TOM anomaly in Portugal's equity market indices for data covering the study sample period 1989–2008. The OLS models used returns and TOM as dependent and independent variables respectively. Positive returns were

observed for a 4- and 6-day TOM period. Risk is believed to be higher at TOM than during the month and this justifies the higher return at TOM using the risk-return relationship. Moreover, information announcement is a determinant of the TOM; this is explained by the fact that firms' tendency to selectively announce positive information towards month end also helps explain positive results at TOM. The payday effect, which results in higher household income at the turn of the month, together with interest and dividends which are mostly received at the turn of the month, all contribute to increased demand for securities due to higher liquidity levels.

Tilica (2015) estimated the regression model with returns as the dependent variable and TOM as the predictor. The investigation was for the Romanian equity market for the period 2005–2014. Results displayed a positive TOM effect. The coefficient levels were observed to be higher for the mean daily return at the TOM. The TOM effect diminishes with time, that is, the closer to the last trading day of the month, the less the impact of TOM. The findings assist investors to find the best strategy to adopt in the presence of a TOM anomaly. Investors who trade at the TOM period can experience higher returns.

Vasileiou (2018) examined the TOM for the period 1999–2016 in European equity markets. The countries covered in the study were Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, The Netherlands, Portugal and Spain. The OLS and TGARCH models were employed. The TOM was modelled in the mean equation only. The results demonstrated a positive impact of TOM on returns. The persistence of TOM effect on returns lasts for a long time. The study confirmed that the TOM returns are higher than on non-TOM days. TOM days are associated with high returns which provide an avenue for investors to improve the profitability of their investments. Outperformance of the market by TOM days violates the EMH. TOM days' profitability has a substantial impact at the growth stage and it has sustainable patterns. The results assist in explaining how the EMH can be violated in equity markets by investors assuming lower risk and exploiting the TOM anomaly. The study examined TOM using GARCH models in the South African equity market.

3. Data and Methodology

JSE indices data covers the period 1995 to 2018 and were sourced from IRESS database, a financial data firm. The indices consist of top 40 (J200), all shares (J203), basic materials (J510), industrials (J520), consumer goods (J530), health care (J540), consumer services (J550), telecommunications (J560), financials (J580) and technology (J590). Eviews 10 integrated with R software was used to analyse the data. The optimum order GARCH, EGARCH and TGARCH models were employed

and interpreted though for specification purposes we use the order (1,1). The present study adapts Bankoti (2012) turn of the month definition of four trading days period that is the last trading day of the preceding month and the first three trading days of the next month. We drop the R_{t-1} and the constant term in the Bankoti's mean equation and retain the variance equation for the GARCH.

$$R_t = \beta_1 D_{tom} + \beta_2 D_{rom} + \epsilon_t \quad (1)$$

$$h_t = a + b\epsilon_{t-1}^2 + ch_{t-1} + dD_{tom}, \quad (2)$$

where D_{tom} is the dummy for turn of the month period. The symbols β_1 and β_2 denote mean equation coefficients for turn of the month period and rest of the month respectively. Parameters, a and d are volatility coefficients for rest of the month and turn of the month respectively.

Turn of the month EGARCH model specification is extended as follows:

$$In(h_t) = a + cIn(h_{t-1}) + f_1 \frac{\epsilon_{t-1}}{\sqrt{h_{t-1}}} + f_2 \frac{|\epsilon_{t-1}|}{\sqrt{h_{t-1}}} + dD_{tom} \quad (3)$$

TGARCH model for turn of the month is provided as follows:

$$h_t = a + b\epsilon_{t-1}^2 + ch_{t-1} + \gamma\epsilon_{t-1}^2 I_{t-1} + dD_{tom} \quad (4)$$

4. Empirical Findings and Discussions

Tables 1 and 2 show the EGARCH and TGARCH optimum models results for turn of the month effect of returns of JSE indices. The AIC, SC and LL findings in the EGARCH and TGARCH support the Student-t distributed errors when compared to the normal distribution (Harvey & Newbold, 2003). The EGARCH and TGARCH models have 8 and 2 JSE indices respectively.

The turn of the month effect is manifested in Table 1 for JSE indices and the effect is higher than for rest of days in the month. Considering the mean equation, we note that there is a positive and highly significant turn of the month effect. The J550 index has the largest turn of the month effect of 0.00189, which highlights that all other variable being constant, an investor earns an average of 0.00189 units on investing one unit of capital on a range of trading days starting from the last trading day of the previous month to the first 3 days of the ensuing month. The lowest turn of the month effect is found in J580. Looking at the rest of the month days, we illustrate that there is a positively significant effect for J200, J203, J540, J550, J580 and J590. However, the turn of the month effect is stronger than the rest of the month days. The variance equation demonstrates a disappearance of the turn of the month effect when volatility is taken into account. The J510 index have a positive and significant turn of the month coefficient of 0.080506 which entails that trading on turn of the month days increases risk by 0.080506 units. In contrast, the rest of the days in the month are

negatively significant for the JSE indices highlighted in Table 1. The negative significant values depict that holding other things constant, a unit of investment on rest of the days of the month will on average reduce volatility in stock returns. The greatest reduction is exhibited in J580 with a negative of 0.424804. Generally, the EGARCH models are able to capture asymmetry behaviour since most of the JSE indices have no sign bias with exception of J203 with a significant positive bias and J590 with a sign bias. The significant parameters are stable since the Nyblom test did not reject the null hypothesis that the parameters are stable. The EGARCH models for the turn of the month have a negative and significant in the f_1 estimated parameters for the JSE indices which confirms the leverage effects that is the negative volatility and stock returns relationship (Brooks, 2014). The f_2 values are positively significant for the JSE indices which indicate that information on previous day have a positive impact on volatility. For f_3 values, the impact on current volatility from information generated 2 days ago reveals that current volatility increases in J203 and J530 and decreases in J540 and J590. Information from previous 3 days have a negative impact on current volatility as highlighted by a negative significant f_4 value of 0.209187. The impact of previous volatility is illustrated by c_1, c_2 and c_3 parameter values. The combined effect of the previous volatility parameters provide evidence that current volatility of JSE indices is significantly influenced by information on previous volatility with all other things being constant. Additionally, high levels of volatility persistence are exhibited by the combined sum of f_2, f_3, f_4, c_1, c_2 and c_3 parameters.

Table 2 discloses the TGARCH model results for turn of the month anomaly of J520 and J560 indices. Examining the variance equation reveals absence of sign bias in the return series of the indices. The Nyblom tests display that parameter instability in the rest of the month days parameter of the volatility equations for J520, indicating that the coefficient is affected by structural changes. The sum of b_1, b_2, c_1, and c_2 parameters are approximately 0.94 for J520 and 0.99 for J560 exhibiting volatility persistence (Brooks, 2014). The parameter γ for J520 is positively significant highlighting leverage effect that is negative shocks in stock returns increases volatility more than the positive shocks in stock returns of equal magnitude. There is no turn of the month effect in the variance equation depicting that investors trading on turn of the month days does not influence the risk of the J520 and J560 indices. However, the mean equation shows positive and significant turn of the month effect for J520 and J560 indices. The greatest turn of the month effect is found in J560 with a coefficient of 0.001631 that denotes that transacting a unit of capital on turn of the month days increases returns by 0.001631 holding other things constant. J520 resembles positively significant in rest of the days though it weaker than the turn of the month effects. Likewise, the positive significant rest of the days are found in the variance equation for J520 and this indicates that the days increases risk for an investor.

Seasonality in turn on the month days is not unique to South African equity but rather an extension of international evidence. Vasileiou (2018) found positive turn of the month using EGARCH models in Ireland, Luxembourg, Netherlands, Portugal, Austria, Belgium, France, Germany, Italy, Finland and Spain stock markets. Aziz and Ansari (2017) illustrated a positive turn of the month for 12 Asia-Pacific equity markets. Islamic stock markets demonstrated significant and positive turn of the month as compared to the rest of the month days (Jebran and Chen, 2017). Despite local evidence being scarce, Darrat *et al*. (2013) revealed positive turn of the month effect before 2008 and disappearance after 2008. Explanations of turn of the month effect found on JSE revolve around two aspects namely window dressing and pay day hypothesis. Zehr (1989) argued that institutional investors such as pension funds convert cash balances and purchase equities which consequently increases the values of stocks they hold. Increased liquidity around turn of the month days, as a result of income from labour and capital put buying pressure on the stocks which drives their prices and hence their returns (Odgen, 1990).

Table 1. EGARCH Models Results for Turn of the MONTH

R_t	J200	J203	J510	J530	J540	J550	J580	J590
Mean equation								
β_1	0.001277**	0.001322**	0.001148**	0.001181**	0.001351**	0.00189**	0.001133**	0.001365**
β_2	0.000287*	0.000355**	6.58E-05	0.000304	0.000355*	0.000729**	0.000378**	0.0005**
Variance equation								
a	-0.409165**	-0.419661**	-0.269106**	-0.086537**	-0.099559**	-0.38987**	-0.424804**	-0.036417**
f_1	-0.11058**	-0.109122**	-0.049414**	-0.028754**	-0.016745**	-0.06193**	-0.084942**	-0.005413*
f_2	0.145476**	0.144073**	0.18992**	0.236213**	0.293408**	0.229965**	0.235733**	0.414054**
f_3	0.083856	0.092166*		0.032067**	-0.234889**			-0.475308**
f_4				-0.209187**				0.08898
c_1	0.574482**	0.529164**	0.836197**	0.724716**	1.453383**	0.585352**	0.765946**	1.698217**
c_2	0.40043*	0.445774*	-0.147903	0.979308**	-0.459597**	0.391221**	0.066218	-0.699768**
c_3			0.298729*	-0.708644**			0.141665	
d	0.024942	0.027679	0.080506*	0.011622	0.002058	0.010863	0.033193	0.019221
AIC	-6.146983	-6.343029	-5.615592	-5.795488	-6.044424	-6.159405	-6.264138	-5.612334
SC	-6.135556	-6.331602	-5.604165	-5.781776	-6.032997	-6.14912	-6.252711	-5.599764
LL	17956.12	18528.47	16404.72	16931.93	17656.7	17991.38	18298.15	16396.21
SB	0.6654	0.5402	0.4569	0.26337	1.4433	0.2953	0.43187	2.0061*
NEGSB	0.7042	0.4611	0.3639	0.29226	1.0712	1.3642	1.28059	0.9086
POSSB	1.7938	2.2083*	0.1068	0.03107	0.7459	0.1202	0.05675	1.5531
JE	3.7338	5.3795	0.3597	0.39437	2.2776	4.0686	1.68701	4.5096

+ indicates significant Nyblom test at 5% level. * and ** indicates significance at 5% and 1% level respectively. n* denote that normal distributed error is assumed in the model.

Table 2. TGARCH Models Results for Turn of the Month

R_t	J520	J560
Mean equation		
β_1	0.001266**	0.001631**
β_2	0.000429**	0.000365
Variance equation		
a	3.25E-06**+	1.48E-06
b_1	0.052652**	0.154935**
γ	0.077696**	0.00974
b_2		-0.121322**
b_3		
c_1	0.884452**	1.359834**
c_2		-0.402449**
c_3		
d	7.53E-07	4.48E-06
AIC	-6.235005	-5.250793
SC	-6.225863	-5.239366
LL	18211.1	15339.69
SB	0.0505	0.9698
NEGSB	1.0543	1.8690
POSSB	0.6199	0.4551
JE	2.8221	3.7655

+ indicates significant Nyblom test at 5% level. * and ** indicates significance at 5% and 1% level respectively. n* denote that normal distributed error is assumed in the model.

5. Conclusion and Recommendations

Findings from EGARCH and TGARCH highlighted that a turn of the month effect was present in the JSE equity returns and volatility. In examining the turn of the month effect, the Top 40, All Shares, Basic materials, Consumer goods, Health care, Consumer services, Financials, and Technology employed EGARCH with Student-t distributed errors. Industrials and Telecommunications sectors used the TGARCH with Student-*t* errors. The mean equation for the aggregate indices, namely the Top 40 and All Shares, unveiled a positive turn of the month effect. Similarly, a positive turn of the month effect was observed in the Basic materials, Consumer goods, Health care, Consumer services, Financials, Technology, Industrials and Telecommunications sectors. The highest turn of the month effect is demonstrated in the Telecommunications sector. The variance equation showed no turn of the month effect in the aggregate indices of the JSE, though the Basic materials sector exhibited a positive turn of the month effect. We recommend that an investor who wants to maximise returns based on the turn of the month strategy should invest in

the Telecommunications sector. Investors should not be anxious for risk in both aggregate and sectoral indices of the JSE when using the turn of the month strategy, though they will need to avoid investing in the Basic materials sector as it increases their exposure.

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