Efficient market hypothesis and calendar effects: Empirical evidences from the Vietnam stock markets

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CHRONICLE	ABSTRACT
	Vietnam's stock market although has small scale without a long history of development but the exchange has just started for a massive development. There have also been a number of anomalies, suggested that the market is not efficient. Therefore, there is a possibility that active investors with right strategy can consistently achieve higher profit than the market portfolio. This paper analyzes the statistical and economic significance of the calendar anomalies to propose appropriate strategies or recommendations. Studying the calendar anomalies in Vietnam also diversifies the research scope and validates some hypotheses in the past. In this research, the authors just analyze the monthly effects and the experimental results of this study may have significant implications not only for financial managers, financial advisers and investors but also for government to implement policy on stock market.

1. Introduction

Calendar effect produces higher or lower yields depending on the nature of the time series (Ariel, 1990). These effects are called market abnormalize since these abnormalize cannot be explained by traditional asset pricing models. Examples of some common effects are January Effect (Haug & Hirschey, 2006), Day-of-the-week effect, Turn of the week effect, etc. (Bouman & Jacobsen, 2002) However, the existence of seasonal factors in stock return is contradicted by an important financial theory called Efficient Market Hypothesis (EMH) (Floros, 2008). The efficient market hypothesis plays an important role in financial model. New data is constantly being added to the market through economic reports, media companies, political reports, and possibly public surveys. If the market is effective in terms of information, stock prices will be adjusted quickly and accurately according to new information. According to EMH, stock prices fully reflect all available information on the market. Since all the information has been included in the price, a stock investor cannot make any surplus profit. Malkiel and Fama (1970) were the first who synthesized and disseminated effective forms of market. There are three variants of the hypothesis: "weak", "semi-strong", and "strong" form.

1.1 Weak form efficiency

This kind of market theory states that the current stock market is a reflection of all the weaknesses of the stock market (historical information), including historical prices, yields in past or changes in price or yield levels at times. In a weak market, the current

market price reflects all past earnings and all information on the market. The market thus assumes that yields of past securities as well as other information are not linked to the future (independent yields). In other words, it is not possible to forecast future stock prices or to make profitable gains on the basis of their similar information in the past (Gultekin & Gultekin, 1983).

1.2 Semi-strong form efficiency

The Semi - strong form effective market theory states that stock prices will rapidly adjust to any public information, i.e. the current price reflects all current market information (or close to present), as well as in the past.

1.3 Strong form efficiency

In strong-form efficiency, share prices reflect all information, public and private, and no one can earn excess returns. So in a highly efficient market, the user can have all the information possible, whether the information is publicly available or not.

2. Theoretical background

2.1. Understand of Ho Chi Minh Stock Exchange Ho Chi Minh City (HOSE):

The Ho Chi Minh City Securities Trading Center (HoSTC) located in Ho Chi Minh City, was officially inaugurated on July 20, 2000, and trading commenced on July 28, 2000. Initially, two stocks were listed, Refrigeration Electrical Engineering Joint Stock Corporation (REE) and Saigon Cable and Telecommunication Material Joint Stock Company (SACOM). On 8 August 2007, HoSTC was renamed and upgraded to the Ho Chi Minh Stock Exchange (HOSE). This is the largest stock exchange of Vietnam at the moment.

2.2. Market Anomalies

A market anomaly is an irregular condition that is inappropriate or deviates from an efficient market hypothesis. The anomaly here is one of the phenomena in the marketplace, where things are found that should not exist and it is assumed that efficient markets exist. Investors can take advantage of conditions in the event of market anomalies to gain abnormal returns on investments (Wong et al., 2006). Jamróz and Koronkiewicz (2014) and Lopez Bernal et al. (2013) state that an anomalous analysis is usually based on observations of long-term financial time series to study its effects and its repetition. Long-term series must be significant since they lower the likelihood of detecting related phenomena. An ongoing anomaly is a necessary condition to create a profitable investment strategy.

2.3. Month of the Year Effect

Schwert (2003) argued that calendar anomalies are empirical results that are inconsistent with the behavior theory of asset valuation. This claim is supported by Hawaldar et al. (2017) and Hawaldar et al. (2017). One of the anomalies that surfaced calendar month of the year is the effect that is the pattern in certain months of each year. Jahfer and Inoue (2014) suggest the most common findings regarding the study of the month of the year effect are the "January effect" and the "April effect". It is well known that stock returns in January and April are significant and different from other months of the year yield. This violates the efficient market hypothesis (EMH) partly developed by Fama in the 1960s (Fama, 1960). Sharpe et al. (1999) say there are three causes of the January effect, that is tax-loss selling, window dressing and small and beta stocks. Tax-loss selling is selling stocks with a low value with the goal of reducing tax debt, while window dressing sells stocks with low value so the year-end portfolio of a company looks good. A small or beta stock is the tendency in January for more small companies to provide a higher level of return compared to large companies.

3. Research methods and data

3.1. Collecting Data

First data is collected for a period of 15 years from March 4, 2002 through March 3, 2017 on the Ho Chi Minh City Stock Exchange (www.hsx.vn) and the first trading was 28/7/2000, however, at this time the stock market trading 3 was days per week until 4/3/2002. Based on the closing index of the VN-Index, a natural logarithmic variation was made for the main data. To create a time series of continuous profit, monthly profit was calculated according to the formula below:

$$R_t = \ln(P_t - P_{t-1}) \times 100,$$

where:

R_t: Return of stock on day t

P_t: The closing price (closing price) on day t

P_{t-1}: The closing price (closing price) on day t–1

3.2 Research Methodology

The initial model for checking the monthly seasonality is as follows:

$$R_t = \alpha_1 + \alpha_2 M2 + \alpha_3 M3 + \alpha_4 M4 + \alpha_5 M5 + \alpha_6 M6 + \alpha_7 M7 + \alpha_8 M8 + \alpha_9 M9 + \alpha_{10} M10 + \alpha_{11} M11 + \alpha_{12} M12 + \varepsilon_t,$$

where R_t is log of market yield, M1…..M12 are dummy variables which represent January to December, respectively (for example, M2 = 1 if data observed is February and 0 otherwise), Intercept α_1 represents the mean yield in January and coefficients α_2 ... α_{12} represent the average difference in market yields between January and the other months, ε_t represents the random error derived from the classical assumption that it has a mean value of 0 assumed to be independent and distribute the same. The first model, used to test the seasonal factor effect on stock returns is the Ordinary Least Square (OLS) regression. The result of the OLS regression will become a false regression if the dependent variable is non-stationary. We will first determine whether the market performance on HOSE is stationary or not. One problem that exists in this method is that the remainder can have serial correlation. To solve this problem, Engle (1982) proposed the ARCH model. Previous researchers have used both OLS and GARCH methods to test the effect of seasonal factors on market yields. However, most recent studies of this phenomenon are mainly based on the GARCH model since it eliminates some of the limitations that OLS model. Chatfield (2016), Fryzlewicz and Subba Rao (2014) also argued that an ARCH or GARCH (Auto-Regressive Conditional Heteroskedasticity or General Autoregressive Conditional Heteroskedasticity) does not assume a constant variance (heteroskedasticity) but it can safely be used for modelling and forecasting.

4. Result

4.1 The Unit Root test:

We first check the stopping of the string and Table 1 demonstrates the results.

Table 1
Correlation chart of the VN Index

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
|** |	|** |	1	0.244	0.244	222.09	0.000
| |	| |	2	0.016	-0.046	223.04	0.000
| |	| |	3	0.015	0.023	223.87	0.000
|* |	|* |	4	0.081	0.077	248.51	0.000
|* |	| |	5	0.079	0.043	271.62	0.000
| |	| |	6	0.032	0.005	275.44	0.000
| |	| |	7	0.039	0.034	281.17	0.000
| |	| |	8	0.020	-0.003	282.68	0.000
| |	| |	9	-0.007	-0.020	282.85	0.000
| |	| |	10	0.002	0.004	282.87	0.000
| |	| |	11	0.019	0.011	284.17	0.000
| |	| |	12	0.031	0.019	287.70	0.000
| |	| |	13	0.061	0.053	301.59	0.000
| |	| |	14	0.033	0.007	305.70	0.000
| |	| |	15	-0.005	-0.016	305.78	0.000
| |	| |	16	-0.006	-0.004	305.92	0.000
| |	| |	17	0.030	0.024	309.27	0.000
| |	| |	18	0.039	0.016	314.89	0.000
| |	| |	19	0.032	0.018	318.76	0.000
| |	| |	20	0.028	0.017	321.72	0.000
| |	| |	21	0.033	0.020	325.75	0.000
| |	| |	22	0.054	0.041	336.69	0.000
| |	| |	23	0.045	0.020	344.34	0.000
| |	| |	24	0.033	0.011	348.48	0.000
| |	| |	25	0.006	-0.015	348.59	0.000
| |	| |	26	-0.003	-0.014	348.63	0.000
| |	| |	27	0.013	0.006	349.29	0.000
| |	| |	28	0.023	0.012	351.29	0.000
| |	| |	29	-0.011	-0.025	351.77	0.000
| |	| |	30	0.010	0.017	352.14	0.000
| |	| |	31	0.003	-0.008	352.18	0.000
| |	| |	32	0.024	0.022	354.35	0.000
| |	| |	33	0.018	0.007	355.60	0.000
| |	| |	34	0.014	0.004	356.29	0.000
| |	| |	35	-0.016	-0.031	357.26	0.000
| |	| |	36	0.011	0.017	357.75	0.000

Table 2 shows the test result of stopping with unit root on VN-Index. Testing the ADF is a common method for unit testing.

Table 2

Unit Root test results for the Index series

Null Hypothesis: RT has a unit root Exogenous: Constant Lag Length: 3 (Automatic - based on SIC, maxlag=21)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-26.46183	0.0000
Test critical values:	1% level		-3.431914	
	5% level		-2.862116	
	10% level		-2.567120	
*MacKinnon (1996) one-sided p-values.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RT(-1)	-0.713862	0.026977	-26.46183	0.0000
D(RT(-1))	-0.032518	0.024130	-1.347582	0.1779
D(RT(-2))	-0.080840	0.020337	-3.975062	0.0001
D(RT(-3))	-0.077208	0.016319	-4.731261	0.0000
C	0.026349	0.022776	1.156917	0.2474
R-squared	0.383862	Mean dependent var		0.000486
Adjusted R-squared	0.383202	S.D. dependent var		1.770965
S.E. of regression	1.390854	Akaike info criterion		3.499051
Sum squared resid	7217.527	Schwarz criterion		3.507383
Log likelihood	-6531.226	Hannan-Quinn criter.		3.502014
F-statistic	581.1160	Durbin-Watson stat		2.006565
Prob(F-statistic)	0.000000			

We see, result in the RT sequence being the stop string. Thus, we can implement the OLS model to test the impact of seasonal factors.

4.2 OLS Model result

Table 3 below shows the monthly effect on the Ho Chi Minh Stock Market. According to the results of regression analysis by method (OLS), it shows that January market yield is higher than the rest of the year and the results are meaningful when the level of significance is five percent.

Table 3

Results of OLS estimation procedures for VN-Index daily returns

Dependent Variable: RT Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
M1	0.276559	0.085482	3.235282	0.0012
M2	0.060351	0.091315	0.660906	0.5087
M3	0.039349	0.078922	0.498578	0.6181
M4	0.144513	0.083584	1.728948	0.0839
M5	-0.059152	0.081807	-0.723063	0.4697
M6	-0.014472	0.080263	-0.180313	0.8569
M7	-0.075163	0.078804	-0.953795	0.3402
M8	0.098169	0.079042	1.241988	0.2143
M9	0.050248	0.082613	0.608233	0.5431
M10	-0.066660	0.078922	-0.844627	0.3984
M11	-0.057589	0.080389	-0.716384	0.4738
M12	0.070477	0.078922	0.892992	0.3719
R-squared	0.004619	Mean dependent var		0.035208
Adjusted R-squared	0.001682	S.D. dependent var		1.439247
S.E. of regression	1.438035	Akaike info criterion		3.567636
Sum squared resid	7709.303	Schwarz criterion		3.587616
Log likelihood	-6659.480	Hannan-Quinn criter.		3.574743
Durbin-Watson stat	1.519726			

The above conclusion is based on OLS results. One major problem encountered with the OLS model is that this model ignores the different time variations (ARCH effects) of profit. Previous studies have found that the ARCH effect is present in market outbreaks. If the ARCH effect persists in the research data then the GARCH (1,1) model will be used. To test the existence of the ARCH effect, Lagrange Multiplier (LM) testing by Engel (1982), was performed with a selected time delay of 6.

4.3 Test LM and GARCH model

Table 4 presents the LM test results. LM tests show that ARCH is present in the model. Furthermore, it is significant at 1%. The ARCH-LM test results show that the ARCH effect exists in the research data (market yield curve)

Table 4
Results of the ARCH LM Test

Heteroskedasticity Test: ARCH

F-statistic	159.4150	Prob. F(7,3725)	0.0000
Obs*R-squared	860.5155	Prob. Chi-Square(7)	0.0000

Test Equation: Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.623393	0.074272	8.393406	0.0000
RESID^2(-1)	0.264739	0.016376	16.16611	0.0000
RESID^2(-2)	0.139069	0.016906	8.225979	0.0000
RESID^2(-3)	0.043827	0.017019	2.575189	0.0101
RESID^2(-4)	0.080259	0.016983	4.725758	0.0000
RESID^2(-5)	0.070994	0.017019	4.171431	0.0000
RESID^2(-6)	0.066281	0.016906	3.920514	0.0001
RESID^2(-7)	0.032167	0.016377	1.964177	0.0596
R-squared	0.230516	Mean dependent var		2.062028
Adjusted R-squared	0.229070	S.D. dependent var		4.067436
S.E. of regression	3.571316	Akaike info criterion		5.385886
Sum squared resid	47509.76	Schwarz criterion		5.399227
Log likelihood	-10044.76	Hannan-Quinn criter.		5.390632
F-statistic	159.4150	Durbin-Watson stat		2.002041
Prob(F-statistic)	0.000000			

Table 5
Results of the GARCH model test

Dependent Variable: RT
Method: ML - ARCH (Marquardt) - Normal distribution

Variable	Coefficient	Std. Error	z-Statistic	Prob.
M1	0.075754	0.048049	1.576599	0.1149
M2	0.086394	0.068100	1.268626	0.2046
M3	0.030078	0.048442	0.620909	0.5347
M4	0.151049	0.055249	2.733992	0.0063
M5	-0.032364	0.053079	-0.609731	0.5420
M6	0.005753	0.054176	0.106198	0.9154
M7	-0.072439	0.043955	-1.648010	0.0994
M8	-0.014043	0.025138	-0.558643	0.5764
M9	0.019952	0.048731	0.409424	0.6822
M10	-0.033122	0.037977	-0.872153	0.3831
M11	-0.097962	0.043815	-2.235840	0.0254
M12	0.035979	0.055603	0.647073	0.5176
	Variance Equation			
C	0.044078	0.005056	8.717547	0.0000
RESID(-1)^2	0.248920	0.015393	16.17136	0.0000
GARCH(-1)	0.752832	0.011822	63.68040	0.0000
R-squared	0.002333	Mean dependent var		0.035208
Adjusted R-squared	-0.000611	S.D. dependent var		1.439247
S.E. of regression	1.439687	Akaike info criterion		3.142100
Sum squared resid	7727.015	Schwarz criterion		3.167074
Log likelihood	-5860.727	Hannan-Quinn criter.		3.150983
Durbin-Watson stat	1.515677			

We find that the p-value of resid ^ 2 (-7) is not statistically meaningful at the 10% level, so that the ARCH effect of the model is of degree 6. Since this time series has an ARCH effect, changing the model estimation using the LS - Least Squares method, in the next step the GARCH (1,1) model is used. The results of the GARCH model are shown in Table 5. The results obtained from the GARCH (1,1) model indicate that the stock price change rule exists on HOSE. Specifically, market yields for January were higher than the average for the rest of the year. The difference in market yields in January over the rest of the year was statistically significant at 5%. This phenomenon can be explained by the January first month of the new year, Vietnamese investors in this period usually have some idle capital. In addition, January is in the stage that institutional investors, domestic and foreign investment funds after the review, restructuring the portfolio, adjusting the budget to invest in the market. Moreover,

some information about the country's economic situation in the previous year as well as development orientations for the next year have been announced, making investors more remarkable in their investment strategy. That's why stock prices tend to rise. Unlike January, research results from the GARCH (1,1) model indicate that the market index fell in November at a statistically significant 5%. The market decline in November may be explained by the fact that November is in the period of price adjustment of the market due to the previous period prices have increased excessively. In addition, November is the time when economic indicators, economic information, and financial statements of companies are published. This, in turn, gives investors the opportunity to evaluate and restructure their portfolio, eliminating low-yielding securities that are more suited to the situation.

5. Conclusions and recommendations

5.1 Conclusion

The study has used the VN-Index series over time from March 4, 2002 to March 3, 2017 and the empirical results from the OLS and GARCH models (1.1) have shown the impact of seasonal factors on the market price on HOSE. Specifically, the results of regression analysis by OLS method indicate that the VN-Index increased in January. The GARCH (1.1) analysis has shown that in addition to the VN-Index rising in January, the index fell in November.

5.2 Limitations and recommendations for subject development

The study just analyzed the HOSE data so it does not reflect the overall situation of the stock market in Vietnam. Future research papers can further be expanded by using other indices on the Ho Chi Minh Stock Exchange or can be further researched on the Hanoi Stock Exchange, thereby improving the market efficiency of the market. In addition, future studies may be performed with a variety of other seasonal effects, such as the effects of day and year and the effects of holidays. As we all know that different stock markets will have different states, so seasonal effects can produce surprisingly different results in each stock market. To broaden the scope of this research, we need to not only check seasonality, but also we have to examine some of the abnormalities in the Vietnamese stock market.

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