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Investigating Seasonal Patterns in Developing Countries: The Case of FYROM Stock Market[1]

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ABSTRACT: This paper uses a data set from FYROM Stock Exchange to investigate the presence of calendar effects in this recently organised equity market during the period 2002–2008. Five well known calendar effects are examined by both mean (OLS) and variance (GARCH) regressions; the day of the week effect, the January effect, the half month effect, the turn of the month effect and the time of the month effect. Results indicate that two of the tested calendar effects are present in the MSE (day of the week and January effects) and conclusions using linear and various GARCH methodologies, always converged to the same results. This survey's evidence are in line with the majority of similar research which report that calendar effects are still present especially in developing equity markets. However, considering the low level of liquidity and maturity of this market, we would expect more effects to appear significant.

Keywords: Calendar Anomalies, mean stock returns, volatility, FYROM
JEL Classifications: C32, G10.

1. Introduction

Since the seminal work of Fama (1965), a vast number of studies have been developed regarding security price anomalies. Some of them are broadly known as calendar effects. The most important calendar effects studied are the day of the week effect (significantly different returns on some day of the week; usually higher Friday returns and lower Monday returns), the monthly (or January) effect (relatively higher January returns), the half month effect (returns are statistically higher over the first half of the month), the turn of the month (statistically higher returns on turn of the month days than other trading days) and the time of the month effect (returns are higher on the first third of the month). Thaler (1987a, 1987b) provides an early and partial survey, while Mills and Coutts (1995) and Coutts et al. (2000) provide selective and more recent international references.

Other studies have examined the time series stock price behaviour in terms of volatility by using generalised autoregressive conditional heteroskedasticity (GARCH) models (French et al., 1987; Hamao et al., 1990; Nelson, 1991; Campbell and Hentschel, 1992; and Glosten et al., 1993). For example, French et al. (1987) support that unexpected stock market returns are negatively correlated to the unexpected changes in volatility, while Campbell and Hentschel (1992) found that an increase in volatility raises the required rate of return on common shares and hence lowers stock prices. Generally, all those studies report that returns in stock markets are time varying and conditionally heteroskedastic.

[1] The early edition of this paper was presented at the "7th Annual Conference of the Hellenic Finance and Accounting Association", 12-13 December, 2008, Crete, Greece.

This study investigates the existence in FYROM stock exchange (MSE) of five well known calendar effects (day of the week effect, January effect, half month effect, turn of the month effect and time of the month effect, as defined above) in mean stock returns and their variances.

The survey is motivated by a number of factors: (i) investigating five calendar anomalies by applying both mean and variance specifications for an emerging Balkan stock market where to the best of our knowledge previous literature findings do not exist; (ii) covering a period which includes some of the most important macroeconomic, political and stock market reformations that took place in the tested country; (iii) avoiding data mining phenomenon by using data sets that are not repeatedly used in similar studies and are different from those studies in which the calendar effects originally discovered and (iv) enriching the existing calendar effects literature by presenting results from a developing country located in the Balkan peninsula.

The paper is organised as follows: Section 2 describes the data set. Section 3 describes the methodology employed in the study. Section 4 presents the empirical findings, while a summary of results and concluding remarks are presented in Section 5.

2. Data Analysis

Our data set consists of daily closing values (in logs) for the MBI – 10 Index, which is the basic index used in the MSE. The MBI – 10 Index is a price index weighted with the market capitalization. It is consisted of 10 listed ordinary shares, chosen by the Stock Exchange Index Commission. The Commission performs regular (twice a year) and extraordinary (if extraordinary circumstances occur) revisions to the index.

Regarding the most important dates in the short history of the FYROM as an independent country, it is worth noting that the Former Yugoslav Republic of Macedonia was created in 1991 due to the break-up of Yugoslavia. An absence of infrastructure, United Nations sanctions on its largest market Federal Republic of Yugoslavia, and a Greek economic embargo hindered economic growth until 1996. Worker remittances and foreign aid have softened the volatility of the subsequent recovery period. GDP has increased each year except 2001, rising by 5% in 2000.

However, growth in 1999 was held down by the severe regional economic dislocations caused by the Kosovo war. The privatisation program of 2000 was proved to be successful boosting the country's reserves to over $700 million. Also, the leadership demonstrated a continuing commitment to economic reform, free trade and regional integration. The economy can meet its basic food needs but depends on outside sources for all of its oil and gas and most of its modern machinery and parts. Inflation jumped to 11% in 2000, largely due to higher oil prices. Since 2002, the FYROM shows some important signs of growth. Due to the relevant stability in the Balkan region, investments in the region have increased in the period 2002 – 2006 by more than 50% (with Greece being by far the primary investor), inflation shows a downward trend while GDP increased by approximately 3% during this period.

Regarding the FYROM stock exchange (MSE), it is worth mentioning that its story began in 1995. On 13 September 1995 the Inaugural Meeting of the MSE took place. This is the official date of the establishment of the first organised securities exchange in the history of the country considering that FYROM had never before a stock exchange. The Exchange was established as a joint stock company operating on a non-profit basis, with a founding capital of one million deutschmarks. The total number of the initial founders of the FYROM Stock Exchange was 19 (13 banks, three insurance companies and three saving houses). These founders simultaneously became first Exchange members with right to trade in securities. The Exchange's first transaction day is connected with the date of 28 March 1996. In the beginning the Exchange was open for trading twice a week, on Tuesdays and Thursdays. In 2002, 'The Takeover Law', the missing link in the chain of securities legislation in the FYROM was adopted. The number of trading days was increased to four days of the week, Monday to Thursday. In 2003 the MSE signed Memorandums of Understanding with the stock exchanges in Belgrade, Zagreb and Sofia. In 2004, a third issue of denationalisation bonds of the FYROM was listed. The new Listing Rules entered into effect. In 2005, the FYROM stock exchange was accepted as a corresponding member of the Federation of European Stock Exchanges (FESE). The main characteristic of the year 2006 was the entrance of capital inflow from regional investors (mainly Greece) into FYROM capital market. Finally, the year 2007 was the most successful since the foundation of MSE back in 1996. The MSE realised record turnover of 41.7 billion euros and MBI 10 index achieved its biggest value breaking the barrier of 10,000 index points.

The data set covers a period from January 2002 until July 2008 (excluding holidays). This period covers a long stock market cycle characterised as a bull market for the region, excluding the stock market crash period started on September 2008 due to the global financial crisis. The 'close to close' data does not contain information about the payment of dividends on stocks. Although, there exist some evidence that the payment pattern of dividends may be a reason for seasonality in non-dividend adjusted returns (Phillips-Patrick and Schneeweis, 1988), most of the studies on calendar effects use non-dividend adjusted returns allowing for direct comparisons to the previously published results. Furthermore, the vast majority of previous studies which use non-dividend adjusted data report that systematic dividend payment patterns do not significantly change their results (e.g., Fishe et al., 1993; French, 1980; Lakonishok and Smidt, 1988).

3. Methodology

The calendar effects in mean stock returns are studied by the OLS regression of the complete return series on appropriately defined dummy variables[2]. On the other hand we allow variances of errors to be time dependent to include a conditional heteroskedasticity that captures time variation of volatility in stock returns applying the GARCH (p,q) model proposed initially by Engle (1982) and further developed by Bollerslev (1986)[3]. Therefore, GARCH [1,1] models, including appropriately defined dummies, are used for testing the calendar effects in conditional variance of stock index returns. The parameters are estimated following the quasi-maximum likelihood (QML) estimation introduced by Bollerslev and Wooldridge (1992)[4].

Estimation of Calendar Effects:

The day of the week effect is studied, using a model, originally proposed by French (1980). In this framework, the trading time hypothesis is evaluated, according to which returns are created only on the working days of the week. This hypothesis is tested, using the following regression with dummy variables (e.g., French, 1980; Rogalski, 1984; Jaffe and Westerfield, 1989; Agrawal and Tandon, 1994; Mills and Coutts, 1995):

$$R_t = \alpha_1 + \sum_{i=2}^{5} \alpha_i D_{it} + \varepsilon_t \qquad (1)$$

where R_t is the daily logarithmic return on a selected index, $D_{it} = 1$ for day i and 0 for all other days (i = 2,…,5 corresponds to Tuesday through to Friday), α_1 indicates the mean daily return for Monday, while α_2 to α_5 represent the difference between the mean daily return for Monday and the mean daily return for each of the other days of the week and ε_t is an error term assumed to be identically and independently distributed (*IID*). If there are no differences among index returns across days of the week, the parameters of α_2 to α_5 are zero. Therefore, the null hypothesis of the relevant Wald test is the following: $H_0 : \alpha_i = 0$ for i = 2,…,5. If the null hypothesis is rejected, then stock returns should exhibit some form of the day of the week seasonality.

The day of the week effect in variance is studied by estimating the following conditional volatility function:

[1] To address the drawback of the OLS that error terms may not be white noise due to autocorrelation and heteroskedasticity problems resulting to misleading inferences, the significance of the regression estimates (t-statistics) is observed using the Newey -West heteroskedasticity and autocorrelation – adjusted standard errors (Newey and West, 1987).

[3] One disadvantage of using the GARCH [1,1] with the relevant dummies for each anomaly is the possibility of being too restrictive. In order to assess the conditional variance better, we include additional terms in the conditional variance equation. Specifically we include (a) additional lag values for the ARCH term [GARCH (1,2)] and (b) additional lag values for the GARCH coefficient [GARCH (2,1)]. The results for all indices are robust with our previous findings and these findings are not tabulated and reported.

[4] The Ljung-Box *Q* and ARCH-LM tests for various lags are also employed in the investigation of each calendar anomaly in variance for all markets. The results, not presented here, confirm that the standardized residuals terms have constant variances and do not exhibit autocorrelation.

$$h_t^2 = a + \beta\varepsilon_{t-1}^2 + \gamma h_{t-1}^2 + \sum_{i=2}^{5}\delta_i D_{it} \quad (2)$$

h_t^2 is the conditional variance of ε_t in the equation (2). Here, we take into account the possibility that the lagged values of the squared residuals and the conditional variances might be too restrictive. If there is no day of the week effect in variance, the parameters δ_2 to δ_5 are zero, so the relevant null is $H_0 : \delta_i = 0$ for $i = 2,\ldots,5$.

For the monthly or January effect, the model used is described by the following equation (e.g., Gultekin and Gultekin, 1983; Jaffe and Westerfield, 1989; Raj and Thurston, 1994):

$$R_t = \beta_1 + \sum_{i=2}^{12}\beta_i \mathrm{M}_{it} + \varepsilon_t \quad (3)$$

where, M_{it} = 1 if the return at time *t* belongs to month *i* and 0 if the it belongs to any other month (i = 2,…,12 corresponds to February through December). The intercept β_1 measures the mean return for January, while the coefficients β_2 to β_{12} represent the average differences in return between January and each individual month. The null hypothesis tested in this equation is $H_0 : \beta_i = 0$ for $i = 2,\ldots,12$. As before, days before stock market vacations are excluded from the analysis.

As in the case of the day of the week effect, the monthly effect in variance is studied by estimating the following equation:

$$h_t^2 = a + \beta\varepsilon_{t-1}^2 + \gamma h_{t-1}^2 + \sum_{i=2}^{12}\delta_i \mathrm{M}_{it} \quad (4)$$

For the half month effect we follow Lakonishok and Smidt's (1988), defining as H_{1t}= 1 if day t is from the first to the fifteenth calendar day of the month if it is a trading day, and if it is not, to the next trading day, and H_{1t} = 0 otherwise. The mean and variance models for the half month effect are the following:

$$R_t = \gamma_0 + \gamma_1 \mathrm{H}_{1t} + \varepsilon_t \quad (5)$$

$$h_t^2 = a + \beta\varepsilon_{t-1}^2 + \gamma h_{t-1}^2 + \delta H_{1t} \quad (6)$$

Lakonishok and Smidt (1988) find that the mean returns on days around the turn of the month are significantly higher than the mean returns on the rest of the month days. Moreover they observe that the returns are higher especially during a four day period starting from the last trading day of the old month until the first three business days of the new month. To test for the existence of turn of the month effect in mean return in the data set the following model is used:

$$R_t = \lambda_0 + \lambda_1\mathrm{M}(-3)_t + \lambda_2\mathrm{M}(-2)_t + \lambda_3\mathrm{M}(-1)_t + \lambda_4\mathrm{M}(+1)_t + \lambda_5\mathrm{M}(+2)_t + \lambda_6\mathrm{M}(+3)_t + \varepsilon_t \quad (7)$$

where $\mathrm{M}(-3)_t$ to $\mathrm{M}(+3)_t$ are turn of the month dummy variables.

The turn of the month effect in variance is tested by using the following model:

$$h_t^2 = a + \beta\varepsilon_{t-1}^2 + \gamma h_{t-1}^2 + \delta_1\mathrm{M}(-3)_t + \delta_2\mathrm{M}(-2)_t + \delta_3(\mathrm{M}(-1)_t + \delta_4\mathrm{M}(+1)_t + \delta_5\mathrm{M}(+2)_t + \delta_6\mathrm{M}(+3)_t \quad (8)$$

The last anomaly to be investigated is the time of the month effect. This monthly anomaly was first identified by Kohers and Patel (1999). They split a calendar month into three segments. The first segment extends from the 28th day of a previous month to the 7th day of the month, the second segment extends from 8th day to the 17th day of the month and the last segment consists of the other days, that is, the 18th day to the 27th day of the month. Using the Standard & Poor's Index (S&P) during the period January 1960 – June 1995 and the NASDAQ Index during the period January 1972 – June 1995, they reported that the returns are highest during the 'first third', experience a drop during the 'second third' and are lowest, and in most cases negative, during the 'last third' of a month. Further they indicate that this pattern remained remarkably consistent for the two indices examined. It also held up well over the business cycles and many different sub periods tested. Following Kohers and Patel (1999) the below regression is estimated:

$$R_t = \beta_0 + \beta_1 d_{2t} + \beta_2 d_{3t} + \varepsilon_t \quad (9)$$

where R_t is the mean return of the stock index on day t and the dummy variable d_{it} indicates the day on which the return is observed (d_{2t} = first third month days and d_{3t} = second third month days). d_{2t} attains a value of 1 if the return is observed on the first third of the month days, 0 otherwise. Similarly, d_{3t} attains a value of 1 if the return is observed on the second third of the month days, 0 otherwise.

On the other hand, in order to test the time of the month effect in variance, we used the following equation:

$$h_t^2 = a + \beta\varepsilon_{t-1}^2 + \gamma h_{t-1}^2 + \delta_1 d_{2t} + \delta_2 d_{3t} \quad (10)$$

4. Empirical Results

Table 1 reports on descriptive statistics for the MBI – 10 index regarding the tested period. The highest average daily (15.1231) appeared in 2 July 2002, while the minimum price (-11.6751) appeared in 29 November 2002. Overall, descriptive statistics indicate that returns are not normally distributed and are characterised as leptokurtic and skewed.

Table 1. Summary statistics

Index	Mean	Minimum	Maximum	Std. Dev.	Skewness	Kurtosis
MBI – 10 Index	0.122934	- 11.6751	15.1231	1.6894428	0.730598	16.81697

Table 2 displays the estimation results of equation (1). From this table, it is clear that the day of the week effect exists (weakly though) in the FYROM stock exchange. Monday appears to have the highest and statistically significant returns while Friday appears to have the lowest and negative returns (reverse Monday effect).

Table 2. The day of the week effect in mean

Index	α_1	α_2	α_3	α_4	α_5	Wald
MBI – 10 Index	0.1602* (0.1199)	- 0.0938 (0.1684)	0.0111 (0.1681)	0.1102 (0.1672)	-0.2182* (0.1671)	2.1311* [0.0861]
Notes: *, **, *** denote significance at 10%, 5% and 1% respectively. Standard errors are reported in parentheses and p - values in brackets. This note also applies to the subsequent Tables.						

Table 3 presents the results of estimating the variance model (equation 2), where it can be seen that the day of the week effect strongly exists in the MSE. Monday presents high and statistically significant variance while Friday appears to have lower (but strongly significant) variance than Monday's.

Table 3. The day of the week effect in volatility

Index	α	β	γ	δ_2	δ_3	δ_4	δ_5	Wald
MBI – 10 Index	2.0177*** (0.2321)	0.1161*** (0.0008)	0.7587*** (0.0123)	-1.0839 (0.4184)	- 2.1974 (0.2852)	-2.6879 (0.2572)	-2.5378*** (0.2441)	2.2696** [0.0472]

The results for the mean model (equation 3) are presented in Table 4, where it was found that the monthly effect strongly exists in the FYROM stock exchange. February has positive and statistically significant returns, while April and May show significantly lower (and negative) returns than February. Furthermore, testing the monthly effect in variance (equation 4), it appears that the monthly effect exists, since the variances of February, April and May are negative and statistically significant. Moreover, January shows the highest positive and significant variance while December has the lowest, so according to the GARCH [1,1] methodology, January effect exists in FYROM stock market.

Table 4. The January effect in mean

Index	MBI – 10 Index
β_1	0.2468 (0.2041)
β_2	0.3682** (0.2983)
β_3	0.2974 (0.2849)
β_4	-0.5521*** (0.2728)
β_5	-0.4279** (0.2714)
β_6	-0.4169 (0.2740)
β_7	0.0879 (0.2715)
β_8	-0.0471 (0.2706)
β_9	-0.0701 (0.2708)
β_{10}	-0.2975 (0.2714)
β_{11}	- 0.2251 (0.2744)
β_{12}	0.0051 (0.2628)
Wald	2.2539** [0.0103]

Table 5. The January effect in volatility

Index	MBI – 10 Index
α	2.2448*** (0.7025)
β	0.1409*** (0.0264)
γ	0.5405*** (0.0101)
δ_2	-1.4514** (0.7247)
δ_3	-0.8621 (0.6888)
δ_4	-0.7671*** (0.6818)
δ_5	-1.7561** (0.6877)
δ_6	-1.9688 (0.6941)
δ_7	0.1811 (0.7342)
δ_8	-1.762 (0.6928)
δ_9	-1.2667 (0.6905)
δ_{10}	-1.6811 (0.6857)
δ_{11}	-1.2565 (0.6859)
δ_{12}	0.0051 (0.2628)
Wald	2.2005** [0.0174]

Table 6 shows that there is no evidence proving the existence of the half month effect in mean for the MBI – 10 index (equation 5), since MBI – 10 index does not present statistically different results for the first half of the month days.

Table 6. The Half Month effect in mean

Index	γ_0	γ_1
MBI – 10 Index	0.1669 (0.0727)	- 0.0855 (0.1049)

Same results are reported measuring the above effect in variance (equation 6), as tabulated in Table 7. Therefore, the half month effect is absent from the MSE as both results from both models imply.

Table 7. The Half Month effect in variance

Index	α	β	γ	δ
MBI – 10 Index	0.2721*** (0.0957)	0.1474*** (0.0428)	0.7843*** (0.0511)	-0.1379 (0.1136)

Table 8 presents the results of testing the turn of the month effect in mean (equation 7). The turn of the month effect appears to be absent from the FYROM stock exchange regardless the fact that coefficient (λ_5) is statistically significant at a 95% level of confidence.

Table 8. The TOM effect in mean

Index	λ_0	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	Wald
MBI – 10 Index	0.0761 (0.2574)	0.1521 (0.2561)	0.1626 (0.2568)	-0.2084 (0.2559)	0.2461 (0.2563)	0.5621** (0.2562)	0.0824 (0.2561)	1.1521 [0.3299]

Results of the turn of the month effect in variance (equation 8), presented at Table 9, are in line with those of the mean model, since the Wald test results cannot reject the null hypothesis of equal variances (although, coefficient δ_5 appears to be 'weakly' significant).

Table 9. The TOM effect in volatility

Index	α	β	γ	δ_1	δ_2	δ_3	δ_4	δ_5	δ_6	Wald
MBI – 10 Index	0.2587** (0.1071)	0.1534*** (0.0464)	0.7519*** (0.0577)	-0.5445 (0.3526)	-0.2389 (0.3579)	0.4828 (0.4824)	-0.8131 (0.3639)	2.0348 (3.9219)	-2.7158 (3.0141)	1.0822 [0.3801]

Table 10 presents the calculations from testing the time of the month effect in the MSE, where it was found that this effect is not present using the mean equation (equation 9), since none of the tested variables present significance.

Table 10. The Time of the Month effect in mean

Index	β_0	β_1	β_2	Wald
MBI – 10 Index	0.1849** (0.0941)	-0.0171 (0.0008)	-0.1701 (0.1325)	1.0237 [0.3598]

Finally, Table 11 shows the estimation results for the variance model (equation 10). These findings appear to be in line with the mean model estimates; the only difference is that coefficient (δ_2) shows a very weak sign of significance at only 10 percent level. However, overall significance as measured by the Wald test implies no rejection of the null hypothesis.

Table 11. The Time of the Month effect in volatility

Index	α	β	γ	δ_1	δ_2	Wald
MBI – 10 Index	0.4038** (0.1464)	0.1501*** (0.0394)	0.7671*** (0.0619)	-0.1911 (0.1624)	-0.2984* (0.1608)	1.7642 [0.1729]

5. Summary and Concluding Remarks

This study has provided an exhaustive empirical analysis for five calendar effects in mean stock returns and their variances in order to test the existence / non – existence of these market anomalies in the FYROM stock exchange (MSE) by using daily closing values of the MBI – 10 index, for the period 2002 - 2008. We documented the existence / non-existence of the January (monthly) effect, the Monday (day) of the week effect, the half month effect, the turn of the month effect and the time of the month effect in mean stock returns (OLS) and their variances (GARCH 1,1).

The empirical analysis is summarized and tabulated in Table 12 for the mean and the variance models. It clearly emerges from the table that the day of the week effect and the monthly effect are present in the MSE using both mean (OLS) and variance (GARCH) equations. These findings suggest that calendar effects are real and exist in the stock markets around the world especially in the newly formed and emerging financial markets. The case of the Former Yugoslav Republic of Macedonia is evidence pointing in this direction. However, we would expect a larger number of calendar effects to be significant, since the other three tested anomalies (i.e. half month effect, turn of the month effect and time of the month effect) have been found absent from the MSE. So, it would be interesting to investigate whether these three absent calendar anomalies were present the years before the period covered from this survey (i.e. 1996 – 2002).

Table 12. Summary of Calendar Effects

MBI – 10 Index	In mean	In variance
Day of the week effect	**Weak**	**Strong**
Monthly Effect	**Strong**	**Strong**
Half Month Effect	None	None
Turn of the month effect	None	None
Time of the Month Effect	None	None

In a decision-making process, a rational financial decision maker must take into account not only returns but also the variance (i.e. risk) or volatility of returns. The calendar effect patterns in return and volatility might encourage investors to take advantage of some regular market shifts by designing and implementing trading strategies, which account for such predictable patterns. Uncovering certain volatility patterns in returns might also benefit investors in valuation, portfolio optimisation, and risk management. However, obtaining profits from calendar anomalies is a risky business, especially in Balkan stock markets (e.g. FYROM Stock Exchange), which display high volatility and sudden movements that cannot be followed reactively. Future research may examine the calendar anomalies on emerging markets such as MSE by covering a switch from a strong bull to a severe bear market situation under the 2008 global financial crisis.

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