

# Monthly Effects on the Trading Behavior of U.S. Exchange Traded Funds

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## Abstract

In this paper, I provide new statistical evidence on the well-known November effect using data from the U.S. Exchange Traded Funds (hereafter ETFs) market. According to my results, the November effect applies to ETFs' performance, volatility and tracking efficiency. Moreover, the November effect concerns all the types of ETFs in terms of capitalization (large, medium and small cap ETFs). In addition, the November effect is valid no matter what the underlying market index is, namely, domestic broad market index, domestic sector index or international indexes. Further research indicates that investing strategies following the November patterns in ETFs' performance can beat the buy-and-hold strategies at the average and accumulated level during a five-year period. Based on this element, investors can gain significant returns if they allow themselves to be exposed to greater volatility.

## Keywords:

ETFs, Seasonality, November Effect, Performance, Risk, Tracking Error.

## JEL classification:

G11

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# Efectos mes en los fondos cotizados en EE.UU.

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## Resumen

En este artículo se aporta nueva evidencia estadística sobre el bien conocido efecto Noviembre a partir de la información del mercado americano de fondos cotizados. De acuerdo con los resultados obtenidos, existe efecto Noviembre tanto en el rendimiento de dichos fondos como en su volatilidad y en la eficiencia de *tracking*. El efecto Noviembre afecta a todo tipo de fondos negociados, independientemente de su capitalización (grande, mediana o pequeña), y se verifica sea cual sea el índice de mercado subyacente (nacional general, nacional sectorial o internacional). También se indica que, en lo que al rendimiento de los fondos cotizados se refiere, las estrategias de inversión que tienen en cuenta el patrón objeto de estudio pueden batir a aquellas basadas en comprar y mantener, tanto en promedio como en acumulado, cuando se considera un periodo de cinco años. En base a ello, los inversores pueden obtener rendimientos significativos si están dispuestos a exponerse a una mayor volatilidad.

## Palabras clave:

Fondos cotizados, Estacionalidad, Efecto Noviembre, Rendimiento, Riesgo, Tracking error.

## ■ 1. Introduction

The current paper provides new statistical evidence on the November effect using data from the U.S. ETF market. Bhabra *et al.* (1999) were the first to empirically test the November effect. In particular, the authors document the existence of a November effect in stock returns related to the implementation of Tax Reform Act of 1986, which shifted the tax-year end for mutual funds from December to October. The shift of tax-year end could probably result in selling pressure within October of stocks that experienced capital losses during the year. Investors offset this way the taxable gains at the beginning of the new tax year. Gibson *et al.* (2000) find similar November effect in stock returns. Specifically, they determine the extent to which mutual funds sell losers by examining quarterly changes in a stock's mutual fund ownership. They found evidence of a strong November effect in 1990, the first year of the 1986 tax regulation's full implementation, for stocks that are prior losers and have high mutual fund ownership.<sup>1</sup> Ken and Chris (2005) also deal with the Tax Reform Act of 1986. The authors calculate holding period returns over each tax year, construct portfolios with large differences in mutual fund ownership, and test for the presence of a bid-ask spread bias. The empirical results obtained demonstrate the existence of a November effect but only in the first week of November. Using data from the emerging market of India, Patel (2008) reveals that a strong November effect on stock prices applies to the Indian stock exchange too. This effect means that the mean November returns of Indian stocks are higher during November compared to the other months' returns. In a recent study, Jun Chia and Sen Liew (2012) report a strong November effect on the pricing of Nikkei 225 Index of the Tokyo Stock Exchange. The authors attribute this effect to the behavior of investors acting according to the tax-loss selling hypothesis<sup>2</sup> as evidenced in other developed stock markets such as the U.S. and the U.K.<sup>3</sup>

When it comes to ETFs, Rompotis (2010) shows the existence of a significant November effect on the performance of ETFs and a reverse November effect on their volatility. In addition, the author finds that ETFs achieve the best replication of their benchmarks' performance in November. The combination of high average return and low risk and tracking error within November signals an opportunity for investors to gain sufficient returns during this month by exposing themselves to modest or low volatility and tracking failure.

<sup>1</sup> Referee's interpretation of the study of Gibson *et al.* (2000).

<sup>2</sup> According to this hypothesis, investors tend to sell the stocks that experienced large capital losses before the tax year-end and postpone the sale of stocks with capital gains until after the new tax year. The mean trade size also decreases for stocks with capital losses before the year-end and for stocks with capital gains after the New Year.

<sup>3</sup> The aforementioned studies of Bhabra *et al.* (1999), Gibson *et al.* (2000), and Ken and Chris (2005) deal with the tax-loss selling hypothesis.

In the current article, I expand the work of Rompotis (2010) in several ways. I first investigate whether the November effect detected by Rompotis (2010) concerns the overall ETF market or it relates to certain market categories or classes of capitalization. In particular, I split ETFs into broad, sector and international groups so as to examine whether the seasonal patterns in return, risk and tracking error are related to specific industries or market segments or if they are independent to the particular characteristics of each market sector and to the institutional environment of local markets.

The results indicate that the November effect in performance concerns all the individual ETF categories and classes. Moreover, I find that the broad, sector and international ETFs achieve about the same mean return each November over the period 2002-2006. Yet, we note that the November's return of all ETF groups does not constantly exceed other monthly returns for all the years of the study. Moreover this study reveals the existence of a less strong reverse November effect on risk, which means that the risk of ETFs in November is relevantly low. This finding almost applies to all the single ETF groups. Moreover, a reverse November effect in ETFs' replication efficiency applying to all the ETF groups is also found. This effect means that the tracking error in November is the lowest among all monthly tracking errors.

Applying an alternative segmentation of ETFs in terms of capitalization, I examine whether the previous findings of the respective literature on common stocks, such as those of Lakonishok *et al.* (1991) who have shown that return seasonal basically relates to small cap stocks, apply to ETFs too. According to my findings, the November effect in ETFs' performance concerns all the classes of capitalization. However, the small cap ETFs achieve slightly better performance than the large and medium ETFs. Moreover, I find that the reverse November effect on risk and tracking error also apply to all ETFs irrespectively of capitalization.

In the last step, I perform an ex-post comparison of performance and volatility of various theoretically implemented strategies by taking into account the capitalization of ETFs and the origin of the benchmarks. In particular, I compare the return and the relating risk that would be available to investors either if they had invested in broad (large cap), sector (medium cap) and international (small cap) ETFs only during November of each year or if they had followed two alternative buy-and-hold strategies. The first buy-and-hold strategy regards the purchase of a compound average market or capitalized portfolio of ETFs at the first day of each year and the hold of this portfolio until the year end. The second buy-and-hold strategy regards the purchase and the hold of a portfolio consisting in ETFs receiving a four or five star rating by Morningstar for a whole year; this portfolio does not consider the market segment or the capitalization of ETFs. I compare the return of these trading strategies by considering the preferences of risk averse and risk taking investors.

When it comes to the three market categories of ETFs, the results indicate that the strategies based on the November effect on ETFs' performance produce higher return and lower risk than the buy-and-hold strategies. Moreover, the sector and international ETFs achieve equal mean returns in November. This return exceeds the average return of broad market ETFs also being more volatile than the returns of broad market ETFs. Based on these results, I suggest that the broad market ETFs would probably be preferred by the risk averse investors while the risk taking investors would rather pick ETFs from the bundle of sector and international market ETFs, which offer higher returns over the period under investigation.

Considering the three classes of capitalization, the findings indicate that the strategies leaning on the seasonal patterns in ETFs' return deliver higher average and accumulated returns than the buy-and-hold strategies over the period 2002-2006. Furthermore, the performance of small cap ETFs exceeds the performance of large and medium cap ETFs yet being more volatile than them. Therefore, we may conclude that the small cap ETFs are appropriate to risk taking investors while the risk averse investors would choose the medium cap ETFs, which produce sufficient performance with a modest exposure to risk.

Finally, the results reveal that, ex-post, the risk taking investors could possibly gain higher returns than the risk averse investors in both the cases of ETF classification. Moreover, the results indicate that the risk averse investors would possibly have more persistent investment preferences while the risk taking investors might change their choices to gain higher performance.

The main contribution of the current paper is that it provides sufficient new statistical evidence on the well-established in the financial literature November effect using data from ETFs, whose seasonal pricing behavior has only partially been examined so far. The results obtained are in line with the corresponding findings of the literature on common stocks and traditional mutual funds thus boosting the inferences drawn so far with respect to November patters in stock markets. Another contribution concerns the investigation of seasonal patterns in ETFs' ability to efficiently replicate the performance of their benchmarks. The demonstration of a significant November effect in this respect, i.e. ETFs achieve their best replication efficiency in November, should be of high interest to investors seeking returns commensurate to those of the selected market benchmarks.<sup>4</sup> Furthermore, the paper provides some hints on profitable seasoned trading strategies beating the buy-and-hold strategies that could be available

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<sup>4</sup> It should be noted that an interesting expansion in the current's paper work would concern the search of the possible explanations on the seasonal patterns detected via the statistical analysis of the trading data. However, the scope of this paper is solely to reveal any meaningful monthly pattern, such as the November effect confirmed by my analysis, and support this through statistical evidence and not to dive in the reasoning behind the existence of seasonality.

with ETFs. Such strategies are definitely in search by short-term traders and, therefore, the results of my paper should be quite interesting to these types of investors.

The rest of the paper is organized as follows: the next section provides the methodology that will be followed for the examination of November effect. Next, the sample used and the period under investigation are discussed. Afterwards, the analysis of empirical results follows. Finally, a summary of the findings is provided in the conclusion of the paper.

## ■ 2. Methodology

### Return

I first isolate the closing trading values of each class, category or group of ETFs among the calendar months and I then calculate the average daily percentage return of each single ETF and tracking index for each individual month. Afterwards, I evaluate the statistical significance of the differences in “monthly” returns of each class, category and group distinctly via the following regression (1):

$$(\text{“Monthly” Return}) = \alpha + \sum_{i=2}^{12} \beta_i D_i + \varepsilon_{pt} \quad (1)$$

where, “Monthly” return is the dependent variable of the model shaped on a pool basis posturing vertically all the monthly returns of each ETF. Then, I construct the independent variables of the model, which are dummy variables for monthly returns named as January, February, etc. The dummies take the value 1 and 0. For example the January dummy receives the value 1 if return relates to January and zero otherwise.

The model’s intercept reflects the average daily or “monthly” return in November. The intercept comprises the comparative basis for the other dummies. We choose November return as the comparative benchmark since Rompotis (2010) has indicated a significant November effect on ETFs performance. Betas count for the differences in returns between November and other months. Therefore, if alpha is significantly positive and betas are significantly negative, we will infer that a positive November pattern exists in returns. The term  $\varepsilon_{pt}$  represents the random error being expected to have zero mean. Finally, model (1) is performed for each year of the period.

### Risk

The next step concerns the estimation of “monthly” risk. The risk of ETFs is calculated for each month by regarding the standard deviation of daily returns of the month.

The risk is estimated and presented individually for each class, category and group of ETFs. The significance of risk estimations is evaluated via the next model (2):

$$(\text{“Monthly” Risk}) = \alpha + \sum_{i=2}^{12} \beta_i D_i + \varepsilon_{pt} \quad (2)$$

In order to be consistent with model (1), model (2) is plotted on a pool basis. “Monthly” risk is the dependent variable, while dummy variables representing the monthly risks for January, February, etc are the control factors of the model.

The constant of the model concerns November risk being the comparative basis for the other monthly dummies. We choose the November risk as the reference basis in order for the findings of model (2) regarding volatility to correspond to those of model (1) on returns. Beta measures the difference in risk between November and other months. If there is a positive November effect on ETFs’ risk, the estimated betas must be negative and statistically significant. The term  $\varepsilon_{pt}$  is the random error and is expected to have zero mean. Similarly to model (1), model (2) is applied for each single year of the period 2002-2006.

### Tracking Error

The next researching issue concerns the tracking error of ETFs, which reflects the divergence between the performance of ETFs and the index portfolios. I calculate tracking error for all the categories of ETFs in each month as the standard deviation of return deviations. This tracking error estimation is formed in equation (3):

$$TE_p = \sqrt{\frac{1}{n-1} \sum_{t=1}^n (e_{pt} - \bar{e}_p)^2} \quad (3)$$

where is the difference of returns in day  $t$  and  $\bar{e}_p$  is the average return’s difference over  $n$  days. Afterwards, I asses the significance of the difference in monthly tracking errors searching for any persistent seasonal characteristics in each individual category with the following model (4):

$$(\text{“Monthly” Tracking Error}) = \alpha + \sum_{i=2}^{12} \beta_i D_i + \varepsilon_{pt} \quad (4)$$

Model (4) follows the structure of models (1) and (2); “monthly” tracking error is the dependent variable constructed on a pool basis. Dummies representing monthly tracking errors and named as January, February, etc. are the independent variables.

The constant of the model refers to tracking error in November and comprises the comparative basis for the other calendar dummies. November tracking error is selected as the reference basis in order for the findings of regression (4) to be

consistent with those of models (1) and (2) on return and risk, respectively. Betas measure the difference in tracking error between November and other months. The existence of a positive November effect on ETFs' tracking error should result in the beta estimates being negative and significant. The term  $\varepsilon_{pt}$  represents the random error. I estimate model (4) for any single year of the period 2002-2006.

### Ex-Post Comparison of Trading Strategies

The last empirical issue in the current study concerns the ex-post comparison of returns that would be obtained from various theoretically implemented investing strategies considering the seasonal patterns in returns and risks of the various categories of ETFs. At first, I examine the profitability of the alternative strategies irrespective to the risk tolerance of investors. Then, I repeat the comparison taking into account the different preferences of investors in regards of risk.

A risk averse investor would prefer to gain the maximum potential return by exposing themselves to the minimum risk. A risk neutral investor would prefer to receive either the minimum risk exposure or the maximum return. A risk taker investor would expose themselves to greater risk if there was a greater amount of return to be gained. Further, the tracking error's optimization described in Roll (1992) suggests the maximization of return by the minimization of tracking error. Therefore, we should consider whether the proposed trading strategies are tracking error efficient.

Rompotis (2010) has demonstrated that the calendar risk and tracking error of ETFs are positively correlated. For convenience purposes, I assume that the risk and tracking error concerned investors have the same profile. I also assume that investors are basically risk averse or risk takers seeking to exploit any seasonal patterns in ETFs' trading behavior. In addition, I assume that the implementation of substitutional trading strategies does not apply to risk neutral investors as they do not have a unique investing orientation. I therefore perform the comparison of the various strategies by considering only the risk averse and risk taking investors.

The implementation of seasoned investing strategies depends on whether the categories and classes of ETFs present equal or different seasonal patterns. The implementation of such strategies also depends on the willingness of risk averse and risk taking investors to buy and sell ETF shares anytime throughout a year.

If the various ETF groups present different return and risk seasonality, I will fashion several trading strategies described as follows: the risk averse investors buy ETF shares when they achieve sufficient and of low risk returns, while these investors sell the ETF shares they hold when the level of risk is intolerable. The risk taking investors



buy ETFs when the prices move upwards regardless risk and sell ETFs when the prices are recessing.

If the return and risk of all the single categories or classes of ETFs present the same seasonal characteristics (e.g. a common November effect), I will follow an alternative approach. More specifically, I will estimate the return and risk of the several groups assuming that the risk averse investors invest in the groups of ETFs which have the lowest risk along with sufficient return during the month in which the seasonal effect is detected whereas risk taking investors invest during the same month in the groups of ETFs that derive the maximum return irrespectively of risk.

Afterwards, I compare the return and risk gained by risk averse and risk takers investing in broad (large cap) or sector (medium cap) or international markets (small cap) ETFs during the month in which a significant seasonal effect is detected to the return and risk of two buy-and-hold strategies. The first strategy regards the purchase of a compound average portfolio of ETFs on the first day of each year and the hold of this portfolio till the year end. With respect to classification according to market categories, the buy-and-hold portfolio consists in one third of broad ETFs, one third of sector ETFs and one third of international ETFs. These weightings are also applied to the average portfolio in the case of ETFs' segmentation according to their capitalization. The second buy-and-hold strategy relates to the purchase of an ETF portfolio comprised of ETFs awarded with a four or five star rating by Morningstar. This portfolio is bought on the first day of a year and is held until the year end. This strategy does not consider the market segmentation or the capitalization.

### ■ 3. The Sample

This paper investigates the monthly behavior of return, volatility and tracking error for a sample of 83 equity-linked ETFs during the period 2002-2006. The period under investigation could be described as relevantly stable compared to the post-subprime crisis period and the economic and financial crisis ensued thereafter at the global level. Therefore, one could assume that the results obtained with the usage of data covering the selected period might be applicable only to smooth stock markets and not necessarily to turbulent markets. However, turbulence is not easy to model and, in any case, the comparison of post- and after-subprime crisis seasonal behavior of ETFs does not fall within the scope of the current paper.

The sample only includes ETFs having completed daily trading data for all the years of the studying period. Based on this requirement, the sample includes 73 iShares,

which cover a variety of domestic and international equity indexes, the Diamonds Trust series, which track the Dow Jones Industrials Index, the SPDRS and MidCap SPDRS, which seek to replicate the return of S&P 500 and S&P 400 Indexes, respectively, the Nasdaq-100 Index Tracking Stock (QQQQ), and 6 streetTRACKS, which invest in various Dow Jones U.S or global indexes.

The website of Nasdaq provided us with all the relevant price data for the calculation of returns and risks. The prices of the tracking indexes have been gathered from several resources. On Nasdaq.com the closing prices of Nasdaq-100 Index, S&P 500 Index, S&P 400 Index and Dow Jones Industrial Index were found. Furthermore, iShares.com has the prices of the underlying indexes. Finally, the website of Dow Jones indexes offered the prices of streetTRACKS' benchmarks. I use the closing values of indexes to calculate the return of ETFs' benchmarks and then I combine the returns of ETFs and indexes to compute the tracking error of ETFs.

Finally, I allocate ETFs in broad, sector and international groups considering the categorization of ETFs found on Nasdaq.com. The classification of ETFs in terms of capitalization also found on Nasdaq.com is used for the ranking of ETFs in small, median and large classes. Finally, Nasdaq exchange offered the Morningstar rating of ETFs. This segmentation of ETFs allows the examination of the various potentially profitable trading strategies.

## ■ 4. Empirical Results

### Return

This section provides a monthly analysis of ETFs return considering the various groups of ETFs according to the categorization by market and capitalization. Table 1 presents the “monthly” return which reflects the average daily return of ETFs within each single month. The table have to be read vertically; Panel A reports the returns of broad, sector and international market ETFs while Panel B records the return of large, medium and small cap ETFs. Table 1 also presents the number of ETFs included in each category.

#### ● Table 1. Monthly Return of ETFs

*This table reports the average daily return of broad, sector and international ETFs and the return of large, medium and large cap ETFs for each calendar month within the period 2002-2006. Table also presents the mean monthly return for each year and the mean return in each single month during the whole studying period. N represents the number of ETFs in each category.*

**Panel A: Categorization by Market**

**Broad Markets ETFs**

| Month | 2002  | 2003  | 2004  | 2005  | 2006  | Mean  |
|-------|-------|-------|-------|-------|-------|-------|
| Jan   | -0.06 | -0.12 | 0.12  | -0.14 | 0.22  | 0.00  |
| Feb   | -0.09 | -0.09 | 0.08  | 0.13  | 0.01  | 0.01  |
| Mar   | 0.26  | 0.05  | -0.03 | -0.10 | 0.10  | 0.06  |
| Apr   | -0.16 | 0.38  | -0.13 | -0.15 | 0.05  | 0.00  |
| May   | -0.08 | 0.33  | 0.09  | 0.22  | -0.17 | 0.08  |
| Jun   | -0.38 | 0.06  | 0.11  | 0.05  | 0.00  | -0.03 |
| Jul   | -0.42 | 0.15  | -0.21 | 0.23  | -0.05 | -0.06 |
| Aug   | 0.05  | 0.14  | 0.00  | -0.05 | 0.10  | 0.05  |
| Sep   | -0.49 | -0.07 | 0.10  | 0.03  | 0.07  | -0.07 |
| Oct   | 0.31  | 0.29  | 0.09  | -0.12 | 0.18  | 0.15  |
| Nov   | 0.34  | 0.12  | 0.27  | 0.21  | 0.12  | 0.21  |
| Dec   | -0.29 | 0.15  | 0.12  | -0.03 | 0.01  | -0.01 |
| Mean  | -0.09 | 0.12  | 0.05  | 0.02  | 0.05  | 0.03  |
| N     | 33    | 33    | 33    | 33    | 33    | 33    |

**Sector Markets ETFs**

| Month | 2002  | 2003  | 2004  | 2005  | 2006  | Mean  |
|-------|-------|-------|-------|-------|-------|-------|
| Jan   | -0.13 | -0.08 | 0.17  | -0.21 | 0.27  | 0.00  |
| Feb   | -0.16 | -0.02 | 0.08  | 0.16  | -0.03 | 0.01  |
| Mar   | 0.28  | 0.04  | -0.04 | -0.12 | 0.10  | 0.05  |
| Apr   | -0.29 | 0.36  | -0.22 | -0.06 | 0.03  | -0.04 |
| May   | -0.06 | 0.41  | 0.12  | 0.20  | -0.20 | 0.09  |
| Jun   | -0.41 | 0.03  | 0.09  | 0.05  | 0.03  | -0.04 |
| Jul   | -0.38 | 0.11  | -0.19 | 0.27  | 0.02  | -0.03 |
| Aug   | 0.05  | 0.15  | 0.02  | -0.01 | 0.14  | 0.07  |
| Sep   | -0.62 | -0.02 | 0.11  | 0.05  | 0.09  | -0.08 |
| Oct   | 0.43  | 0.24  | 0.14  | -0.13 | 0.17  | 0.17  |
| Nov   | 0.46  | 0.10  | 0.24  | 0.17  | 0.15  | 0.22  |
| Dec   | -0.34 | 0.19  | 0.11  | -0.02 | -0.02 | -0.02 |
| Mean  | -0.10 | 0.13  | 0.05  | 0.03  | 0.06  | 0.03  |
| N     | 24    | 24    | 24    | 24    | 24    | 24    |

**International Markets ETFs**

| Month | 2002  | 2003  | 2004  | 2005  | 2006  | Mean  |
|-------|-------|-------|-------|-------|-------|-------|
| Jan   | -0.06 | -0.04 | 0.15  | -0.08 | 0.39  | 0.07  |
| Feb   | 0.08  | -0.16 | 0.18  | 0.28  | -0.04 | 0.07  |
| Mar   | 0.29  | -0.05 | -0.02 | -0.18 | 0.12  | 0.03  |
| Apr   | 0.04  | 0.48  | -0.23 | -0.09 | 0.31  | 0.10  |
| May   | -0.01 | 0.35  | 0.06  | 0.07  | -0.26 | 0.04  |
| Jun   | -0.25 | 0.11  | 0.13  | 0.10  | 0.04  | 0.03  |
| Jul   | -0.49 | 0.17  | -0.14 | 0.22  | 0.07  | -0.03 |
| Aug   | 0.07  | 0.15  | 0.11  | 0.11  | 0.12  | 0.11  |
| Sep   | -0.66 | 0.10  | 0.19  | 0.22  | 0.05  | -0.02 |
| Oct   | 0.35  | 0.30  | 0.18  | -0.17 | 0.21  | 0.17  |
| Nov   | 0.26  | 0.12  | 0.34  | 0.14  | 0.22  | 0.22  |
| Dec   | -0.21 | 0.25  | 0.15  | 0.12  | 0.10  | 0.08  |
| Mean  | -0.05 | 0.15  | 0.09  | 0.06  | 0.11  | 0.07  |
| N     | 26    | 26    | 26    | 26    | 26    | 26    |

**Panel B: Categorization by Capitalization**

**Large Cap ETFs**

| 2002  | 2003  | 2004  | 2005  | 2006  | Mean  |
|-------|-------|-------|-------|-------|-------|
| -0.12 | -0.07 | 0.13  | -0.12 | 0.27  | 0.02  |
| 0.04  | -0.09 | 0.11  | 0.20  | -0.03 | 0.05  |
| 0.26  | 0.00  | -0.06 | -0.14 | 0.09  | 0.03  |
| -0.10 | 0.42  | -0.17 | -0.10 | 0.17  | 0.04  |
| -0.02 | 0.34  | 0.07  | 0.14  | -0.21 | 0.06  |
| -0.26 | 0.07  | 0.10  | 0.04  | 0.02  | -0.01 |
| -0.49 | 0.12  | -0.17 | 0.22  | 0.03  | -0.06 |
| 0.08  | 0.14  | 0.04  | 0.03  | 0.12  | 0.08  |
| -0.72 | 0.02  | 0.13  | 0.12  | 0.08  | -0.07 |
| 0.44  | 0.28  | 0.14  | -0.13 | 0.17  | 0.18  |
| 0.29  | 0.09  | 0.27  | 0.16  | 0.16  | 0.19  |
| -0.23 | 0.23  | 0.12  | 0.04  | 0.05  | 0.04  |
| -0.07 | 0.13  | 0.06  | 0.04  | 0.08  | 0.05  |
| 63    | 63    | 63    | 63    | 63    | 63    |

**Medium Cap ETFs**

| 2002  | 2003  | 2004  | 2005  | 2006  | Mean  |
|-------|-------|-------|-------|-------|-------|
| -0.08 | -0.09 | 0.19  | -0.22 | 0.30  | 0.02  |
| 0.01  | -0.04 | 0.12  | 0.17  | 0.04  | 0.06  |
| 0.29  | 0.08  | 0.07  | -0.12 | 0.12  | 0.09  |
| -0.06 | 0.32  | -0.28 | -0.04 | -0.02 | -0.02 |
| -0.04 | 0.40  | 0.16  | 0.22  | -0.18 | 0.11  |
| -0.27 | 0.04  | 0.10  | 0.13  | 0.05  | 0.01  |
| -0.33 | 0.20  | -0.16 | 0.30  | -0.03 | 0.00  |
| 0.02  | 0.12  | 0.10  | -0.03 | 0.10  | 0.06  |
| -0.38 | -0.01 | 0.08  | 0.01  | 0.05  | -0.05 |
| 0.12  | 0.22  | 0.14  | -0.13 | 0.23  | 0.12  |
| 0.30  | 0.18  | 0.28  | 0.22  | 0.18  | 0.23  |
| -0.16 | 0.11  | 0.19  | 0.01  | -0.05 | 0.02  |
| -0.05 | 0.13  | 0.08  | 0.04  | 0.06  | 0.05  |
| 12    | 12    | 12    | 12    | 12    | 12    |

**Small Cap ETFs**

| 2002  | 2003  | 2004  | 2005  | 2006  | Mean  |
|-------|-------|-------|-------|-------|-------|
| 0.00  | -0.13 | 0.17  | -0.16 | 0.39  | 0.05  |
| -0.14 | -0.15 | 0.10  | 0.12  | 0.00  | -0.01 |
| 0.37  | 0.03  | 0.04  | -0.13 | 0.20  | 0.10  |
| 0.05  | 0.43  | -0.23 | -0.26 | 0.01  | 0.00  |
| -0.20 | 0.44  | 0.11  | 0.31  | -0.23 | 0.09  |
| -0.30 | 0.07  | 0.20  | 0.15  | 0.00  | 0.02  |
| -0.63 | 0.27  | -0.28 | 0.31  | -0.14 | -0.09 |
| 0.04  | 0.22  | -0.03 | -0.07 | 0.10  | 0.05  |
| -0.38 | -0.11 | 0.21  | 0.02  | 0.02  | -0.05 |
| 0.17  | 0.37  | 0.10  | -0.16 | 0.24  | 0.14  |
| 0.37  | 0.20  | 0.39  | 0.25  | 0.14  | 0.27  |
| -0.25 | 0.06  | 0.08  | -0.06 | -0.01 | -0.04 |
| -0.07 | 0.14  | 0.07  | 0.02  | 0.06  | 0.04  |
| 8     | 8     | 8     | 8     | 8     | 8     |

The results concerning the broad market ETFs show that the return of this category is subject to a significant November effect in two of five years of the period 2002-2006. Also, November return is steadily positive during the whole period contrasting the other months which present either positive or negative returns. In period's mean terms, November return is equal to 21 b.p. The period's mean returns of other months are inferior to November return. For example, October return equals the 15 b.p. being the second highest monthly return. The results of sector ETFs are quite similar to these of broad ETFs. More specifically, November effect exists in two of five years and November performance is persistently positive during the whole period. The mean November return of the period 2002-2006 is the highest among all months and equals the 22 b.p. October and May mean returns are the second and the third highest for the period and equal the 17 b.p. and 9 b.p., respectively. Interestingly, we note that May return is the highest for 2003 and for 2005 but experiences significant losses in 2002 and especially in 2006. The results of international ETFs slightly differentiate from the results of broad and sector ETFs. Particularly, November presents the highest monthly return only during 2004 but the mean period's return is the highest among all months and equals the 22 b.p. In addition, November return does not present any negative record during the whole period. October return is the second highest mean return for the period and equals the 17 b.p. Contrary to the results of broad and sector, the third highest mean monthly return for international ETFs relates to April and equals the 10 b.p.

Table 2 presents the results of regression (1) which evaluates the statistical significance of return differences between November and other months considering the classification of ETFs per market category. The coefficients show that November return is significantly higher than the return of other months in 2002 and 2004. The results for 2005 indicate that November return is higher than the majority of other monthly returns and is not statistically different from May and July returns which, seem to be greater than November return in raw terms. The model's results on sector ETFs indicate that November return statistically exceeds the performance of other months in 2002 and 2004. Furthermore, the results of international ETFs report that November return is superior to other monthly returns during 2004 while the seemingly greater raw returns of March and October during 2002 do not significantly diverge from November return.

● **Table 2. Seasonality of ETFs Return Per Market Categories**

*This table reports the coefficients of a pool regression model, which evaluates the statistical significance of the differences in returns of ETFs between November and other months. The dependent variable of the model is the monthly return of ETFs in a pool shape and the independent variables are dummy variables, which take the value one or zero according to the month of reference.*

| Broad Markets ETFs |                     |                     |                    |                     |                     |                     |                     |                     |                    |                     |
|--------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|---------------------|
| Month              | 2002                |                     | 2003               |                     | 2004                |                     | 2005                |                     | 2006               |                     |
|                    | Coeffs              | T-stat              | Coeffs             | T-stat              | Coeffs              | T-stat              | Coeffs              | T-stat              | Coeffs             | T-stat              |
| Nov                | 0.34                | 22.36 <sup>a</sup>  | 0.12               | 9.42 <sup>a</sup>   | 0.27                | 18.22 <sup>a</sup>  | 0.21                | 23.48 <sup>a</sup>  | 0.12               | 23.82 <sup>a</sup>  |
| Jan                | -0.40               | -18.66 <sup>a</sup> | -0.24              | -15.83 <sup>a</sup> | -0.15               | -9.99 <sup>a</sup>  | -0.35               | -26.63 <sup>a</sup> | 0.10               | 4.91 <sup>a</sup>   |
| Feb                | -0.43               | -13.62 <sup>a</sup> | -0.21              | -10.95 <sup>a</sup> | -0.18               | -11.48 <sup>a</sup> | -0.08               | -6.88 <sup>a</sup>  | -0.12              | -13.02 <sup>a</sup> |
| Mar                | -0.08               | -3.62 <sup>a</sup>  | -0.07              | -4.90 <sup>a</sup>  | -0.30               | -17.57 <sup>a</sup> | -0.32               | -29.95 <sup>a</sup> | -0.02              | -1.68 <sup>c</sup>  |
| Apr                | -0.50               | -13.76 <sup>a</sup> | 0.26               | 16.59 <sup>a</sup>  | -0.40               | -20.08 <sup>a</sup> | -0.36               | -21.88 <sup>a</sup> | -0.07              | -6.56 <sup>a</sup>  |
| May                | -0.42               | -19.02 <sup>a</sup> | 0.21               | 9.79 <sup>a</sup>   | -0.17               | -10.54 <sup>a</sup> | 0.01                | 0.50                | -0.30              | -24.62 <sup>a</sup> |
| Jun                | -0.72               | -28.82 <sup>a</sup> | -0.06              | -4.10 <sup>a</sup>  | -0.15               | -9.06 <sup>a</sup>  | -0.16               | -9.38 <sup>a</sup>  | -0.12              | -21.16 <sup>a</sup> |
| Jul                | -0.76               | -25.24 <sup>a</sup> | 0.03               | 1.86 <sup>c</sup>   | -0.48               | -21.26 <sup>a</sup> | 0.02                | 1.53                | -0.18              | -8.37 <sup>a</sup>  |
| Aug                | -0.29               | -15.21 <sup>a</sup> | 0.03               | 1.81 <sup>c</sup>   | -0.27               | -15.01 <sup>a</sup> | -0.26               | -23.80 <sup>a</sup> | -0.02              | -2.82 <sup>a</sup>  |
| Sep                | -0.84               | -35.21 <sup>a</sup> | -0.18              | -10.92 <sup>a</sup> | -0.17               | -12.89 <sup>a</sup> | -0.18               | -16.19 <sup>a</sup> | -0.05              | -4.53 <sup>a</sup>  |
| Oct                | -0.03               | -1.39               | 0.17               | 16.47 <sup>a</sup>  | -0.18               | -11.81 <sup>a</sup> | -0.33               | -23.16 <sup>a</sup> | 0.05               | 7.38 <sup>a</sup>   |
| Dec                | -0.63               | -21.99 <sup>a</sup> | 0.03               | 1.13                | -0.15               | -7.86 <sup>a</sup>  | -0.24               | -20.86 <sup>a</sup> | -0.11              | -9.35 <sup>a</sup>  |
| R <sup>2</sup>     | 0.84                |                     | 0.84               |                     | 0.79                |                     | 0.85                |                     | 0.73               |                     |
| F-Stat             | 184.39 <sup>a</sup> |                     | 176.9 <sup>a</sup> |                     | 135.33 <sup>a</sup> |                     | 202.05 <sup>a</sup> |                     | 96.54 <sup>a</sup> |                     |

| Sector Markets ETFs |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |
|---------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Nov                 | 0.46               | 5.27 <sup>a</sup>  | 0.10               | 4.86 <sup>a</sup>  | 0.24               | 14.26 <sup>a</sup> | 0.17               | 5.91 <sup>a</sup>  | 0.15               | 5.89 <sup>a</sup>  |
| Jan                 | -0.59              | -6.09 <sup>a</sup> | -0.17              | -5.19 <sup>a</sup> | -0.06              | -1.15              | -0.38              | -7.77 <sup>a</sup> | 0.12               | 2.35 <sup>b</sup>  |
| Feb                 | -0.61              | -4.53 <sup>a</sup> | -0.12              | -2.95 <sup>a</sup> | -0.15              | -4.65 <sup>a</sup> | -0.01              | -0.17              | -0.18              | -3.78 <sup>a</sup> |
| Mar                 | -0.18              | -1.94 <sup>c</sup> | -0.06              | -2.08 <sup>b</sup> | -0.28              | -8.95 <sup>a</sup> | -0.30              | -9.17 <sup>a</sup> | -0.05              | -1.40              |
| Apr                 | -0.75              | -6.82 <sup>a</sup> | 0.26               | 5.77 <sup>a</sup>  | -0.45              | -7.44 <sup>a</sup> | -0.24              | -4.71 <sup>a</sup> | -0.12              | -2.55 <sup>b</sup> |
| May                 | -0.52              | -5.62 <sup>a</sup> | 0.31               | 6.44 <sup>a</sup>  | -0.12              | -2.68 <sup>a</sup> | 0.02               | 0.50               | -0.35              | -8.87 <sup>a</sup> |
| Jun                 | -0.87              | -7.06 <sup>a</sup> | -0.07              | -2.56 <sup>b</sup> | -0.14              | -5.62 <sup>a</sup> | -0.12              | -2.96 <sup>a</sup> | -0.12              | -3.83 <sup>a</sup> |
| Jul                 | -0.84              | -8.48 <sup>a</sup> | 0.02               | 0.36               | -0.43              | -7.54 <sup>a</sup> | 0.10               | 2.57 <sup>b</sup>  | -0.13              | -2.49 <sup>b</sup> |
| Aug                 | -0.41              | -4.36 <sup>a</sup> | 0.05               | 1.09               | -0.21              | -4.46 <sup>a</sup> | -0.18              | -4.30 <sup>a</sup> | -0.01              | -0.25              |
| Sep                 | -1.07              | -7.88 <sup>a</sup> | -0.11              | -3.52 <sup>a</sup> | -0.13              | -4.15 <sup>a</sup> | -0.12              | -3.13 <sup>a</sup> | -0.06              | -1.39              |
| Oct                 | -0.02              | -0.26              | 0.14               | 3.36 <sup>a</sup>  | -0.10              | -2.89 <sup>a</sup> | -0.30              | -6.96 <sup>a</sup> | 0.02               | 0.59               |
| Dec                 | -0.79              | -5.51 <sup>a</sup> | 0.10               | 2.06 <sup>b</sup>  | -0.12              | -3.28 <sup>a</sup> | -0.19              | -5.12 <sup>a</sup> | -0.17              | -3.97 <sup>a</sup> |
| R <sup>2</sup>      | 0.54               |                    | 0.44               |                    | 0.35               |                    | 0.46               |                    | 0.35               |                    |
| F-Stat              | 29.29 <sup>a</sup> |                    | 19.48 <sup>a</sup> |                    | 13.66 <sup>a</sup> |                    | 21.02 <sup>a</sup> |                    | 13.62 <sup>a</sup> |                    |

| International Markets ETFs |                    |                     |                    |                    |                    |                     |                    |                    |                    |                     |
|----------------------------|--------------------|---------------------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|--------------------|---------------------|
| Nov                        | 0.26               | 5.70 <sup>a</sup>   | 0.12               | 3.03 <sup>a</sup>  | 0.34               | 14.46 <sup>a</sup>  | 0.14               | 5.75 <sup>a</sup>  | 0.22               | 9.77 <sup>a</sup>   |
| Jan                        | -0.32              | -4.99 <sup>a</sup>  | -0.16              | -3.02 <sup>a</sup> | -0.19              | -4.17 <sup>a</sup>  | -0.23              | -6.62 <sup>a</sup> | 0.16               | 4.96 <sup>a</sup>   |
| Feb                        | -0.18              | -2.73 <sup>a</sup>  | -0.27              | -5.74 <sup>a</sup> | -0.16              | -4.75 <sup>a</sup>  | 0.13               | 3.36 <sup>a</sup>  | -0.26              | -8.01 <sup>a</sup>  |
| Mar                        | 0.02               | 0.36                | -0.17              | -2.81 <sup>a</sup> | -0.36              | -7.74 <sup>a</sup>  | -0.32              | -8.78 <sup>a</sup> | -0.11              | -3.35 <sup>a</sup>  |
| Apr                        | -0.23              | -3.46 <sup>a</sup>  | 0.37               | 4.59 <sup>a</sup>  | -0.57              | -12.07 <sup>a</sup> | -0.24              | -7.23 <sup>a</sup> | 0.08               | 2.49 <sup>b</sup>   |
| May                        | -0.27              | -4.11 <sup>a</sup>  | 0.23               | 5.19 <sup>a</sup>  | -0.28              | -9.51 <sup>a</sup>  | -0.07              | -1.81 <sup>c</sup> | -0.48              | -14.77 <sup>a</sup> |
| Jun                        | -0.51              | -7.84 <sup>a</sup>  | 0.00               | -0.10              | -0.21              | -6.58 <sup>a</sup>  | -0.04              | -1.33              | -0.19              | -5.73 <sup>a</sup>  |
| Jul                        | -0.75              | -11.53 <sup>a</sup> | 0.05               | 0.96               | -0.48              | -11.26 <sup>a</sup> | 0.08               | 2.32 <sup>b</sup>  | -0.16              | -4.79 <sup>a</sup>  |
| Aug                        | -0.20              | -3.02 <sup>a</sup>  | 0.03               | 0.50               | -0.23              | -6.63 <sup>a</sup>  | -0.04              | -0.91              | -0.11              | -3.24 <sup>a</sup>  |
| Sep                        | -0.92              | -14.19 <sup>a</sup> | -0.02              | -0.39 <sup>a</sup> | -0.15              | -4.99 <sup>a</sup>  | 0.08               | 1.83 <sup>c</sup>  | -0.17              | -5.37 <sup>a</sup>  |
| Oct                        | 0.09               | 1.37                | 0.18               | 3.74 <sup>a</sup>  | -0.16              | -4.89 <sup>a</sup>  | -0.32              | -9.49 <sup>a</sup> | -0.02              | -0.57               |
| Dec                        | -0.48              | -7.31 <sup>a</sup>  | 0.14               | 3.51 <sup>a</sup>  | -0.19              | -5.95 <sup>a</sup>  | -0.02              | -0.81              | -0.13              | -3.89 <sup>a</sup>  |
| R <sup>2</sup>             | 0.62               |                     | 0.46               |                    | 0.51               |                     | 0.53               |                    | 0.66               |                     |
| F-Stat                     | 44.83 <sup>a</sup> |                     | 23.39 <sup>a</sup> |                    | 28.64 <sup>a</sup> |                     | 30.41 <sup>a</sup> |                    | 52.00 <sup>a</sup> |                     |

<sup>a</sup> Significant at 0.01% level, <sup>b</sup> Significant at 0.05% level, <sup>c</sup> Significant at 0.10% level

After examining monthly returns from the market categorization perspective, I proceed to the analysis of monthly returns according to the classification by capitalization. The relevant return's estimations are presented in Panel B of Table 1.

The performance of large cap ETFs is influenced by a November effect in one of five years and November return is steadily positive during the whole period resulting in a mean period's return amounting to 19 b.p., which is the highest among all monthly returns. October return is the second highest mean return of the period equaling the 18 b.p. and being essentially equal to the mean period's November return.

The results of medium cap ETFs reveal that the November effect exists in 2002 and 2004. The mean November return equals the 23 b.p. and is the highest monthly return whereas November return presents no negative records during the entire period. In addition, the mean October return is the second highest return of the period and equals the 12 b.p. but the individual October returns are either positive or negative. Finally, the results of Table 1 demonstrate that the return of small cap ETFs is affected by November seasonality in 2002 and 2004 while November return is positive during the whole period delivering an average of 27 b.p. which is the highest monthly return of the period. Moreover, October mean return is the second highest return of the period and equals the 14 b.p.

Table 3 presents the results of model (1) which evaluates the significance in return differences between November and other months according to the classification of ETFs per capitalization. Regarding the large cap ETFs, we note that November return is significantly greater than the other monthly returns within 2004 and is not statistically inferior to the highest raw returns in 2005 and 2006.

Going further, November return does not statistically differ from October return, which is the highest monthly return in 2002. Focusing on the regression's estimates for medium and small cap ETFs, we see that these results statistically support the existence of a clear November effect on performance during 2002 and 2004.

● **Table 3. Seasonality of ETFs Return Per Categories of Capitalization**

*This table reports the coefficients of a pool regression model, which evaluates the statistical significance of the differences in returns of ETFs between November and other months. The dependent variable of the model is the monthly return of ETFs in a pool shape and the independent variables are dummy variables, which take the value one or zero according to the month of reference.*

| Large Cap ETFs |                     |                     |                    |                    |                    |                     |                    |                     |                    |                     |
|----------------|---------------------|---------------------|--------------------|--------------------|--------------------|---------------------|--------------------|---------------------|--------------------|---------------------|
| Month          | 2002                |                     | 2003               |                    | 2004               |                     | 2005               |                     | 2006               |                     |
|                | Coeffs              | T-stat              | Coeffs             | T-stat             | Coeffs             | T-stat              | Coeffs             | T-stat              | Coeffs             | T-stat              |
| Nov            | 0.36                | 9.18 <sup>a</sup>   | 0.09               | 5.27 <sup>a</sup>  | 0.27               | 21.32 <sup>a</sup>  | 0.16               | 10.60 <sup>a</sup>  | 0.16               | 11.54 <sup>a</sup>  |
| Jan            | -0.45               | -9.73 <sup>a</sup>  | -0.16              | -6.06 <sup>a</sup> | -0.14              | -5.07 <sup>a</sup>  | -0.29              | -11.10 <sup>a</sup> | 0.11               | 4.24 <sup>a</sup>   |
| Feb            | -0.42               | -6.65 <sup>a</sup>  | -0.18              | -6.55 <sup>a</sup> | -0.15              | -8.08 <sup>a</sup>  | 0.03               | 1.05                | -0.19              | -8.36 <sup>a</sup>  |
| Mar            | -0.10               | -2.39 <sup>b</sup>  | -0.09              | -3.41 <sup>a</sup> | -0.33              | -16.62 <sup>a</sup> | -0.30              | -15.95 <sup>a</sup> | -0.07              | -3.99 <sup>a</sup>  |
| Apr            | -0.53               | -10.06 <sup>a</sup> | 0.33               | 9.34 <sup>a</sup>  | -0.43              | -15.74 <sup>a</sup> | -0.26              | -12.40 <sup>a</sup> | 0.00               | 0.20                |
| May            | -0.39               | -8.87 <sup>a</sup>  | 0.25               | 10.15 <sup>a</sup> | -0.19              | -9.87 <sup>a</sup>  | -0.02              | -0.99               | -0.37              | -15.33 <sup>a</sup> |
| Jun            | -0.72               | -13.07 <sup>a</sup> | -0.01              | -0.64              | -0.16              | -9.90 <sup>a</sup>  | -0.12              | -5.66 <sup>a</sup>  | -0.15              | -8.61 <sup>a</sup>  |
| Jul            | -0.78               | -16.28 <sup>a</sup> | 0.03               | 1.22               | -0.44              | -16.07 <sup>a</sup> | 0.06               | 2.96 <sup>a</sup>   | -0.13              | -5.36 <sup>a</sup>  |
| Aug            | -0.29               | -6.58 <sup>a</sup>  | 0.06               | 1.88 <sup>c</sup>  | -0.23              | -10.88 <sup>a</sup> | -0.13              | -5.57 <sup>a</sup>  | -0.04              | -1.96 <sup>b</sup>  |
| Sep            | -1.00               | -16.69 <sup>a</sup> | -0.07              | -3.11 <sup>a</sup> | -0.14              | -8.43 <sup>a</sup>  | -0.04              | -1.62               | -0.09              | -3.73 <sup>a</sup>  |
| Oct            | 0.07                | 1.85 <sup>c</sup>   | 0.19               | 8.11 <sup>a</sup>  | -0.13              | -7.46 <sup>a</sup>  | -0.30              | -13.68 <sup>a</sup> | 0.01               | 0.35                |
| Dec            | -0.66               | -10.23 <sup>a</sup> | 0.14               | 6.12 <sup>a</sup>  | -0.15              | -7.65 <sup>a</sup>  | -0.13              | -6.01 <sup>a</sup>  | -0.12              | -5.55 <sup>a</sup>  |
| R <sup>2</sup> | 0.63                |                     | 0.48               |                    | 0.44               |                     | 0.46               |                     | 0.45               |                     |
| F-Stat         | 113.59 <sup>a</sup> |                     | 63.65 <sup>a</sup> |                    | 53.42 <sup>a</sup> |                     | 58.71 <sup>a</sup> |                     | 56.05 <sup>a</sup> |                     |

| Medium Cap ETFs |                    |                    |                    |                    |                    |                    |                    |                     |                    |                     |
|-----------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|---------------------|
| Month           | 2002               |                    | 2003               |                    | 2004               |                    | 2005               |                     | 2006               |                     |
|                 | Coeffs             | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat              | Coeffs             | T-stat              |
| Nov             | 0.30               | 5.85 <sup>a</sup>  | 0.18               | 5.78 <sup>a</sup>  | 0.28               | 8.08 <sup>a</sup>  | 0.22               | 14.26 <sup>a</sup>  | 0.18               | 9.54 <sup>a</sup>   |
| Jan             | -0.38              | -5.19 <sup>a</sup> | -0.27              | -6.14 <sup>a</sup> | -0.09              | -2.02 <sup>b</sup> | -0.44              | -10.73 <sup>a</sup> | 0.13               | 4.07 <sup>a</sup>   |
| Feb             | -0.29              | -3.93 <sup>a</sup> | -0.23              | -5.09 <sup>a</sup> | -0.16              | -4.23 <sup>a</sup> | -0.06              | -1.34               | -0.14              | -4.19 <sup>a</sup>  |
| Mar             | -0.01              | -0.17              | -0.10              | -2.22 <sup>b</sup> | -0.21              | -4.45 <sup>a</sup> | -0.34              | -11.61 <sup>a</sup> | -0.06              | -1.91 <sup>c</sup>  |
| Apr             | -0.36              | -5.00 <sup>a</sup> | 0.14               | 3.06 <sup>a</sup>  | -0.56              | -6.20 <sup>a</sup> | -0.26              | -4.36 <sup>a</sup>  | -0.19              | -3.67 <sup>a</sup>  |
| May             | -0.34              | -4.73 <sup>a</sup> | 0.22               | 4.88 <sup>a</sup>  | -0.12              | -2.21 <sup>b</sup> | 0.00               | 0.09                | -0.36              | -14.54 <sup>a</sup> |
| Jun             | -0.57              | -7.89 <sup>a</sup> | -0.14              | -3.20 <sup>a</sup> | -0.18              | -4.27 <sup>a</sup> | -0.09              | -3.96 <sup>a</sup>  | -0.13              | -3.98 <sup>a</sup>  |
| Jul             | -0.63              | -8.67 <sup>a</sup> | 0.02               | 0.41               | -0.44              | -7.99 <sup>a</sup> | 0.08               | 2.31 <sup>b</sup>   | -0.21              | -4.69 <sup>a</sup>  |
| Aug             | -0.28              | -3.87 <sup>a</sup> | -0.06              | -1.44              | -0.18              | -2.88 <sup>a</sup> | -0.25              | -5.33 <sup>a</sup>  | -0.08              | -3.71 <sup>a</sup>  |
| Sep             | -0.68              | -9.32 <sup>a</sup> | -0.19              | -4.26 <sup>a</sup> | -0.20              | -5.20 <sup>a</sup> | -0.21              | -11.14 <sup>a</sup> | -0.12              | -7.14 <sup>a</sup>  |
| Oct             | -0.18              | -2.43 <sup>b</sup> | 0.04               | 0.79               | -0.14              | -3.20 <sup>a</sup> | -0.36              | -24.51 <sup>a</sup> | 0.05               | 1.92 <sup>c</sup>   |
| Dec             | -0.46              | -6.27 <sup>a</sup> | -0.07              | -1.58              | -0.09              | -2.54 <sup>b</sup> | -0.21              | -7.21 <sup>a</sup>  | -0.23              | -5.99 <sup>a</sup>  |
| R <sup>2</sup>  | 0.60               |                    | 0.64               |                    | 0.56               |                    | 0.70               |                     | 0.65               |                     |
| F-Stat          | 18.00 <sup>a</sup> |                    | 21.32 <sup>a</sup> |                    | 15.04 <sup>a</sup> |                    | 28.00 <sup>a</sup> |                     | 22.41 <sup>a</sup> |                     |

| Small Cap ETFs |                    |                     |                    |                     |                     |                     |                     |                     |                     |                     |
|----------------|--------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Month          | 2002               |                     | 2003               |                     | 2004                |                     | 2005                |                     | 2006                |                     |
|                | Coeffs             | T-stat              | Coeffs             | T-stat              | Coeffs              | T-stat              | Coeffs              | T-stat              | Coeffs              | T-stat              |
| Nov            | 0.37               | 8.59 <sup>a</sup>   | 0.20               | 12.69 <sup>a</sup>  | 0.39                | 22.09 <sup>a</sup>  | 0.25                | 21.76 <sup>a</sup>  | 0.14                | 19.65 <sup>a</sup>  |
| Jan            | -0.37              | -6.04 <sup>a</sup>  | -0.33              | -14.69 <sup>a</sup> | -0.22               | -8.82 <sup>a</sup>  | -0.41               | -14.10 <sup>a</sup> | 0.25                | 20.94 <sup>a</sup>  |
| Feb            | -0.51              | -6.01 <sup>a</sup>  | -0.35              | -15.46 <sup>a</sup> | -0.29               | -11.74 <sup>a</sup> | -0.13               | -8.10 <sup>a</sup>  | -0.14               | -12.99 <sup>a</sup> |
| Mar            | 0.00               | 0.09                | -0.18              | -7.78 <sup>a</sup>  | -0.34               | -13.86 <sup>a</sup> | -0.38               | -24.42 <sup>a</sup> | 0.06                | 5.66 <sup>a</sup>   |
| Apr            | -0.32              | -4.60 <sup>a</sup>  | 0.22               | 9.89 <sup>a</sup>   | -0.61               | -24.73 <sup>a</sup> | -0.51               | -38.99 <sup>a</sup> | -0.12               | -16.30 <sup>a</sup> |
| May            | -0.56              | -11.03 <sup>a</sup> | 0.24               | 10.40 <sup>a</sup>  | -0.28               | -11.32 <sup>a</sup> | 0.06                | 4.55 <sup>a</sup>   | -0.37               | -16.53 <sup>a</sup> |
| Jun            | -0.67              | -11.61 <sup>a</sup> | -0.13              | -5.69 <sup>a</sup>  | -0.19               | -7.56 <sup>a</sup>  | -0.10               | -6.71 <sup>a</sup>  | -0.13               | -14.36 <sup>a</sup> |
| Jul            | -1.00              | -17.76 <sup>a</sup> | 0.06               | 2.84 <sup>a</sup>   | -0.67               | -27.10 <sup>a</sup> | 0.06                | 3.93 <sup>a</sup>   | -0.28               | -12.82 <sup>a</sup> |
| Aug            | -0.33              | -6.22 <sup>a</sup>  | 0.01               | 0.65                | -0.41               | -16.75 <sup>a</sup> | -0.32               | -26.47 <sup>a</sup> | -0.03               | -2.33 <sup>b</sup>  |
| Sep            | -0.75              | -14.04 <sup>a</sup> | -0.31              | -13.83 <sup>a</sup> | -0.18               | -7.29 <sup>a</sup>  | -0.23               | -13.64 <sup>a</sup> | -0.11               | -9.31 <sup>a</sup>  |
| Oct            | -0.20              | -5.16 <sup>a</sup>  | 0.16               | 7.15 <sup>a</sup>   | -0.29               | -11.63 <sup>a</sup> | -0.41               | -20.48 <sup>a</sup> | 0.10                | 6.58 <sup>a</sup>   |
| Dec            | -0.62              | -8.12 <sup>a</sup>  | -0.14              | -6.26 <sup>a</sup>  | -0.31               | -12.39 <sup>a</sup> | -0.31               | -18.36 <sup>a</sup> | -0.15               | -13.00 <sup>a</sup> |
| R <sup>2</sup> | 0.88               |                     | 0.96               |                     | 0.94                |                     | 0.97                |                     | 0.96                |                     |
| F-Stat         | 56.26 <sup>a</sup> |                     | 173.6 <sup>a</sup> |                     | 110.11 <sup>a</sup> |                     | 234.25 <sup>a</sup> |                     | 208.25 <sup>a</sup> |                     |

<sup>a</sup> Significant at 0.01% level, <sup>b</sup> Significant at 0.05% level, <sup>c</sup> Significant at 0.10% level

The analysis of monthly return's estimations indicate that the November effect on performance essentially applies to all the single ETF categories or classes providing investors (both long-term and short-term ones) with good chances of gaining sufficient returns via implementing seasoned investing strategies with ETFs.

## Risk

The “monthly” risk of ETFs is analyzed in this section. The relevant calculations are presented in Table 4. According to the results, the broad market ETFs present the lowest monthly volatility in November and December during the entire period of 2002-2006 in a persistent fashion. More specifically, November risk is the lowest monthly risk in 2005 and December risk is the lowest monthly risk in 2003 and 2006 while November and December risk are equal to each other in 2005 being the lowest monthly risk for that year. On average, December risk is the lowest monthly risk of the period equaling the 77 b.p. and November risk is the second lowest risk equaling the 89 b.p. The findings signals the existence of a strong reverse seasonality in the risk of broad market ETFs during December along with the existence of a modest reverse monthly effect on risk during November.

The monthly risks of sector ETFs also indicate the existence of a strong reverse seasonal effect during December. December risk is the lowest monthly risk in three of five years and the lowest mean risk of the period equaling the 79 b.p. Contrary to the findings of broad ETFs, November risk is significantly high in the case of sector ETFs. In particular, November risk equals the 98 b.p. being the fifth lowest average monthly risk of the period. Therefore, we may infer that the strong reverse December effect applies to sector ETFs but the modest reverse November effect does not. The results of international ETFs demonstrate that the reverse December effect and the modest reverse November effect on risk apply only for the average terms of the period. November and December are essentially equal to each other approximating the 113 b.p. In particular, November risk is the second lowest monthly risk in 2005 and 2006 while December risk is not found to be the lowest monthly risk in any year. Furthermore, Table 4 reveals that, on average, the broad market ETFs have inferior levels of risk compared to mean risks of sector and international ETFs while sector ETFs are less risky in relation to international ETFs. This finding applies both to the average November terms and average annual terms and I shall consider it when I compare the profitability of investing strategies by regarding the risk preferences of risk averse and risk taking investors.

### ● Table 4. Monthly Risk of ETFs

*This table reports the average risk of broad, sector and international ETFs and the risk of large, medium and large cap ETFs for each calendar month within the period 2002-2006. Also presents the mean monthly risk for each year and the mean risk in each single month during the whole studying period. N represents the number of ETFs in each category.*



**Panel A: Categorization by Market**

**Broad Markets ETFs**

| Month | 2002 | 2003 | 2004 | 2005 | 2006 | Mean |
|-------|------|------|------|------|------|------|
| Jan   | 1.14 | 1.49 | 0.75 | 0.79 | 0.75 | 0.98 |
| Feb   | 1.29 | 1.18 | 0.78 | 0.76 | 0.66 | 0.93 |
| Mar   | 1.06 | 1.61 | 1.07 | 0.69 | 0.64 | 1.01 |
| Apr   | 1.11 | 1.11 | 0.92 | 1.04 | 0.70 | 0.98 |
| May   | 1.41 | 1.06 | 0.95 | 0.71 | 0.96 | 1.02 |
| Jun   | 1.46 | 1.06 | 0.77 | 0.61 | 1.25 | 1.03 |
| Jul   | 2.67 | 1.05 | 0.83 | 0.65 | 1.12 | 1.26 |
| Aug   | 2.11 | 0.84 | 0.95 | 0.69 | 0.66 | 1.05 |
| Sep   | 1.88 | 1.05 | 0.69 | 0.64 | 0.68 | 0.99 |
| Oct   | 2.29 | 0.85 | 0.85 | 1.09 | 0.61 | 1.14 |
| Nov   | 1.61 | 0.88 | 0.65 | 0.60 | 0.69 | 0.89 |
| Dec   | 1.18 | 0.81 | 0.68 | 0.60 | 0.56 | 0.77 |
| Mean  | 1.60 | 1.08 | 0.82 | 0.74 | 0.77 | 1.00 |
| N     | 33   | 33   | 33   | 33   | 33   | 33   |

**Sector Markets ETFs**

| Month | 2002 | 2003 | 2004 | 2005 | 2006 | Mean |
|-------|------|------|------|------|------|------|
| Jan   | 1.40 | 1.91 | 1.07 | 1.00 | 1.01 | 0.88 |
| Feb   | 1.54 | 1.37 | 0.94 | 0.95 | 0.89 | 0.86 |
| Mar   | 1.46 | 1.80 | 1.25 | 0.95 | 0.87 | 0.91 |
| Apr   | 1.52 | 1.41 | 1.33 | 1.11 | 0.91 | 1.05 |
| May   | 1.79 | 1.33 | 1.20 | 0.88 | 1.11 | 1.08 |
| Jun   | 1.77 | 1.34 | 0.97 | 0.71 | 1.37 | 0.97 |
| Jul   | 3.19 | 1.21 | 1.04 | 0.82 | 1.20 | 1.27 |
| Aug   | 2.33 | 0.99 | 1.12 | 0.90 | 0.84 | 1.07 |
| Sep   | 2.15 | 1.19 | 0.95 | 0.84 | 0.94 | 0.98 |
| Oct   | 2.81 | 1.01 | 1.08 | 1.24 | 0.80 | 1.23 |
| Nov   | 2.06 | 1.01 | 0.97 | 0.86 | 0.93 | 0.98 |
| Dec   | 1.43 | 0.88 | 0.87 | 0.73 | 0.71 | 0.79 |
| Mean  | 1.95 | 1.29 | 1.07 | 0.92 | 0.96 | 1.01 |
| N     | 24   | 24   | 24   | 24   | 24   | 24   |

**International Markets ETFs**

| Month | 2002 | 2003 | 2004 | 2005 | 2006 | Mean |
|-------|------|------|------|------|------|------|
| Jan   | 1.52 | 1.83 | 1.35 | 1.07 | 1.34 | 1.42 |
| Feb   | 1.43 | 1.54 | 1.21 | 0.81 | 0.98 | 1.20 |
| Mar   | 1.42 | 2.03 | 1.57 | 0.99 | 1.05 | 1.41 |
| Apr   | 1.41 | 1.50 | 1.25 | 1.18 | 0.99 | 1.27 |
| May   | 1.24 | 1.38 | 1.85 | 0.94 | 1.60 | 1.40 |
| Jun   | 1.82 | 1.25 | 1.43 | 0.85 | 1.99 | 1.47 |
| Jul   | 2.85 | 1.40 | 1.16 | 0.92 | 1.49 | 1.56 |
| Aug   | 2.31 | 1.05 | 0.98 | 1.12 | 0.86 | 1.26 |
| Sep   | 2.14 | 1.26 | 1.02 | 0.92 | 1.03 | 1.28 |
| Oct   | 2.62 | 1.18 | 0.97 | 1.27 | 0.84 | 1.38 |
| Nov   | 1.86 | 1.16 | 0.95 | 0.83 | 0.86 | 1.13 |
| Dec   | 1.62 | 1.09 | 1.00 | 0.99 | 0.89 | 1.12 |
| Mean  | 1.85 | 1.39 | 1.23 | 0.99 | 1.16 | 1.32 |
| N     | 26   | 26   | 26   | 26   | 26   | 26   |

**Panel B: Categorization by Capitalization**

**Large Cap ETFs**

| 2002 | 2003 | 2004 | 2005 | 2006 | Mean |
|------|------|------|------|------|------|
| 1.41 | 1.85 | 1.12 | 0.91 | 1.08 | 1.27 |
| 1.44 | 1.45 | 0.96 | 0.80 | 0.85 | 1.10 |
| 1.24 | 1.93 | 1.32 | 0.87 | 0.83 | 1.24 |
| 1.38 | 1.41 | 1.12 | 1.11 | 0.84 | 1.17 |
| 1.32 | 1.28 | 1.33 | 0.83 | 1.21 | 1.20 |
| 1.75 | 1.21 | 1.06 | 0.71 | 1.51 | 1.25 |
| 3.16 | 1.25 | 0.97 | 0.77 | 1.23 | 1.48 |
| 2.43 | 0.95 | 0.97 | 0.86 | 0.75 | 1.19 |
| 2.28 | 1.17 | 0.90 | 0.79 | 0.87 | 1.20 |
| 2.98 | 1.01 | 0.97 | 1.14 | 0.73 | 1.37 |
| 1.94 | 1.00 | 0.85 | 0.73 | 0.77 | 1.06 |
| 1.54 | 0.91 | 0.84 | 0.78 | 0.72 | 0.96 |
| 1.91 | 1.28 | 1.03 | 0.86 | 0.95 | 1.21 |
| 63   | 63   | 63   | 63   | 63   | 63   |

**Medium Cap ETFs**

| 2002 | 2003 | 2004 | 2005 | 2006 | Mean |
|------|------|------|------|------|------|
| 0.94 | 1.27 | 0.68 | 0.98 | 0.81 | 0.94 |
| 1.15 | 0.99 | 0.84 | 0.92 | 0.73 | 0.92 |
| 1.07 | 1.39 | 1.09 | 0.91 | 0.84 | 1.06 |
| 1.08 | 1.06 | 1.28 | 0.99 | 0.86 | 1.05 |
| 1.28 | 1.11 | 1.20 | 0.80 | 1.15 | 1.11 |
| 1.32 | 1.20 | 0.90 | 0.67 | 1.44 | 1.11 |
| 2.44 | 0.96 | 1.02 | 0.75 | 1.23 | 1.28 |
| 1.92 | 0.88 | 1.11 | 0.97 | 0.78 | 1.13 |
| 1.62 | 0.98 | 0.74 | 0.76 | 0.75 | 0.97 |
| 2.01 | 0.87 | 0.83 | 1.29 | 0.69 | 1.14 |
| 1.40 | 0.98 | 0.86 | 0.77 | 0.94 | 0.99 |
| 1.04 | 0.81 | 0.79 | 0.66 | 0.63 | 0.79 |
| 1.44 | 1.04 | 0.94 | 0.87 | 0.90 | 1.04 |
| 12   | 12   | 12   | 12   | 12   | 12   |

**Small Cap ETFs**

| 2002 | 2003 | 2004 | 2005 | 2006 | Mean |
|------|------|------|------|------|------|
| 1.22 | 1.33 | 0.84 | 1.10 | 0.78 | 1.05 |
| 1.31 | 1.13 | 1.16 | 0.95 | 0.79 | 1.07 |
| 1.05 | 1.38 | 1.29 | 0.75 | 0.83 | 1.06 |
| 1.12 | 0.98 | 1.15 | 1.24 | 0.92 | 1.08 |
| 1.36 | 1.09 | 1.26 | 0.90 | 1.21 | 1.17 |
| 1.41 | 1.14 | 0.98 | 0.76 | 1.65 | 1.19 |
| 2.55 | 1.17 | 1.14 | 0.92 | 1.51 | 1.46 |
| 1.99 | 1.04 | 1.18 | 0.90 | 0.97 | 1.22 |
| 1.97 | 1.30 | 0.89 | 0.78 | 0.97 | 1.18 |
| 2.26 | 1.08 | 1.04 | 1.39 | 0.89 | 1.33 |
| 1.67 | 1.14 | 0.72 | 0.82 | 0.94 | 1.06 |
| 1.17 | 1.14 | 0.88 | 0.80 | 0.75 | 0.95 |
| 1.59 | 1.16 | 1.04 | 0.94 | 1.02 | 1.15 |
| 8    | 8    | 8    | 8    | 8    | 8    |

Table 5 reports the estimations of model (2) which evaluates the statistical significance of the difference between November risk and other monthly risks. While I have found that a strong reverse December effect in ETFs risk exists, I use the November risk as the benchmark since we have found that performance is significantly influenced by a positive November pattern and that a modest reverse November effect on ETFs' risk also exists. The combination of November return and risk will allow the comparison of return's gaining by risk taking and risk averse investors in a subsequent section of this paper.

According to the results in Table 5, November risk of broad market ETFs is inferior to all other monthly risks in 2004 and 2005 while November risk does not statistically differ from the lower risk of August, October and December during 2003. Regarding the sector market ETFs, November risk is high in 2002 and exceeds the majority of other monthly risks while November risk is generally lower than the other monthly risks during the period 2003-2006 exempting December risk in 2003, 2005 and 2006 and the October risk in 2006. Finally, the results of international ETFs show that November risk is significantly high in 2002 while it is substantially low compared to other monthly risks during the remaining four years. Considering the results of Table 4 that regard the classified ETFs according to the size of capitalization, we see that the large cap ETFs present their lowest mean risk that equals the 96 b.p during December. Single December risks are the lowest monthly risks in three of five years (2003, 2004 and 2006). Moreover, November risk is the second lowest average risk of the period equaling the 106 b.p. Therefore, we conclude that the reverse November and December effects on risk apply to large cap ETFs. Regarding the medium cap ETFs, we observe that December risk is the lowest monthly risk in three of five years while the average December risk is the lowest during the whole period of 2002-2006 equaling the 79 b.p. Additionally, November risk is the fifth lowest risk approximating the 100 b.p. Thus we draw the conclusion that the risk of medium cap ETFs is influenced by a strong reverse December effect but is not affected by a strongly reverse November effect. Finally, the risk's estimations of small cap ETFs demonstrate that the reverse December effect found above applies to the average terms of the period. The mean December risk of the period is equal to 95 b.p. being the lowest risk among all months. Yet, we note that December risk is the lowest monthly risk only within 2006 considering the monthly risks on a year-by-year basis. Additionally, November risk is almost the second lowest risk for the period equaling the 106 b.p.

● **Table 5. Seasonality of ETFs Risk Per Market Categories**

*This table reports the coefficients of a pool regression model, which evaluates the statistical significance of the differences in risks of ETFs between November and other months. The dependent variable of the model is the monthly risk of ETFs in a pool shape and the independent variables are dummy variables, which take the value one or zero according to the month of reference.*

### Broad Markets ETFs

| Month          | 2002                |                    | 2003               |                    | 2004               |                    | 2005               |                    | 2006               |                    |
|----------------|---------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                | Coeffs              | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat             |
| Nov            | 1.61                | 31.02 <sup>a</sup> | 0.88               | 25.57 <sup>a</sup> | 0.65               | 56.83 <sup>a</sup> | 0.60               | 23.16 <sup>a</sup> | 0.69               | 22.88 <sup>a</sup> |
| Jan            | -0.46               | -6.34 <sup>a</sup> | 0.60               | 12.38 <sup>a</sup> | 0.09               | 4.03 <sup>a</sup>  | 0.20               | 4.98 <sup>a</sup>  | 0.06               | 1.70 <sup>c</sup>  |
| Feb            | -0.32               | -4.34 <sup>a</sup> | 0.30               | 6.10 <sup>a</sup>  | 0.12               | 2.77 <sup>a</sup>  | 0.17               | 4.97 <sup>a</sup>  | -0.03              | -0.76              |
| Mar            | -0.55               | -7.46 <sup>a</sup> | 0.72               | 14.79 <sup>a</sup> | 0.42               | 13.68 <sup>a</sup> | 0.09               | 3.35 <sup>a</sup>  | -0.06              | -1.52              |
| Apr            | -0.49               | -6.70 <sup>a</sup> | 0.23               | 4.65 <sup>a</sup>  | 0.27               | 7.76 <sup>a</sup>  | 0.44               | 12.29 <sup>a</sup> | 0.00               | 0.12               |
| May            | -0.20               | -2.73 <sup>a</sup> | 0.18               | 3.67 <sup>a</sup>  | 0.30               | 7.66 <sup>a</sup>  | 0.11               | 3.30 <sup>a</sup>  | 0.27               | 6.03 <sup>a</sup>  |
| Jun            | -0.14               | -1.95 <sup>c</sup> | 0.17               | 3.57 <sup>a</sup>  | 0.12               | 3.61 <sup>a</sup>  | 0.01               | 0.31               | 0.56               | 9.94 <sup>a</sup>  |
| Jul            | 1.06                | 14.54 <sup>a</sup> | 0.17               | 3.43 <sup>a</sup>  | 0.18               | 4.09 <sup>a</sup>  | 0.05               | 1.64               | 0.43               | 8.69 <sup>a</sup>  |
| Aug            | 0.50                | 6.89 <sup>a</sup>  | -0.04              | -0.84              | 0.29               | 9.57 <sup>a</sup>  | 0.09               | 3.08 <sup>a</sup>  | -0.03              | -0.83              |
| Sep            | 0.27                | 3.69 <sup>a</sup>  | 0.16               | 3.33 <sup>a</sup>  | 0.04               | 1.75 <sup>c</sup>  | 0.04               | 1.97 <sup>b</sup>  | -0.01              | -0.48              |
| Oct            | 0.69                | 9.37 <sup>a</sup>  | -0.03              | -0.66              | 0.20               | 8.53 <sup>a</sup>  | 0.49               | 17.53 <sup>a</sup> | -0.08              | -3.63 <sup>a</sup> |
| Dec            | -0.43               | -5.87 <sup>a</sup> | -0.08              | -1.56              | 0.03               | 1.07               | 0.01               | 0.27               | -0.13              | -6.54 <sup>a</sup> |
| R <sup>2</sup> | 0.75                |                    | 0.60               |                    | 0.31               |                    | 0.52               |                    | 0.53               |                    |
| F-Stat         | 102.83 <sup>a</sup> |                    | 51.74 <sup>a</sup> |                    | 15.96 <sup>a</sup> |                    | 37.75 <sup>a</sup> |                    | 39.63 <sup>a</sup> |                    |

### Sector Markets ETFs

|                |                    |                    |                   |                    |                   |                    |                   |                    |                   |                    |
|----------------|--------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|
| Nov            | 2.06               | 11.64 <sup>a</sup> | 1.01              | 10.96 <sup>a</sup> | 0.97              | 12.01 <sup>a</sup> | 0.86              | 13.34 <sup>a</sup> | 0.93              | 15.89 <sup>a</sup> |
| Jan            | -0.66              | -2.63 <sup>a</sup> | 0.90              | 5.51 <sup>a</sup>  | 0.10              | 0.90               | 0.13              | 1.45               | 0.08              | 0.96               |
| Feb            | -0.52              | -2.06 <sup>b</sup> | 0.36              | 2.92 <sup>a</sup>  | -0.02             | -0.19              | 0.08              | 0.93               | -0.04             | -0.51              |
| Mar            | -0.59              | -2.38 <sup>b</sup> | 0.79              | 5.45 <sup>a</sup>  | 0.29              | 2.53 <sup>b</sup>  | 0.09              | 1.00               | -0.06             | -0.71              |
| Apr            | -0.54              | -2.15 <sup>b</sup> | 0.40              | 2.92 <sup>a</sup>  | 0.37              | 3.21               | 0.25              | 2.54 <sup>b</sup>  | -0.02             | -0.30              |
| May            | -0.27              | -1.08              | 0.31              | 2.48 <sup>b</sup>  | 0.24              | 2.08 <sup>b</sup>  | 0.02              | 0.20               | 0.18              | 2.14 <sup>b</sup>  |
| Jun            | -0.28              | -1.14              | 0.33              | 2.66 <sup>a</sup>  | 0.01              | 0.06               | -0.15             | -2.03 <sup>b</sup> | 0.44              | 4.22 <sup>a</sup>  |
| Jul            | 1.13               | 4.54 <sup>a</sup>  | 0.19              | 1.57               | 0.07              | 0.63               | -0.05             | -0.62              | 0.27              | 3.29 <sup>a</sup>  |
| Aug            | 0.27               | 1.10               | -0.02             | -0.22              | 0.15              | 1.36               | 0.03              | 0.45               | -0.09             | -1.17              |
| Sep            | 0.10               | 0.40               | 0.18              | 2.00 <sup>b</sup>  | -0.01             | -0.10              | -0.02             | -0.40              | 0.01              | 0.10               |
| Oct            | 0.75               | 3.02 <sup>a</sup>  | -0.01             | -0.11              | 0.11              | 1.00               | 0.37              | 5.24 <sup>a</sup>  | -0.13             | -1.98 <sup>c</sup> |
| Dec            | -0.63              | -2.52 <sup>b</sup> | -0.14             | -2.01 <sup>b</sup> | -0.10             | -0.88              | -0.13             | -2.81 <sup>a</sup> | -0.22             | -4.25 <sup>a</sup> |
| R <sup>2</sup> | 0.30               |                    | 0.27              |                    | 0.11              |                    | 0.19              |                    | 0.23              |                    |
| F-Stat         | 10.78 <sup>a</sup> |                    | 9.44 <sup>a</sup> |                    | 3.01 <sup>a</sup> |                    | 5.72 <sup>a</sup> |                    | 7.63 <sup>a</sup> |                    |

### International Markets ETFs

|                |                    |                    |                    |                    |                    |                    |                   |                    |                    |                    |
|----------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------------------|--------------------|--------------------|
| Nov            | 1.86               | 16.89 <sup>a</sup> | 1.16               | 19.16 <sup>a</sup> | 0.95               | 20.09 <sup>a</sup> | 0.83              | 20.00 <sup>a</sup> | 0.86               | 15.69 <sup>a</sup> |
| Jan            | -0.34              | -2.20 <sup>a</sup> | 0.67               | 5.87 <sup>a</sup>  | 0.40               | 4.71 <sup>a</sup>  | 0.24              | 3.56 <sup>a</sup>  | 0.48               | 5.36 <sup>a</sup>  |
| Feb            | -0.43              | -2.90 <sup>a</sup> | 0.38               | 3.39 <sup>a</sup>  | 0.26               | 3.64 <sup>a</sup>  | -0.02             | -0.41              | 0.12               | 1.18               |
| Mar            | -0.44              | -3.05 <sup>a</sup> | 0.87               | 5.75 <sup>a</sup>  | 0.62               | 6.10 <sup>a</sup>  | 0.17              | 2.44 <sup>b</sup>  | 0.18               | 1.89 <sup>c</sup>  |
| Apr            | -0.45              | -3.06 <sup>a</sup> | 0.34               | 3.48 <sup>a</sup>  | 0.30               | 3.50 <sup>a</sup>  | 0.35              | 4.21 <sup>a</sup>  | 0.13               | 1.71 <sup>c</sup>  |
| May            | -0.62              | -3.78 <sup>a</sup> | 0.22               | 2.46 <sup>b</sup>  | 0.90               | 6.60 <sup>a</sup>  | 0.12              | 1.76 <sup>c</sup>  | 0.73               | 6.10 <sup>a</sup>  |
| Jun            | -0.04              | -0.27              | 0.09               | 1.11               | 0.48               | 4.73 <sup>a</sup>  | 0.02              | 0.32               | 1.13               | 9.28 <sup>a</sup>  |
| Jul            | 0.99               | 6.13 <sup>a</sup>  | 0.23               | 2.38 <sup>b</sup>  | 0.21               | 3.28 <sup>a</sup>  | 0.09              | 1.53               | 0.62               | 6.54 <sup>a</sup>  |
| Aug            | 0.45               | 3.27 <sup>a</sup>  | -0.11              | -1.23              | 0.03               | 0.56               | 0.29              | 4.50 <sup>a</sup>  | 0.00               | -0.03              |
| Sep            | 0.28               | 2.53 <sup>b</sup>  | 0.10               | 1.34               | 0.07               | 1.44               | 0.09              | 2.02 <sup>b</sup>  | 0.17               | 2.59 <sup>b</sup>  |
| Oct            | 0.76               | 5.85 <sup>a</sup>  | 0.02               | 0.34               | 0.02               | 0.40               | 0.45              | 4.73 <sup>a</sup>  | -0.02              | -0.35              |
| Dec            | -0.24              | -2.75 <sup>a</sup> | -0.07              | -0.95              | 0.05               | 1.03               | 0.16              | 2.69 <sup>a</sup>  | 0.03               | 0.51               |
| R <sup>2</sup> | 0.41               |                    | 0.30               |                    | 0.35               |                    | 0.17              |                    | 0.46               |                    |
| F-Stat         | 19.08 <sup>a</sup> |                    | 11.91 <sup>a</sup> |                    | 14.85 <sup>a</sup> |                    | 5.68 <sup>a</sup> |                    | 23.03 <sup>a</sup> |                    |

<sup>a</sup> Significant at 0.01% level, <sup>b</sup> Significant at 0.05% level, <sup>c</sup> Significant at 0.10% level

By comparing the mean November and mean annual risk levels of the large, medium and small cap ETFs, we see that large cap ETFs are more risky than medium and small cap ones while medium cap ETFs are more risky than the small cap ones. The risk superiority of large ETFs is reasonable as this class includes, among others, the international ETFs which present greater risk than the broad and sector ETFs.

Table 6 reports the regression analysis of the differences in risks between November and other months when the classification of ETFs by the level of capitalization is considered. The results indicate that November risk of large cap ETFs is significantly high in 2002 being superior to the majority of other monthly risks while it is substantially low in relation to other monthly risks during the remaining four years. November risk is found to be statistically lower only than December risk in 2003 and 2006. A similar view is shown in the case of medium cap ETFs; November risk is high in 2002 and low during the period 2003-2006. Yet, November risk is greater than the risk in February, September, October and December of 2006. The results of small cap ETFs follow the results of large and medium cap ETFs. November risk is large compared to other monthly risks in 2002 and decreases during the period 2003-2006. During this period November risk is statistically superior only to April risk in 2003 and January, February, March and December risk in 2006.

● **Table 6. Seasonality of ETFs Risk Per Categories of Capitalization**

*This table reports the coefficients of a pool regression model, which evaluates the statistical significance of the differences in risks of ETFs between November and other months. The dependent variable of the model is the monthly risk of ETFs in a pool shape and the independent variables are dummy variables, which take the value one or zero according to the month of reference.*

| Large Cap ETFs |                    |                    |                    |                    |                    |                    |                    |                    |                    |                    |
|----------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Month          | 2002               |                    | 2003               |                    | 2004               |                    | 2005               |                    | 2006               |                    |
|                | Coeffs             | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat             | Coeffs             | T-stat             |
| Nov            | 1.91               | 22.35 <sup>a</sup> | 1.00               | 21.84 <sup>a</sup> | 0.85               | 28.18 <sup>a</sup> | 0.73               | 20.97 <sup>a</sup> | 0.77               | 23.25 <sup>a</sup> |
| Jan            | -0.49              | -4.77 <sup>a</sup> | 0.85               | 11.65 <sup>a</sup> | 0.27               | 4.72 <sup>a</sup>  | 0.18               | 3.90 <sup>a</sup>  | 0.30               | 5.52 <sup>a</sup>  |
| Feb            | -0.45              | -4.44 <sup>a</sup> | 0.45               | 6.84 <sup>a</sup>  | 0.11               | 2.25 <sup>b</sup>  | 0.07               | 1.52               | 0.08               | 1.43               |
| Mar            | -0.55              | -5.25 <sup>a</sup> | 0.93               | 11.38 <sup>a</sup> | 0.47               | 7.91 <sup>a</sup>  | 0.13               | 2.90 <sup>a</sup>  | 0.06               | 0.98               |
| Apr            | -0.52              | -4.83 <sup>a</sup> | 0.41               | 6.38 <sup>a</sup>  | 0.27               | 4.69 <sup>a</sup>  | 0.38               | 7.23 <sup>a</sup>  | 0.07               | 1.34               |
| May            | -0.40              | -3.16 <sup>a</sup> | 0.29               | 4.99 <sup>a</sup>  | 0.49               | 6.03 <sup>a</sup>  | 0.10               | 2.23 <sup>b</sup>  | 0.44               | 6.49 <sup>a</sup>  |
| Jun            | -0.15              | -1.51              | 0.21               | 4.03 <sup>a</sup>  | 0.22               | 3.46 <sup>a</sup>  | -0.02              | -0.42              | 0.74               | 9.84 <sup>a</sup>  |
| Jul            | 1.09               | 11.36 <sup>a</sup> | 0.26               | 4.14 <sup>a</sup>  | 0.13               | 2.40 <sup>b</sup>  | 0.04               | 1.02               | 0.46               | 8.44 <sup>a</sup>  |
| Aug            | 0.41               | 4.83 <sup>a</sup>  | -0.04              | -0.86              | 0.12               | 2.92 <sup>a</sup>  | 0.13               | 3.13 <sup>a</sup>  | -0.02              | -0.64              |
| Sep            | 0.22               | 2.95 <sup>a</sup>  | 0.18               | 3.93 <sup>a</sup>  | 0.05               | 1.30               | 0.06               | 2.03 <sup>b</sup>  | 0.10               | 2.43 <sup>b</sup>  |
| Oct            | 0.77               | 10.05 <sup>a</sup> | 0.02               | 0.53               | 0.12               | 3.88 <sup>a</sup>  | 0.41               | 8.63 <sup>a</sup>  | -0.05              | -1.62              |
| Dec            | -0.43              | -7.41 <sup>a</sup> | -0.09              | -2.28 <sup>b</sup> | -0.01              | -0.32              | 0.04               | 1.32               | -0.06              | -1.76 <sup>c</sup> |
| R <sup>2</sup> | 0.41               |                    | 0.37               |                    | 0.13               |                    | 0.16               |                    | 0.28               |                    |
| F-Stat         | 47.23 <sup>a</sup> |                    | 39.38 <sup>a</sup> |                    | 10.32 <sup>a</sup> |                    | 12.61 <sup>a</sup> |                    | 26.90 <sup>a</sup> |                    |

| Medium Cap ETFs |                   |                    |                   |                    |                   |                    |                   |                    |                    |                    |
|-----------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|--------------------|--------------------|
| Nov             | 1.40              | 8.38 <sup>a</sup>  | 0.98              | 10.17 <sup>a</sup> | 0.86              | 10.21 <sup>a</sup> | 0.77              | 13.39 <sup>a</sup> | 0.94               | 13.28 <sup>a</sup> |
| Jan             | -0.46             | -1.93 <sup>c</sup> | 0.30              | 2.17 <sup>b</sup>  | -0.18             | -1.82 <sup>c</sup> | 0.21              | 2.56 <sup>b</sup>  | -0.13              | -1.29              |
| Feb             | -0.25             | -1.07              | 0.01              | 0.06               | -0.02             | -0.23              | 0.15              | 1.80 <sup>c</sup>  | -0.21              | -2.08 <sup>b</sup> |
| Mar             | -0.33             | -1.38              | 0.42              | 3.07 <sup>a</sup>  | 0.23              | 2.02 <sup>b</sup>  | 0.13              | 1.59               | -0.10              | -1.02              |
| Apr             | -0.32             | -1.34              | 0.09              | 0.64               | 0.42              | 2.41 <sup>b</sup>  | 0.21              | 2.61 <sup>b</sup>  | -0.08              | -0.82              |
| May             | -0.12             | -0.51              | 0.13              | 0.96               | 0.34              | 3.08 <sup>a</sup>  | 0.02              | 0.25               | 0.21               | 2.15 <sup>b</sup>  |
| Jun             | -0.08             | -0.35              | 0.22              | 1.61               | 0.04              | 0.46               | -0.11             | -1.30              | 0.50               | 5.02 <sup>a</sup>  |
| Jul             | 1.04              | 4.41 <sup>a</sup>  | -0.01             | -0.10              | 0.16              | 1.37               | -0.02             | -0.30              | 0.29               | 2.91 <sup>a</sup>  |
| Aug             | 0.52              | 2.18 <sup>b</sup>  | -0.09             | -0.69              | 0.25              | 2.30 <sup>b</sup>  | 0.20              | 2.43 <sup>b</sup>  | -0.16              | -1.58              |
| Sep             | 0.22              | 0.94               | 0.00              | -0.01              | -0.12             | -1.65              | -0.01             | -0.14              | -0.18              | -1.85 <sup>c</sup> |
| Oct             | 0.61              | 2.58 <sup>b</sup>  | -0.11             | -0.78              | -0.03             | -0.39              | 0.52              | 6.35 <sup>a</sup>  | -0.25              | -2.46 <sup>b</sup> |
| Dec             | -0.36             | -1.51              | -0.17             | -1.22              | -0.07             | -1.15              | -0.12             | -1.43              | -0.31              | -3.13 <sup>a</sup> |
| R <sup>2</sup>  | 0.39              |                    | 0.21              |                    | 0.34              |                    | 0.44              |                    | 0.50               |                    |
| F-Stat          | 7.76 <sup>a</sup> |                    | 3.26 <sup>a</sup> |                    | 6.06 <sup>a</sup> |                    | 9.44 <sup>a</sup> |                    | 12.06 <sup>a</sup> |                    |

| Small Cap ETFs |                    |                    |                   |                    |                    |                    |                    |                    |                    |                    |
|----------------|--------------------|--------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Nov            | 1.67               | 17.04 <sup>a</sup> | 1.14              | 19.69 <sup>a</sup> | 0.72               | 14.31 <sup>a</sup> | 0.82               | 25.84 <sup>a</sup> | 0.94               | 26.07 <sup>a</sup> |
| Jan            | -0.45              | -3.25 <sup>a</sup> | 0.19              | 2.26 <sup>b</sup>  | 0.12               | 1.65               | 0.28               | 6.15 <sup>a</sup>  | -0.16              | -3.14 <sup>a</sup> |
| Feb            | -0.36              | -2.57 <sup>b</sup> | -0.01             | -0.18              | 0.44               | 6.16 <sup>a</sup>  | 0.13               | 2.78 <sup>a</sup>  | -0.15              | -2.87 <sup>a</sup> |
| Mar            | -0.62              | -4.48 <sup>a</sup> | 0.24              | 2.96 <sup>a</sup>  | 0.57               | 8.01 <sup>a</sup>  | -0.07              | -1.56              | -0.11              | -2.10 <sup>b</sup> |
| Apr            | -0.54              | -3.93 <sup>a</sup> | -0.16             | -1.95 <sup>c</sup> | 0.43               | 5.96 <sup>a</sup>  | 0.42               | 9.33 <sup>a</sup>  | -0.02              | -0.31              |
| May            | -0.30              | -2.20 <sup>b</sup> | -0.05             | -0.60              | 0.54               | 7.53 <sup>a</sup>  | 0.08               | 1.78 <sup>c</sup>  | 0.27               | 5.38 <sup>a</sup>  |
| Jun            | -0.26              | -1.88 <sup>c</sup> | 0.00              | -0.01              | 0.26               | 3.65 <sup>a</sup>  | -0.06              | -1.45              | 0.71               | 14.02 <sup>a</sup> |
| Jul            | 0.88               | 6.37 <sup>a</sup>  | 0.03              | 0.32               | 0.42               | 5.81 <sup>a</sup>  | 0.10               | 2.17 <sup>b</sup>  | 0.57               | 11.23 <sup>a</sup> |
| Aug            | 0.32               | 2.32 <sup>b</sup>  | -0.11             | -1.29              | 0.46               | 6.45 <sup>a</sup>  | 0.08               | 1.75 <sup>c</sup>  | 0.04               | 0.73               |
| Sep            | 0.30               | 2.15 <sup>b</sup>  | 0.16              | 1.93 <sup>c</sup>  | 0.17               | 2.40 <sup>b</sup>  | -0.04              | -0.88              | 0.03               | 0.61               |
| Oct            | 0.59               | 4.28 <sup>a</sup>  | -0.06             | -0.75              | 0.32               | 4.44 <sup>a</sup>  | 0.57               | 12.70 <sup>a</sup> | -0.05              | -1.02              |
| Dec            | -0.50              | -3.58 <sup>a</sup> | 0.00              | -0.04              | 0.15               | 2.14 <sup>b</sup>  | -0.02              | -0.55              | -0.19              | -3.71 <sup>a</sup> |
| R <sup>2</sup> | 0.77               |                    | 0.36              |                    | 0.63               |                    | 0.84               |                    | 0.90               |                    |
| F-Stat         | 25.27 <sup>a</sup> |                    | 4.28 <sup>a</sup> |                    | 12.91 <sup>a</sup> |                    | 40.71 <sup>a</sup> |                    | 65.51 <sup>a</sup> |                    |

<sup>a</sup> Significant at 0.01% level, <sup>b</sup> Significant at 0.05% level, <sup>c</sup> Significant at 0.10% level

Overall, the analysis of monthly risks signals the existence of a significant reverse December effect in ETFs volatility. Additionally, the results indicate that a modest reverse November effect on ETFs risk also exists. The combination of the steadily positive performance and the relevantly low risk of ETFs in November can enable investors to gain significant returns during this month simultaneously bearing relevantly low risk.

### Tracking Error

The tracking error of the various ETF categories are analyzed in this section. Table 7 reports the monthly tracking error calculations. According to the results, the broad market ETFs reach, on average, their best replication in November as the mean November tracking error of the period is the lowest among all mean monthly tracking errors equaling the 26 b.p. Furthermore, November tracking error is the

lowest among all the monthly tracking errors in 2004 and 2006. The sector market ETFs also present the period's lowest mean tracking error, which equals the 32 b.p., in November. The same pattern applies to international ETFs, whose mean November tracking error is equal to 80 b.p. The results of sector and international ETFs for each individual year indicate that November tracking error is the lowest monthly tracking error in 2003 and 2004 for sector ETFs while it is the lowest monthly tracking in 2003, 2004 and 2005 for international ETFs. These results indicate the existence of a significant reverse November effect on ETFs' replication efficiency.

The comparison of monthly tracking errors among the marker categories of ETFs shows that the broad ETFs more efficiently perform their replication strategies as compared to sector and international ETFs. In addition, the sector ETFs suffer from less replication's failure than international ETFs. These findings regard both November and the majority of other months in each single year during the period 2002-2006.

● **Table 7. Monthly Tracking Error of ETFs**

*This table reports the average tracking of broad, sector and international ETFs and the tracking error of large, medium and large cap ETFs for each calendar month within the period 2002-2006. Table also presents the mean monthly tracking error for each year and the mean tracking error in each single month during the whole studying period. N represents the number of ETFs in each category.*

| Panel A: Categorization by Market |      |      |      |      |      |      | Panel B: Categorization by Capitalization |      |      |      |      |      |  |
|-----------------------------------|------|------|------|------|------|------|-------------------------------------------|------|------|------|------|------|--|
| Broad Markets ETFs                |      |      |      |      |      |      | Large Cap ETFs                            |      |      |      |      |      |  |
| Month                             | 2002 | 2003 | 2004 | 2005 | 2006 | Mean | 2002                                      | 2003 | 2004 | 2005 | 2006 | Mean |  |
| Jan                               | 0.39 | 0.41 | 0.25 | 0.21 | 0.20 | 0.29 | 0.78                                      | 0.78 | 0.64 | 0.44 | 0.44 | 0.62 |  |
| Feb                               | 0.38 | 0.47 | 0.21 | 0.17 | 0.19 | 0.28 | 0.89                                      | 0.85 | 0.49 | 0.38 | 0.39 | 0.60 |  |
| Mar                               | 0.31 | 0.42 | 0.28 | 0.24 | 0.19 | 0.29 | 0.66                                      | 0.90 | 0.66 | 0.43 | 0.40 | 0.61 |  |
| Apr                               | 0.34 | 0.36 | 0.26 | 0.24 | 0.21 | 0.28 | 0.72                                      | 0.69 | 0.56 | 0.54 | 0.37 | 0.57 |  |
| May                               | 0.34 | 0.31 | 0.28 | 0.23 | 0.24 | 0.28 | 0.73                                      | 0.63 | 0.67 | 0.40 | 0.52 | 0.59 |  |
| Jun                               | 0.51 | 0.29 | 0.24 | 0.21 | 0.27 | 0.31 | 0.97                                      | 0.66 | 0.53 | 0.36 | 0.71 | 0.65 |  |
| Jul                               | 0.79 | 0.32 | 0.26 | 0.20 | 0.22 | 0.36 | 1.93                                      | 0.70 | 0.55 | 0.40 | 0.58 | 0.83 |  |
| Aug                               | 0.56 | 0.30 | 0.25 | 0.21 | 0.16 | 0.29 | 1.37                                      | 0.56 | 0.50 | 0.40 | 0.37 | 0.64 |  |
| Sep                               | 0.65 | 0.27 | 0.24 | 0.22 | 0.17 | 0.31 | 1.32                                      | 0.59 | 0.41 | 0.37 | 0.36 | 0.61 |  |
| Oct                               | 0.88 | 0.30 | 0.22 | 0.24 | 0.15 | 0.36 | 1.64                                      | 0.54 | 0.46 | 0.53 | 0.33 | 0.70 |  |
| Nov                               | 0.46 | 0.29 | 0.19 | 0.22 | 0.15 | 0.26 | 1.04                                      | 0.52 | 0.41 | 0.33 | 0.35 | 0.53 |  |
| Dec                               | 0.43 | 0.26 | 0.27 | 0.25 | 0.18 | 0.28 | 1.02                                      | 0.56 | 0.49 | 0.43 | 0.42 | 0.58 |  |
| Mean                              | 0.50 | 0.33 | 0.25 | 0.22 | 0.19 | 0.30 | 1.09                                      | 0.67 | 0.53 | 0.42 | 0.44 | 0.63 |  |
| N                                 | 33   | 33   | 33   | 33   | 33   | 33   | 63                                        | 63   | 63   | 63   | 63   | 63   |  |

| Sector Markets ETFs |      |      |      |      |      |      | Medium Cap ETFs |      |      |      |      |      |
|---------------------|------|------|------|------|------|------|-----------------|------|------|------|------|------|
| Month               | 2002 | 2003 | 2004 | 2005 | 2006 | Mean | 2002            | 2003 | 2004 | 2005 | 2006 | Mean |
| Jan                 | 0.62 | 0.58 | 0.36 | 0.30 | 0.29 | 0.43 | 0.38            | 0.38 | 0.23 | 0.24 | 0.22 | 0.29 |
| Feb                 | 0.69 | 0.68 | 0.30 | 0.24 | 0.19 | 0.42 | 0.44            | 0.38 | 0.25 | 0.18 | 0.21 | 0.29 |
| Mar                 | 0.59 | 0.64 | 0.41 | 0.27 | 0.20 | 0.42 | 0.39            | 0.38 | 0.29 | 0.30 | 0.24 | 0.32 |
| Apr                 | 0.50 | 0.49 | 0.36 | 0.27 | 0.19 | 0.36 | 0.31            | 0.36 | 0.26 | 0.32 | 0.21 | 0.29 |
| May                 | 0.56 | 0.47 | 0.35 | 0.24 | 0.21 | 0.37 | 0.33            | 0.38 | 0.31 | 0.23 | 0.30 | 0.31 |
| Jun                 | 0.64 | 0.44 | 0.35 | 0.22 | 0.25 | 0.38 | 0.43            | 0.35 | 0.32 | 0.24 | 0.39 | 0.35 |
| Jul                 | 1.64 | 0.48 | 0.30 | 0.22 | 0.25 | 0.58 | 0.81            | 0.29 | 0.26 | 0.26 | 0.24 | 0.37 |
| Aug                 | 0.91 | 0.41 | 0.27 | 0.24 | 0.18 | 0.40 | 0.50            | 0.31 | 0.24 | 0.24 | 0.20 | 0.30 |
| Sep                 | 0.84 | 0.41 | 0.24 | 0.22 | 0.21 | 0.38 | 0.53            | 0.29 | 0.26 | 0.28 | 0.20 | 0.31 |
| Oct                 | 0.99 | 0.37 | 0.24 | 0.22 | 0.18 | 0.40 | 0.80            | 0.28 | 0.25 | 0.28 | 0.18 | 0.36 |
| Nov                 | 0.59 | 0.34 | 0.25 | 0.20 | 0.20 | 0.32 | 0.37            | 0.26 | 0.19 | 0.25 | 0.19 | 0.25 |
| Dec                 | 0.58 | 0.34 | 0.29 | 0.24 | 0.23 | 0.34 | 0.48            | 0.27 | 0.27 | 0.26 | 0.26 | 0.31 |
| Mean                | 0.76 | 0.47 | 0.31 | 0.24 | 0.22 | 0.40 | 0.48            | 0.33 | 0.26 | 0.26 | 0.24 | 0.31 |
| N                   | 24   | 24   | 24   | 24   | 24   | 24   | 12              | 12   | 12   | 12   | 12   | 12   |

  

| International Markets ETFs |      |      |      |      |      |      | Small Cap ETFs |      |      |      |      |      |
|----------------------------|------|------|------|------|------|------|----------------|------|------|------|------|------|
| Month                      | 2002 | 2003 | 2004 | 2005 | 2006 | Mean | 2002           | 2003 | 2004 | 2005 | 2006 | Mean |
| Jan                        | 1.05 | 1.15 | 1.10 | 0.72 | 0.74 | 0.95 | 0.36           | 0.47 | 0.30 | 0.26 | 0.26 | 0.33 |
| Feb                        | 1.09 | 1.15 | 0.85 | 0.63 | 0.69 | 0.88 | 0.34           | 0.47 | 0.25 | 0.18 | 0.21 | 0.29 |
| Mar                        | 0.88 | 1.36 | 1.09 | 0.70 | 0.71 | 0.95 | 0.30           | 0.43 | 0.31 | 0.22 | 0.19 | 0.29 |
| Apr                        | 1.01 | 1.04 | 0.89 | 0.97 | 0.64 | 0.91 | 0.29           | 0.36 | 0.27 | 0.26 | 0.28 | 0.29 |
| May                        | 0.98 | 0.96 | 1.18 | 0.65 | 0.99 | 0.95 | 0.33           | 0.31 | 0.32 | 0.32 | 0.29 | 0.31 |
| Jun                        | 1.31 | 1.09 | 0.89 | 0.59 | 1.46 | 1.07 | 0.40           | 0.33 | 0.29 | 0.25 | 0.41 | 0.33 |
| Jul                        | 2.24 | 1.08 | 0.94 | 0.71 | 1.09 | 1.21 | 0.88           | 0.31 | 0.28 | 0.24 | 0.26 | 0.39 |
| Aug                        | 1.78 | 0.86 | 0.85 | 0.66 | 0.70 | 0.97 | 0.51           | 0.33 | 0.32 | 0.25 | 0.19 | 0.32 |
| Sep                        | 1.67 | 0.93 | 0.69 | 0.63 | 0.62 | 0.91 | 0.69           | 0.25 | 0.30 | 0.21 | 0.16 | 0.32 |
| Oct                        | 2.00 | 0.83 | 0.80 | 1.00 | 0.58 | 1.04 | 0.93           | 0.33 | 0.26 | 0.28 | 0.18 | 0.40 |
| Nov                        | 1.36 | 0.80 | 0.66 | 0.54 | 0.63 | 0.80 | 0.53           | 0.29 | 0.21 | 0.27 | 0.21 | 0.31 |
| Dec                        | 1.28 | 0.95 | 0.80 | 0.72 | 0.76 | 0.90 | 0.45           | 0.33 | 0.34 | 0.34 | 0.21 | 0.33 |
| Mean                       | 1.39 | 1.02 | 0.89 | 0.71 | 0.80 | 0.96 | 0.50           | 0.35 | 0.29 | 0.26 | 0.24 | 0.33 |
| N                          | 26   | 26   | 26   | 26   | 26   | 26   | 8              | 8    | 8    | 8    | 8    | 8    |

Table 8 presents the results of regression (4), which estimates the significance of the difference between the tracking error of November and other months. The results of broad ETFs reveal that the reverse November effect on tracking error is strongly significant in 2004 and 2004 as the coefficients of the respective dummies are all positive. Additionally, November tracking error during 2003 is not statistically different from September and December tracking errors, which are lower in raw terms. The regression's estimations for sector ETFs confirm the existence of the reverse November effect on tracking error in 2003 and 2004. In the other years, the majority of monthly dummies' coefficients are positive whilst the negative estimations are all insignificant at any acceptable level. Therefore, we infer that the reverse November effect on tracking error of sector ETFs basically concerns the entire period of 2002-2006. Viewing the results of international ETFs, we confirm the significance of the reverse November effect on tracking error during 2003, 2004 and 2005 as the constant of model (4) is steadily

positive and significant at the 1% level while the coefficients of dummies are all positive showing that the monthly tracking errors are superior to November tracking error. Moreover, the only one negative coefficient in 2006 relates to October but it is insignificant indicating that October and November tracking errors are not different.

Table 7 records the monthly tracking errors of the size-classified ETFs. The results indicate the existence of a strong reverse November effect on the tracking error of large cap ETFs in 2003, 2004 and 2005 while the period's average November tracking error is the lowest among all monthly tracking errors equaling the 53 b.p. The results also confirm the existence of a November effect on the tracking error of medium cap ETFs during the interval of 2003-2004. The period's mean November tracking error of medium cap ETFs is equal to 25 b.p. being the lowest among all mean monthly tracking errors. Finally, the results of small cap ETFs partially confirm the reverse November effect on tracking error. More specifically, November tracking error is the lowest monthly tracking error in 2004 whereas mean November tracking error is the second lowest monthly tracking error of the period equaling the 31 b.p. Combining the tracking error's measurements of the individual ETF classes, we ascertain that the large ETFs steadily present greater records of tracking error than the medium and small cap ETFs during November. The same pattern also applies to all the other months.

● **Table 8. Seasonality of ETFs Tracking Error Per Market Categories**

*This table reports the coefficients of a pool regression model, which evaluates the statistical significance of the differences in tracking errors of ETFs between November and other months. The dependent variable of the model is the monthly tracking error of ETFs in a pool shape and the independent variables are dummy variables, which take the value one or zero according to the month of reference.*

| Broad Markets ETFs |                   |                    |                   |                   |        |                   |        |                    |                   |                   |
|--------------------|-------------------|--------------------|-------------------|-------------------|--------|-------------------|--------|--------------------|-------------------|-------------------|
|                    | 2002              |                    | 2003              |                   | 2004   |                   | 2005   |                    | 2006              |                   |
| Month              | Coeffs            | T-stat             | Coeffs            | T-stat            | Coeffs | T-stat            | Coeffs | T-stat             | Coeffs            | T-stat            |
| Nov                | 0.46              | 9.10 <sup>a</sup>  | 0.29              | 8.63 <sup>a</sup> | 0.19   | 7.92 <sup>a</sup> | 0.22   | 10.14 <sup>a</sup> | 0.15              | 7.99 <sup>a</sup> |
| Jan                | -0.06             | -1.08              | 0.12              | 2.61 <sup>a</sup> | 0.06   | 1.76 <sup>c</sup> | -0.01  | -0.30              | 0.05              | 1.81 <sup>c</sup> |
| Feb                | -0.07             | -1.24              | 0.18              | 3.77 <sup>a</sup> | 0.02   | 0.47              | -0.06  | -1.82 <sup>c</sup> | 0.04              | 1.47              |
| Mar                | -0.15             | -2.72 <sup>a</sup> | 0.13              | 2.85 <sup>a</sup> | 0.09   | 2.62 <sup>a</sup> | 0.02   | 0.71               | 0.04              | 1.59              |
| Apr                | -0.12             | -2.08 <sup>b</sup> | 0.07              | 1.49              | 0.07   | 2.10 <sup>b</sup> | 0.02   | 0.63               | 0.06              | 2.18 <sup>b</sup> |
| May                | -0.11             | -1.80 <sup>c</sup> | 0.02              | 0.34              | 0.09   | 2.65 <sup>a</sup> | 0.01   | 0.21               | 0.09              | 3.27 <sup>a</sup> |
| Jun                | 0.05              | 0.77               | 0.00              | 0.04              | 0.05   | 1.51              | -0.01  | -0.27              | 0.12              | 4.57 <sup>a</sup> |
| Jul                | 0.33              | 3.27 <sup>a</sup>  | 0.04              | 0.74              | 0.07   | 2.07 <sup>b</sup> | -0.02  | -0.68              | 0.07              | 2.63 <sup>b</sup> |
| Aug                | 0.10              | 1.42               | 0.01              | 0.16              | 0.06   | 1.79 <sup>c</sup> | -0.01  | -0.34              | 0.01              | 0.30              |
| Sep                | 0.19              | 2.85 <sup>a</sup>  | -0.02             | -0.37             | 0.05   | 1.33              | -0.01  | -0.20              | 0.02              | 0.60              |
| Oct                | 0.42              | 4.14 <sup>a</sup>  | 0.01              | 0.23              | 0.03   | 0.81              | 0.02   | 0.63               | 0.00              | -0.01             |
| Dec                | -0.02             | -0.58              | -0.03             | -0.67             | 0.08   | 2.37 <sup>b</sup> | 0.03   | 0.84               | 0.03              | 1.09              |
| R <sup>2</sup>     | 0.20              |                    | 0.10              |                   | 0.04   |                   | 0.03   |                    | 0.10              |                   |
| F-Stat             | 8.61 <sup>a</sup> |                    | 4.05 <sup>a</sup> |                   | 1.42   |                   | 1.11   |                    | 3.84 <sup>a</sup> |                   |



| Sector Markets ETFs |                   |                   |                   |                   |                   |                   |      |                    |       |                   |
|---------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|--------------------|-------|-------------------|
| Nov                 | 0.59              | 7.97 <sup>a</sup> | 0.34              | 5.32 <sup>a</sup> | 0.25              | 6.75 <sup>a</sup> | 0.20 | 12.23 <sup>a</sup> | 0.20  | 8.87 <sup>a</sup> |
| Jan                 | 0.02              | 0.18              | 0.24              | 2.65 <sup>a</sup> | 0.11              | 2.05 <sup>b</sup> | 0.10 | 2.65 <sup>a</sup>  | 0.09  | 2.05 <sup>b</sup> |
| Feb                 | 0.10              | 0.91              | 0.34              | 3.75 <sup>a</sup> | 0.05              | 0.86              | 0.04 | 1.52               | 0.00  | -0.18             |
| Mar                 | 0.00              | 0.00              | 0.30              | 3.32 <sup>a</sup> | 0.15              | 2.89 <sup>a</sup> | 0.07 | 2.65 <sup>a</sup>  | 0.00  | 0.10              |
| Apr                 | -0.09             | -0.86             | 0.15              | 1.61              | 0.11              | 2.00 <sup>b</sup> | 0.07 | 2.10 <sup>b</sup>  | -0.01 | -0.46             |
| May                 | -0.04             | -0.37             | 0.13              | 1.45              | 0.09              | 1.78 <sup>c</sup> | 0.04 | 1.39               | 0.01  | 0.30              |
| Jun                 | 0.05              | 0.49              | 0.10              | 1.06              | 0.10              | 1.85 <sup>c</sup> | 0.02 | 0.71               | 0.05  | 1.54              |
| Jul                 | 1.05              | 7.55 <sup>a</sup> | 0.14              | 1.52              | 0.05              | 0.91              | 0.02 | 0.76               | 0.05  | 1.32              |
| Aug                 | 0.31              | 2.78 <sup>a</sup> | 0.07              | 0.74              | 0.01              | 0.24              | 0.04 | 1.73 <sup>c</sup>  | -0.02 | -0.93             |
| Sep                 | 0.25              | 2.72 <sup>a</sup> | 0.07              | 0.74              | -0.02             | -0.33             | 0.02 | 0.89               | 0.01  | 0.48              |
| Oct                 | 0.40              | 2.81 <sup>a</sup> | 0.03              | 0.34              | -0.01             | -0.21             | 0.02 | 1.35               | -0.02 | -0.89             |
| Dec                 | -0.01             | -0.16             | 0.00              | -0.02             | 0.04              | 0.78              | 0.04 | 1.80 <sup>c</sup>  | 0.04  | 1.32              |
| R <sup>2</sup>      | 0.27              |                   | 0.11              |                   | 0.08              |                   | 0.05 |                    | 0.06  |                   |
| F-Stat              | 9.07 <sup>a</sup> |                   | 3.08 <sup>a</sup> |                   | 2.15 <sup>b</sup> |                   | 1.22 |                    | 1.58  |                   |

| International Markets ETFs |                    |                    |                   |                    |                   |                   |                    |                    |                    |                    |
|----------------------------|--------------------|--------------------|-------------------|--------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| Nov                        | 1.36               | 17.13 <sup>a</sup> | 0.80              | 12.42 <sup>a</sup> | 0.66              | 9.84 <sup>a</sup> | 0.54               | 13.12 <sup>a</sup> | 0.63               | 16.10 <sup>a</sup> |
| Jan                        | -0.30              | -2.92 <sup>a</sup> | 0.35              | 3.90 <sup>a</sup>  | 0.43              | 4.54 <sup>a</sup> | 0.18               | 3.15 <sup>a</sup>  | 0.11               | 1.17               |
| Feb                        | -0.27              | -2.33 <sup>b</sup> | 0.35              | 3.89 <sup>a</sup>  | 0.18              | 1.90 <sup>c</sup> | 0.09               | 1.58               | 0.07               | 0.98               |
| Mar                        | -0.48              | -4.63 <sup>a</sup> | 0.56              | 6.19 <sup>a</sup>  | 0.42              | 4.41 <sup>a</sup> | 0.16               | 2.81 <sup>a</sup>  | 0.08               | 1.19               |
| Apr                        | -0.35              | -3.28 <sup>a</sup> | 0.24              | 2.61 <sup>a</sup>  | 0.22              | 2.31 <sup>b</sup> | 0.44               | 7.51 <sup>a</sup>  | 0.02               | 0.31               |
| May                        | -0.38              | -3.57 <sup>a</sup> | 0.16              | 1.77 <sup>c</sup>  | 0.51              | 5.36 <sup>a</sup> | 0.12               | 2.01 <sup>b</sup>  | 0.37               | 4.08 <sup>a</sup>  |
| Jun                        | -0.05              | -0.47              | 0.29              | 3.16 <sup>a</sup>  | 0.23              | 2.41 <sup>b</sup> | 0.05               | 0.89               | 0.83               | 7.31 <sup>a</sup>  |
| Jul                        | 0.89               | 5.83 <sup>a</sup>  | 0.28              | 3.06 <sup>a</sup>  | 0.27              | 2.87 <sup>a</sup> | 0.17               | 3.01 <sup>a</sup>  | 0.46               | 4.96 <sup>a</sup>  |
| Aug                        | 0.42               | 3.58 <sup>a</sup>  | 0.06              | 0.62               | 0.19              | 1.99 <sup>b</sup> | 0.13               | 2.18 <sup>b</sup>  | 0.07               | 1.42               |
| Sep                        | 0.31               | 3.53 <sup>a</sup>  | 0.13              | 1.39               | 0.02              | 0.23              | 0.09               | 1.53               | 0.00               | -0.04              |
| Oct                        | 0.64               | 5.98 <sup>a</sup>  | 0.03              | 0.29               | 0.13              | 1.37              | 0.46               | 7.90 <sup>a</sup>  | -0.05              | -1.58              |
| Dec                        | -0.08              | -1.05              | 0.15              | 1.67 <sup>c</sup>  | 0.14              | 1.45              | 0.18               | 3.15 <sup>a</sup>  | 0.13               | 2.73 <sup>a</sup>  |
| R <sup>2</sup>             | 0.44               |                    | 0.19              |                    | 0.17              |                   | 0.30               |                    | 0.36               |                    |
| F-Stat                     | 21.76 <sup>a</sup> |                    | 6.41 <sup>a</sup> |                    | 5.53 <sup>a</sup> |                   | 11.58 <sup>a</sup> |                    | 15.07 <sup>a</sup> |                    |

<sup>a</sup> Significant at 0.01% level, <sup>b</sup> Significant at 0.05% level, <sup>c</sup> Significant at 0.10% level

The econometric assessment of the size-classified tracking errors is presented in Table 9. Considering large cap ETFs, the reverse November effect is clearly significant in 2003-2004 and 2005 as the model's constant is positive and significant at the 1% level and the coefficients of calendar dummies are all positive. Moreover, the difference between the constant and the negative coefficient of October's dummy in 2006 is not significant. The results of medium cap ETFs indicate the significance of the reverse November effect in 2003 and 2004 while November tracking error does not statistically differ from the negative coefficients in 2002, 2005 and 2006.

Finally, the estimations concerning small cap ETFs indicate the significance of the reverse November effect in 2004. In addition, November tracking error is not materially different from the negative estimations concerning the non-November dummies in 2002, 2003 and 2006.

● **Table 9. Seasonality of ETFs Tracking Error Per Categories of Capitalization**

*This table reports the coefficients of a pool regression model, which evaluates the statistical significance of the differences in tracking error of ETFs between November and other months. The dependent variable of the model is the monthly tracking error of ETFs in a pool shape and the independent variables are dummy variables, which take the value one or zero according to the month of reference.*

| Large Cap ETFs  |                    |                    |                   |                    |                   |                    |                   |                    |                   |                    |
|-----------------|--------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|
| Month           | 2002               |                    | 2003              |                    | 2004              |                    | 2005              |                    | 2006              |                    |
|                 | Coeffs             | T-stat             | Coeffs            | T-stat             | Coeffs            | T-stat             | Coeffs            | T-stat             | Coeffs            | T-stat             |
| Nov             | 0.89               | 13.13 <sup>a</sup> | 0.52              | 11.96 <sup>a</sup> | 0.41              | 11.57 <sup>a</sup> | 0.33              | 13.04 <sup>a</sup> | 0.35              | 10.34 <sup>a</sup> |
| Jan             | -0.13              | -1.61              | 0.26              | 3.93 <sup>a</sup>  | 0.23              | 3.54 <sup>a</sup>  | 0.11              | 3.01 <sup>a</sup>  | 0.09              | 1.89 <sup>c</sup>  |
| Feb             | -0.10              | -1.25              | 0.32              | 4.68 <sup>a</sup>  | 0.09              | 1.58               | 0.05              | 1.31               | 0.04              | 0.94               |
| Mar             | -0.25              | -3.20 <sup>a</sup> | 0.38              | 4.61 <sup>a</sup>  | 0.25              | 3.83 <sup>a</sup>  | 0.10              | 2.84 <sup>a</sup>  | 0.05              | 1.09               |
| Apr             | -0.20              | -2.49 <sup>b</sup> | 0.16              | 2.51 <sup>b</sup>  | 0.15              | 2.68 <sup>a</sup>  | 0.21              | 3.95 <sup>a</sup>  | 0.02              | 0.41               |
| May             | -0.20              | -2.53 <sup>b</sup> | 0.10              | 1.64               | 0.26              | 3.69 <sup>a</sup>  | 0.07              | 1.78 <sup>c</sup>  | 0.17              | 2.73 <sup>a</sup>  |
| Jun             | 0.03               | 0.37               | 0.13              | 2.17 <sup>b</sup>  | 0.13              | 2.45 <sup>b</sup>  | 0.03              | 0.89               | 0.36              | 4.35 <sup>a</sup>  |
| Jul             | 0.81               | 7.28 <sup>a</sup>  | 0.18              | 2.93 <sup>a</sup>  | 0.15              | 2.97 <sup>a</sup>  | 0.07              | 1.83 <sup>c</sup>  | 0.23              | 3.72 <sup>a</sup>  |
| Aug             | 0.32               | 3.76 <sup>a</sup>  | 0.04              | 0.83               | 0.09              | 2.34 <sup>b</sup>  | 0.06              | 2.15 <sup>b</sup>  | 0.02              | 0.67               |
| Sep             | 0.27               | 4.09 <sup>a</sup>  | 0.07              | 1.53               | 0.00              | 0.13               | 0.04              | 1.80 <sup>c</sup>  | 0.01              | 0.45               |
| Oct             | 0.51               | 5.83 <sup>a</sup>  | 0.02              | 0.61               | 0.05              | 1.63               | 0.20              | 5.18 <sup>a</sup>  | -0.02             | -1.01              |
| Dec             | -0.06              | -1.20              | 0.04              | 0.94               | 0.08              | 2.95 <sup>a</sup>  | 0.10              | 3.51 <sup>a</sup>  | 0.07              | 2.44 <sup>b</sup>  |
| R <sup>2</sup>  | 0.21               |                    | 0.07              |                    | 0.04              |                    | 0.04              |                    | 0.07              |                    |
| F-Stat          | 18.07 <sup>a</sup> |                    | 5.26 <sup>a</sup> |                    | 3.07 <sup>a</sup> |                    | 2.81 <sup>a</sup> |                    | 5.33 <sup>a</sup> |                    |
| Medium Cap ETFs |                    |                    |                   |                    |                   |                    |                   |                    |                   |                    |
| Nov             | 0.37               | 4.27 <sup>a</sup>  | 0.26              | 4.68               | 0.19              | 3.66 <sup>a</sup>  | 0.25              | 4.82 <sup>a</sup>  | 0.19              | 2.53 <sup>b</sup>  |
| Jan             | 0.02               | 0.13               | 0.12              | 1.58               | 0.04              | 0.49               | -0.01             | -0.20              | 0.03              | 0.27               |
| Feb             | 0.07               | 0.61               | 0.12              | 1.60               | 0.05              | 0.71               | -0.07             | -0.96              | 0.02              | 0.23               |
| Mar             | 0.03               | 0.22               | 0.13              | 1.65               | 0.10              | 1.32               | 0.05              | 0.62               | 0.05              | 0.45               |
| Apr             | -0.05              | -0.44              | 0.10              | 1.32               | 0.07              | 0.92               | 0.07              | 1.01               | 0.02              | 0.22               |
| May             | -0.04              | -0.30              | 0.12              | 1.56               | 0.12              | 1.53               | -0.02             | -0.33              | 0.11              | 1.02               |
| Jun             | 0.07               | 0.55               | 0.09              | 1.19               | 0.13              | 1.69               | -0.01             | -0.19              | 0.20              | 1.89 <sup>c</sup>  |
| Jul             | 0.44               | 3.65 <sup>a</sup>  | 0.03              | 0.42               | 0.07              | 0.92               | 0.01              | 0.18               | 0.05              | 0.45               |
| Aug             | 0.14               | 1.12               | 0.05              | 0.69               | 0.05              | 0.64               | -0.01             | -0.10              | 0.01              | 0.12               |
| Sep             | 0.16               | 1.32               | 0.04              | 0.50               | 0.06              | 0.82               | 0.03              | 0.43               | 0.02              | 0.14               |
| Oct             | 0.43               | 3.55 <sup>a</sup>  | 0.02              | 0.25               | 0.05              | 0.71               | 0.03              | 0.45               | -0.01             | -0.10              |
| Dec             | 0.11               | 0.90               | 0.02              | 0.22               | 0.08              | 1.06               | 0.01              | 0.10               | 0.07              | 0.70               |
| R <sup>2</sup>  | 0.23               |                    | 0.06              |                    | 0.03              |                    | 0.04              |                    | 0.05              |                    |
| F-Stat          | 3.65 <sup>a</sup>  |                    | 0.79              |                    | 0.43              |                    | 0.52              |                    | 0.60              |                    |

| Small Cap ETFs |                   |                    |       |                   |      |                   |       |                    |                   |                   |
|----------------|-------------------|--------------------|-------|-------------------|------|-------------------|-------|--------------------|-------------------|-------------------|
| Nov            | 0.53              | 4.01 <sup>a</sup>  | 0.29  | 5.15 <sup>a</sup> | 0.21 | 4.47 <sup>a</sup> | 0.27  | 10.81 <sup>a</sup> | 0.21              | 4.83 <sup>a</sup> |
| Jan            | -0.17             | -1.18              | 0.17  | 2.13 <sup>b</sup> | 0.09 | 1.31              | -0.01 | -0.43              | 0.04              | 0.73              |
| Feb            | -0.20             | -1.39              | 0.17  | 2.16 <sup>b</sup> | 0.04 | 0.59              | -0.09 | -2.89 <sup>a</sup> | 0.00              | 0.04              |
| Mar            | -0.24             | -1.72 <sup>c</sup> | 0.13  | 1.66              | 0.10 | 1.42              | -0.05 | -1.47              | -0.02             | -0.27             |
| Apr            | -0.24             | -1.77 <sup>c</sup> | 0.07  | 0.85              | 0.06 | 0.84              | -0.02 | -0.30              | 0.07              | 1.14              |
| May            | -0.21             | -1.44              | 0.01  | 0.16              | 0.11 | 1.58              | 0.05  | 1.36               | 0.08              | 1.34              |
| Jun            | -0.14             | -0.95              | 0.03  | 0.41              | 0.07 | 1.08              | -0.03 | -0.80              | 0.20              | 3.26 <sup>a</sup> |
| Jul            | 0.35              | 1.15               | 0.01  | 0.18              | 0.07 | 1.07              | -0.03 | -0.76              | 0.05              | 0.73              |
| Aug            | -0.02             | -0.15              | 0.04  | 0.46              | 0.11 | 1.65              | -0.03 | -0.52              | -0.02             | -0.36             |
| Sep            | 0.16              | 0.86               | -0.05 | -0.59             | 0.08 | 1.24              | -0.06 | -1.90 <sup>b</sup> | -0.05             | -0.79             |
| Oct            | 0.40              | 2.07 <sup>b</sup>  | 0.03  | 0.41              | 0.05 | 0.72              | 0.01  | 0.24               | -0.03             | -0.53             |
| Dec            | -0.08             | -0.89              | 0.04  | 0.44              | 0.13 | 1.94 <sup>c</sup> | 0.06  | 0.50               | 0.00              | -0.03             |
| R <sup>2</sup> | 0.30              |                    | 0.16  |                   | 0.07 |                   | 0.11  |                    | 0.24              |                   |
| F-Stat         | 3.25 <sup>a</sup> |                    | 1.48  |                   | 0.56 |                   | 0.97  |                    | 2.47 <sup>a</sup> |                   |

<sup>a</sup> Significant at 0.01% level, <sup>b</sup> Significant at 0.05% level, <sup>c</sup> Significant at 0.10% level

## Ex-Post Comparison of Trading Strategies

In this section we perform an ex-post comparison of performance and volatility that could be achieved by investors, if they implemented their investing strategies by considering the seasonal patterns in ETFs' return and risk and investing only during the months that present favorable seasonality or if they chose to follow buy-and-hold strategies. As I have shown that a strong positive November effect and a significantly reverse November effect respectively influence return and risk of all ETF groups, I perform the comparison assuming that investors apply seasoned strategies only during November. In other words, I compare the performance and risk gained in November of each ETF category or class to the relevant annual return and risk delivered by the buy and hold strategies. In addition, I assess the return and risk that could be received every year by risk averse and risk taking investors assuming that the risk averse investors would select the safest investing choices whilst the risk taking investors would follow the more profitable strategies regardless the level of risk.

I calculate the total November return of each average portfolio by multiplying the average daily November return to the square root of 30. In order to calculate the total annual return of buy and hold strategies, I multiply the average annual daily return of the average portfolios to the square root of 360 [SQRT(30\*12)]. I consider two alternative buy and hold strategies which regard the annual hold of the average market or capitalized portfolio and the annual hold of the average Morningstar portfolio.

Table 10 presents the average returns and risks delivered by the seasonality-based strategies and the buy-and-hold strategies. The table records the return and risk in each single year along with the period's mean and accumulated return and risk. Regarding

market ETFs, the three seasoned strategies clearly beat the buy-and-hold strategies in two of five years. In particular, the return of broad, sector and international ETFs exceeds the performance of buy and hold strategies during 2002 and 2004. Broad and sector ETFs also outperform the buy-and-hold strategies in 2005.

● **Table 10. Comparison of Investing Strategies**

*This table presents an ex-post comparison of returns and risks of various theoretically implemented investing strategies. The first three strategies concern investing in Broad, Sector or International Markets ETFs, respectively only during November of each year. The fourth strategy considers investing in the average market portfolio at the beginning of each year and the hold of this portfolio until the end of the year (Buy-and-Hold 1). The fifth strategy assumes investing in a portfolio including ETFs that receive a four and five star rating by Morningstar, irrespectively of the market or capitalization, at the beginning of each year and the hold of this portfolio until the end of the year (Buy-and-Hold 2). The table presents the returns and risks on an annual, mean and accumulated basis.*

| Market Categories |             |           |             |           |                    |           |                |             |                |             |
|-------------------|-------------|-----------|-------------|-----------|--------------------|-----------|----------------|-------------|----------------|-------------|
| Year              | Broad ETFs  |           | Sector ETFs |           | International ETFs |           | Buy-and-Hold 1 |             | Buy-and-Hold 2 |             |
|                   | Nov. Return | Nov. Risk | Nov. Return | Nov. Risk | Nov. Return        | Nov. Risk | Annual Return  | Annual Risk | Annual Return  | Annual Risk |
| 2002              | 1.86        | 8.82      | 2.52        | 11.28     | 1.42               | 10.19     | -1.48          | 34.18       | -0.93          | 27.88       |
| 2003              | 0.66        | 4.82      | 0.55        | 5.53      | 0.66               | 6.35      | 2.52           | 23.77       | 2.30           | 19.55       |
| 2004              | 1.48        | 3.56      | 1.31        | 5.31      | 1.86               | 5.20      | 1.20           | 19.72       | 1.31           | 17.09       |
| 2005              | 1.15        | 3.29      | 0.93        | 4.71      | 0.77               | 4.55      | 0.82           | 16.71       | 0.77           | 15.17       |
| 2006              | 0.66        | 3.78      | 0.82        | 5.09      | 1.20               | 4.71      | 1.37           | 18.29       | 1.31           | 16.32       |
| Mean              | 1.15        | 4.87      | 1.20        | 6.41      | 1.20               | 6.19      | 0.88           | 22.51       | 0.93           | 19.23       |
| Accumulated       | 5.81        | 24.27     | 6.13        | 31.92     | 5.91               | 31.00     | 4.43           | 112.67      | 4.76           | 96.01       |

  

| Categories of Capitalization |             |           |             |           |                    |           |                |             |                |             |
|------------------------------|-------------|-----------|-------------|-----------|--------------------|-----------|----------------|-------------|----------------|-------------|
| Year                         | Broad ETFs  |           | Sector ETFs |           | International ETFs |           | Buy-and-Hold 1 |             | Buy-and-Hold 2 |             |
|                              | Nov. Return | Nov. Risk | Nov. Return | Nov. Risk | Nov. Return        | Nov. Risk | Annual Return  | Annual Risk | Annual Return  | Annual Risk |
| 2002                         | 1.59        | 10.63     | 1.64        | 7.67      | 2.03               | 9.15      | -1.20          | 31.22       | -0.93          | 27.88       |
| 2003                         | 0.49        | 5.48      | 0.99        | 5.37      | 1.10               | 6.24      | 2.52           | 22.02       | 2.30           | 19.55       |
| 2004                         | 1.48        | 4.66      | 1.53        | 4.71      | 2.14               | 3.94      | 1.31           | 19.06       | 1.31           | 17.09       |
| 2005                         | 0.88        | 4.00      | 1.20        | 4.22      | 1.37               | 4.49      | 0.66           | 16.87       | 0.77           | 15.17       |
| 2006                         | 0.88        | 4.22      | 0.99        | 5.15      | 0.77               | 5.15      | 1.26           | 18.13       | 1.31           | 16.32       |
| Mean                         | 1.04        | 5.81      | 1.26        | 5.42      | 1.48               | 5.81      | 0.93           | 21.47       | 0.93           | 19.23       |
| Accumulated                  | 5.32        | 28.99     | 6.35        | 27.12     | 7.41               | 28.97     | 4.55           | 107.3       | 4.76           | 96.01       |

Considering the mean return of the period, November investing significantly outperforms the “long-run” strategies. The mean return of broad, sector and international ETFs is 115, 120 and 120 b.p., correspondingly while the mean returns of the two alternative buy-and-hold strategies are 88 and 93 b.p., respectively. November investing also delivers greater accumulated return than the buy-and-hold strategies. The accumulated return of broad, sector and international ETFs is 581 b.p., 613 and 591 b.p. correspondingly while the two buy and hold strategies derive returns equal to 443 and 476 b.p., respectively.

The results indicate that the seasonality-based strategies are permanently less risky than the buy and hold strategies at the annual, average and accumulated level. For example, the mean risk of sector ETFs, which are the most risky ETFs, is 6.41 while the mean risks of the two buy and hold strategies are 22.51 and 19.23 respectively. The risk “superiority” of the buy and hold strategies is expectable due the fact that the prices of ETFs are more fluctuant in the long-run period than in the short-run period. The long-run fluctuation is related to the rationally increased amount of events and information emerging over an entire year compared to the news released only in one month. However, we cannot be certain that significant business or political events that could increase the volatility of ETF prices do not occur.

Comparing the seasonality-based strategies to each other, we see that the sector and international ETFs deliver equal mean returns but unequal accumulated returns. Sector and international outperform the broad market ETFs both on the mean and accumulated basis. In addition, sector ETFs load investors with the highest levels of mean and accumulated risk compared to the risk of the other seasoned strategies. In particular, the mean period’s risk of broad, sector and international ETFs are 4.87, 6.41 and 6.19 respectively while the accumulated risk of these three ETF categories is 24.27, 31.92 and 31.00 correspondingly. Comparing the buy-and-hold strategies to each other, we see that the first strategy underperforms the Morningstar rating-based strategy being simultaneously more risky.

Turning our attention to capital-classified ETFs, we see that the November investing in large, medium and small cap ETFs beat the both buy-and-hold strategies in 2002, 2004 and 2005. The buy-and-hold strategies significantly outperform the seasonal strategies in 2003 and 2006. Furthermore, the seasonal strategies offer investors higher period’s mean and accumulated return compared to buy-and hold strategies. The period’s mean returns of large, medium and small cap ETFs are equal to 104, 126 and 148 b.p. respectively while the mean return of the two buy-and-hold strategies equals the 93 b.p. The relevant accumulated returns for large, medium and small ETFs are 532, 635 and 741 b.p. while the accumulated performance of the first and the second buy-and-hold strategy is 455 and 476 b.p. correspondingly.

On the question of volatility, the seasonality-based strategies are less risky in comparison to buy-and-hold strategies. The mean risks of large, medium and small cap ETFs are 5.81, 5.42 and 5.81 respectively and the mean risks of the two buy-and-hold strategies are 21.47 and 19.23 respectively. A relevant risk advantage of seasonality-based strategies also applies at the annual and accumulated level. The annual November risks are persistently inferior to the risks of the buy and hold strategies. Moreover, the accumulated risks of large, medium and small cap ETFs

are 28.99, 27.12 and 28.97 correspondingly while the accumulated risks of the buy and hold strategies are 107.30 and 96.01, respectively.

Comparing the seasonal-based strategies to each other, we see that the small cap ETFs clearly outperform their peers during the period 2002-2005 and underperform their peers only in 2006. Small cap ETFs also outperform their peers at the average and accumulated level. In addition, the results indicate that the both buy-and-hold strategies have the same period's mean return but the Morningstar rating-based strategy offers greater accumulated performance being at the same time less risky than the first buy-and-hold strategy in average and accumulated terms.

We now compare the return and risk that would be obtained by a risk averse and a risk taking investor every year by applying risk and return optimized strategies, respectively. Table 11 presents the return and risk received by the risk averse and risk taking investor respecting the three ETF market categories and the three classes of capitalization.

When it comes to market categories, the risk averse investor would choose to invest in broad ETFs in November gaining significant positive performance and modest risk exposure. The mean annual return gained by the risk averse investor would be equal to 116 b.p. accompanied with a mean annual risk equaling 4.85. In addition, the non-weighted accumulated return offered to risk averse investor would be equal to 581 b.p. bearing a non-weighted accumulated risk equal to 24.27.

● **Table 11. Return and Risk of Risk Averse and Risk Taking Investors**

*This table presents an ex-post comparison of returns and risks that would be received by risk averse and risk taking investors if they chose to invest during November of each year or if they applied buy-and-hold strategies. Two buy-and-hold strategies are considered; investing in the average market portfolio at the beginning of each year and the hold of this portfolio until the end of the year (Buy-and-Hold 1) and investing in a portfolio including ETFs receive a four and five star rating by Morningstar, irrespectively of the market or capitalization, at the beginning of each year and the hold of this portfolio until the end of the year (Buy-and-Hold 2). The table presents the returns and risks on a annual, mean and accumulated basis.*

| Market Categories    |                       |        |       |                            |        |       |
|----------------------|-----------------------|--------|-------|----------------------------|--------|-------|
| Risk Averse Investor |                       |        |       | Risk Taking Investor       |        |       |
| Year                 | Portfolio             | Return | Risk  | Portfolio                  | Return | Risk  |
| 2002                 | Broad ETFs (November) | 1.86   | 8.82  | Sector ETFs (November)     | 2.52   | 11.28 |
| 2003                 | Broad ETFs (November) | 0.66   | 4.82  | Buy-and-Hold 1 (Annual)    | 2.52   | 23.77 |
| 2004                 | Broad ETFs (November) | 1.48   | 3.56  | International ETFs (Novem) | 1.86   | 5.20  |
| 2005                 | Broad ETFs (November) | 1.15   | 3.29  | Broad ETFs (November)      | 1.15   | 3.29  |
| 2006                 | Broad ETFs (November) | 0.66   | 3.78  | Buy-and-Hold 1 (Annual)    | 1.37   | 18.29 |
| Mean                 |                       | 1.16   | 4.85  |                            | 1.88   | 12.37 |
| Accumulated          |                       | 5.81   | 24.27 |                            | 9.42   | 61.83 |

**Categories of Capitalization**

| Year        | Risk Averse Investor   |        |       | Risk Taking Investor    |        |       |
|-------------|------------------------|--------|-------|-------------------------|--------|-------|
|             | Portfolio              | Return | Risk  | Portfolio               | Return | Risk  |
| 2002        | Medium ETFs (November) | 1.64   | 7.67  | Small ETFs (November)   | 2.03   | 9.15  |
| 2003        | Medium ETFs (November) | 0.99   | 5.37  | Buy-and-Hold 1 (Annual) | 2.52   | 22.02 |
| 2004        | Small ETFs (November)  | 2.14   | 3.94  | Small ETFs (November)   | 2.14   | 3.94  |
| 2005        | Large ETFs (November)  | 0.88   | 4.00  | Small ETFs (November)   | 1.37   | 4.49  |
| 2006        | Large ETFs (November)  | 0.88   | 4.22  | Buy-and-Hold 2 (Annual) | 1.31   | 16.32 |
| Mean        |                        | 1.31   | 5.04  |                         | 1.87   | 11.18 |
| Accumulated |                        | 6.53   | 25.20 |                         | 9.37   | 55.92 |

Considering the risk taking investor, the results indicate that this investor would not choose to follow a stable investing strategy. In particular, this investor would invest in sector ETFs in November of 2002, they would pursue the first type of buy-and-hold strategy by investing in the average market portfolio during 2003, they would pick international ETFs during November of 2004, they would buy broad ETFs in November of 2005 and they would return to the first-buy-and hold strategy in 2006. This investing strategy could derive a mean and a non-weighted accumulated return of 188 and 942 b.p., respectively. The corresponding risk amounts are equal to 12.37 and 61.83.

Regarding the classes of capitalization, the risk averse investor would choose to invest in medium ETFs during November of 2002 and 2003, they would prefer the small ETFs in November of 2004 and they would invest in large ETFs in November of 2005 and 2006. Applying this strategy, the risk averse investor would gain a mean and a non-weighted accumulated return equaling the 131 and 653 b.p. correspondingly. The respective mean and accumulated risk would be 5.04 and 25.20.

The risk taking investor would invest in small cap ETFs in November of 2002, 2004 and 2005 and he/she adopt buy and hold strategies in 2002 and 2006. In particular, the average capitalized portfolio offers the highest return during 2003 and the Morningstar portfolio provides the highest performance in 2006. The risk taker would receive a mean and a non-weighted accumulated return 187 and 937 b.p., respectively by exposing themselves to a mean and a non-weighted accumulated risk level of 11.18 and 55.92, respectively.

Compounding the returns and risks of risk averse and risk taking investors with respect to the ETF market categories and the classes of capitalization, we see that the risk taking investor would gain significantly greater performance than the risk averse investor. On the other hand, the risk averse investor would be more protected by the volatility in the prices of ETFs. Of course, I have to note that the return and risk comparison between the risk averse and risk taking investors is performed ex-post implying that the practical implementation of such strategies faces significant

restrictions relating to the difficulties predicting performance and risk. Nevertheless, the results presented in Table 11 indicate that investors could possibly gain significant performance from their investments in ETFs by exposing themselves to some increased volatility.

## ■ 5. Conclusion

This study expands that of Rompotis (2010), who has revealed the existence of a material November effect on ETFs' return along with a semi-strong and a strong reverse November effect on ETFs' risk and tracking error, respectively. In the current paper ETFs are broken down in three categories, which are the broad, sector and international market ETFs, according to the origin of the tracking index. Alternatively, ETFs are split in three groups regarding the class of capitalization. The classes considered are the large, medium and small cap ETFs. Rompotis (2010) does not consider such a discrimination. The goal is to verify whether the November patterns found by Rompotis (2010) are connected to particular ETF groups or if they concern ETFs overall.

With respect to performance, the results indicate that the November effect affects the return of all the individual categories or classes of ETFs during the five-year period 2002-2006. November return of all ETF groups is persistently positive during the whole studying period while the other months present either positive or negative returns. Simultaneously, the period's mean November return of all ETF groups exceeds that of all the other months. However, November return is not always the highest one among all the monthly returns over the entire period. The seasonal pattern traced in performance of all ETFs groups can enable investors to gain significant returns by investing in ETFs during November of each year.

The risk analysis demonstrates that the volatility of all ETF categories or classes is subject to a significant reverse December effect. The period's mean December risk is the lowest among all the monthly risks being simultaneously the lowest monthly risk for the majority of ETF groups almost in any single year of the studying period. In addition, a less strong reverse November effect on ETFs' volatility is accentuated. In particular, the period's mean November risk is the second lowest monthly risk for broad market, sector market, large cap and small cap ETFs. Combining the material reverse November effect on ETFs' risk to the strong November effect on ETFs' performance, I suggest that investors can gain relevantly safe and significant returns by investing in various types of ETFs during November of each year.

Regarding tracking error, the results disclose that ETFs achieve their best replication efficiency each year in November. This strong reverse November effect on tracking



error concerns all the single categories and classes of ETFs. The period's mean November tracking error is the lowest among all the monthly tracking errors exempting the small cap ETFs, whose mean November tracking error is the second lowest tracking error over the whole period.

Via an ex-post comparison of the return and risk received by the November seasoned and average market/capitalized- and the Morningstar rating-based buy-and-hold strategies, respectively, I find that the seasoned strategies clearly beat the buy-and-hold strategies at the average and accumulated level during the period 2002-2006. This pattern applies to all ETF market categories or classes of capitalization. However, the seasonality-based strategies do not beat the buy-and-hold strategies in every successive year of the studying period. Furthermore, the comparison indicates that investing during November is substantially less risky than the buy and hold strategies.

In the final step, I assess the return and risk that would be obtained by risk averse and risk taking investors if they could predict the trend in ETFs' pricing in order to apply risk and return optimized strategies assuming that they would adjust or alter their strategies every year if this would be necessary. The comparison demonstrates that the risk taking investors would outperform the risk averse investors. At the same time, the risk averse investors would be exposed to less volatility than the risk taking ones. Even though the practical implementation of risk and return optimized strategies faces significant restrictions due to the inability of return's and risk's accurate prediction, the results indicate that investors could probably gain material returns by exposing themselves to less higher levels of volatility.

As a conclusion, I suggest the research about seasonality in return and risk of ETFs can be expanded to the searching for the existence of a material half monthly effect, turn-of-the-month effect, and Christmas, New Year's day or other holidays effects. Moreover, one could search if the holdings of ETF portfolios are seasonally affected and how the possible seasonal rebalances of portfolios affect the performance and risk of ETFs. Finally, considering the issue of seasonality-based strategies against the buy-and-hold strategies, the administrative and transaction costs of such strategies should be examined. This expansion is strongly desirable since the current paper only compares the performance and risk received by the seasonality-based and the buy-and-hold strategies revealing without considering the costs accrued by these strategies.

In the above suggestions about how the current study could be expanded, the thorough investigation of the possible explanations on the existence of any seasonal effect that can be detected should also be added. The latter recommendation also applies to the findings of the current study, which has basically provided new

statistical evidence on a well-known monthly effect and suggested some possible profitable trading strategies without searching for the reasoning behind the existence of the effect.

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