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# Are African Stock Markets Inefficient? New Evidence on Seasonal Anomalies

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**Abstract**

It is widely acknowledged that having efficient financial markets is paramount in the allocation of social resources to their most productive uses. This paper explores the informational efficiency of six of the most important African stock markets for indication of seasonal predictability in stock returns. The results reveal that all markets exhibited some kind of seasonal patterns. The prevalence of the phenomenon was higher in the Egyptian and Tunisian markets, suggesting the presence of inefficient prices. Surprisingly, the only advanced emerging market of the sample (South Africa) showed a relatively large number of anomalies. This paper also reports the existence of strong pre-holiday effects and turn-of-the-month effects in most of the markets under scrutiny. Moreover, this study is the first to document the presence of quarterly effects in African markets. Collectively, the evidence obtained highlights the opportunity for arbitrageurs to reap profits as well as the need of decision-makers to implement legal and regulatory reforms in the markets of the continent.

**Keywords:** Africa; market efficiency; stock markets; seasonal anomalies.

**JEL classification:** G11; G14; G15.

## 1. INTRODUCTION

It is well established today that in order to allocate the resources saved by a nation's citizens to their most productive uses, to have an efficient financial market is key. Well-functioning financial markets provide good and easily accessible information which can lower transaction costs and subsequently improve resource allocation, enhance economic growth and reduce poverty (Wurgler, 2000; Durnev *et al.*, 2004).

In addition, one of the chief features of an efficient capital market is that it should be very difficult to predict how prices will evolve (Fama, 1970). The study of financial markets efficiency is especially pertinent in the case of those countries that lack a banking system that is able to perform the supplementary role of channeling funds from lenders to the most productive ends (Levine and Zervos, 1998; Demirguc-Kunt and Levine, 2001).

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This paper draws motivation from these insights to study the informational efficiency of six of the most important African markets (Egypt, Kenya, Morocco, Nigeria, South Africa and Tunisia) for indication of seasonal predictability in stock returns.

Seasonal predictability refers to the tendency of financial asset returns to display systematic patterns at certain times of the day, week, month or year. For example, one of the best well-known stock market anomalies is the January effect (Rozeff and Kinney, 1976), which occurs when stock returns in January are significantly higher than returns in the remaining months of the year. The existence of seasonal anomalies is also important from the perspective of investors since it implies that they could develop trading strategies which generate systematic abnormal profits on the basis of such patterns.

In order to analyze the efficiency of African markets we examine eight potential seasonal patterns: i) the month-of-the-year effect, ii) the quarter-of-the-year effect, iii) the half-of-the-year effect, iv) the Halloween effect, v) the day-of-the-week effect, vi) the half-of-the-month effect, vii) the turn-of-the-year effect and viii) the pre-holiday effect. This paper expands the existing literature on this topic in several important directions. First, unlike what happens in most similar studies, we investigate a broad set of seasonal patterns (eight anomalies) which allows us to analyze the level of efficiency of each one of the African markets in a more comprehensive and robust way. Second, our sample goes until the end of 2016, thus including recent significant financial events such as the financial crises of the 21$^{st}$ century which may have altered the dynamics of the market prices under scrutiny. Furthermore, having a larger sample is important since it will likely lead to more robust results, i.e., results less sensitive to period-specific features in the data. Third, we are the first to inquiry about the existence of quarterly and semi-annual seasonality patterns in African stock markets. And finally, we complement the sparse literature on some of the calendar anomalies conducting the first study on the Halloween effect in three of the African markets (Kenya, Nigeria and Tunisia); this is also the first contribution on the half-of-the-month effect and on the turn-of-the-month effect in four of the six markets of our sample.

We conclude that all markets exhibited some kind of seasonal patterns, indicating the presence of inefficient prices. Moreover, a country-by-country analysis reveals significant differences among African countries thus corroborating previous evidence of heterogeneity regarding the level of efficiency of the stock markets of the continent (e.g., Appiah-Kusi and Menyah, 2003). Overall, our results suggest that investors could have generated positive abnormal returns by exploiting the detected anomalies; furthermore, the findings illustrate the need to implement legal and regulatory reforms in the markets of the continent.

Regarding the prevalence of the anomalies, we report three main findings. First, our results show the existence of strong pre-holiday effects, turn-of-the-month effects and quarterly effects. Also, we document for the first time the existence of a substantial quarterly seasonality pattern in African stock indices. Second, there are moderate signs of monthly effects and of the day-of-the-week effect. Third, there were only tenuous signs of the Halloween effect, the half-of-the-month effect and of half-year seasonality patterns.

The remainder of this paper is organized as follows. Section 2 presents the data used in this paper. Section 3 reviews the empirical evidence regarding financial market anomalies and explains the methodologies employed. Section 4 displays the empirical results. Section 5 summarizes the results and offers conclusions.

## 2. DATA

We study the presence of seasonal anomalies in the markets of Egypt (EGX 30 Index), Kenya (NSE 20 Index), Morocco (MASI Index), Nigeria (NSE 30 Index), South Africa (FTSE/JSE All Share) and Tunisia (Tunindex). All the indices are market capitalization-weighted.

Table no. 1 reports the examination window used in this study as well as some characteristics for the six markets under study. Starting dates of the sample are different in each country since we used the data pertaining to each index since its inception. The daily data were retrieved from Thomson Reuters Datastream. Returns for each index were computed as:

$$R_t = \log(I_t/I_{t-1}) * 100$$

where $R_t$ = log return of the index on date *t*; and $I_t$ and $I_{t-1}$ are closing values on day *t* and *t-1* for that same index.

**Table no. 1 – Economic, institutional and cultural features of the markets under study**

| Country | Egypt | Kenya | Morocco | Nigeria | South Africa | Tunisia |
|---|---|---|---|---|---|---|
| Stock Index | EGX 30 Index | NSE 20 Index | MASI Index | NSE 30 Index | FTSE/JSE All-Share | Tunindex |
| Start date | 2/01/1998 | 21/01/1991 | 3/01/2002 | 17/12/2009 | 5/01/1987 | 2/01/1998 |
| End date | 29/12/2016 | 30/12/2016 | 30/12/2016 | 30/12/2016 | 30/12/2016 | 30/12/2016 |
| Population (thousands) (July 2016)[a] | 95,688 | 48,461 | 35,276 | 185,989 | 56,015 | 11,403 |
| GDP per capita (USD) (2016)[b] | 11,132 | 3,156 | 7,838 | 5,867 | 13,225 | 11,599 |
| Percent of population living under 1.90 USD a day[b] | 1.4 | 33.6 | 3.1 | 53.5 | 16.6 | 2.0 |
| Number of listed domestic companies[c] | 251 | 65 | 74 | 169 | 303 | 79 |
| Stocks traded, total value (% of GDP) (2016)[c] | 3.03 | 3.28 | 3.07 | 0.37 | 136.21 | 1.86 |
| Market capitalization of listed domestic companies (% of GDP) (2016)[c] | 10.01 | 26.98 | 55.78 | 7.36 | 321.98 | 20.09 |
| Short-selling legality[d] | No | No | No | No | Yes | No |
| Short-selling feasibility[d] | No | No | No | No | Yes | No |
| Short selling: period when legal[e] | None | n.a. | None | None | Since inception | None |
| FTSE Country Classification (2016)[f] | Secondary Emerging | Frontier | Frontier | Frontier | Advanced Emerging | Frontier |
| Disclosure requirements[g] | 0.50 | 0.50 | n.a. | 0.67 | 0.83 | n.a. |
| Liability standard index[g] | 0.22 | 0.44 | n.a. | 0.39 | 0.66 | n.a. |
| Public enforcement index[g] | 0.30 | 0.70 | n.a. | 0.33 | 0.25 | n.a. |
| Anti-self-dealing index[h] | 0.20 | 0.21 | 0.56 | 0.43 | 0.81 | 0.15 |
| Institutional Quality[i] | -0.108 | -0.423 | -0.396 | -0.205 | n.a. | n.a. |
| Trust in others[i] | 0.184 | n.a. | 0.129 | 0.256 | n.a. | n.a. |
| Individualism[j] | 25 | 25 | 46 | 30 | 65 | n.a. |

*Sources:* [a] United Nations (World Population Prospects), [b] World Bank (World Development Indicators Database), [c] World Bank (World Bank Open Data), [d] Daouk and Charoenrook (2005), [e] Jain et al. (2013), [f] FTSE Annual Country Classification Review (September 2016), [g] La Porta et al. (2006), [h] Djankov et al. (2008), [i] Gennaioli et al. (2013); [j] Hofstede (2001) cultural dimensions (www.hofstede-insights.com); n.a.: data not available.

Significant differences between the markets comprising the sample are evident, especially in the case of the South African stock market, the only African market to be classified as "Advanced Emerging" by the FTSE. In fact, South Africa has a GDP per capita more than four times larger than the Kenyan GDP per capita. The percentage of population living in poverty varies from 2% in the case of Tunisia to 53.5% in Nigeria. The number of poor people living in those six countries reaches almost 130 million (roughly the whole population of a country such as Japan). Also the differences regarding the size of the South African stock market seem to be significant. For example, the total value of traded stocks (in percentage of GDP) ranged between 0.37 for Nigeria and 136.21 for South Africa. According to Daouk and Charoenrook (2005), short sales are only possible in the Johannesburg stock exchange. This in theory may make more difficult to profit from market inefficiencies in most markets of our sample.

Table no. 1 also reports the disclosure requirement index, liability standard index and the public enforcement index as defined and computed by La Porta *et al.* (2006). All these indices take values between zero and one, and higher values indicate that countries have relatively stronger shareholders' protection systems. The anti-self-dealing index measures the strength of minority shareholder protection against self-dealing by controlling shareholders (Djankov *et al.*, 2008) and varies between 0.20 for Egypt and 0.81 for South Africa. It is plausible to assume that weaker corporate governance environment causes extra risk to international arbitrageurs which may result in having a lower degree of market efficiency. The variables “Institutional Quality” and “Trust in Others” were used by Gennaioli *et al.* (2013). “Institutional Quality” takes into account factors such as the prevalence of informal payments, government predictability and access to financial instruments. Higher values indicate better institutions. Finally, the cultural variable “Trust in Others” captures the percentage of respondents in the country who believe that most people can be trusted and “Individualism” reflects that trait associated to each country according to Hofstede (2001). Hofstede (2001)'s cultural dimensions score on a 0-100 point scale. It is to be expected that a higher level of trust among investors and a lower level of individualism will result in a more effective dissemination of information, which should cause prices to be more efficient (e.g., Chui *et al.*, 2010). The available results regarding these variables show that Nigeria exhibits the higher level of trust among its citizens and that South Africa is the only country of the sample that may be considered individualistic with a relatively high score of 65.

Table no. 2 displays the summary statistics on the indices returns.

**Table no. 2 – Summary statistics on indices data series**

| Country | N. Obs. | Mean (%) | Std. Dev. (%) | Kurtosis | Skewness |
|---|---|---|---|---|---|
| Egypt | 4625 | 0.0549 | 1.7326 | 8.4812 | -0.3231 |
| Kenya | 6148 | 0.0019 | 1.2599 | 749.6429 | 0.0310 |
| Morocco | 3734 | 0.0307 | 0.7706 | 6.7959 | -0.4409 |
| Nigeria | 1731 | 0.0206 | 1.0898 | 4.9310 | 0.1599 |
| South Africa | 7476 | 0.0460 | 1.2207 | 7.4550 | -0.6749 |
| Tunisia | 4595 | 0.0363 | 0.5429 | 11.6880 | -0.1041 |

All the mean returns are positive, with a range of 0.0019% (Kenyan market) to 0.0549% (market of Egypt). Egypt presents not only the highest average return but also the

highest standard deviation of all the countries of the sample. There is no pattern in the asymmetry of the returns distributions. Moreover, all the stock markets show a significant number of outliers.

## 3. LITERATURE REVIEW AND METHODOLOGY

We follow the standard methodology of using dummy variables for the time-period of interest to capture excess returns (e.g., Mehdian and Perry, 2002; Galai *et al.*, 2008; Bouges *et al.*, 2009; Darrat *et al.*, 2011). Daily returns on the subject index for the period of the sample are regressed on a series of dummy variables that stand for the excess average daily return during the time-period they represent. The regressions were computed following the standard Ordinary Least Squares (OLS) methodology with Newey - West (1987) heteroskedasticity and autocorrelation adjusted standard deviations.

In the present paper we study a number of seasonality patterns. The literature review that follows focuses on the seminal contributions and on those papers that have dealt with the issue at hand in African stock markets.

### *Seasonality by months, quarters and semesters*

Rozeff and Kinney (1976) wrote the seminal paper on the existence of monthly seasonality patterns. The phenomenon was studied in an index of shares of the New York Stock Exchange (NYSE) for the period 1904-1974. The authors concluded that January presented significantly higher returns (3.48% on average compared to 0.42% in the remaining months of the year), which has become to be known as the "January effect".

There are several authors that have investigated the presence of monthly patterns on the African context. For example, Ayadi *et al.* (1998) focused on the markets of Nigeria, Ghana and Zimbabwe during the period 1984-1995. They concluded that the effects of seasonality (namely, the January effect) were only present in the Ghanaian market. In another study, Alagidede (2013) analyzed markets of Egypt, Kenya, Morocco, Nigeria, South Africa, Tunisia and Zimbabwe in different sample periods ending in 2006. The results showed significant seasonal effects in most markets but without an obvious pattern. The January effect was present in the markets of Egypt, Nigeria and Zimbabwe with an excess average daily returns ranging from 3 basis points (hereafter, bp) (Nigeria) to 28 bp (Zimbabwe). The findings regarding the Nigerian market have been debated in the literature. Thus, while Ogieva and Osamwonyi (2013) use a model with dummy variables to confirm that the months of January, August, September, October and November are associated with positive returns in 2005-2010, Olowe (2009) recurred to E-GARCH models to find that such effects were absent in the period 2004-2009.

The results obtained for the markets of South Africa and Tunisia have been discussed as well. For example, in a recent study, Seif *et al.* (2017) found that the returns in the South African market were no different in January but tended to be higher in December during 1973-2014. Auret and Cline (2011) and Darrat *et al.* (2013) provide evidence that confirms the absence of the January effect in South Africa. Regarding the Tunisian market, both Chaouachi and Douagi (2014) and Ahmed and Boutheina (2017) found positive excess returns in the months of August and September. However, while the former authors observe a significant January effect, this is not confirmed in the latter study.

Collectively, the existing evidence about the prevalence of monthly seasonal effects is mixed. Furthermore, to the best of our knowledge, the existence of quarterly or semi-annual seasonal patterns has never been studied in African markets.

The month-of-the-year effect then posits that the returns on stocks in some month of the year will be significantly higher than in any other month. In the current study, monthly dummy variables $(D_{2t} - D_{12t})$ are created and the anomaly is tested using the following equation:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + \alpha_2 D_{3t} + \cdots + \alpha_{11} D_{12t} + e_t$$

where $R_t$ = log return of the index on date *t*; $D_{2t}, \ldots, D_{12t}$=1 if the trading day falls in the months of February, March, …, December, respectively, and 0 otherwise; $e_t$ = error term. In this model the estimates of $(\alpha_1 - \alpha_{11})$ capture the excess average daily return during the months of February-December, and the constant $(\alpha_0)$ represents the excess average daily return during January.

We also studied the potential variation in seasonality patterns throughout the quarters and the semesters of the year. Thus, quarterly dummy variables $(D_{2t} - D_{4t})$ were designed and the existence of differential returns on each quarter of the year was tested using the following equation:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + \alpha_2 D_{3t} + \alpha_3 D_{4t} + e_t$$

where $R_t$ = log return of the index on date *t*; $D_{2t}, \ldots, D_{4t}$=1 if the trading day *t* falls in the second quarter, third quarter and fourth quarter of the year, respectively, and 0 otherwise; $e_t$ = error term. In this model the estimates of $(\alpha_1 - \alpha_3)$ capture the excess average daily return during the second quarter, third quarter and fourth quarter of the year, respectively, and the constant $(\alpha_0)$ represents the excess average daily return during the first quarter.

Finally, the hypothesis that the returns on the first semester are no different than the returns on the second semester is tested by estimating the following dummy variable regression for each index:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + e_t$$

where $R_t$ = log return of the index on date *t*; $D_{2t}$=1 if the trading day *t* falls on the second semester of the year, and 0 otherwise; $e_t$ = error term. In this model the estimate of $(\alpha_1)$ captures the excess average daily return during the second semester of the year, and the constant $(\alpha_0)$ represents the excess average daily return during the first semester.

***Halloween effect***

Bouman and Jacobsen (2002) analyzed 37 major stock markets from January 1970 through August 1998. They found that the returns were significantly higher during the period November–April than during the remainder of the year (May–October) in 36 of those markets (Australia was the exception). The authors concluded that this Halloween effect was difficult to reconcile with the efficient market paradigm.

Jacobsen and Zhang (2014) expanded the sample of Bouman and Jacobsen (2002) to include data from 109 countries with samples ending in July 2011. Among those countries,

Jacobsen and Zhang (2014) considered three African markets: Egypt, Morocco and South Africa. They report that the effect is pervasive around the world and that existed in those African countries.

According to the Halloween effect, returns should be higher in the half-year between November and April than in the half-year between May and October. In order to compare the returns on each one of those two periods, we run the following regression with a dummy variable:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + e_t$$

where $R_t$ = log return of the index on date $t$; $D_{2t}$=1 if the trading day $t$ falls in the November-April period, and 0 otherwise; $e_t$ = error term. The constant $(\alpha_0)$ represents the excess average daily return during the May-October period whereas $(\alpha_1)$ captures the excess average daily return in the remainder of the year (November–April).

***Day-of-the-week effect***

One of the most commonly investigated seasonal patterns is the difference in returns across the days of the week. Since French (1980) originally observed that stock returns in the US are higher than average on Fridays and lower than average on Mondays, many researchers have attempted to test what has come to be known as the day-of-the-week effect. For example, Jaffe and Westerfield (1985) found significantly negative mean returns on Mondays and significantly positive mean returns on Fridays in Australia, Canada, Japan and the UK stock markets. Agrawal and Tandon (1994) documented large, positive mean returns on Fridays and Wednesdays and lower or even negative mean returns on Mondays and Tuesdays in most of the eighteen markets (both developed and emerging markets) under analysis.

There are several studies on the day-of-the-week seasonality in African stock markets. For example, Aly *et al.* (2004) examined the Egyptian stock market and concluded that the returns on Mondays, although significantly positive, were not significantly different from the daily returns observed during the rest of the week. Alagidede (2008) also studied the topic but for the markets of Egypt, Kenya, Morocco, Nigeria, South Africa, Tunisia and Zimbabwe. The authors documented significantly positive average returns on Fridays in Nigeria and Zimbabwe and also a positive effect on Mondays in South Africa.

These studies aroused the interest of other researchers. For example, Chukwuogor (2008) used a Kruskal-Wallis test in a sample for the period 1997-2004. The conclusion is that weekly effects were not present in any of the markets analyzed (Egypt, Nigeria, South Africa, Ghana and Botswana). In later studies, Darrat *et al.* (2013) and Seif *et al.* (2017) corroborate the inexistence of day-of-the-week effects in the South African market.

The evidence is mixed for most other markets. For example, Gbeda and Peprah (2017) found no signs of the phenomenon in Ghana but concluded that there was a positive Friday effect in Kenya. On the contrary, Alagidede and Panagiotidis (2009) refuted the existence of such effects in Ghana. Finally, Ogieva and Osamwonyi (2013) found positive and statistically significant abnormal returns on Tuesdays in Nigeria while Chaouachi and Douagi (2014) reported positive effects in Tunisia on Fridays. In a related study, Osarumwense (2015) shows that the day-of-the-week effect in Nigeria is sensitive to the assumptions made on the distribution of returns. In general, the lack of consensus in the literature claims for new studies on the subject.

The day-of-the-week effect predicts that returns for stocks are significantly lower on Mondays, relative to the remaining weekdays. The following regression with dummy variables representing the days of the week was used to test that effect:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + \alpha_2 D_{3t} + \alpha_3 D_{4t} + \alpha_4 D_{5t} + e_t$$

where $R_t$ = log return of the index on date *t*; $D_{2t}, \ldots, D_{5t}$=1 if the day-of-the-week on day *t* is Tuesday–Friday, and 0 otherwise; $e_t$ = error term. The coefficient $(\alpha_1 - \alpha_5)$ on each of the dummy variables captures the excess average daily return on week days from Tuesday to Friday, and the constant $(\alpha_0)$ represents the excess average daily return on Mondays.

***Half-of-the-month effect***

Ariel (1987) examined the pattern of returns within months in the US stock market. He found an intriguing result: in the 19 years of data from 1963 through 1981, the returns in the first half of each month were significantly higher than the ones observed in the latter half. In fact, the mean return observed in the second part of each month was negative, that is, all the returns for the period occurred in the first part of the month. This half-of-the-month effect was found to be independent from other known calendar anomalies such as the January effect. Jaffe and Westerfield (1989) examined the anomaly in four other countries, finding a similar pattern in Australia, the reverse effect in Japan, and not much evidence of any effect in Canada and the UK.

The studies for this effect on African markets are very scarce. In fact, to the best of our knowledge, there is only two papers about the half-of-the-month effect on African markets that have been published to date. Giovanis (2009) included Egypt and Zambia in his sample of 55 stock market indices to conclude that the returns in the two markets were not statistically significant in the two halves of the month. More recently, Chaouachi and Douagi (2014) reached a similar conclusion for the Tunisian market with a sample covering the period between 1998 and 2011.

In order to test whether the returns in the first half of the month are higher than the returns obtained in the latter half of the month, the following regression with a dummy variable representing the days belonging to the first half of the month was used:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + e_t$$

where $R_t$ = log return of the index on date *t*; $D_{2t}$=1 if the trading day *t* belongs to the first half of the month, i.e., is one of the first 15 calendar days of each month, and 0 otherwise; $e_t$ = error term. The coefficient $(\alpha_0)$ captures the excess average daily return on trading days that fall on the latter half of the month, i.e., days 16-31 of each month, and $(\alpha_1)$ represents the excess average daily return in the first 15 days of each calendar month.

***Turn-of-the-month effect***

Lakonishok and Smidt (1988) appear to have been the first to detect a turn-of-the-month effect in stock returns, with the turn of the month beginning on the last trading day of the month and ending on the third trading day of the following month. Using the Dow Jones index, they found that only those four days accounted for all of the positive return to the index in the period 1897-1986. The international evidence suggests that the turn-of-the-month effect

is not a US-only phenomenon. For example, Cadsby and Ratner (1992) found a significant turn-of-the-month effect in Canada, the UK, Australia, Switzerland and Germany.

Also in this case, studies on African markets are very scarce. Giovanis (2009) concluded that the turn-of-the-month anomaly was absent in the markets of Egypt and Zambia. More recently, Darrat *et al.* (2013) addressed the issue for the South African market, considering the period from January 1973 to September 2012. The authors show that the effect was quite pronounced, with the returns in the second and third trading days being significantly larger than that in other trading days.

The hypothesis that the returns on the last trading day of the previous month and the first 3 trading days of the following month are no different than the returns on the remaining days is tested by estimating the following dummy variable regression for each index:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + e_t$$

where $R_t$ = log return of the index on date *t*; $D_{2t}$=1 if the trading day t is at the turn-of-the-month defined as -1 to +3 trading days of each month, and 0 otherwise; $e_t$ = error term. In this model the estimate of $(\alpha_1)$ captures the excess average daily return during the turn-of-the-month, and the constant $(\alpha_0)$ represents the excess average daily return observed in the remaining days.

***Pre-holiday effect***

Lakonishok and Smidt (1988), Ariel (1990) and Kim and Park (1994) introduced the pre-holiday effect in the academic literature. Lakonishok and Smidt (1988) compared pre-holidays to regular days using the Dow Jones index. They found the average return for pre-holidays was 23 times as large as the regular day rate of return. Also, Ariel (1990) documented that for the US index returns over the 1963-1982 period, the average pre-holiday return was nine to 14 times higher than the mean return on the remaining days. Kim and Park (1994) used the NYSE, the AMEX Composite Index and the NASDAQ to show that the pre-holiday returns were 9.0, 27.0, and 10.9 times as large as other days for those three markets, respectively. In addition, they found that the effect was also observed in the markets of the UK and Japan.

So far only two studies have been carried out on this subject regarding the African stock markets. Alagidede (2013) examined the markets of Egypt, Kenya, Morocco, Nigeria, South Africa, Tunisia and Zimbabwe in samples ending in 2006. The results suggest the prevalence of a strong pre-holiday effect only in the South African market. However, Seif *et al.* (2017) disagree. They re-examined the stock market of South Africa showing that the returns on the days preceding holidays were actually on average lower than the returns observed on the remaining trading days during the period 1973-2014.

The pre-holiday effect then predicts that returns should be higher on trading days before holidays than on the other days of the year. We compared the returns on trading days before the national holidays of each one of the countries of the sample with the returns observed on all other days. The following regression with dummy variables is used to compare the returns on trading days before these holidays to the returns on non-pre-holiday trading days:

$$R_t = \alpha_0 + \alpha_1 D_{2t} + e_t$$

where $R_t$ = log return of the index on date *t*; $D_{2t}$=1 if the trading day *t* is a pre-holiday trading day, and 0 otherwise; $e_t$ = error term. The constant $(\alpha_0)$ represents the excess

average daily return during the non-pre-holiday trading day, while the estimate of $(\alpha_1)$ captures the excess average daily return observed during the pre-holiday days.

Table no. 3 summarizes the empirical evidence we have been describing. Since there are no studies on quarterly and semi-annual patterns, the columns relating to these anomalies were excluded from the table. The table highlights the paucity of studies on the Halloween effect, the half-of-the-month effect and the turn-of-the-month effect. However, it should be noted that the relative abundance of studies on monthly and day-of-the-week anomalies does not allow robust conclusions to be drawn about the prevalence of these phenomena in African markets. In fact, there is considerable evidence both for and against the existence of these effects, which advises the conduct of further studies.

**Table no. 3 – Summary-table of the empirical evidence regarding seasonal anomalies in African stock markets**

| | | Monthly effects? | | Halloween effects? | | Day-of-the-week effects? | | Half-of-the-month effects? | | Turn-of-the-month effects? | | Pre-holiday effects? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| Markets included in the sample | Egypt | (9) | (6) | (12) | | | (2), (3), (4), (6) | | (6) | | (6) | | (9) |
| | Kenya | (9) | | | | (15) | (3) | | | | | | (9) |
| | Morocco | (9) | | (12) | | | (3) | | | | | | (9) |
| | Nigeria | (9), (11) | (1), (7) | | | (3), (11) | (4) | | | | | | (9) |
| | South Africa | (9), (16) | (8), (10) | (12) | | (3) | (4), (10), (16) | | | | (10) | (9) | (16) |
| | Tunisia | (14) | (9), (13) | | | (13) | (3) | | (13) | | | | (9) |
| Other African markets | Botswana | | | | | | (4) | | | | | | |
| | Ghana | (1) | (5) | | | | (4), (5), (15) | | | | | | |
| | Zambia | (6) | | | | (6) | | | (6) | | (6) | | |
| | Zimbabwe | (9) | (1) | | | (3) | | | | | | | (9) |

*Notes:* The correspondence between the codes in the table and the bibliographic references are as follows: (1): Ayadi *et al.* (1998), (2): Aly *et al.* (2004), (3): Alagidede (2008), (4): Chukwuogor (2008), (5): Alagidede and Panagiotidis (2009), (6): Giovanis (2009), (7): Olowe (2009), (8): Auret and Cline (2011), (9): Alagidede (2013), (10): Darrat *et al.* (2013), (11): Ogieva and Osamwonyi (2013), (12): Jacobsen and Zhang (2014), (13): Chaouachi and Douagi (2014), (14): Ahmed and Boutheina (2017), (15): Gbeda and Peprah (2017), (16): Seif *et al.* (2017).

## 4. EMPIRICAL RESULTS

Table no. 4 shows the model estimates for monthly seasonality. The evidence shows that the month of January, captured by the constant, is the only one that presents positive and statistically significant average daily returns in some of the markets under scrutiny. In the remaining months the observed returns are either negative or statistically non-significant at the conventional levels. In fact, the January effect appears to be alive for the markets of Egypt, Morocco and Tunisia, with higher average daily returns ranging between 11 bp (Tunisia) and 30 bp (Egypt). This partially corroborates the results obtained by Alagidede (2013) for an earlier period.

The evidence regarding the remaining months of the year is somewhat scattered. The months of March, June and November affect, in each case, the returns in a negative and statistically significant fashion of three of the markets that comprise the sample. The months

of June, August and October are the only ones that produced negative coefficients in all the markets of the sample.

**Table no. 4 – Monthly seasonality**

| Dependent variable | $R_t$ Egypt | | $R_t$ Kenya | | $R_t$ Morocco | | $R_t$ Nigeria | | $R_t$ South Africa | | $R_t$ Tunisia | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | 0.303*** | *0.0096* | 0.144 | *0.1528* | 0.123** | *0.0253* | -0.037 | *0.8522* | 0.021 | *0.7331* | 0.109* | *0.0669* |
| February | -0.339** | *0.0258* | -0.099 | *0.3468* | 0.005 | *0.9373* | 0.056 | *0.7936* | 0.026 | *0.7363* | -0.074 | *0.3681* |
| March | -0.283* | *0.0528* | -0.248** | *0.0318* | -0.116* | *0.0787* | 0.102 | *0.6447* | 0.089 | *0.2598* | -0.045 | *0.5040* |
| April | -0.168 | *0.2411* | -0.147 | *0.1977* | -0.037 | *0.5732* | 0.209 | *0.3592* | 0.101 | *0.2238* | -0.011 | *0.8787* |
| May | -0.376*** | *0.0092* | -0.131 | *0.2393* | -0.172** | *0.0261* | 0.285 | *0.2027* | 0.014 | *0.8591* | -0.088 | *0.1720* |
| June | -0.439*** | *0.0018* | -0.068 | *0.5365* | -0.173*** | *0.0081* | -0.025 | *0.9076* | -0.020 | *0.7972* | -0.111* | *0.0925* |
| July | -0.201 | *0.1643* | -0.157 | *0.1377* | -0.147** | *0.0235* | 0.015 | *0.9439* | 0.030 | *0.6887* | -0.066 | *0.3131* |
| August | -0.262* | *0.0564* | -0.238** | *0.0280* | -0.020 | *0.7552* | -0.143 | *0.5084* | -0.038 | *0.6435* | -0.030 | *0.6406* |
| September | -0.170 | *0.2219* | -0.173 | *0.1166* | -0.155** | *0.0315* | 0.131 | *0.5362* | -0.033 | *0.6525* | -0.091 | *0.1830* |
| October | -0.307* | *0.0502* | -0.103 | *0.3764* | -0.113 | *0.1151* | -0.048 | *0.8243* | -0.001 | *0.9870* | -0.126* | *0.0805* |
| November | -0.359** | *0.0165* | -0.120 | *0.2993* | -0.118* | *0.0839* | -0.106 | *0.6184* | 0.020 | *0.7989* | -0.121* | *0.0611* |
| December | -0.062 | *0.6553* | 0.015 | *0.8986* | -0.050 | *0.4856* | 0.231 | *0.3620* | 0.123 | *0.1325* | -0.096 | *0.1214* |
| ***N*** | ***4625*** | | ***6148*** | | ***3734*** | | ***1731*** | | ***7476*** | | ***4595*** | |
| ***$R^2$*** | ***0.0052*** | | ***0.0037*** | | ***0.0069*** | | ***0.0142*** | | ***0.0016*** | | ***0.0054*** | |

*Notes:* This table reports the result of regressions used to calculate monthly seasonality effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable ($R_t$) is daily return. February-December represent dummy variables equal to unity for the respective calendar month. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. ***: significant at the 1 percent level; **: significant at the 5 percent level; *: significant at the 10 percent level.

Table no. 5 and Table no. 6 display the results regarding quarterly and half-year effects, respectively. As can be observed from the intercept shown in Table no. 5, all markets under study performed better during the first quarter. For three of the countries (Morocco, South Africa and Tunisia), the effect is statistically significant at least at the 5% level. The effect on average returns has a magnitude of 6 bp to 8 bp per trading session, which means that in the quarter as a whole the differences in the returns may reach 4.8 percentage points in comparison with the remaining quarters of the year.

**Table no. 5 – Quarterly seasonality**

| Dependent variable | $R_t$ Egypt | | $R_t$ Kenya | | $R_t$ Morocco | | $R_t$ Nigeria | | $R_t$ South Africa | | $R_t$ Tunisia | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | 0.095 | *0.1008* | 0.023 | *0.6411* | 0.084*** | *0.0019* | 0.016 | *0.8350* | 0.060** | *0.0443* | 0.068*** | *0.0097* |
| Second Quarter | -0.126* | *0.0930* | 0.005 | *0.9286* | -0.088** | *0.0164* | 0.097 | *0.3246* | -0.009 | *0.8279* | -0.030 | *0.3474* |
| Third Quarter | -0.004 | *0.9505* | -0.068 | *0.2208* | -0.069** | *0.0483* | -0.054 | *0.5706* | -0.051 | *0.1957* | -0.022 | *0.4830* |
| Fourth Quarter | -0.032 | *0.6775* | 0.048 | *0.4372* | -0.053 | *0.1520* | -0.025 | *0.8107* | 0.006 | *0.8936* | -0.074** | *0.0202* |
| ***N*** | ***4625*** | | ***6148*** | | ***3734*** | | ***1731*** | | ***7476*** | | ***4595*** | |
| ***$R^2$*** | ***0.0008*** | | ***0.0011*** | | ***0.0018*** | | ***0.0027*** | | ***0.0003*** | | ***0.0024*** | |

*Notes*: This table reports the result of regressions used to calculate quarterly seasonality effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable ($R_t$) is daily return. Second Quarter, Third Quarter and Fourth Quarter represent dummy variables equal to unity for the respective calendar quarter. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. ***: significant at the 1 percent level; **: significant at the 5 percent level; *: significant at the 10 percent level.

From Table no. 6 we can conclude that the quarterly effect that we have just mentioned tends to be diluted when one considers half-year seasonality patterns. Still, for the markets of Egypt and South Africa, returns appear to be significantly higher during the second half of the year.

**Table no. 6 – Half-year seasonality**

| Dependent variable | $R_t$ Egypt | | $R_t$ Kenya | | $R_t$ Morocco | | $R_t$ Nigeria | | $R_t$ South Africa | | $R_t$ Tunisia | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | 0.077** | *0.0255* | 0.011 | *0.5966* | 0.022 | *0.1947* | -0.023 | *0.5704* | 0.036* | *0.0961* | 0.020 | *0.1136* |
| First Semester | -0.045 | *0.3689* | 0.014 | *0.7048* | 0.016 | *0.5060* | 0.088 | *0.1973* | 0.018 | *0.5424* | 0.032 | *0.1238* |
| ***N*** | ***4625*** | | ***6148*** | | ***3734*** | | ***1731*** | | ***7476*** | | ***4595*** | |
| ***$R^2$*** | ***0.0001*** | | ***0.0000*** | | ***0.0001*** | | ***0.0016*** | | ***0.0000*** | | ***0.0009*** | |

*Notes:* This table reports the result of regressions used to calculate half-year seasonality effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable ($R_t$) is daily return. First Semester represents a dummy variable equal to unity for that semester. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. ***: significant at the 1 percent level; *: significant at the 10 percent level.

Table no. 7 reports the regression results for the Halloween effect. The results do not show a clear pattern. Although average daily returns appear to have been higher in all markets during the period that goes from November to April (the coefficient of the "Halloween" variable is higher in all markets), the effect is only statistically significant at the conventional levels for Egypt and South Africa.

**Table no. 7 – Halloween effect**

| Dependent variable | $R_t$ Egypt | | $R_t$ Kenya | | $R_t$ Morocco | | $R_t$ Nigeria | | $R_t$ South Africa | | $R_t$ Tunisia | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Intercept | 0.010 | *0.7622* | -0.001 | *0.9245* | 0.027** | *0.0331* | -0.004 | *0.9186* | 0.013 | *0.5296* | 0.022* | *0.0788* |
| Halloween | 0.091* | *0.0725* | 0.042 | *0.2552* | 0.084 | *0.2271* | 0.049 | *0.4434* | 0.066** | *0.0244* | 0.027 | *0.1967* |
| ***N*** | ***4625*** | | ***6148*** | | ***3734*** | | ***1731*** | | ***7476*** | | ***4595*** | |
| ***$R^2$*** | ***0.0007*** | | ***0.0002*** | | ***0.0004*** | | ***0.0005*** | | ***0.0007*** | | ***0.0006*** | |

*Notes:* This table reports the result of regressions used to calculate Halloween effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable ($R_t$) is daily return. Halloween represents a dummy variable equal to unity during the months November-April. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. **: significant at the 5 percent level; *: significant at the 10 percent level.

Table no. 8 contains the results for the day-of-the-week effect. The results for the markets of Egypt, Kenya and Nigeria indicate that the week starts weak and ends strong. Tunisia exhibits the opposite pattern and Morocco and South Africa do not show any significant day-of-the-week effect. The positive average returns on Fridays are statistically significant for the markets of Egypt (15 bp, significant at the 10% level), Kenya (10 bp, significant at 1% level) and Nigeria (17 bp, significant at 1% level). This strong Friday effect in the Nigerian market goes in accordance with the evidence presented by Alagidede (2008) and the absence of weekly patterns in stock market of South Africa is in line with the conclusions of Darrat *et al.* (2013) and Seif *et al.* (2017). The coefficient for Wednesdays is positive for all series but non-significant at the conventional levels. The returns on Mondays

are only statistically different in the case of Tunisia, where average daily returns are higher by 3 bp on that day of the week, being this result significant at the 5% level.

**Table no. 8 – Day-of-the-week effect**

| Dependent variable | $R_t$ Egypt | $R_t$ Kenya | $R_t$ Morocco | $R_t$ Nigeria | $R_t$ South Africa | $R_t$ Tunisia |
|---|---|---|---|---|---|---|
| Intercept | -0.069 *0.1859* | -0.019 *0.4736* | 0.035 *0.2418* | -0.050 *0.3470* | 0.033 *0.3137* | 0.030** *0.0110* |
| Tuesday | 0.086 *0.2700* | -0.003 *0.9407* | -0.036 *0.3617* | 0.031 *0.6100* | 0.001 *0.9652* | 0.115** *0.0424* |
| Wednesday | 0.114 *0.1289* | 0.084 *0.1115* | 0.026 *0.5093* | 0.054 *0.5152* | 0.031 *0.4744* | 0.058 *0.1790* |
| Thursday | 0.267*** *0.0004* | 0.005 *0.8701* | -0.008 *0.8481* | 0.094 *0.2386* | 0.059 *0.1744* | 0.027 *0.5280* |
| ***Friday*** | ***0.155* 0.0642*** | ***0.106*** 0.0001*** | ***-0.002 0.9479*** | ***0.172*** 0.0075*** | ***-0.033 0.4335*** | ***-0.013 0.7415*** |
| ***N*** | ***4625*** | ***6148*** | ***3734*** | ***1731*** | ***7476*** | ***4595*** |
| ***$R^2$*** | ***0.0025*** | ***0.0013*** | ***0.0006*** | ***0.0029*** | ***0.0006*** | ***0.0051*** |

*Notes:* This table reports the result of regressions used to calculate day-of-the-week effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable ($R_t$) is daily return. Tuesday-Friday represents dummy variables equal to unity for the respective day of the week. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. ***: significant at the 1 percent level; **: significant at the 5 percent level; *: significant at the 10 percent level.

Table no. 9 displays the results for the half-of-the-month effect. The constant shows the average daily return that was earned during the second half of each month. Thus, we document that the returns were higher on average on the second half of the month for most countries of the sample (Egypt is the exception). However, the results are not statistically significant at the conventional levels with the exception of the Tunisian market. In Tunisia, the results show that the daily returns were higher on average by 3 bp in the sessions occurring in the second half of each month. This result is at odds with that reached by Chaouachi and Douagi (2014). As it happened with the day-of-week anomaly, the Tunisian market appears to exhibit different seasonal patterns than the other African markets under analysis.

**Table no. 9 – Half-of-the-month effect**

| Dependent variable | $R_t$ Egypt | $R_t$ Kenya | $R_t$ Morocco | $R_t$ Nigeria | $R_t$ South Africa | $R_t$ Tunisia |
|---|---|---|---|---|---|---|
| Intercept | 0.027 *0.4517* | 0.016 *0.4585* | 0.026 *0.1230* | 0.052 *0.1800* | 0.032 *0.1136* | 0.035*** *0.0077* |
| First Half | 0.056 *0.2668* | 0.005 *0.8368* | 0.008 *0.7443* | -0.065 *0.3150* | 0.028 *0.3356* | 0.000 *0.9608* |
| ***N*** | ***4625*** | ***6148*** | ***3734*** | ***1731*** | ***7476*** | ***4595*** |
| ***$R^2$*** | ***0.0002*** | ***0.0000*** | ***0.0000*** | ***0.0008*** | ***0.0001*** | ***0.0000*** |

*Notes:* This table reports the result of regressions used to calculate half-of-the-month effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable (Rt) is daily return. First Half represents a dummy variable equal to unity during the first 15 calendar days of each month. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. ***: significant at the 1 percent level.

Collectively, the results on the half-of-the-month effect in African stock markets seem to confirm the anomaly is now very tenuous or even non-existent, as has been observed in several developed markets (e.g., Giovanis, 2009; Siegel, 2014).

Table no. 10 presents the regression results for the turn-of-the-month effect. The variable TOTM is the dummy variable for the turn-of-the-month trading days covering the last and the first three trading days of the month. The constant is the average daily return earned on trading days other than the last and the first three days of the month. The constant is only negative for

Nigeria, albeit the coefficient is not statistically significant. Average daily returns are in general higher in the turn-of-the-month (Morocco is the exception). We report a very significant turn-of-the-month effect for the markets of Egypt, Nigeria, South Africa and Tunisia. Average daily returns on turn-of-the-month days ranged from 8 bp (Tunisia) to 21 bp (Egypt). The differences observed in the Kenyan market are not significant while the profitability in Morocco was actually higher in the non-turn-of-the-month days (a statistically significant coefficient at the 10% level), although the difference is marginal.

**Table no. 10 – Turn-of-the-month effect**

| Dependent variable | $R_t$ Egypt | $R_t$ Kenya | $R_t$ Morocco | $R_t$ Nigeria | $R_t$ South Africa | $R_t$ Tunisia |
|---|---|---|---|---|---|---|
| Intercept | 0.014 *0.6066* | 0.006 *0.7198* | 0.025* *0.0570* | -0.013 *0.6748* | 0.024 *0.1537* | 0.021* *0.0554* |
| TOTM | 0.208*** *0.0023* | 0.060 *0.1453* | 0.024 *0.4733* | 0.177** *0.0443* | 0.114*** *0.0022* | 0.076*** *0.0019* |
| ***N*** | ***4625*** | ***6148*** | ***3734*** | ***1731*** | ***7476*** | ***4595*** |
| ***$R^2$*** | ***0.0022*** | ***0.0003*** | ***0.0001*** | ***0.0041*** | ***0.0013*** | ***0.0031*** |

*Notes:* This table reports the result of regressions used to calculate turn-of-the-month effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable (Rt) is daily return. TOTM represents a dummy variable equal to unity during the -1 to +3 days of each calendar month. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. ***: significant at the 1 percent level; **: significant at the 5 percent level; *: significant at the 10 percent level.

Our evidence are in line with that reported by Darrat *et al.* (2013) for the South African market and is at odds with the findings presented by Giovanis (2009) for the market of Egypt.

Overall, these results provide evidence of a turn-of-the-month effect in most African markets. The implication is that investors could have earned higher returns by trading at the turn-of-the month which runs counter to the efficient market hypothesis.

Table no. 11 shows the results for the pre-holiday effect. The variable "Pre-holiday" is a dummy variable for daily returns earned on each index in the trading sessions immediately preceding the national holidays of each country. The constant term is the average daily return observed on non-pre-holiday trading days. The coefficient on the pre-holiday variable is positive and statistically significant at the 1% level for Egypt, Kenya, Nigeria and Tunisia. The anomaly is especially pronounced in the case of Egypt and Nigeria representing an average daily excess return around 40 bp.

**Table no. 11 – Pre-holiday effect**

| Dependent variable | $R_t$ Egypt | $R_t$ Kenya | $R_t$ Morocco | $R_t$ Nigeria | $R_t$ South Africa | $R_t$ Tunisia |
|---|---|---|---|---|---|---|
| Intercept | 0.043* *0.0977* | 0.012 *0.4964* | 0.027** *0.0331* | 0.005 *0.8700* | 0.045*** *0.0033* | 0.031*** *0.0032* |
| Pre-holiday | 0.390*** *0.0015* | 0.191*** *0.0017* | 0.084 *0.2271* | 0.434*** *0.0013* | 0.004 *0.9465* | 0.112*** *0.0038* |
| ***N*** | ***4625*** | ***6148*** | ***3734*** | ***1731*** | ***7476*** | ***4595*** |
| ***$R^2$*** | ***0.0015*** | ***0.0007*** | ***0.0004*** | ***0.0053*** | ***0.0000*** | ***0.0016*** |

*Notes:* This table reports the result of regressions used to calculate pre-holiday effects for the six data series under examination. Data refer to the period ending in December 2016. The dependent variable (Rt) is daily return. Pre-holiday represents a dummy variable equal to unity for the days preceding the national holidays of each country. Newey-West (1987) heteroskedasticity and autocorrelation adjusted standard errors are used to calculate p-values as reported next to the coefficients. ***: significant at the 1 percent level; **: significant at the 5 percent level; *: significant at the 10 percent level.

In the case of the South African market, the results suggest that the returns earned during the pre-holiday days were lower than the ones observed in the other days. This evidence contradicts the results presented by Alagidede (2013) for the South African market giving credence to the conclusions offered by Seif *et al.* (2017) instead.

Overall, our evidence suggests that an investor could have exploited the turn-of-the-month anomaly trading in the days immediately preceding holidays.

## 5. SUMMARY AND CONCLUSION

Efficient financial markets are crucial to allocate the resources saved by a country's citizens to their most productive ends. Testing for indication of seasonal anomalies is one the approaches to understand whether financial markets are efficient. Whereas a considerable body of empirical evidence has been gathered on the impact of seasonal patterns on developed markets, the literature regarding the potential seasonality in African stock markets is relatively scarce. This paper contributes to fill this gap since it provides evidence about the existence of eight seasonal patterns in six African market for the period ending in December 2016.

In a country-by-country analysis, it is possible to conclude that all markets exhibited some kind of seasonal patterns. Overall, our findings seem to support those authors that argue that emerging markets are significantly inefficient in comparison with developed markets (e.g., Bekaert and Harvey, 2003). It is also noteworthy that in general the number and intensity of the detected anomalies tended to be higher on the Egyptian and Tunisian markets. This is not surprising considering that the institutional conditions in these two countries are not conducive to the efficient functioning of their capital markets (see Table no. 1). What is an unanticipated result is that the South African stock market had a similar (if not higher) prevalence of anomalies than the markets of Kenya, Morocco and Nigeria. This suggests that the market of South Africa, despite its recent growth, still has a long way to go before equating itself with the capital markets of more developed economies.

Considering the intensity of the effects, their statistical significance and the number of markets that were affected, we can organize the evidence about seasonality patterns into three categories. First, we have the anomalies that exhibit a greater intensity: the pre-holiday effect, the turn-of-the-month effect and the effects that occur on a quarterly basis.

In fact, our results reveal the existence of a robust pre-holiday effect. This pre-holiday effect was detected in most markets, it is highly significant and presents an impact with a magnitude from 11 bp to 43 bp in average daily returns.

The African indices exhibited also a strong turn-of-the-month effect. The anomaly affected four of the six markets under examination with an impact in average daily returns that varied between 8 bp and 20 bp.

We report for the first time the existence of a substantial quarterly seasonality pattern in African stock indices. Our results indicate that the first quarter produced the highest returns in all the markets of the sample, with the exception of Nigeria. Despite this, the effects were statistically significant in only three markets, ranging from 6 bp to a 8 bp increase in daily returns. Although this effect appears to be relatively modest, it should be noted that the increase in the daily profitability accumulates over the quarter, thus reaching an aggregate impact of around 5 percentage points for the quarter as a whole.

Second, there are moderate signs of monthly effects and of the day-of-the-week effect. Regarding monthly effects, our findings show that the January effect is still present in the markets of Egypt, Morocco and Tunisia, with an intensity varying between 11 bp and 30 bp. The evidence also suggests a positive Friday effect in Egypt, Kenya and Nigeria, with an impact on the average daily returns ranging between 11 bp and 17 bp.

Finally, there were only tenuous signs of the Halloween effect, the half-of-the-month effect and of half-year seasonality patterns.

Although the returns in the November-April period tended to be higher in all markets, the Halloween effect had a statistically significant impact (at the 10% level) on only two countries (Egypt and South Africa). The half-of-the-month anomaly affected significantly only the Tunisian market. Finally, the half-year seasonality is almost absent from African markets. Signals of this type of anomaly were only observed in the markets of Egypt and South Africa, but with relatively modest impacts (between 4 bp and 8 bp) and with moderate statistical significance.

The results reported in this paper provide important implications for academics, regulatory authorities and investors. Given the relative scarcity of empirical studies in the context of African markets, this study will result in a better understanding of returns in these markets. This information may also help financial regulators and political decision-makers to improve the microstructure of security trading. Moreover, since there are indications of complementarities between banks and stock market finance (e.g., Demirguc-Kunt and Huizinga, 2001), it is plausible to sustain that improvements in the legal and regulatory environment of capital markets should benefit the development of the financial system as a whole.

The existence of anomalies tend to negate the notion of market efficiency since investors can earn abnormal returns just by examining patterns and setting strategies accordingly. The presence of seasonality in African stock indices should appeal to a wide range of market participants, such as portfolio managers and individual investors, in their quest for the best time to buy and sell stocks. However, taking into account the historical trading costs that individual investors have been bearing and the existing restrictions in short-selling practices it may be difficult to exploit the detected anomalies. Nevertheless, an investor can implicitly benefit from these seasonal patterns by postponing or push forward buying (selling) when he has already decided to purchase (sell) stocks in an African market.

We believe that some possible extensions of this work deserve to be considered. For example, it would be interesting to address the possibility that some of the anomalies may interact with each other. Moreover, additional evidence is needed in order to help political and regulatory authorities to determine which features of the economic and legal environment should be improved in order to benefit from more efficient capital markets.

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