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A COMPARATIVE STUDY OF THE DAY OF THE WEEK EFFECT IN THE EMERGING AND FRONTIER MARKETS IN AFRICA

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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List of abbreviations

APT	Arbitrage Pricing Theory
BE	Book Equity
BSE	Botswana Stock Exchange
CAPM	Capital Asset Pricing Model
CASPI	CSE All-Share Price Index
CV	Coefficient of Variation
D/E	Debt to Equity Ratio
EMH	Efficient Market Hypothesis
E/P	Earnings Yield
GCC	Gulf Cooperation Council
IFC	International Finance Corporation
JSE	Johannesburg Stock Exchange
B/M	Book to Market Ratio
ME	Market Equity
MENA	Middle East and North Africa
NGSE	Nigerian Stock Exchange
NSE	Nairobi Securities Exchange
NYSE	New York Stock Exchange
OTC	Over the Counter
PE	Price to Earnings Ratio
SEM	Stock Exchange of Mauritius
US	United States

Abstract

The study focuses on comparing the daily share prices of five major stock markets in Africa comprising of the emerging and frontier markets in Africa. The study uses daily share prices of stock market indices of Botswana, Kenya, Mauritius, Nigeria and South Africa over the period from October 20, 2014 to October 19, 2015. A regression based approach is employed to identify the existence of the day-of-the-week effect and the test of mean differences is used to compare the magnitude of the day of the week effect across the emerging and frontier markets. The results indicate that while all the African stock markets provide evidence of daily seasonality, the day-of-the-week effect is typically stronger in frontier markets. Specifically, a negative effect is observed for Monday while a positive effect occurs on Friday. The low level of observed daily seasonality in the stock markets of South Africa implies that the emerging market is weak form efficient, supporting the notion that the stock market development is accompanied by efficiency. The results have useful implications for international portfolio diversification. This may be of particular interest for the stock market authorities and the international investor.

Key words: *Day of the week effect, emerging markets, frontier markets, daily returns*

1 Introduction

1.1 Background to the study

The day-of-the-week effect (also known as the Monday effect, the weekend effect or the Monday seasonal) refers to the tendency of stocks to exhibit relatively large returns on Fridays compared to those on Mondays. Research has shown that stocks tend to move more on Fridays than Mondays, and that there is a bias toward positive market performance on Fridays. It is not a huge discrepancy, but it is a persistent one. This is a particularly puzzling anomaly because, as Monday returns span three days, if anything, one would expect returns on a Monday to be higher than returns for other days of the week due to the longer period and the greater risk.

In classical finance theory, economic agents are considered to be rational and stock market prices are close to the intrinsic value. The Efficient Market Hypothesis of Fama (1970, 1991) states that, stock market prices must reflect all the available information in the market and that the securities 'prices quickly adjust to new information as readily as that information is available. This theory, which has been strongly rejected, still constitutes the core of the modern finance. Some authors explain the rejection of efficient market hypothesis in the sense that investors are prone to cognitive biases that influence their beliefs and preferences. Investor's decision making depends on many parameters such as utility maximization, return, socioeconomic, age, education, capital invested, profession, etc. These parameters are helpful to determine biases rising from the investor's behavioral finance.

1.2 Problem statement

A number of hypotheses have been put forward to explain the presence of the Day of the Week Effect (Marrett, 2008) even though the effect is rarely consistent across different market contexts. The number of explanations for this anomaly include, an information release hypothesis, whereby firms delay the release of negative information until late in the week, a settlement regime hypotheses, associated with differences in the timing of transactions and settlement, and an information processing hypotheses linked with the asymmetry in information costs across small and large investors.

This study compares the difference in magnitude of the day of the week effect between the frontier and emerging markets in Africa. Emerging markets do not have the

strength of nations like the United States of America or Japan, but are in the process of establishing a more mature marketplace. On the other hand, frontier markets are even less developed than emerging markets. Unlike emerging markets, frontier markets are characterized by fewer number of investors, illiquidity, non-transparency, low levels of regulation, political and currency risk among other risks.

Looking ahead, frontier markets may represent the final frontier for global capital. As the emerging markets of today move on to become part of the developed world, the stage is set to bring along a new set of emerging candidates in the frontier markets. While available information is often sparse, local regulations are complex, and research coverage by analysts and brokerage firms is limited, these were exactly the characteristics of emerging markets 20 years ago. It would be interesting to study the weekend effect among these different stock markets and compare the difference in magnitude among the emerging and frontier markets in Africa.

1.3 Research objective

To compare the magnitude of day of the week effect in frontier markets and the emerging market in Africa.

1.4 Research question

How significant is the difference between of day of the week effect in frontier markets and that in the emerging market in Africa?

1.5 Significance of the study

The study of this anomaly is important especially for investors because it has brought about trends in the behaviors of investors on buying and selling thereby affecting stock market prices as well as stock market returns. *Don't Sell Stocks on Monday. Facts on File New York* is an example of a book that was published as a result of this trend indicating that this anomaly is indeed quite significant and needs to be understood in order to maximise stock market returns.

Moreover, financial markets are minimally rational hence, market irrationality needs to be defined to allow investors to be certain about the characteristics of other investors in the market in order to maximise stock market returns. Stock brokers and dealers will be able to maximize returns and even achieve supernormal returns with the knowledge of such crucial information by buying the securities when prices are low and selling them when the prices are high.

2 Literature Review

2.1 Introduction

This chapter starts by reviewing the efficient markets theory and the traditional price stock return determining models, that is, the Capital Asset Pricing Model and the Arbitrage Pricing Theory. The empirical literature on the day of the week effect in the developed markets, the emerging markets and the stock markets of Africa is reviewed systematically. Supporting literature on emerging and frontier markets is also provided. Finally, the methodologies that have been used in past empirical literature and the explanations given for this anomaly are reviewed.

2.2 Review of theory

Efficient market hypothesis is one of the important paradigms of traditional finance theories. Fama (1970) defined an efficient market as a market with large numbers of rational profit maximizing individuals actively competing with each other and making attempts to predict future market values of individual securities, and where all important relevant information is almost freely available to all investors.

On the basis of relevant information, efficient market is divided into three stages, weak form, semi strong form and strong form. In the weak form of EMH, all the past information including past prices and returns is already reflected in the current prices of stocks. The assumption of weak form is consistent with random walk hypothesis i.e. stock prices move randomly, and price changes are independent of each other. So if the weak form holds, no one can predict the future on the basis of past information. Hence, no one can beat the market by earning abnormal returns. Therefore, the technical (trend) analysis, in which analysts make the chart of past price movements of stocks to accurately predict future price changes, is of no use (Bodie et al. 2007). However, one can beat the market and get abnormal returns on the basis of fundamental analysis or on the basis of private information.

In the semi strong form, current stock prices reflect all publicly available information as well as past information. Therefore, no one can make extra profit on the basis of fundamental analysis (Bodie et al. 2007). However, one can beat the market by insider trading. In the strong form of market efficiency, all relevant information including past, public and private information is reflected in the current stock prices. So if the

strong form persists, then no one can beat the market in any way, not even by insider trading.

However, most empirical evidence reported in recent years indicate that the distribution of common stock returns varies by the day of the week. Vast number of studies provide evidence for daily seasonality in international stock markets.

The following models that have been used to determine stock market returns; (1) Capital Asset Pricing Model (CAPM); (2) Arbitrage Pricing Theory (APT).

2.2.1 The Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) as put forth by Sharpe (1964) and Lintner (1965) and Mossin (1966) is probably the most widely used model in determining stock returns and it marked the birth the asset pricing theory. CAPM offers powerful and intuitively pleasing predictions about how to measure risk and the relationship with expected return (Fama & French, 2004). According to CAPM, there is a direct linear relationship between the return on an asset and its non-diversifiable risk above the risk free rate. The model determines the equilibrium prices and in turn the equilibrium returns in the market. In other words, in a market where the static CAPM holds, actual returns should be consistent with equilibrium returns. The CAPM assumes that the investors eliminate all diversifiable risk and what matters is only the non-diversifiable or systematic risk measured by beta.

Unfortunately, the empirical record of CAPM is poor. Further research on CAPM has documented anomalous factors which have cast doubt on the practicability and application of the model. These anomalies may be due to market inefficiency or due to misspecification of static CAPM (Fama, 1970). Reinganum (1981) and Ball (1978) find that anomalies are caused by model misspecification rather than market inefficiency. Recent empirical research in financial economics has revealed abnormal returns inconsistent with equilibrium in a market where the CAPM holds. Few of the important anomalous factors identified are explained below.

2.2.1.1 Size Effect

It is found that smaller firms have had higher risk adjusted returns, on average, than larger firms. This 'size effect' has been in existence for at least forty years and is evidence that the capital asset pricing model is misspecified (Banz 1981). The size effect is not linear in the market value; the main effect occurs for very small firms while there

is little difference in return between average sized and large firms. Banz (1981) and Reinganum (1981) investigated the impact of size on expected returns. They found that size measured as the market value of equity (ME) is negatively associated with average stock returns for samples of NYSE and NYSE-AMEX firms, respectively. According to Banz, this was due to insufficient information on small firms leading to limited diversification hence higher risk adjusted return on these small stocks. Reinganum (1982) reports that, while the direction of the bias in beta estimation is consistent with these adjusted betas will still exhibit a pronounced negative relation to firm size.

Excess returns earned by low-M/B firms are related to decreases in systematic risk, while the returns of high- M/B firms are related to higher profitability. Fargher and Weigand (2009) examined cross-sectional differences in the profits, returns and risk of high and low-market-to-book ratios (M/B) stocks before and after the initiation of regular cash dividend payments. They found that low-M/B stocks displayed the most positive price reaction to dividend initiation announcements. High-M/B firms were found to have larger profits, cash levels and capital expenditure before and at the time of dividend initiation, but more closely resembled the low-M/B firms.

2.2.1.2 Value Effect

The value effect is another anomaly that shows a positive relationship between the book to market value equity and the stock returns. One explanation is that investors overreact to growth aspects for growth stocks, and value stocks are therefore undervalued.

Evidence of this is given by Stattman (1980) and Rosenberg, Reid and Lanstein (1985) who find that the average returns on US stocks are positively related to the ratio of a firm's book value of common equity, BE, to its market value, ME. This indicates that BE/ME[1] provided valuable information to investors wishing to earn higher returns than those associated to that particular level of risk. Chan, Hamao and Lakonishok (1991) also find that BE/ME is also has a role in explaining the cross-section of average returns on Japanese stocks. Chan and Chen (1991) attributed the value effect to mismanagement and higher financial leverage.

[1] BE/ME is the book-to-market equity is a ratio used to identify undervalued or overvalues securities by taking the book value and dividing it by market value

Moreover, Fama and French (1993) evaluated the impact of size and value effect in addition to beta on expected returns in a three-factor model. They showed the importance of additional factors besides beta in explaining expected returns. They find that the variations in returns in the three-factor model decreased significantly when portfolios were formed by sorting stocks according to size, value, and dividend yield or earnings-to-price ratios abnormal returns from the three-factor model were leading to zero.

Further evidence is provided by Fama and French (1995). They find that size and BE/ME were not only a proxy for risk factors, but they were also a proxy for profitability that helped to explain cross-sectional variation in common stock returns. Firms with higher BE/ME were found to be persistently distressed.

2.2.1.3 Leverage Effect

The leverage effect is another contradiction to the CAPM model whereby there is a positive relation between leverage and average return documented by Bhandhari (1988). It is possible that leverage is associated with risk and expected return, but in the CAPM model, leverage risk should be captured by market beta. Bhandhari finds however, that leverage explains the cross-section of average stock returns in tests that include size (ME) as well as beta.

2.2.1.4 Earnings Price Ratio Effect

This anomaly is documented by Basu (1983) who shows that the earnings-price ratios (E/P) help explain the cross-section of average returns on U.S stocks in tests that included size and market beta. He found that returns on stocks with low P/E ratios tended to be larger than warranted by the underlying risk and vice versa.

A related study by Ball (1978), found that not only was E/P found to be an important factor in explaining asset returns, but it contains information on all factors not explained by the CAPM. He argues that E/P is likely to be higher than for stocks with higher risks and expected returns irrespective of the sources of risk.

2.2.2 Arbitrage Pricing Theory

The Arbitrage Pricing Theory (APT) is a mere extension of CAPM where different securities have different sources of risk because of different exposures to the various factors.

It is a one-period model in which every investor believes that the stochastic properties of returns of capital assets are consistent with a factor structure. Ross (1976) argues that if equilibrium prices offer no arbitrage opportunities over static portfolios of the assets, then the expected returns on the assets are approximately linearly related to the factor loadings. The reward to the residual component in the return to a particular asset, *unsystematic* or *idiosyncratic* risk, can be made arbitrarily small simply by considering portfolios with an arbitrarily large number of assets. Ross (1976) shows that the linear pricing relation is a necessary condition for equilibrium in a market where agents maximize certain types of utility.

2.3 Market Anomalies

The following are some of the market anomalies that contradict the efficient market hypothesis.

2.3.1 Time-Related or Calendar Anomalies

January Effect- this is a market anomaly whereby the rate of return on common stocks is unusually high during the month of January. It is the observed phenomenon that small stocks have outperformed the broader market in the month of January, with most of the disparity occurring before the middle of the month.

Week of the Month -- The 1st two weeks of the month have a considerably higher rate of return than the last two weeks of the month.

Monday Effect – Returns are seen to be lowest on Monday compared to the other days of the week.

2.4 Day of the week effect

The day-of-the-week effect has been extensively studied across both developed and emerging markets. Studies such as Hess (1981), Keim and Stambaugh (1984), Solnik and Bousquet (1990), Basher and Sadorsky (2006) and Enowbi, Guidi, and Mlambo (2009), to name but a few, demonstrate that the distribution of returns on many indicators of stock market pricing are not normally distributed across the days of the week. Three distinct categories of market effects exist. These include the Monday effect whereby Monday exhibits the lowest returns for the week, the weekend effect which studies the differences between Monday and Friday patterns in isolation, and finally, the day-of-the-week effect which exhibits a unique expected return or movement pattern for each trading day.

2.5 Empirical Studies on the Calendar anomalies

2.5.1 Calendar anomalies in Developed Markets

In the US stock market, the weekend effect was first documented by Field (1931). Keim & Stambaugh (1984) confirmed this effect in their study to investigate the weekend effect in stock returns by examining additional time periods, extending the total period covered to 55 years based on the Standard & Poor's Consumer Index. They examined additional stocks such as those of small (low capitalization) firms and those traded over the counter. In all cases, the data exhibits a weekend effect that is at least as strong as that reported in previous studies. The results indicate consistently negative Monday returns throughout. They also noted a consistent trend even among one day weekends where the Stock Exchange was open on Saturday and two day weekends, the returns were still negative and the last price of the week is consistently high. There has to be an aspect of the human behaviour that leads to this trend that is not captured in the efficient market hypothesis.

In addition, Abraham & Ikenberry (1994) found that Monday returns are negative nearly 80% of the time with a mean return of -0.61% and when Friday returns are positive, Monday returns are positive.

Findings by French (1980) and Cross (1973) were consistent. They studied the Standard and Poor Index from 1953 to the 1970s. They observed that returns remained dependent on the day of the week. Further tests revealed that Monday mean returns over the study period were significantly negative while Wednesday through Friday returns were significantly positive.

In a study examining five seasonal patterns in stock markets of eighteen countries, Aggrawal and Tandon (1994) find the weekend effect in nine countries. They also find that the daily seasonal largely disappears in the 1980s.

An analysis study of the day of the week in the Russian Stock Market was done McGowan and Ibrahim (2009) using the Russian trading System Index for the period when the market opened in 1995 to August 2003. They found that Wednesday had the lowest returns while Friday had the highest positive returns.

A strong and persistent negative return on Tuesday is found by Solnik and Bousquet (1990) for Paris Bourse, which is in line with studies on Australia and Japan. Barone (1990) reports similar results for the Italian Stock Market, with the largest decline in

stock prices occurring in the first two days of the week and more pronounced on Tuesday.

2.5.2 Calendar anomalies in Africa

Various studies on this anomaly have been done in African stock markets. Agathee (2008) finds that the Friday returns appeared to be higher relative to the other trading days in the Stock Exchange of Mauritius (SEM). The paper used daily observations from 1998-2006 and the empirical results suggested that the mean returns across the five week days are jointly not significantly different from zero for the whole sample period.

Similarly, Bundoo (2008) carried out tests on day of the week and January effect on the SEM. The study found that SEM had positive and statistically significant Wednesday and Friday effects. The study also found a positive and significant Monday effect although the effect was smaller in magnitude compared to the other days of the week.

In the Egyptian stock market, Aly et al. (2004) studied the existence of the day-of-the week effect using Capital Market Authority Index for the period April 26, 1998 to June 6, 2001. The empirical results indicated that while Monday stock returns were significantly positive, they were not significantly different from returns during the rest of the week. Furthermore, Monday returns were significantly more volatile than returns from Tuesday to Thursday. They concluded that the significantly positive returns on Monday were associated with riskier returns.

The presence of the day of the week effect was contradicted by Chukwuogor (2008) in his analysis of the annual returns of five African stock markets. He investigated the stock market indices in Botswana, Egypt, Ghana, Nigeria and South Africa for the period 1997-2004 to determine the daily returns, day-of-the-week effect and volatility of stock returns. The results did not show the day of the week effect but they indicated insignificant daily returns volatility. Similarly, Malambo and Biekpe (2006) investigated seasonal effects in 17 indices on nine African stock markets. They discovered a weekday effect in three indices only.

The day of the week has also been nullified in the Khartoum Stock Exchange. Abdalla (2012) investigated the existence of the day of the week effect in the Sudanese stock market for both the returns and conditional variance using daily observations of the general price index series from 2006 to 2011. The results found negative and

statistically insignificant mean returns for all days of the week which indicated the absence of the day of the week effect in both return and volatility equations.

The day of the week effect has been previously studied in the Nairobi Stock Exchange with contradicting results. Kulavi (2003) performed a study of the day of the week effect and stock market volatility in the Nairobi Stock Exchange constituting of daily stock returns of 50 companies listed on the Nairobi Stock Exchange. He found that there is existence of the day of the week effect and found that the highest volatility is experienced on Monday and the lowest volatility is experienced on Thursday. However, the volatility pattern that he found on his study does not refute public information hypothesis. On the other hand, (Sifuna 2012) performed a Day of the Week Effect on stock returns at the Nairobi Stock Exchange study where daily market capitalization is used to compute the stock returns and carry out multiple regression from January 2008 to December 2011 and found that there is no day of the week effect at the Nairobi Stock Exchange.

2.6 Emerging Stock Markets

Emerging stock markets have recently been of great importance to the worldwide investment community (Balaban (1995)). According to the International Finance Corporation (IFC), a subsidiary of the World Bank, all markets in developing countries are treated as emerging. The World Bank defines developing countries to have per capita GNP below 7,620 U.S. dollars in 1990 prices.

There has been an increase in empirical and policy-oriented studies concerning emerging markets thanks to the reliable and continuous data provided by the IFC. A partial list of these studies includes Wider (1990), Chuppe and Atkin (1992), Divecha et al(1992), Pardy (1992), Singh (1992), Vittas (1992), Wilcox (1992), Claessens and Gooptu (1993), Cornelius (1993), Keane (1993), Mullin (1993), Claessens and Rheee (1994), Errunza (1994), Hauser et al.(1994), Kalotay and Alvarez (1994), and Satyanarayan and Varangis (1994). Unfortunately, the IFC's data set is, in general, aggregate in nature. This may prevent researchers to focus on comparative studies using high frequency data from emerging markets. However, it is feasible to provide individual country evidence to extend the results of the previous international research.

2.7 Frontier Stock Markets

Typically, access can be difficult and liquidity can be low for frontier markets. (Spiedell & Krohne (2007)).However, their valuations are also low, as are their correlations, both among themselves and with other more developed markets. Many frontier countries have undergone a radical restructuring of their economies since the early 1990's, and their macroeconomic fundamentals are often sound and encouraging. Frequently, real per capita GDP is rising, inflation is low, currency exchange rates are becoming more stable, and corporate profits and return on investment are relatively high.

The weak-form efficiency in the African stock markets compare favourably with those performed on other emerging stock markets (Magnusson & Jafferis (2010)). This research uses recent data from the eight largest African stock markets to test whether these markets meet the criterion of weak-form stock market efficiency with returns characterised by a random walk. Results are then compared with similar tests on emerging stock markets in South-east Asia and Latin America.

2.8 Stock market volatility

A strong and persistent effect on volatility is also present in this anomaly. Islam. R & Sultana.R (2015), in their study to investigate the day of the week effect in stock return and market volatility during January2004 to September 2014 periods by utilising CSE all-share price index (CASPI) found that the highest returns and lowest returns were found to be observed on Thursday & Sunday respectively and the highest and lowest volatility are observed on Sunday and Thursday respectively. Furthermore, all findings were found to be statistically significant except the effect of Thursday returns on market volatility.

Moreover, Janabi & Hatemi (2010) found that stock return volatility is negatively correlated with stock returns in their study to investigate empirically the underlying nexus of stock market returns and volatility in the Gulf Cooperation Council (GCC) countries and Middle East and North Africa (MENA) region using the GARCH-M model.

2.9 Explanations for the day of the week effect

Numerous explanations have been developed to rationalize this trend. While most authors linked this anomaly with the trading pattern of individual patterns, Keim & Stambaugh (1984) argued that this trend is due to a measurement error that the low

Monday returns are partially due to the positive errors in prices on Friday. However they found that the general versions of measurement error are inconsistent because using the Dow Jones Industrial Index, they found that the correlations are highest between Friday returns and Monday returns. For the 30 individual stocks of the Dow Jones Industrial Index, the average correlation between Friday and Monday returns was positive and the highest of all pairs of successive days.

On the other hand, (Miller (1988)) individual investors typically do not have time during the weekday trading hours and therefore process information and make investment decisions only during the weekend. In addition, since brokers who tend to issue more buy than sell order recommendations do not work on the weekend, individual investors are less likely to be affected by brokers' buy order recommendations when they make their investment decisions during the weekend. Lakonishok and Maberly (1990) provide empirical evidence to support this view. They find that when the market reopens on Monday, individual investors tend to increase trading activity (especially sell transactions) on that day. Because of the increased selling activity by individual investors on Monday relative to the rest of the week, it is possible that an association exists between the trading behaviour of individual investors and the Monday seasonal. However, there is yet to be direct evidence indicating that those stocks traded by individual investors on Monday are actually the stocks that cause the average price decline in the stock market on Monday.

The trading behaviour of individual investors seems to be an influencing factor, because individual investors are more active sellers of stock on Mondays. Moreover, the weekend effect is seen to be related to the trading patterns of less sophisticated individual investors. Chan, Leung & Wang (2004) found that the mean Monday returns of stock portfolios with high institutional holdings are mostly positive and are not significantly different from the mean returns on other weekdays.

2.10 Further studies on the day of the week effect

The weekend effect is notably a present and interesting market anomaly, however, it has been regarded as obsolete by some scholars. Brusa, Liu & Schulman (2003) found a reverse effect whereby returns for Monday are positive and significantly greater than returns for the preceding Friday in recent data for major stock indexes. Furthermore, the average weekend decline of 0.098% found by Siegel (1998) would only amount to 0.0045 for a $50 stock which is less than the bid ask spread. Consequently, the only

potential for benefitting from the day of the week effect through trading individual stocks would be through changing the timing of trades that are already planned, such as timing purchases for Mondays and sales for Fridays.

The day of the week effect is so prominent that it can be examined across different market types, because it's not only possible present in the Stock Exchange but also on the Over the Counter (OTC) stocks. Using closing bid and ask quotations for actively traded NASDAQ stocks, Keim & Stambaugh (1984) computed returns going bid to bid and ask to ask to confirm this.

The weekend effect for firms with different sizes differs, this has been evidenced by Keim & Stambaugh (1984) and Abraham & Ikenberry (1994). In addition, they both agree that the weekend effect is most acute in small and mid-size companies rather than the larger companies. Keim & Stambaugh (1984) in their investigation of the relations between the weekend effect and the firm size found that the smaller the firms, the greater the tendency for average returns to be high on Friday. They figured that such results suggest some form of upward bias in week ending prices that is reversed on Monday, but a formal test based on a comparison of means fails to support such a hypothesis.

The idea that the day of the week effect does not remain fixed over time is not unique either. Doyle and Chen (2009) coined the idea of changing patterns of the day-of-the-week as "seasonal flux". It appears, however, that the testing of this "flux" has not been conducted on African markets. Most previous studies on the day-of-the-week effect have examined extensive periods of financial data and sought to find a singular pattern in returns which spans these periods. For instance, Yalcin and Yucel (2006) and Dicle and Levendis (2010) argue that the findings from the day of-the-week studies can be used by investors to reap returns by buying shares at a low price on Monday and selling at a high price on Friday. They argue that the pattern could have changed over time because of at least two reasons. Firstly, African stock markets such as Nigeria, Zambia, and South Africa are growing rapidly and secondly, the global financial crisis of 2007/2008 could have altered trading patterns and returns on the stock exchanges of Africa.

The day of the week effects are seen to be subject to changes and movements across time (Kalidas (2013)). This raises the important question as to how African markets are progressing with regards to market efficiency. There is therefore a constant need for

current analysis of the markets to understand the movements and patterns that investors face.

2.11 Methodologies used in empirical studies on the day of the week effect

Research on the day-of-the-week effects can be classified into two main categories - papers examining volatility and testing for returns.

Most of the earlier works in this area include Cross (1973), French (1980), Gibbons and Hess (1981), Keim and Stambaugh (1984) and Aggarwal and Rivoli (1989), focus only on the mean equations of the stock market returns and use Ordinary Least Squares (OLS) estimation method to regress returns on five daily dummy variables to test whether there is any statistical significant difference among stock market returns. Balaban (1995) however goes further to perform a sign analysis to detect weekend effect. Following Abraham and Ikenberry (1994), percentages of sign of Monday return in week w conditional on the sign of Friday return in week w-1 are calculated for each year and for the whole period.

Recent empirical studies are now considering not only the mean returns but also the variance equations. This can be found in the studies by Hsieh (1988), Berument and Kiymaz (2001), Kiymaz and Berument (2003) and Yalcin and Yucel (2006). Considering day of the week in the variance equation also has the support of Engle (1993) as he points out that those risk-averse investors would reduce their investment on those assets which are likely to increase in volatility. Therefore, consideration of both returns and volatility are critical to investors. Kiymaz and Berument (2003) clearly show that investors are not only interested about a day returns but also about the corresponding volatility of the day and having such knowledge allow investors to adjust their portfolios by taking into account day of the week variation in volatility.

Many studies on the day of the week both on developed and other emerging markets have used GARCH (1, 1) model to examine the effect on the day of the week. However, Ndako (2013) uses the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model. The advantages that EGARCH would have over GARCH (1, 1) is that it would be possible to capture the possible asymmetric effect which is not possible with GARCH (1, 1) models, it shows the leverage effect that is the reaction of the investors to the news in the markets and that in EGARCH,

we do not require the assumption of non-negativity restriction, which ensures that all coefficients are positive under GARCH (1, 1) model.

2.12 Concluding remarks on the literature

Finally, Alagidede and Panagiotidis (2006) find that a considerable number of empirical evidence support the view that capital markets in the UK, US, Germany, Japan and other developed economies are efficient. Recent studies in stock market returns do not only concentrate on traditional test of market efficiency but also focus on establishing the existence of patterns in stock returns. Previous research on anomalies has concentrated exclusively on developed economies. The few existing studies in developing economies pay little attention to the emerging and frontier equity markets of Africa. This study goes ahead to compare the difference in magnitude of the day of the week effect anomaly amongst emerging markets and between the emerging and frontier markets in Africa using the major stock indexes of South Africa, Kenya, Botswana, Nigeria and Mauritius.

3 Methodology

3.1 Introduction

This chapter highlights the research design, population, sample design, and the model specification.

3.2 Research design

This study employs a comparative research design. A comparative study makes comparisons across different countries or cultures. This research makes a comparison of the magnitude of the day of the week effect between the emerging and frontier markets thus a comparative research design is the appropriate research design.

The data consists of the daily prices from October 20, 2014 to October 19, 2015 for the JSE (South Africa), representing the emerging markets. The frontier markets considered in this work include NGSE (Nigeria), NSE (Kenya), BSE (Botswana), and SEM (Mauritius).

3.3 Model specification

3.3.1 Return generating process

Returns in each market (R_t) are expressed in local currencies and are calculated as the first difference in the natural logarithms of the stock market indexes.

Equation 1

$$R_t = [\log P_t - logP_{t-1}]$$

Where P_t is the price level of an index at time t and R_t is the return.

Returns for each day of the week are separately calculated for each year as well as for the whole period.

3.3.2 Analysis of the day of the week effect

The following regression on for the whole period is run to test whether there is any statistically significant difference among index returns on different days of the week:

Equation 2

$$R_t = BD_{1t} + BD_{2t} + BD_{3t} + BD_{4t} + BD_{5t} + \mu_t$$

Where$D_{1t} = 1$ if day t is a Monday and 0 otherwise; $D_{2t} = 1$ if t is a Tuesday and 0 otherwise; and so on. The OLS coefficients $B_1$to B_5 are the mean returns for Monday through Friday, respectively. The stochastic disturbance term is indicated byμ_t.

The hypothesis to be tested is as shown in ***Equation 3*** below:

Equation 3

$$B_1 = B_2 = B_3 = B_4 = B_5$$

The same regression is repeated for each individual country.

3.3.3 Test of differences

The test of differences is used to test two hypotheses. The first hypothesis is that the size of the weekend effect is equal across all the countries considered in this study. The second hypothesis is that the size of the weekend effect is equal across the frontier markets and emerging market.

The hypotheses of equality of mean returns across the countries for a particular day i is shown in ***Equation 4*** below;

Equation 4

$$a_{1i} = a_{2i} = a_{3i} = a_{4i} = a_{5i}$$

The Welch test with the two sample mean assuming unequal variances is used to test the hypotheses.

4 Empirical Results

4.1 Daily Summary Statistics

The coefficient of variation (CV), standard deviation divided by mean return, is used as a measure of risk per unit return. The highest CV values are observed on Monday, Tuesday and Wednesday in the emerging markets and the lowest CV values appear towards the end of the week (Thursday, Friday) returns. Therefore, it is advisable to trade on the first three days of the week as the risk return trade-off is high. The CV values are negative in the frontier markets; therefore, we cannot make inferences on the risk return trade-off in these markets. The highest standard deviations return on Mondays conforms with the studies: Fama (1965), Gibbons and Hess (1981), Agrawal and Tandon (1994), and Balaban (1995, 1996). Moreover, it is interesting to observe the lowest standard deviations of the daily returns on Tuesdays, just after Mondays with the highest standard deviations

The Monday, Tuesday and Friday returns for the frontier markets are negatively skewed, indicating that they are non-symmetric, while the all the daily returns for the emerging markets are positively skewed. Furthermore, all the returns exhibit high levels of kurtosis, indicating that these distributions have thicker tails than normal distributions. These findings show that daily returns are not normally distributed.

Table 1: Daily Summary Statistics

Frontier Markets					
	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	- 0.05792	- 0.00109	- 0.00071	- 0.00020	- 0.00054
Std Dev	0.81776	0.01235	0.01351	0.01148	0.01153
Skewness	- 7.54106	-0.09568	1.60012	0.31927	-0.60579
Kurtosis	91.13788	3.77467	10.26778	5.69123	6.60414
CV	- 14.11940	- 11.37016	- 19.13047	-58.20780	-21.20989
Emerging Markets					
Mean	0.04289	0.04352	0.04266	0.00369	0.00000
Std Dev	0.30462	0.30507	0.29868	0.00991	0.00938
Skewness	7.05836	7.05673	7.19674	1.08309	0.24195
Kurtosis	49.87810	49.86211	51.85947	3.35354	0.85506
CV	7.10157	7.00981	7.00099	2.68297	-5,508.81126

4.2 Regression results for stock market returns over the period

Average daily returns over the trading period for the Emerging and Frontier stock markets with their t-values[2] are presented in Table 2 (all days of the week are included). The hypothesis that the mean returns across the week are equal is rejected. In fact, the insignificance of all F-values of the major African stock market two indices supports the conclusion that the distribution of returns for each day of the week might be independently identically distributed.

The Monday returns are lowest in SEM although the differences in the mean returns are insignificant for this stock market, while they are highest in NGSE. Returns are highest on Thursday in the NGSE, Tuesday in the NSE, and Thursday in the SEM, Monday in the BSE and Tuesday in the JSE. However, these mean differences are very insignificant as demonstrated by the high p-values.

Wednesday returns are lowest in the NGSE, the NSE and the SEM while the returns are lowest on Thursday in the BSE and the JSE. Since, the null hypothesis of equality among the means of returns of each day of the week can be rejected, we can conclude that the phenomenon of the day of the week effects exist for the case of the major African stock markets during the period of study and the trading time hypothesis holds.

Table 2: Regression results for the stock market indices

	B_1	B_2	B_3	B_4	B_5	R^2 Adjusted
NGSE	0.151973	0.002619	-0.00358	0.000479	0.004385	0.000118
	(1.612122)	(0.027918)	(-0.053718)	(0.005001)	(0.045037)	
NSE	0.003756	0.04573	0.000212	0.002869	0.001533	-0.003026
	(0.120058)	(1.474879)	(0.009733)	(0.09214)	(0.048302)	
SEM	-0.00018	-0.00023	-0.00043	0.000138	-0.00025	-0.012725
	(-0.374098)	(-0.464606)	(-1.22612)	(0.273227)	(-0.493549)	
BSE	0.001129	-0.00036	-0.00066	-0.000027	0.000368	-0.004711
	(1.203209)	(-0.385638)	(-0.995939)	(0.028498)	(0.38988)	
JSE	0.000231	0.000858	0.042663	-0.038971	-0.042664	-0.009095
	(0.004886)	(0.018119)	(1.287063)	(-0.814532)	(-0.896509)	

Table one shows the results for the regression $R_t = BD_{1t} + BD_{2t} + BD_{3t} + BD_{4t} + BD_{5t} + \mu_t$
All p-values indicate that the day of the week effects are insignificant at all conventional levels of significance.

[2] The t-values are the values in parenthesis at 10% confidence level.

4.3 Regression results of the emerging and frontier markets

Table 3 provides a comparison of the weighted average of the frontier markets and the emerging market. The p-values suggest that the mean daily returns are insignificant in the emerging markets as opposed to the frontier markets. The returns are lowest on Wednesday in the frontier markets and lowest on Friday in the emerging markets. The emerging market findings are contradicting with Balaban (1995, 1996) and Dubois and Louvet (1996) for positive Wednesday returns.

In the emerging market, returns are positive on Monday, Tuesday and Wednesday and are negative on Thursday and Friday. The reverse is true for the frontier markets. The returns are negative on Monday, Tuesday and Wednesday while they are positive on Thursday and Friday. This is consistent with Solnik and Bousquet (1990), Barone (1990), Agrawal and Tandon (1994), Balaban (1995, 1996), and Dubois and Louvet (1996) who provide evidence for negative Tuesday returns. The F-values are insignificant in the emerging markets showing that the differences in the mean returns are insignificant and the distribution of returns for each day of the week are independently identically distributed. The F-values in the frontier markets are significant to show that the mean returns are not independently identically distributed.

Table 3: Regression results for the emerging and frontier markets

Index	Emerging markets		Frontier markets	
B_1	0.000231	(0.004886)	-0.052525	(-1.491498)
B_2	0.000858	(0.018119)	-0.000527	(-0.014989)
B_3	0.042663	(1.287063)	-0.000661	(-0.026571)
B_4	-0.038971	(-0.814532)	0.000416	(0.01166)
B_5	-0.042664	(-0.896509)	0.000161	(0.004495)
R^2-Adjusted	-0.009095		-0.000473	
F-Value	0.441218		0.882811	
P-Values	0.778750		0.473557	
DW	0.34404		1.008338	

4.4 Comparison of the mean daily returns for emerging and frontier markets

The test of mean differences between the emerging and frontier markets is provided by the t values in Table 4. We reject the hypothesis that the mean differences are equal across all days of the week. The observed differences between the emerging and frontier markets is convincing enough to lead us to the conclusion that the daily mean differences between emerging and frontier markets differ significantly on all the days of the week.

Table 4: Test of mean differences for emerging and frontier markets

	Monday	Tuesday	Wednesday	Thursday	Friday
Emerging					
Mean	0.0429	0.0435	0.0427	0.0037	0.0000
Variance	0.0947	0.0950	0.0910	0.0001	0.0001
Frontier					
Mean	-0.0579	-0.0011	- 0.0007	-0.0002	-0.0005
Variance	0.6723	0.0002	0.0002	0.0001	0.0001
t-Stat	-1.3583	0.1556	-1.0367	-2.2984	- 0.3357
t-Critical two tail	1.9713	2.0096	2.0076	1.9883	1.9861

The highest average return is observed on Tuesdays in the emerging markets while the highest average return is observed on Thursday in the frontier markets. The average returns in the frontier markets are negative while the average returns in the emerging are positive across the week.

The lowest return being on Monday in the frontier markets is consistent with the findings of different literature (Cross 1973; Lakonishok and Levi 1982; Rogalski1984; Keim and Stambaugh 1984; Harris 1986a, 1986b; Berument and Kiymaz 2001 and Kiymaz and Berument 2003) where Monday act as first trading day of the week. The emerging markets findings, contradict all previous findings as the lowest average returns are on Friday while the second highest returns are on Monday.

5 Conclusion

The day of the week effect is documented extensively in both equity and non-equity markets. This paper investigates the existence of day of the week effect in stock returns in the major stock markets in Africa, and compares the significance of the day of week between the emerging and frontier markets in Africa. The results based on this study shows that day of the week effect is present, though statistically insignificant, in the stock return equations of all the individual stock markets under study.

However, when a weighted average of the frontier markets is done and is compared with the emerging market, a low level of observed daily seasonality is found on the emerging market as compared to the frontier markets. This paper provides direct evidence that the well-known day of the week effect is typically stronger in frontier markets. The frontier markers findings are consistent with previous literature that the highest returns are observed on Friday while the lowest returns are observed on Monday.

The low level of observed daily seasonality in the emerging market implies that the South African stock market overall is approximately weak-form efficient. A number of contributory factors are possible, including the growth in derivative markets, the increasing internationalization and liberalization of the domestic capital market and the dramatic fall in transaction costs, especially those relating to brokerage, taxation and information procurement.

The findings also suggests that an active participation of institutional investors in the emerging markets reduce inefficiency in the market. This is true because institutional investors may be able to actively "arbitrage" the market anomaly given that they should be more aware of the day of the week and have lower trading costs than most individuals.

According to Bailey, Alexander and Sharpe (1999), seasonal patterns in stock returns should be quite minor (if they exist at all), because they are not suggested by traditional asset pricing models. It is often assumed that the expected daily returns on stocks are the same for all the days of the week.

From the research findings, it is evident that the day of the week effect anomaly exists in the frontier markets. The observed seasonality observed in the frontier markets represents unexploited profit opportunities and violations of market efficiency,

interesting opportunities for research exist in terms of identifying whether market conditions such as liquidity and/or industry-specific operational factors represent the source of these anomalies.

As the presence of the day of the week anomaly indicates inefficiency of the market, it informs the regulators and policy makers that appropriate measures should be taken to bring informational and operational efficiency in the market. It is argued by Islam and Gomes (1999) that a combination of factors like inadequate financial information, thin and discontinuous trading, reliance on price momentum as a basis for trading and manipulation by the market makers creates the conditions that lead to the day of the week effect. Thus the regulators should take appropriate steps to remove such anomalies to bring the efficiency of the market.

There is also need for traders to study market trends further and take trading advantage of such anomalies. The regulators in the frontier markets should also study this anomaly and other market trends and come up with a structure that reduces these anomalies to make their stock markets more efficient thus reducing trading advantages. Moreover, the study recommends that investors should not consider the days of the week in their trading transactions. Investors should carry out fundamental and a detailed market analysis to identify the key factors that affect stock returns.

6 References

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