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L'efficience informationnelle des marches boursiers Africains

Information Efficiency of African Stocks Markets

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Résumé

Les rendements quotidiens des indices boursiers ont été analysées pour étudier la forme faible de l'efficience du marché dans 11 marchés africains. Sur la base d'un ensemble de test, le test d'autocorrélation, le test des runs, le test de racine unitaire et le teste de normalité et pour une période de 6 ans allant du 04/03/2014 au 18/12/20, nos résultats montrent des aboutissements mitigés pour les différents indices. Cependant, les séries de rendements des marchés africains indiquent l'absence de la forme faible de l'efficience informationnelle tels que défini par Fama. Dans l'ensemble nous avons conclu que les rendements quotidiens des indices boursiers ne suivent pas une marche aléatoire dans les pays africains. Par conséquent, il est conclu que les investisseurs peuvent réaliser des gains anormaux en raison de la prévisibilité des cours des indices boursiers de ces marchés.

Mots clés : Efficience du marché, Marché financiers africains, Marche aléatoire, Runs test, test de racine unitaire, test d'Anderson darling, Test d'autocorrélation, rendements quotidiens.

Abstract

The daily returns of stock market indices were analysed to study the weak form of market efficiency in 11 African markets. Based on a set of tests, the autocorrelation test, the runs test, the unit root test and the normality test and for a period of 6 years from 04/03/2014 to 18/12/20, our results show mixed outcome for the different indices. However, the series of African market returns indicate the absence of the weak form of informational efficiency as defined by Fama. Overall, we conclude that the daily returns of stock market indices do not follow a random walk in African countries. Therefore, it is concluded that investors can make abnormal gains due to the predictability of stock index prices in these markets.

Keywords: Market efficiency, random walk, African financial Markets, test runs, unit root test, Anderson darling test, Autocorrelation Test, daily returns.

Introduction

Today, the stock markets represent an important alternative for financing economic activity. One of the channels through which the stock market impacts the economy is its ability to mobilise savings and direct capital towards the most profitable sectors of activity. This role of optimal capital allocation is closely linked to the degree of efficiency of the stock market.

The hypothesis of financial market efficiency, first formulated by Fama (1965)(Fama, 1965), states that in the financial markets the price of a share must reflect its fundamental value and therefore reflect at all times all relevant information available. Indeed, on the one hand, the observed share price must be very close to its intrinsic value reflected by its economic fundamentals. On the one hand, this assumption assumes that the share prices of the most profitable companies must be higher than the share prices of the least profitable companies. This would allow an optimal allocation of savings towards the most profitable projects and would promote stronger economic growth. On the other hand, the market efficiency hypothesis assumes that the most profitable economies should attract more international capital. The best economic performances achieved by emerging countries coincide with periods of boom in their financial markets. In 30 years, the share of foreign direct investment to developing countries has risen from 15% to 25%. These capital flows have benefited the emerging countries of Asia and Latin America to a much greater extent. Africa attracted only 7% of these capital flows to developing countries1. This influx of capital to these regions to the detriment of African countries, according to some studies, can be explained by the inefficiency of African markets.

Since the seminal work of (Tobin, 1958)) and (Harry, 1959), several studies have been carried out on the theory of financial market efficiency to test its validity. These include the work of (Fama, 1970); (Fama, 1991), (Levy, 1967),(Grossman & Stiglitz, 1980a) etc. These studies have been carried out on different samples of capital markets around the world. The results tend to show that African financial markets in general are inefficient.

The work on testing the efficiency of African financial markets has focused on markets clustered in a given region of Africa (MENA, Sub-Saharan Africa etc...) and has generally not aimed at a global analysis of the African situation, which will be the objective of our paper.

Our work aims, on the one hand, to test the hypothesis of efficiency in the weak sense of 11 African countries using the most recent data (2014-2020). Indeed, the efficiency test should be renewed periodically to update the results, since an inefficient market can become efficient from one period to another if conditions improve. On the other hand, help the different actors in these markets, especially investors, to select their portfolios.

The rest of this study will be presented in the following order: a review of the literature where the definition of efficiency and the components of the tests of the weak form of efficiency will be discussed in the first part, the second part will be devoted to the presentation of the methodology adopted and the results obtained, while the conclusion will be the subject of the last part.

1. Literature Review

The concept of capital market efficiency generally refers to informational efficiency, i.e., the fact that stock prices instantaneously reflect all available information. However, the concept of efficiency is also linked to the concept of investor rationality and the economic efficiency of markets.

1.1. Information Efficiency

In a traditional analysis, financial market efficiency can be understood in relatively different senses. It can be understood in an operational sense, in terms of the cost of operating the markets, or more simply in terms of the conditions of access to them. It is also defined by the quality of capital allocation that emerges from the confrontation between supply and demand for funds. Finally, it is conceived in relation to the role of the financial system in the formation of economic equilibrium, notably in the coordination of investment savings plans.

Naturally, these different approaches are not independent: for example, capital allocation will be all the more efficient the lower the cost of transactions on the markets, and asset prices will be good regulators of individual decisions. There are therefore overlaps or crossing points between the different conceptions of the problem. Regardless of the way in which it is approached, one is particularly led to wonder about the value of markets contained in market prices. And one arrives at the idea that a market is efficient if the prices that form it reflect all the information available.

On the other hand, a market will be efficient if all the information relevant to the valuation of the financial assets traded in it is instantaneously and completely repeated in the prices. It therefore instantaneously incorporates the consequences of past events and accurately reflects the expectations expressed about future events.

Thus, the price of a share is at all times an unbiased estimate of its intrinsic value. It is totally impossible to predict its future variations since all known or anticipated events are already integrated into the current share price; only an unforeseeable event will be able to modify it, and this instantaneously. It should be noted that the incorporation of new information into the price of securities has been facilitated by the numerous technological developments that have taken place on the stock exchanges (computers, Internet, algorithmic trading, electronic order book, etc.).

Since it is by construction impossible to predict the unpredictable, price forecasting is illusory. Competition between investors is such that, quickly, any stock will be quoted at its "fair price" which depends on its characteristics, its "attributes" and its risk: therefore, even the most ignorant of investors can trust the market, and simply choose the attributes and the level of risk of his portfolio that suits him.

1.1.1 Forms of efficiency

1.1.1.1 The weak form of information efficiency

Under the low form of efficiency, the current price of a security fully incorporates the information contained in past price history, i.e., no one can "beat" the market by analyzing past price movements. The low form of efficiency got its name for the following reason: security prices are probably among the easiest pieces of information to obtain. Thus, no one is able to benefit from the use of this information since it is known by all the actors of the financial market. However, many investors conduct detailed studies, analyzing the series of past prices and transaction volumes, in order to detect short-term trends and thus to generate profits. Similarly, the random walk hypothesis suggests that successive price movements should be independent. It implies that future returns cannot be predicted from past returns.

1.1.1.2 The semi-weak form of information efficiency

The semi-strong form of efficiency suggests that the current price fully incorporates all publicly available information. This information includes not only past price history, but also corporate financial publications (annual reports, income statements, etc.), announcements of earnings, dividends, etc., as well as studies by financial analysts. This hypothesis can be empirically tested by studying the reaction of prices to announcements made by companies. In fact, the price of a security should react immediately and correctly to any announcement of relevant information concerning a company. In other words, when the market is efficient, prices should adjust quickly to any new information announced by the company.

1.1.1.3 The strong form of information efficiency

The strong form of efficiency stipulates that the current price fully integrates all existing information, both public and private. Consequently, in a highly efficient market, no investor, including insiders, can beat the market and make abnormal gains. According to the strong form of efficiency, when people with private information make trades that are spottable by other operators, they act as a signal informing the entire market that a particular event is expected.

Indeed, according to the assumption of informational efficiency of financial markets, in its simplest formulation, share prices reflect all available information at all times. In a theoretical model,(Grossman & Stiglitz, 1980b) show that market efficiency can be achieved if information and transaction costs are zero. In a similar but economically more meaningful version, prices reflect all available information to the point where the marginal benefits that can be derived from information exceed the marginal costs of obtaining that information (Jensen, 1978). Of course, information and transaction costs are difficult to measure, but they are not zero and therefore the extreme version of the hypothesis efficiency cannot theoretically be perfectly accurate. The validity of market efficiency is therefore a question that needs to be examined by tests of efficiency.

1.2. Empricial Overview

The methodologies used to test the validity of the informational efficiency hypothesis vary according to the form of efficiency considered.

Empirical tests of the weak version of the informational efficiency of markets are based on the results of the work of Bachelier (1900). This author shows that stock prices evolve like a random walk. He explains this random change in prices by the fact that the only source of market variability is exogenous and comes from the random arrival of unpredictable elements or information shocks (small contingencies) that prices must reflect. The amplitude of price variations, which is the result of these exogenous information shocks, is calibrated according to (Louis, 1900) by Gauss's law. This means that random information shocks are homogeneous and non-hierarchical. Thus, no event is more significant than another, no information has more effect on average than another: "there is no singular event. There are only average events" (Walter, 1996). Tests of the weak form of informational efficiency are based on the analysis of the predictability of stock prices or returns.

The results of most studies on the stock markets of developed countries such as France, the United States, Japan and Great Britain tend to validate the hypothesis of efficiency in the weak sense. On the other hand, the results of tests on the markets of emerging countries have mostly led to the rejection of the random walk hypothesis and show that the markets of emerging countries are not efficient.

(BEKAERT & HARVEY, 1995) and (Jorge L., 1995) have shown that emerging markets are less efficient than developed country markets. Their studies highlighted strong serial correlations of returns in emerging markets in contrast to developed markets. According to these authors, this inefficiency in emerging markets is due to the low frequency of transactions and the poor quality of the economic and political environment.

The work of (Khalid, 2002) on the daily returns of both the general index and most individual stocks on the Moroccan stock market between 1996 and 1998 showed that this market is not informationally efficient. This author used a range of tests, namely the ADF tests of stationarity, autocorrelation, coat hanger, and runs.
(Mlambo & Biekpe, 2007) studied the behavior of the main stock market indices of ten (10) African stock markets (Egypt, Kenya, Zimbabwe, Morocco, Mauritius, Tunisia, Ghana, Namibia, Botswana, and Côte d'Ivoire) over the period 1997-2002 using daily data. Their results indicated that all these markets are inefficient in the weak sense except for Namibia, Kenya and Zimbabwe.

(Lim & Tong, 2009) used several nonlinearity tests (McLeod-Li test, Engle LM test, BDS test, Tsay test, Hinich bicorrelation test and Hinich bispectrum test) to analyze nonlinear serial dependence in five stock markets in the Middle East and Africa (Egypt, Israel, Morocco, Jordan, South Africa). The results of the application of this battery of tests reveal that after removing all short-term linear dependence, stock returns still contain predictable non-linearities that contradict the random walk hypothesis.

(Enowbi et al., 2009) tested the random-walk hypothesis in four African markets, namely Egypt, Morocco, South Africa, and Tunisia between January 2000 and March 2009 using daily data. Their results showed that only the South African stock market is efficient in the weak sense.

(Faycal & Mir, 2015) tested the weak form of efficiency of the Moroccan stock market. On the basis of the main empirical efficiency tests: autocorrelation, unit root test, variance ratio and run test. The time series considered are made up of daily data from 4 indices: Masi (Casablanca Stock Exchange index), BNQ (banking sector index), ASSUR (insurance sector index) and IMMO (real estate sector index) over a period from January 1, 2002 to December 31, 2013. The results show that the Moroccan stock market is inefficient in a weak sense.

(Elhami & Hefnaoui, 2018) studied the behavior of daily and weekly returns of 4 emerging and 4 frontier indices namely TASI (Saudi Arabia), QSI (qatar) EGX 30 (Egypt), DFMGI (United Arab Emirates), MASI (Morocco), BAX (Bahrain), MSI (Oman) and Tunindex (Tunisia) over the period 2010-2017. They used a set of tests (Anderson Darling test of normality, autocorrelation test, run test, unit root test and the variance ratio test) to verify the weak form of informational efficiency. Overall, the results showed that MENA emerging and frontier markets are inefficient in the weak sense.

2. Data and methodology

In the low form of efficiency, all available information includes only historical price and profitability series. Weak form tests (which will be discussed further in the next section) are essentially random walk tests and are designed to determine whether future returns can be predicted from past returns.

Weak form tests are the most numerous since they have been commonly associated with random walk tests. The underlying idea is to determine whether future returns can be predicted from past returns. Recall that the Pt price of a stock follows a logarithmic random walk if it satisfies the following relationship: ln (Pt) = ϕ ln (Pt - 1) + εt , where ϕ = 1 and εt is Gaussian white noise.

Thus, the presence of a root equal to unity (ϕ = 1) and the presence of non-self-correlated price variations (εt white Gaussian noise) are the two fundamental characteristics of a random walk. For this reason, the main random-walk tests are based on unit root tests and autocorrelation tests.

In our study, we selected the main indices from 11 African countries. Referring to the Investising.com website, the Daily Returns were calculated for the period from 04/03 /2014 to 18/12/2020 using the following formula:

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) * 100$$

Daily yield rates were examined using the Anderson-Darling test, autocorrelation test, run test and unit root test. The objective was to verify the existence of the weak form of efficiency in the selected stock markets.

We chose a daily frequency because it seemed more judicious to us to retain a daily frequency insofar as, if the efficiency hypothesis is rejected on daily data, this will be sufficient to reject it at a lower frequency. In other words, if the complete integration of information is not achieved in one day, it cannot logically be achieved in a shorter period of time.

3. Results and discussion

3.1. Descriptive statistics

Table N°1 : Descriptive statistics

	Botswana	Ivory Cost	Ile Maurice	Kenya	Morocco	Niger	South Africa	Tanzania	Tunis	Uganda	Zambie
Mean	-0,015994	-0,041438	-0,015314	-0,060183	0,011382	-0,001192	0,013744	-0,006495	0,024061	-0,010955	-0,024020
Median	0	-0,063530	-0,007735	-0,007735	0,015486	-0,05670	0,039253	0	0,015245	0	0
Max	4,368126	9,999641	10,266604	3,361211	5,305362	1,150469	7,907103	16,37011	2,6777703	16,84748	4,970269
Min	-4,199350	-10,384883	-10,10390	-5,138248	-9,231677	-0,815042	-10,45042	-17,01485	-4,185852	-18,33204	-9,213884
Std.dev	0,322102	1,082362	0,626377	0,697276	0,7087762	0,155002	1,198861	1,627320	0,474328	1,574658	0,600064
Skewness	-1,494875	0,011213	-2,264248	-0,742266	-1,714947	0,417096	-0,645476	0,174916	-1,101298	0,124251	-2,772813
Kurtosis	93,11519	16,07785	123,2017	8,739832	32,80267	8,416958	11,38299	39,37880	13,84129	47,47671	62,43115
Jaque-Berra	561287,1	11879,51	1013430	2450,213	62397,45	2078,971	5023,889	90772,77	8536,352	132542,1	240935,4
Probability	0	0	0	0	0	0	0	0	0	0	0
Sum	-26,50254	-69,07727	-25,74208	-100,6864	18,93890	-1,980492	23,03452	-10,69073	40,27771	-17,61535	-38,98452
Sum Sq. Dev.	171,8099	1951,730	659,1453	812,9158	835,3983	39,88236	2407,422	4356,241	376,4029	3984,632	584,0438

Source: Developed by the authors

The asymmetry coefficient (Skewness) is close to 0 for all the indices studied. As for the flattening coefficient (Kurtosis Coefficient), we notice that the majority of the indices have a coefficient lower than 3, so they are leptokurtic i.e., they indicate a distribution with a less flat peak and thicker extremities compared to the normal distribution.

From the point of view of Jacques Berra statistics, the hypothesis of normality of returns during the study period can be rejected. That is, there is an excessive deviation from the mean. To test the normality of returns we will use the Anderson Darling test

3.2. Anderson Darling Test

The Anderson-Darling test is a variant of the Kolmogorov-Smirnov test, with the difference that it gives more importance to the distribution tails. Concerning the adequacy to the normal distribution, the critical A values criticized for different levels of risk are summarized in the following table, they were produced by simulation and do not depend on the size of the sample:

α	A critique
0,1	0,630
0,05	0,572
0,01	1,035

The hypothesis of normality is rejected when the A statistic takes too high values:

A > A critical

Tableau N°2: Result of Anderson Darling Test

	Value	**Adj.Value**
Botswana	244.1086	244.2193
Coté d'ivoire	36.07287	36.08913
Ile Maurice	161.2617	161.3337
Kenya	13.04380	13.04966
Maroc	41.23917	41.25780
Niger	30.51936	30.53317
South Africa	16.28074	16.28804
Tanzanie	118.5475	118.6016
Tunisie	24.33150	24.34242
Uguanda	110.6999	110.7516
Zambie	228.2130	228.3186

Source: Developed by the authors

According to the table below, we find that the statistical values of the Anderson Darling test are higher than 0.572 for the different stock market indices, which allows us to reject the assumption of normality of returns and subsequently conclude that these African stock markets are not concerned by informational efficiency in the weak sense.

3.3. Runs test

The Runs test, also known as the Geary test(Geary, 1970), is a non-parametric test in which the number of positive and negative yield sequences is tabulated and compared to its sampling distribution under the assumption of random walk. It is capable of testing and investigating serial dependence in (random) stock price movements, which may not be detected by the parametric autocorrelation test. It is a robust test for proving the random walk model because it is independent of the normality and constant variance of the data and ignores the properties of the distribution (Hou and Sun 2014).

A run can be defined as a series of price changes of the same sign preceded and followed by price changes of different signs. Run numbers are calculated as a sequence of price changes of the same sign (such as +, +, - -, 0 0) (Siegel, 1956). The null hypothesis of the test is that successive price changes are independent and random. The null hypothesis of the randomness of the daily return series is rejected if the expected number of races is radically different from the observed number of races.

The test is conducted on Eviews, with time series of daily returns of stock market indices from 11 African countries. The null hypothesis of this test is that the values in the time series are in random order versus the alternative that they are not. In particular, our runs test tests for the number of runs up or down. Too few runs indicate a trend, and too many runs indicate an oscillation.

The Z statistic tests the significance of the difference between the observed and expected number of runs and is able to give the probability of the difference between the actual and expected number of runs. If the Z value is greater than or equal to ±1.96, the null hypothesis can be rejected at a significance level of 5% (Sharma & Kennedy, 1977) .

Table N°3: Result of runs test

	Botswana	**Ivory Cost**	**Ile Maurice**	**Kenya**	**Morocco**	**Niger**	**South Africa**	**Tanzania**	**Tunis**	**Uganda**	**Zambie**
Valeur de testa	0	0,0635299	-0,0077347	-0,0538711	0,015486	-0,0056702	0,0392533	0	0,015245	0	0
Observations< valeur du test	699	833	840	836	832	830	838	799	837	790	567
Observations> valeur du test	958	834	841	837	832	831	838	847	837	818	1056
Nombre total d'observations	1657	1667	1681	1673	1664	1661	1676	1646	1674	1608	1623
Nombre de suite	711	887	661	746	797	629	844	826	731	716	765
Z	-4,95	2,572	-8,807	-4,475	-1,766	-9,94	0,244	0,133	-5,232	-4,429	1,429
Sig Asymptotique (bilatérale)	0	0,01	0	0	0,077	0	0,807	0,894	0	0	0,153

Source: Developed by the authors

By analyzing the Z-statistic for the daily returns of the stock market indices of the 11 African countries we find that 4 stock market indices among 11 stock markets are efficient in the weak sense (the Z-statistic is below the Critical threshold of 1.96 and the probability is above the threshold of 0.05). These countries are: Zambia, South Africa, Morocco, Tanzania.

Therefore, we can accept the null hypothesis that the studied values of the markets are in Random order. Hence the presence of the weak form of market efficiency for the daily returns for which the Z statistic is significant.

3.4. Autocorrelation test

Autocorrelation measures the degree of displacement of two different series with respect to its own time-shifted values (Selier, 2004) . Serial correlation coefficients measure the relationship between the value of a random variable (X) at time (t) and its k-period value earlier. Indicates whether daily or weekly price changes of period t are influenced by previous k-period price changes.

Table N°4: Result of autocorrelation test

	Botswana	**Ivory Cost**	**Ile Maurice**	**Kenya**	**Morocco**	**Niger**	**South Africa**	**Tanzania**	**Tunis**	**Uganda**	**Zambie**
1	-0,209	-0,148	0,277	0,287	0,178	0,370	-0,039	-0,334	0,252	-0,228	0,048
2	0,030	-0,014	-0,007	0,161	0,088	0,109	0,0080	0,020	0,078	0,014	0,092
3	0,035	-0,003	0,081	0,073	0,020	0,012	0,067	-0,068	0,067	0,017	-0,027

4	0,032	0,001	0,136	0,061	-0,053	0,036	-0,011	0,070	-0,002	0,070	0,021
5	0,048	0,068	0,048	0,055	0,012	0,067	0,006	-0,003	0,033	-0,056	0,054
6	0,084	-0,028	-0,018	0,026	-0,007	-0,015	-0,081	-0,048	0,009	0,045	0,003
7	-0,050	-0,06	0,098	0,004	0,054	-0,020	0,068	0,054	-0,025	-0,032	-0,027
8	0,073	-0,008	0,054	-0,003	-0,016	-0,021	-0,064	0,008	0,028	0,020	-0,028
9	0,026	0	-0,005	0	0,064	0,022	-0,033	0,041	0,018	-0,002	0,019
10	0,021	0,018	-0,013	0,068	0,025	-0,001	0,020	-0,091	-0,011	-0,007	0,138
11	0,001	-0,040	0,118	0,044	-0,041	-0,025	0,011	0,049	0,039	0,021	-0,005
12	0,035	-0,001	-0,058	0,020	0,033	-0,022	-0,016	-0,039	0,062	-0,011	0,054
13	0,018	-0,032	-0,154	-0,007	0,039	-0,003	-0,056	0,052	0,043	-0,021	-0,061

14	-0,003	-0,015	-0,082	-0,009	0,046	0,031	0,058	-0,017	0,043	-0,001	-0,053
15	0,027	0,033	-0,054	-0,007	0,035	0,036	0,040	0,007	0,045	0,021	0,060
16	0,010	0,031	-0,154	-0,018	0,013	0,047	-0,049	-0,003	0,032	-0,013	0,017
17	0,025	0,019	-0,131	0,046	-0,004	0,049	-0,046	-0,044	0,057	-0,001	0,051
18	0	0,034	0,161	0,034	-0,002	0,053	-0,036	0,064	0,046	-0,018	0,021
19	0,023	0,002	0,087	0,042	0,018	0,021	0,012	-0,013	0,028	0,027	-0,031
20	0,018	-0,028	-0,040	0,009	-0,003	-0,007	0,013	-0,014	-0,001	-0,014	-0,013

Source: Developed by the authors

Table 4 presents the autocorrelation coefficients for the daily stock market index survey. Autocorrelation was calculated up to 20 laps.

Here we can see that the daily returns show autocorrelations that are not all significantly different 0.This test is one of the best tools to study the weak form of efficiency due to the relationship between the price change of the current period and the previous period (Bizhan, 2009). For a market to be fully efficient, non-significant correlations are to be expected for all observed lags, but the presence of significant autocorrelation coefficients excluded the presence of fully efficient capital markets. Because of the dependence observed in the daily returns, we reject the presence of a weak form of informational efficiency.

3.5. Dickey Fuller Augmented

Augmented Dickey-Fuller tests allow us to verify the presence of a unit root in time series, i.e. it establishes the non-stationary nature of the time series using an autoregressive model(David A & Wayne A, 1981). (Faycal & Mir, 2015) explains that the unit root test can be used to test the efficiency of markets that requires the non-stationarity of securities prices, and this test intervenes to verify whether time series are non-stationary or not. If the test statistic is negative or below the critical value (Mackinnon's tabulated value) then the null hypothesis will be rejected which means that the time series is not stationary.

Table N°5: Result of Stationarity test

Countries	Model 3 (Intercept and Trend)		Model 2 (Intercept)		Model 1 (None)	Process type
	Trend	Unit Root	Intercept	Unit Root	Unit Root	
Kenya	0.982523	0	-2.403868	0	0	Stationary process
Afrique du Sud	-0.219176	0	0.517079	0	0	Stationary process
Maroc	0.224682	0	0.555998	0	0	Stationary process
Tunisie	-0.754030	0	-0.249540	0	0	Stationary process
Uganda	1.390489	0	-0.286978	0	0	Stationary process
Niger	-0.628439	0	-0.281042	0	0	Stationary process
Ile Maurice	0.996148	0	-0.850265	0	0	Stationary process
Coté d'ivoire	1.102723	0	-1.815078	0	0,001	Stationary process
Zambie	1.126778	0	-1.247751	0	0	Stationary process
Tanzania	1.545712	0	-0.272903	0	0	Stationary process
Botswana	3.0606764	0	-1,378093	0	0	Stationary process

Source: Developed by the authors

As we mentioned, the weak form of market efficiency requires that the series of returns or prices be random, meaning that the series must be non-stationary. Since the daily return series of stock market indices for African markets do not contain any unit roots and the data is stationary, we conclude that these markets are not efficient markets in the weak sense.

Conclusion

We examined the long-run behavior of equity prices in African markets using empirical tests of the low informational efficiency of financial markets. We performed autocorrelation tests, run tests, unit root tests, and Anderson-Darling normality tests on the daily returns of the main stock market indices of 11 African countries over the period from 04/03/2014 to 18/12/2020.

On the basis of the three tests in particular, the autocorrelation, unit root (Dickey-Fuller) and normality (Anderson-Darling) tests, we conclude that African markets are inefficient markets in the sense of a weak form of efficiency. However, following the fourth test, that of runs, we found a difference from the other tests. The results admit the presence of random walks in 4 countries, namely Morocco, South Africa, Zambia and Tanzania, which validates the presence of the weak form of informational efficiency in these stock markets.

On the basis of all the results, we find that the series of daily returns of the African stock markets do not follow a random market, which represents a concrete proof of the inefficiency of the markets. These results mean that returns are highly predictable on African stock exchanges and depend fundamentally on their past values. It is therefore possible for speculators to make abnormal gains in these markets based on historical price levels. Observed prices therefore depend more on their past levels and less on available information.

Our empirical observation is consistent with the results obtained by several studies on African markets, namely: Khalid Bakir (2002) and Ahmed MIR and Chiny Faysal (2015) for the Moroccan market, Lim and Tong (2009) and Elhami and Hefnaoui (2018) for the entire sample.

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