Revue du Contrôle de la Comptabilité et de l'Audit
ISSN: 2550-469X
Numéro 8 : Mars 2019

Can we talk about low informational efficiency in the Casablanca Stock Exchange? "Literature review"

Peut-on parler de l'efficience informationnelle faible au sein de la Bourse de Casablanca ? « Revue de littérature »

Nada EL BIJRI

Phd student - LRMFC, FSJES Kenitra,
Laboratoire de recherche en Management, Finance et Comptabilité
IBN TOFAIL University, Morocco.

Driss DAOUI

Full professor (PES) - LRMFC, FSJES Kenitra
Laboratoire de recherche en Management, Finance et Comptabilité
IBN TOFAIL University, Morocco.

Date de soumission : 20/02/2019
Date d'acceptation : 10/03/2019
Pour citer cet article :
EL BIJRI N & DAOUI D. (2019) « Can we talk about low informational efficiency in the Casablanca Stock Exchange? "Literature review" », Revue du contrôle, de la comptabilité et de l'audit « Numéro 8 : Mars 2019 / Volume 3 : numéro 4 » p : 135-151

Abstract:

Several researchers have adopted the informational efficiency of financial markets as a research subject and the basis of a lot of studies. The large number of studies carried out in this field proves the importance of this theme in the academic world. However few studies are devoted to the Moroccan financial market. It is for this reason that we decided to elaborate this work in order to test the informational efficiency of the Casablanca Stock Exchange. Fama classified informational efficiency into three forms (strong, semi-strong and weak). Thus, this work is devoted mainly to its weak form. We set three steps to carry out this study: Present the theory of the informational efficiency of the financial markets, Define all the tests used in the weak form and present the main bases of the Casablanca Stock Exchange

Keywords: Information, The weak form, The Casablanca Stock Exchange, Efficiency, Market.

Résumé :

Plusieurs chercheurs ont adopté l'efficience informationnelle des marchés financiers comme sujet de recherche et base de nombreuses études. Le grand nombre des travaux réalisés dans ce domaine prouvent l'importance de ce thème dans le milieu académique. Cependant rares sont les études consacrées au marché financier marocain. C'est pour cette raison que nous avons décidé d'élaborer ce travail dans le but de tester l'efficience informationnelle de la Bourse de Casablanca. Fama a classifié l'efficience informationnelle selon trois formes (forte, semi-forte et faible). Ainsi, ce travail est consacré principalement à sa forme faible. Nous fixons trois étapes à réaliser pour mener à bord de cette étude : Présenter la théorie de l'efficience informationnelle des marchés financiers, Définir l'ensemble des tests utilisés dans la forme faible et présenter les principales bases de la Bourse de Casablanca.

Keywords: Information, La forme faible, la Bourse de Casablanca, Efficience, Marché.

Introduction:

The informational efficiency of the financial markets is one of the main theories in finance. It was born with (Fama, 1970) and it has developed through its scientific work and research. He is considered as the father of this theory. According to him, "A market is considered efficient when the prices of financial assets reflect all the information available in the market". He dissected after the efficient market into three forms (weak, semi-strong and strong). Each of these forms follows a number of conditions to be respected. Several researches came later to confirm this theory and make it universal.

Morocco, as an emerging country has experienced a remarkable development during the last decade in terms of its international transactions, which has increased its IPOs. The informational efficiency of the Casablanca Stock Exchange has become a hot topic that will attract a large number of researchers. So, can we talk about efficient Moroccan market in the low form?

The purpose of this work is to test the efficiency of the Moroccan stock market in its weak form. We will first present the theoretical foundations of the theory of information efficiency. Then, we will present the foundations of the empirical study namely the Casablanca Stock Exchange. Finally, we concluded our work with a plan for future empirical study.

Our study is mainly based on two hypotheses:

Hyp1: The Casablanca Stock Exchange would be an efficient market in its weak form.

Hyp2: The Casablanca Stock Exchange would be inefficient market in its weak form.

1- The theoretical foundations of informational efficiency:

The hypothesis of market efficiency has been proven through a large number of scientific works performed in this field. It exceeds 300 references, which explains the importance given by academics and finance professionals to this theory. The EMH is based on the Random Walk. It consists in testing the random nature of the price variation. It helps to characterize a series of prices, or all subsequent price changes represent a random departure at previous prices. The random walk is based on if the flow of information is independent, and the information is immediately reflected in the price of the stock, tomorrow's price change will only reflect the information of tomorrow and will not have any connection with today's price changes.

In addition, new information is unpredictable so price changes are inevitably unpredictable and random. As a result, current prices reflect all new information, and even misinformed investors who buy a portfolio diversified by the market price will get a rate of return as generous as that obtained by the experts.

According to (Kendal, 1953): "Changes in stock prices are independent of each other and have the same probability of distribution". The price of actions is mostly random and unpredictable, (Lo & Hasanhodzic, 2010). (Malkiel, 1973) advocates that: "The market and the actions can be random like the turning of a coin". While (Shiller, 2000) states that: "The price of shares describes the random walk through time: the price change is unpredictable because it occurs only in response to new information that, as a result, is unpredictable ".

Efficient markets, according to the economist (Malkiel, 2003): "Do not allow investors to earn above-average returns without accepting above-average risks".

Essentially, the efficient market hypothesis advocates the informational efficiency of the financial market. According to (Fama, 1970): "There are large numbers of rational profit maximizes actively competing with each other to predict future market values of individual securities and where important current information is almost freely available to all participants". Indeed, the stock market is efficient when it fully reflects the information available and can integrate it into the current stock price. (Malkiel, 2003) said that: "The accepted point of view is when the information comes up, the news spreads and integrates into the share price without delay."

The efficient markets hypothesis was considered the prestigious financial model of Eugene Fama in the 1960s. (Karz, 2012) confirms that: "Fama has convincingly argued that in an active market that includes many sophisticated investors, the securities will be valued at an

appropriate price and will reflect all available information. (Fama, 1965) postulates that: "In an efficient market, competition will ensure that the full effects of new information on intrinsic values are reflected instantly in real prices". The information that is rapidly integrated into market prices is public and available. Even the most active investors aren't able to achieve a higher return by exploiting the confidential information available. The market anticipates, therefore the information is integrated at the market price with all objectivity and in an instructive way than the insiders. So, Fama divides the information into three forms namely the strong form, the semi-strong form and the weak form.

- The strong form includes public, personal and confidential information. This form contributes to inventory pricing and, therefore, does not allow investors to gain a competitive advantage in the investment process.
- The semi-strong form differs from the fact that the price reflects all public information i.e. the ads of listed companies etc...
- The weak form is the part where all the prices of the existing actions are integrated into the current prices; we treat the history of each action. Therefore, they can't be used for future forecasts.

This classification of market efficiency has allowed researchers to understand the fundamentals of the efficient market hypothesis (EMH). According to Konstantinidis, Katarachia, Borovas and Voutsa, investors can't exceed the markets and, therefore, they can't achieve high returns because the information is accessible to everyone. Thus, individuals can't be considered as specialized market investors because all investors receive the same information at the same time. On the other hand, any new information can't generate abnormal profits because it is directly accessible to the markets and reflects the price of the stock.

Market efficiency also depends on the investment method used by individual investors. According to the EMH, individuals who tend to invest in stock markets are characterized by rationality. Rational investors are characterized by the expected utility characteristics. There are three types of rationality in the theory of the informational efficiency of markets. The fundamentalist rationality that allows investors to anticipate rationally. The second rationality is financial that maximizes wealth, and the third is the strategic rationality that presumes to take into consideration the opinion of others in decision-making. Rationality focuses on the ability to evaluate and the ability to realize stock market gains to achieve informational market efficiency. (Lucas, 1978) argues that: "In markets where all investors are rational,

prices fully reflect all available information and the weighted prices of marginal services follow martingales". The EMH confirms that the rational attitude of the investor is assumed in all investment shares. Investors can sometimes act to get a quick and easy profit. When this action is irrational and the investment decision is random, the equilibrium price deviates. It is a short-lived project since the irrational actions are balanced against each other. In addition, because of this irrationality, investors receive undervalued returns to those of rational investors. Thus, they lose money and therefore the value of their assets decreases which will impact their status within the stock market.

On the other hand, the involvement of rational investors in arbitrage leads to an efficient and balanced price, which means that the markets are always efficient and thus a maximum benefit. Therefore, these researchers in EMH explain that despite the irrational behavior of investors sometimes, markets are still rational and efficient.

To conclude the discussion on the EMH, it should be emphasized that this theory has developed over the years to correct a set of anomalies found to achieve a suitable model to the theory. It has expanded to include other areas of activity such as forecasting, human resources, dividends and portfolio construction.

2- The practical foundations of low information efficiency:

Validation of the weak form of information efficiency has progressed over time based on a large number of studies in different markets. All of these lead to acceptance or rejection of the hypothesis of the weak form of informational efficiency. The tests of low efficiency started with ideas inspired by the exploitation of the graphs of price variation. This is called the Chartist study to beat the walk and provide greater gains than those obtained by other tests. (Fama & Blume, 1966) were the first to develop direct tests, namely active filter testing, and applied it to the US market. This method involves buying the securities when their price increases by one percent and reselling them once the price drops by the same% or more. (Dumontier, 1989) applied the test on the Paris market by comparing active and passive portfolio management using the moving average.

2-1- The autocorrelation test:

When the time series is stationary, the autocorrelation function decreases very rapidly. This test allows random walk (Random Walk) stock prices. This is done by testing the serial correlation which must be zero.

We have:

$$\hat{e}_k = \frac{\sum_{t=K+1}^{T}(R_t - \bar{R})(R_{t-K} - \bar{R})}{\sum_{t=1}^{T}(R_t - \bar{R})}; 0 \leq K \leq T-1$$

In order to have a random walk, we must first be reassured that $e_1=e_2=e_3=e_4=\ldots=e_k=\ldots=e_T=0$.This means that these series are independent and identically distributed. And so $T\sum_{K=1}^{q}\hat{e}_K^2$is a chi-square law with q degree of freedom (Box Pierce) also called the Portmanteau test.

$$\text{BP (q)} = T\sum_{K=1}^{q}\hat{e}_K^2$$

q: num delay

T: num observation

If BP (q) <x ^ 2 (q) then the random walk is validated.

2-2- The TS and DS process:

This process is particularly relevant to the non-stationarity of time series. According to (Nelson & Plosser,1982), there are two types of processes: TS[1]and DS[2]. TS is a process that explains the existence of stationary fluctuations. The positioning of a TS is linked to a transformation that will remove the deterministic component. As for the DS (d) is a process that can differentiate a series of times to stationarize. These processes have a constant average and a non-constant variance as well as a hope that increases over time. We are talking here about stochastic non-stationarity. By and large, the DS is denoted by order d if the sequences of the d differences are stationary.

It's hard to tell the difference between a DS process and a TS process. It can only be done through unit root tests, such as the Dickey-Fuller test.

2-2-1- The Dickey-Fuller test:

Unit root tests make it possible to understand the stationarity of a series. Many tests have been developed by several researchers namely (Perron, 1988) and (Dolado, Jenkinson& Sosvilla-Rivero,1990).

[1] Trend Stationnary
[2] Differency Stationnary

We will first present the test of (Dickey & Fuller, 1981). This is the first test that detected the unit root. It presents two hypotheses:

H0: The time series is non-stationary (there is at least one unit root).

H1: The time series is stationary (there is no unit root).

It comes in three models:

- The model without constant or trend: $Y_t = \alpha Y_{t-1} + \varepsilon_t$
- The model with constant and without trend: $Y_t = \alpha Y_{t-1} + \mu\,(1-\alpha)\varepsilon_t$
- The model with constant and trend: $Y_t = \alpha Y_{t-1} + \beta\,(1-\alpha) + \gamma\alpha + \gamma(1-\alpha)t + \varepsilon_t$

Assuming that ε_t is a white noise, the DF test models are arbitrary. However, this can be implicated due to heteroscedasticity and autocorrelation. For that, the increased Dickey-Fuller test was born.

2-2-2- The Augmented Dickey-Fuller test:

The goal of DF's correction is the missing of the explanatory variables. This is the cause of the presence of autocorrelation. As a result, DF added explanatory variables by introducing delayed values on the endogenous variable. The models remain the same as before. In this test, the unit root test is not applied to all three models; it is only applied to one of the three. This is called the sequential strategy that goes through three stages:

Step 1: This step allows to estimate the general model with constant and trend. Thus, we test the significance of the trend. If the latter is significant, we keep the model. If not, we go to the next step.

Step 2: we test in this step the significance of the constant. If the constant is significant, we use the test of the unit root. Otherwise, we go to step 3.

Step 3: it is applied only if the constant is not significant. We test the hypothesis of the unit root, two results are possible:

- No rejection of the null hypothesis, the function is not stationary, so we must start all over again.

- Rejection of the null hypothesis, the function is stationary and therefore the procedure is finished.

2-3- The ARMA processes:

(Box & Jenkins, 1970) are the first to introduce the ARMA process. The purpose of this process is to model a time series based on past and present values. We call the autoregressive process of order p, noted AR (p), (Dickey & Fuller, 1981). This is the presentation of an observation Xt based on the past observations until p-th period. Its presentation is in the following form:

$$X_t = \beta_1 X_{t-1} + \beta_2 X_{t-2} + \cdots + \beta_p X_{t-p} + \varepsilon_t$$

Hence the β is the coefficient and each hazard is generated by a white noise process.

We call the moving average process of order q, noted MA (q). Any observation Xt is generated by a weighted average of hazards up to the q-i period. His formula is as follows:

$$X_t = \varepsilon_t - \theta_1 \varepsilon_{t-1} - \theta_2 \varepsilon_{t-2} - \cdots - \theta_q \varepsilon_{t-q}$$

Box and Jenkins were the first to determine the proper process for modeling a time series. They suggested then a methodology divided into four stages; identification, estimation, validation and forecasting.

- The identification:

It makes it possible to identify the parameters p and q of the ARMA process. For this, we base ourselves on the study of autocorrelation and partial autocorrelation functions.

- The estimate:

After the identification of the parameters p and q, the following step makes it possible to estimate the coefficients associated with the autoregressive and moving average terms.

- The validation:

After estimating the coefficients, we have several ARMA processes. It is necessary to validate these models. For this purpose, we applied the tests on the coefficients namely the tests of significativities (tests of student), and the tests on the residues to demonstrate if they are homoscedastic and not auto correlated.

- The prediction:

This step represents the final step in the Box and Jenkins methodology. It allows predicting the proper modeling of the time series while basing on the three previous steps.

3- The foundations of the empirical study: case of the Casablanca Stock Exchange

Several authors have chosen to study informational efficiency in the weaker sense of emerging markets in order to detect the impact of the external environment on the market itself. (Urrutia, 1995), (Harvey, 1995) and (Bekaert & Harvey, 2002) compared the efficiency of the markets of emerging countries and markets of developed countries. They noted that developed markets are more efficient than emerging markets. This comes down to a number of reasons, including the slow pace of adjustments and the low frequency of transactions in financial markets. Other authors have pointed out that this result differs according to the periods of analysis chosen, daily, weekly, monthly or annual periods, as well as the tests used. The study of (Omran & Farrar, 2006) applied on Morocco, Jordan, Egypt, Turkey and Israel as well as the study by (Abdmoulah, 2009) which included eleven Arab countries led to a common result that confirms informational inefficiency in the weak sense with the exception of the index of the stock market of Israel.

(Mambo & Biekpe, 2007) have chosen to apply their study to the markets of ten African countries to test information efficiency in the weak sense. The study period was between January 1997 and May 2002. The result of this study confirmed the inefficiency of the stock markets with the exception of three markets, Namibia, Kenya and Zimbabwe. (Al Khazali, et al, 2007) elaborated their study on the Mena region, tested data from eight stock markets and rejected the random walk hypothesis. (Enowbi, et al, 2009) also confirmed the rejection of the weak efficiency of the stock markets of African countries. According to all these authors, the youth of these stock markets and the low number of transactions are the main causes of the inefficiency of these markets. All of the studies cited above concluded that equity markets in emerging countries including Morocco are inefficient. Few researchers have conducted a specific study on the Moroccan stock market. (Khalid Bakir, 2003) tested the weak efficiency of the Moroccan stock market based on 28 listed securities over a period from January 1996 to December 2000. The result of this study rejected the hypothesis of the informational efficiency in the weak sense of the Casablanca stock market. (Khattab & Moudine, 2014) also developed a study on the MASI index between 2004 and 2012 using the ARIMA model (p, d, q). They also rejected the hypothesis of low efficiency in the Moroccan stock market. (Chiny.

F &Mir. A, 2015) also confirm the same result through their study of four stock indexes over 12 years from January 2002 to December 2013.

In order to conduct a study in the same context, we tried to present the Moroccan stock market as well as all of its foundations. The Casablanca Stock Exchange was created in 1929. It was named the Securities Clearing Office "Office de Compensation des Valeurs Mobilières". The name changed in 1948 and became the Securities Trading Office "Office de Cotation des Valeurs Mobilières". In 1967, the Moroccan stock market experienced the first reform and then began a new adjustment in 1986 to control the debt and inflation of the Moroccan market.

The major reform was initiated in 1993 to establish a program of liberalization, privatization and modernization of the Moroccan stock market. According to the Casablanca Stock Exchange, these reforms are:

- The dahir carrying the law n ° 1.93.211 relating to the stock exchange.
- The dahir carrying the law n ° 1.93.212relatif to the ethical council of the securities and to the information required of the legal persons making public call to the saving.
- The dahir bearing the law n ° 1.93.213 relating to the organizations of collective investment of the securities.

The main goals through these reforms were to create a Securities Ethics Board (CDVM) to protect savers, accredit brokers and specialized intermediaries who are responsible for trades in listed securities, create securities regulators collective investment in securities as well as the Casablanca stock exchange company (SBVC), and finally, oblige listed companies to publish their accounting and financial statements. In October 1998, the Casablanca Stock Exchange set up the central depository (MAROCLEAR) to improve transactions within the Moroccans tock market.

All these reforms applied in the 90s had as objective to make the Moroccan economy healthier. It allowed Morocco to pass to an emerging country according to the international financial community on November 3rd 1996. It is in March 1997 that the Casablanca Stock Exchange has started the electronic trading system. It adopts the system of an order-driven market, it is the orders introduced on the market by the participants which determine the prices at which the assets must be exchanged. In November 1998, the official market and the sale market was replaced by the central market and the block market. The central market allows the comparison of buy and sell orders for securities admitted to official listing without taking into consideration size. The block market allows for direct trading of securities listed

on the stock exchange but which relate to significant volumes of trade. They must respect the conditions of size and price.

- The minimum size of blocks (TMB):

TMB is primarily dependent on the last three months of the daily average exchange traded on the central market, average central market and block market prices, and the average amount traded in the block market.

According to the Casablanca Stock Exchange, the TMB selected depends on two cases, the first is equal to five times the average of securities traded on the central market if the volume corresponding to the latter in the last three months is greater than the average market volume of blocks. The second case is the opposite, the TMB is the quantity obtained by dividing the average volume of the block market by the average market price of blocks during the last three months.

For the new values, the TMB is determined by floating capitalization at the issuer's introduction. The one chosen depends on the highest volume.

V1 = X% * Floating capitalization;
V2 = average TMB * introductory price
If V1> V2, TMB = V1 / introductory course;
If V1 <V2, TMB retained is the average TMB.

- The price conditions:

The price depends on a range that is defined either in relation to the last traded price or the closing price of the previous day. For values traded at fixing, block trades are conducted at a price within the range, including limits, determined on the basis of the last traded price, decreased or increased. For continuously quoted securities, block trades are carried out at a price within the weighted average range, inclusive, defined from the central market, within the limit of the maximum variation applied during a trading session stock Exchange.

Since independence the Moroccan dirham has experienced several changes that have beaten the value of the Moroccan dirham. The Sharifian currency was created in 1959 to replace the franc, but it remains attached to the French currency. It was in 1973 that the Moroccan dirham was linked to eight other currencies, including the US dollar, the Italian lira, the Belgian franc, the Spanish peseta, the pound sterling and other currencies. The advent of the Euro in 1999 made it possible to replace all European currencies by the common currency. It was in

2001 that the government applied the Moroccan dirham basket redistribution to the tune of 20% Dollar and 80% Euro. In 2015, a second reshuffle took effect due to the commercial and financial changes of Morocco abroad. The dollar goes up to 40% and the Euro drops to 60%. With six months late, Morocco has managed to start the process of liberalization of the dirham on January 15, 2018, stage presented as the most important exchange regime that the Casablanca Stock Exchange can know. From Monday, January 15, 2018, the exchange rate system of the currency is partially liberalized. The Moroccan dirham is allowed to fluctuate 2.5% above and below a central rate fixed against a basket of currencies 60% Euro and 40% USD.

With all these reforms and development experienced by the Casablanca Stock Exchange, Morocco operates according to international financial standards. However, the investment decision depends mainly on the relevance of the information in the financial market.

The objective of our work is to study the informational efficiency in the weak sense of the Casablanca Stock Exchange.

History of the creation of stock indexes within the Casablanca Stock Exchange:

In order to develop our study, we will apply our tests on the stock indexes of the Casablanca Stock Exchange. Before starting our study, we will present all the indices of the Casablanca Stock Exchange. The history of index creation starts in 1986 with the creation of the general index of the Casablanca Stock Exchange. It has risen since the stock market reform from 1993 until 1998. But after that, it experienced a stock market depression. In 2002, the Casablanca stock exchange saw the creation of the MASI[3] indices, MADEX[4], and sector indices[5]. In 2004, the Casablanca Stock Exchange adopts floating capitalization in the calculation of indices. This method of calculation makes it possible to establish a certain coherence between the stock market reality and its translation into the indices. The floating capitalization makes it possible to evaluate the weighting of the securities composing each index on the basis of this fraction held by the public and not on total capital.

The formula for calculating the indices is as follows:

$$I = 1000 \frac{\sum_{i=1}^{N} \text{fit. Fit. Qit. Cit}}{\text{Bo. Kt}}$$

[3] Global index composed of all equity-type securities.
[4] Compact index composed of securities listed on a continuous basis.
[5] compact indexes composed of securities belonging to the same sector of activity

Or :

t = calculation time

N = number of sample values

fit = floating factor

Fit = capping factor

Qit = number of total titles of the value i in t

Cit = price of the value i in t

Bo = basic capitalization at 31/12/1991

Kt = adjustment coefficient in t of the base capitalization

Conclusion:

The informational efficiency of a financial market is one of the world's leading theories of finance. Fama has limited the study of informational efficiency in three forms (strong, semi-strong and weak). The objective of this work is to study the weak form of the informational efficiency of the Moroccan stock market. This study will enable us on the one hand to invalidate or confirm its validity and on the other hand to draw all the reasons that explain the results found, the purpose of which is to propose measures to improve this stock market.

We tried to explain in detail the methods to follow to carry out our empirical study and to gather the necessary data to elaborate the tests. We also presented a general illustration on the Casablanca Stock Exchange to understand the context in which we will develop our study while respecting the standards and conditions of each test.

The next work will be devoted to the application of the empirical study of this study in order to provide a clear answer to the informational efficiency of the Moroccan stock market in its weak form and to analyze the retained results. We will adopt the BOX & JENKINS test which is based on the three stages of study (identification, estimation and diagnosis). We will first test the stationarity using the ADF test, then we will identify our parameters using autocorrelation tests, and finally we will apply the Runs test. All of this will be applied using the Eviews statistical software.

Our research methodology has been clear since the beginning of this work. We tried to follow a hypothetic-negative method by putting forward hypotheses and then testing them in order to answer our general problematic

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