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Research Article

The effect of Efficiency and behavioral Finance on the Stock Investment Strategy: the Case of the TSE

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Abstract
In this paper we will study the effect of efficiency and behavioral finance on the stock investment strategy. For this, we will use the recent theory and current literature to analyze our subject. First, we will analyze the main previous work that treated our problem. Secondly, we will utilize sophisticated econometric tools to empirically validate our problem for a sample of 40 financial and non-financial corporations' during the period from 1st January 2003 to 31 December 2013. The results show that the investment strategy is insensitive to efficiency-behavioral finance since the Tunisian financial market is vulnerable and very fragile. Also, the inefficiency of the Tunisian banking and non-banking companies influenced in a straightforward manner the investment strategy and increased the vulnerability of the Tunisian financial system.
Keyword: Efficiency, Behavioral Finance, stock investment strategy,Static Panel Cointegration.
Jel classification: D61, G02, F24, E22

1. Introduction

Financial theory is a branch of the economy that is mainly intended to evaluate the financial assets. This theoriy has considerable autonomy within the discipline of economics. All the work of the financial economy since at least the thesis of Louis Bachelier (2000), was to design a theoretical framework to make sense of the stock chance. This was followed by a prolonged effort on almost a century, characterized by strong commutative results, collective effort that ultimately led, in the early eighties, formalism of both great elegance and of great rigor. From a reduced number of assumptions, neoclassical finance has succeeded in uniting a rich set of results (CAPM formula, Black-Scholes formula, and informational efficiency or Modigliani-Miller theorem) by showing that they could all be rethought in a single evaluation framework whose central operator is the "martingale under the risk neutral probability." This undeniable formal achievement was able to tell some that Neoclassical finance is "the most scientific of all social sciences" (Ross, 2004). If, of course, these theoretical successes play an important role in how the current finance designs its research programs. There is, in fact, that despite its impressive results, the preponderance of this neoclassical finance is now strongly challenged by current research alternatives, solidly represented in the international academic community through what is called the "behavioral finance". Financial research gives rise to an intellectual climate entirely new, not found elsewhere in the economy. Certainly, there is a major controversy on many economic issues but they are always local controversies against the background of a general agreement on the methods and theoretical approaches.

2. Literature Review

The finance market is one of the fields of social sciences which have the greatest number of empirical data. For example, the composite index of "Standard and Poor" traces the evolution of the price of shares listed on the New York Stock Exchange for more than a century. Currently, most exchanges are at the disposal of researchers from computer files containing

the history of their order book (sometimes to the second as the Paris stock market). These data allow the precise description of a wide variety of phenomena. However, as pointed Hamon (1997) testing financial theory requires the definition of complex concepts such as information on the market, the motivations of investors to carry out exchanges and the fundamental value of financial assets. Thus, econometrics must make approximations and additional assumptions about the models tested.

The experiments provide an ideal complement to empirical studies as they meet two basic advantages: the observability and control. They make it possible to directly observe the financial processes in a controlled environment. Thus, the experimental method will create situations where the environment is suitable for testing a given theory, observing otherwise inaccessible economic objects such as the fundamental value of assets or expected returns by investors, modifying market organization, isolating the behavior of individual agents. Any experience in the financial markets relies on these four properties.

The purpose of this literature review is to show how, through observability and control, the experimental method contributes to understanding the effect of efficiency and behavioral finance on the stock market investment strategy. Since Chamberlin (1948), economics (see Smith, 1982, Plott, 1991, and Rabin, 2000) uses this method of research. Marketing or human resources management (see Rasenti, Smith, and Wilson, 2001) have also used this technique. This article highlights the contribution of financial markets to the stock market investment strategy.

The review of the following literature describes the course of the effect of efficiency and behavioral finance on the investment strategy in the stock market. The rest of this review focuses on principles that are particularly important to the topic. Thus, the second paragraph is based on the ability of the experimenter to control the returns expected by investors and to create an environment without information asymmetry. It presents the study of portfolio choice and testing of the Capital Asset Equilibrium Model. The third paragraph concerns the financial markets in the presence of heterogeneous expectations and tests of the theory based on rational expectations; it relies on the ability to control private signals. The microstructure of financial markets is the subject of the fourth paragraph and brings together studies on the influence on price formation of the rules governing trade. These studies often represent in an implicit way game theory tests and are based on the control of market institutions. The fifth paragraph reflects the ability to observe individual behaviors and psychological characteristics (through questionnaires) of the participants. It addresses the issue of the rationality of markets and the influence of psychology on the exchange activity.

2.1 Experimental method: progress, challenges and validity

The organization of an experiment in the financial markets is conducted as follows. An experiment includes several sessions. Participants are usually students. When this is not the case in the studies presented here, the source of the participants will be mentioned.

At the beginning of a session, the rules are explained: they describe the course of the session, the type of financial assets on the market, the rules of the market and the incentive system in place. During each session, a cohort of individuals participates in several replications of the same market game. Each replication contains one or more periods of exchange. During these periods, the agents can exchange one or more financial assets. At the beginning of a replication, each agent receives the initial allocations in cash and securities. At the end of a period, possession of a title is entitled to the payment of a dividend. The successive replications have the same structure but are independent in regard to the value of securities. To introduce the risk, the value of dividends is made uncertain: it is randomly determined at the beginning of each period and not revealed to agents, the law of distribution of potential dividends being chosen by the experimenter and known to all participants. In addition to the risk of information asymmetries can be created: at the beginning of each period, after determining the dividend attached to securities, information is distributed to agents. Two information structures are possible: some agents may receive a perfect signal revealing the final value of the asset or each agent can receive imperfect quality information that does not determine with certainty the value of the asset.

During an experiment, the study of an interest factor can be achieved in two ways. The factor can be changed within the same session. In this case, a same cohort participates in an experiment under different regimes. The order of the variations in a session is randomly determined and independent from one session to another so that the results are not biased by learning phenomena. Bloomfield & O'Hara (1999) used this mode for example. On the other hand, the factor may be modified between sessions. The same cohort participates in one regime only. This kind of experience is particularly directed by Plott & Sunder (1988). The two methods each have a respective interest: the variation of a factor during the sessions requires holding a small number of sessions (and the calling of a small number of participants), while the change by a factor of between sessions allowed participants broad opportunities for learning.

2.2 Risk, portfolio choice and measurement of financial assets or asset pricing

The interaction between risk adverse economic agents in the financial markets allows, through the establishment of the equilibrium price, the exchange of securities and therefore the risk sharing. One of the most utilized theories by finance practitioners explain how financial assets are assessed is the Capital Asset

Equilibrium Model (CAEM) and Capital Asset Pricing Model (CAPM). This model allows determining the expected returns of the securities based on their sensitivity to market risk or systematic risk (as opposed to the individual risk of each title). It is based on the fact that investors, regardless of their risk aversion, choose efficient portfolios in terms of mean - variance. According to this principle, under a given level of risk, investors prefer the portfolio that has the highest expected return (or, for a given yield, investors prefer the portfolio that has the lowest risk). A consequence of CAPM is that only the systematic risk is compensated. An investor who bears individual risk associated with a title is not rewarded since this risk could be diversified. Thus the fundamental relationship of the CAPM indicates that returns in excess of a security relative to the risk-free asset are a linear function of excess market returns. The linear adjustment coefficient called "beta" mainly represents the covariance between the movements of the title and those of the market price. The CAPM also establishes that when agents can borrow or lend to a single risk-free rates, efficient portfolios are composed only of the market portfolio and the risk-free asset: the separation theorem (any other distribution of the portfolio of an agent between the available securities and a riskless asset is dominated in terms of mean - variance).

The calculation of expected returns through the CAPM allows appreciating the attraction of investment projects by comparing them with investment opportunities at an equivalent level of risk. Although this calculation is a practical assessment technique, the empirical validity of the CAPM remains unanswered. In fact Fama & Mc Beth (1973) provided some evidence supporting this model but Fama & French (1992) showed that the coefficient "beta" of the titles do not predict their expected return contrary to the predictions of the CAPM .

2.3 Heterogeneous Expectations and asset pricing

Theoretical models including experimental tests were previously deferred assumed homogeneous expectations regarding the future value of assets. Yet, on the financial markets, operators may have different beliefs about the evolution of prices or future distributions of dividends. Therefore, a more appropriate description of these markets is to assume heterogeneous beliefs. Two situations can be distinguished.

First, the heterogeneity of beliefs can be exogenous to the exchange process. So when investors have private information through their activity or through more or less elaborate financial analysis, their beliefs about the value of the assets will be necessarily different, reflecting the diversity of their private information. On the other hand, even in a situation of symmetric information, the exchange process itself can generate heterogeneous beliefs. In fact, the interaction between agents can lead to different perceptions of the capital gain opportunities available on the market.

The theoretical tool used in situations of heterogeneous beliefs is the hypothesis of rational expectations. It requires that investors form their expectations about the future value of assets taking into account the public and private information they have, and market reactions. Moreover, these expectations have to be adjusted in the sense that they must fully reflect the statistical relationship between the information held by the various stakeholders in the market and the equilibrium price. This hypothesis of rational expectations is used to model the informational role of prices and the notion of informational efficiency of financial markets by anticipating the relationship between information and priciest equilibrium, agents can deduce the underlying information from the observed prices. Roger (1988) clearly exposed this stream of theoretical literature. He also highlighted the difficulty of making empirical tests of its validity. In fact the econometrician finance cannot observe the information held by investors or their beliefs nor the fundamental value of assets. Empirical studies therefore use indirect approaches to discuss the efficiency of financial markets. Shiller (1981) shows that the volatility of the stock price is too high in comparison to the variability of dividends (the expected value of the risk-adjusted dividend s is considered here as the fundamental value of the shares). French & Roll (1986) found that the returns are more volatile during periods of exchange than during periods without exchange, suggesting that the interaction of investors in the marketplace generates its own volatility independently of the fundamentals of the economy.

2.4 The microstructure of financial markets

Market microstructure describes principles and rules that regulate trade. The influence of the market organization on the price formation has been the subject of many theoretical studies. These studies highlight in particular the role of the information that the investors have access to (opaque markets or transparent markets) and the role of the terms of trade (price driven markets or orders driven markets). The mode of organization of exchange becomes important when agents have strategic behavior because it determines the sets of information, the various possible actions as well as the type of operators on the market. Thus, theoretical studies have shown that these characteristics could influence the strategies adopted by investors. Equilibrium prices that reflect the interactions between agents will therefore be influenced by market microstructure.

Many empirical studies attempt to measure the impact of microstructure on price formation. Huang & Stoll (1996) showed that the execution prices are cheaper on the NYSE (auction market) and on the

NASDAQ (counterparty market). By expanding the notion of quality of execution, Battaglio Hatch & Jennings (2011) moderated the significance of this result and found that the execution time obtained on the NYSE is longer than that obtained from a market maker from the NASDAQ. De Jong, Nijman & Röell (1995) compared the transaction costs associated with the exchange of a sample of French titles in London (on a counterparty market) and Paris (on an auction market). They have shown that small-sized orders are cheaper to Paris but London is a more liquid market for high-volume orders.

Jong, Nijman & Röell (1995) confirm that these empirical studies face several limitations. First, they found that it is still difficult to isolate the influence of a single factor. The various markets studied are complex and differ in more than one dimension (types of listed securities, types of stakeholders, degree of market transparency ...). Then, the simultaneous functioning of various institutions creates a problem related to endogeneity of price formation in the various markets. The work of Jong, Nijman and Röell (1995) measured the quality of execution of orders for the same securities in different markets but does not take into account the potential interactions between these markets.

2.5 Rationality, Psychology and Financial Markets

Forsythe, Palfrey & Plott (2012) constructed an experiment to show that financial markets have the ability to reflect the fundamental value of the securities. Nevertheless, their result is based on a simple environment with multiple types of agents but with no uncertainty. Market efficiency is confirmed by Plott & Sunder (2012) in the presence of risk and fully informed agents. However, Plott and Sunder (2012) have shown that the aggregation of information is not effective when each agent only has a flawed or an imperfect signal.

These experimental considerations on the relationship between fundamental value and financial asset prices are related to empirical work on behavioral finance. This literature describes anomalies in the functioning of markets that are not compatible with market efficiency. Grech and Ledyard (2000) observed that the shares that have lost (won) a lot of value tends to have a better (lower) performance than other shares. They identified a potential cause of this phenomenon, which is a psychological one and according to which - in disagreement with the Bayesian rationality- individuals seem to attribute too much weight to recent information compared to long-term trends. However, if these studies attempt to link the alleged anomalies and cognitive biases of investors, the relationship between psychology and financial behavior is still very ambiguous.

In this context, the experimental method is useful because it provides the ability to measure the psychological traits of agents and observe their actions and aggregated market data. It allows to study the transition from individual behavior to market performance and to investigate the origin of "irrationalities". During normal market conditions, participants must understand the rules of the market, evaluate financial assets based on the information they hold or the observation of their competitors. In addition, participants must make decisions in a small period of time. Given the limited cognitive capacity that human beings have, the latter can behave completely irrationally. The question that emerges is one of the links between the rationality of investors and that of the market (prices and allocations).

3. Empirical validation

Our database is extracted on the stock exchange of the security of Tunisia (TSE), the Tunisian Central Bank (BCT) and the National Institute of Statistics (INS). This database contains 40 financial and non-financial Tunisian companies. These companies are: AIR LIQUIDE, TSIE, ALKIMIA, AMEN BANK, ASTREE, ATB, ATL, ATTIJARI BANK ,ATTIJARI LEASING, BH, BIAT, BTE (ADP), CIL, EL MAZRAA, ELECTROSTAR, ICF, CARD, GENERAL STORE, MONOPRIX, PALM BEACH (AA), SIAME, SIMPAR, SIPHAT, SOTETEL, SOTRAPIL, SOTUMAG, SOTUVER, SPDIT-SICAF, STAR, STB, BT, STEG ,BTK,TUNINVEST-SICAR, TUNISAIR, TUNISIE LAIT, TUNISIA LEASING, UBCI and UIB. Hence, we use a sample that includes 40 banking and non-banking companies during a study period from 1 January 2003 to 31 December 2013.

In this article, we will use a two-dimensional linear model (a time dimension and an individual dimension) to identify the impact of the theory of efficiency and behavioral finance on the stock market investment strategy in the financial market of Tunisia during the years 2003-2013 on daily frequencies. To study this impact we will refer to the transaction of each Tunisian society in quantity and value. This individual transaction corresponds to the endogenous variable of our reference model. This model is an extension of the work of Shiller (2003) Skata (2008), Sornette, Woodard & Zhou (2009). In addition, we use eight variables. These latter are classified into two groups: Variables of the efficiency theory and variables of the behavioral finance.

Variables of the theory of efficiency:

 Momentum: it is equal to the price difference for a given time interval. Their formula x day is: $Momentum_{(X\ jours)} = C_t - C_{t-X}$ where C_t is the course of day t.

 Moving averages (MM): It is equal to the previous courses sum divided by either. $MM_X = (P_t + P_{t-1} + P_{t-2} + ... + P_{t-x+1})/X$

 The Relative Strengh Index (RSI): This is calculated as follows:

$$RSI_{(X\ jours)} = 100 - [100/(1+RS)]$$

And RS= increased average for X last days/Drops average for last days

 Stochastic oscillators (Oss Stock): An order stochastic D is calculated as follows: With C is the last closing price is the lowest last x days, Lx is the highest during the last x days. $Oss\,Stock_{(x\ jours)} = 100 * [(C - Lx)/(Hx - Lx)]$

 Variables of the theory of efficiency:

 Feeling investor → 1, $Sent1 = \frac{ADV_t}{DEC_t}$, With ADV_t: is the number of titles that have seen a price increase at t and DEC_t: is the number of titles that have experienced a decline in price at time t.

 Investor Sentiment → 2, $Sent2 = \frac{HI}{LO}$, With HI: is the number of new increases. Where LO: Is the number of new cuts.

 Investor Sentiment → 3, $Sent3 = ARMS_{q_t} = \frac{ADV_t / ADV_{vol_{q,t}}}{DEC_t / DEC_{vol_t}}$ With ADV_t : is the number of titles that have experienced an increase in price at time t. ADV_{vol_t}: Is the volume of trade in quantity of securities that have experienced price increases. DEC_t is the number of titles that have experienced a decline in price at time t. DEC_{vol_t} is the volume of trade in quantity of securities which experienced a decrease in prices.

 Investor Sentiment → 4, $Sent4 = ARMS_t = \frac{ADV_t / ADV_{vol_t}}{DEC_t / DEC_{vol_t}}$

The theoretical model that identifies the impact of efficiency and behavioral finance on the dung beetle investment strategy for the 40 Tunisian financial and non-financial companies during the period from 2003 to 2013 on data daily can be specified by the following linear equation:

$$Y_{it} = \alpha_i + \beta_i Momuntum + \chi_i OssStock_{it} + \delta_i MM_{it} + \phi_i RSI_{it} + \gamma_i Sent1_{it} + \lambda_i Sent2_{it} + \varphi_i Sent3_{it} + \eta_i Sent4_{it} + \varepsilon_{it}$$

The amount or value of transaction corresponds to the endogenous variable of every financial and non-financial company in our sample during the 2003-2013 years.

Empirical validation of this article around three paragraphs. In the first, we will do a descriptive diagnosis for the different components of our basic model. In the second, we estimate this model by appropriate technical and we award between these techniques by an arbitration Haussman test (1978). In the last paragraph, we will study the dynamics of the efficiency and behavioral finance on investment strategy.

3.1 Descriptive Statistics

In this section, we will use the position Indicators, dispersions and forms to study normality, the adjustment and quality of the estimation of each component of our basic model. For this, the table below corresponds to a descriptive analysis of the explanatory variables and endogenous variables during a study period running from 2003 to 2013 on daily frequencies for 40 Tunisian companies.

Table 1 : Position Indicators

Indicators Variables	Averages	Median	Deviation	Jarque & Berra	Sig.
Momentum	-0.00000225	2.3045238473	0.0392212261	7.60575×10^{9}	0.00
Oss-Stock	44.200589784	20.345213	36.538016815	4699.07528	0.00
MM	0.0001002161	-0.17643589	0.0090034184	225819161.5672	0.00
RSI	97.7818970	101.1453278	388.2916798	121205078.684	0.00
Sent1	1.07652067025	0.0987436213	0.6624195733	545295.38230	0.00
Sent2	0.1063443310	0.1345768	0.0896013923	2.24719×10^{9}	0.00
Sent3	1.548925066	1.76435087	5.517126386	945.15897	0.00
Sent4	1.6771723494	2.654980543	4.5637177574	173553354.501	0.00
TURQ	0.0006590985	0.0098657412	0.0098067117	2.16256×10^{12}	0.00
TURVAL	0.002042926	0.1458732	0.0195811638	1.05076×10^{11}	0.00

From this table, we can see that the average for the eight explanatory variables and the transaction of each Tunisian society in value and volume, are very low. Also, the median, which shares the increasing cumulative frequency of each variable of our theoretical model into two equal classified is very low except for Oss-Stock & RSI variables. We will study the estimation quality and adjustment of each component of this model by the indicators of absolute dispersions.

The table below indicates the dispersions criteria for these variables. We note that the quality of estimating these variables, except Oss-Stock & RSI is very good since the variance of each variable above is very low. We find that these variables do not follow the normal distribution since Jarque Berra & statistics are greater than the critical value of chi-square with two degrees of freedom. Also, these variables are asymmetric because the statistics of kurtosis are greater than three and do not have parabolic branches of asymptotic directions to the abscissa axis.

3.2 Static Estimation of the transaction in value and volume

Specification tests show that our theoretical model can be formalized as a panel with individual effects (see table below).

Table 2: Homogeneity tests

	Homogeneity constant	Homogeneity of coefficients
$TURQ_{it}$	44.04 (0,000)	0.45 (0.8636)
$TURVAL_{it}$	45.16 (0.000)	0.75 (0.9124)

We can see from this table, that all the coefficients of the transaction in volume and values are the same for 40 Tunisian companies despite the fact that the invariant effects are heterogeneous between these companies for this transaction. Hence, our reference model is specified as a panel with individual effects.

$$Y_{it} = \alpha_i + \beta Momuntum + \chi OssStock_{it} + \delta MM_{it} + \phi RSI_{it} + \gamma Sent1_{it} + \lambda Sent2_{it} + \varphi Sent3_{it} + \eta Sent4_{it} + \varepsilon_{it}$$

The estimation of the transaction in value and volume for the Tunisian banking and non-banking companies during the period from 2003 to 2013 on daily frequencies, is based on the Within and GLS techniques. The table below will summarize the two estimating procedures in the observation of static relationships described by the linear equation that relates either the transaction value or the transaction volume as a function of the fundamental and behavioral variables.

Table 3: Estimation of the transaction volume and value

			GLS estimation Method	
Variables	**Within Estimation technique**			
	TURQ	**TURVAL**	**TURQ**	**TURVAL**
Momentum	-0,14155	0,44034	-0,4687	-0,13755
Oss-Stock	**0,52449**	**0,17387**	**0,6334**	**0,20425**
MM	**0,0227**	**0,0852**	**0,0238**	**0,0883**
RSI	0,39453	0,16329	0,55328	0,20892
Sent1	**-0,72905**	**-0,22829**	-0,19399	-0,73883
Sent2	**-0,46456**	**-0,16706**	-0,6004	-0,21506
Sent3	-0,87073	**-0,1304**	-0,94443	-0,13253
Sent4	**0,29318**	**0,25278**	**0,30404**	**0,25591**

*The values in bold correspond to significances of the explanatory variables

By referring to the table above, we can see that the estimation of both static relationships from Within and GLS techniques give expected and significant results. But Momentum variable has a negative and non-significant effect on the transaction in volume and value in the TSE. Also, feelings 1 and 2 of investment play a significant negative impact on the value and volume of market transactions in the Tunisian financial market. The other variables have positive and significant signs of the transaction in value and volume. We will use the Haussman test (1978) for arbitration between the two estimation techniques above. The table below will summarize the Haussman test (1978) for the two previous techniques.

Table 4 : Haussman test (1978)

Stat-Haussman of $TURQ_{it}$	$\chi^2(8)$ = 53.32 (0.0002)
Stat-Haussman of $TURVAL_{it}$	$\chi^2(8)$ = 73.09 (0.0000)

The Haussmann specification test (1978) for both static relationships that describe transactions in value and volumes are specified by a panel with fixed individual effects since Haussmann statistics are greater than the critical value of chi-square eight degrees of freedom.

3.3 The linear dynamic efficiency and behavioral finance on the investment strategy

The purpose of this section is to provide an overview of developments in the econometrics of panel of different dynamic relationships (efficiencies - behavioral finance) on the investment strategy. For this, we will apply the unit root tests on the components of our theoretical model, and then we will show the presence of co-integration relationships for this model. The table below indicates the Levin, A and Chu's (2002) homogeneous unit root tests and the Pesaran, Im and Shin's (2003) heterogeneous unit root tests for the fundamental and behavioral explanatory variables as well as the transactions in value or volumes in the Tunisian financial market.

Table 5 : Unit root tests

	Levin and Lin test (2003)			**IPS test (2003)**	
	Model 1	**Model 2**	**Model 3**	**Model 2**	**Model 3**
Momentum	-0.2291			-0.1057	
Oss-Stock		-1.3791		-0.8483	
MM	-0.6971				-0.3936
RSI		-0.448		-0.018	
Sent1	-0.0645				-0.2812
Sent2		-1.5132		-0.5250	
Sent3		-0.3799		-0.9941	
Sent4			-0.0188		-0.9402
TURQ		-0.6230		-0.1749	
TURVAL	-1.7665				-0.6378

T-statistics of the Levin & Lin's test are greater than the critical value of the standard normal threshold of risk of 5% (-1.64). Hence, the above variables are non-stationary in level since there are homogeneous unit roots. But after only one difference these variables become stationary. The Zt bar statistics are greater than the critical value of the normal distribution to the threshold of risk of 5%, that is to say, there will be heterogeneous unit roots for these different variables above, detected from the IPS test (2003). Fundamental and behavioral variables as well as the transactions in volumes and in values are integrated of order one. Therefore we will use the linear cointegration theory on Panel data to study the dynamic adjustment of efficiency and behavioral theory on the stock market investment strategy within the Tunisian financial market for a sample of 40 Tunisian banking and non-banking companies during the years 2003-2013 on daily frequencies.

The study of the existence of the dynamics of behavioral finance-efficiency on the investment strategy is based on the Peter Pedroni's (1999-2000) cointegration test. This test requires stationarity in level of the residues of the transactions in volumes and values. The table below will present the seven tests of Peter Pedroni of residues of impact of efficiency of behavioral theory on the stock market investment strategy.

Table 6 : Peter Pedroni tests

	Rho-stat	v-stat	pp-stat	Adf-stat	Rho-stat*	pp-stat*	Adf-sta*
TURQ	-0.09832	-20.1436	-20.43678	-3.3245	-10.5327	-1.09853	-1.76543
TURVAT	-2.08753	-4.35612	-1.97645	0.4537	-7.6587	-4.98754	-3.2452

*these tests are based on the Between dimension

Under the Within dimension, the residue of the cointegration relationship is stationary based on the statistics above for transaction volumes of financial and non-financial Tunisian companies. Also, under the Between dimension this residue is stable under Rho-stat and Adf-stat statistics. We accept this cointegrating relationship since the offset relative to the target transaction volumes is stationary. However, in the Between dimension, the residue of the cointegration relationship that combines the values of transactions and the explanatory variables is stationary based on the three statistics above. This relationship is stable, while referring to the three Within statistics, despite the non-stationary of the residue level from the ADF-Stat statistics. Finally, we accept these two cointegrating relations since the deviation relative to the equilibrium is stationary for the seven tests of Peter Pedroni.

To estimate the cointegrating vectors we will use the FM-OLS procedure (Fully Modified Ordinary Least Squares) proposed by Philips and Hansen (1990). The table below summarizes the estimates by the technique of FM-OLS of intra-company vectors of the effect of efficiency- behavioral finance on the stock market investment strategy within the Tunisian financial market during the period 2003-2013 on daily frequencies for 40 Tunisian companies.

Table 7: The cointegrating vector stock deal intra-company on the Tunisian financial market

	TURQ		TURVAL	
Variables	**Coefficient**	**T-Statistics**	**Coefficient**	**T-Statistics**
MOMENTUM	-0. 574132	3.992628	-0.123664	-3.235823
OSSSTOCK	0.214526	11.553390	0.121021	10.871861
MM	0.051297	19.034225	0.176355	18.093232
RSI	0.21053	1.561729	0.10321	2.134762
SENT1	-0.142147	-0.576152	-0.132119	0.594059
SENT2	0.132201	1.359616	0.124182	0.891865
SENT3	-0.196325	-5.446322	-0.12532	-5.861979
SENT4	0.1143217	7.582687	0.132113	7.156816

By referring to this table, we notice that the coefficients of the estimated cointegration relationships are very inelastic and significant. Hence, the investment strategy is insensitive to efficiency-behavioral finance since the Tunisian financial market is vulnerable and very fragile. The portfolio investment decision is far from being efficient since the TSE has been very tight in terms of volume and transaction values. Also, the inefficiency of the Tunisian banking and non-banking companies influenced in a straightforward manner the investment strategy and increased the vulnerability of the Tunisian financial system.

4. Conclusion

In this paper we studied the effect of efficiency and behavioral finance on the investment strategy in the Tunis Stock Exchange (TSE). At first, we synthesized the main previous work that treated the impact of this effect on the stock market investment strategy. To do this we have divided this prior work into four parts: the experimental method; risk, portfolio choice and asset pricing; heterogeneous expectations and asset pricing; the microstructure of financial markets and lastly rationality psychology and financial markets.

Using several statistical tools, we analyzed the variables of efficiency, behavioral finance and transaction volumes or values of each company. Forms indicators showed that these variables do not follow the normal distribution since Jarque Berra & statistics are greater than the critical value of chi-square with two degrees of freedom. Hence, the information asymmetry is a dominant character for all the variables mentioned before. We have specified our reference model by a panel with individual effects and we used the Within and GLS procedures to estimate transaction relationships either in value or in volume depending on the variable of efficiency and that of behavioral finance. Given the results of the specification test, we retain the relationships estimated by the within technique since Haussmann statistics (1978) are significant. Therefore, either the volume or the value of transactions is specified by a panel with fixed individual effects.

We have identified the presence of homogeneous and heterogeneous unit roots by applying unit root tests on Panel Data. The variables of our theoretical model are integrated of order one. In addition, we verified the stationarity of residuals using the Within-Between seven tests of Peter Pedroni (1999-2000). Finally, we estimated the cointegrating vectors by the FM method and we generated expected and significant coefficients for the explanatory variables of efficiency. However, the coefficients of the behavioral finance theory are expected and insignificant.

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