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FINANCIAL MARKET ANOMALIES AND BEHAVIORAL BIASES: IMPLICATIONS OF OVERCONFIDENCE BIAS

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Abstract

This research comes within the framework of behavioral finance and aims at explain high levels of trading volume, the excessive volatility, under and overreaction to news caused by the overconfidence of investors. A market anomaly in a notion of neoclassical theory, affected situations where market conditions would not correspond to the theoretical case of perfect competition encompass perfect rationality. We have thus studied the implication of overconfidence in the French market during the period extending from March2000 to December 2012.

The results obtained seem to confirm the overconfidence hypothesis.

First, we found that overconfident investors trade more aggressively in periods subsequent to market gains. Second, the analysis of the relation between return volatility and trading volume showed that the excessive trading of overconfident investors makes a contribution to the observed excessive volatility in its conditional measure. However, the overconfidence can't explain the excessive volatility in its implicit measure, this is due to the incorporation of the risk premium.

Third, we showed that overconfident investors overreact to private information and underreact to public information.

Keywords: Overconfidence, trading volume, excessive volatility, over (under) reaction.

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1. Introduction

According to the rationality hypothesis, agents are supposed to behave rationally in order to maximize their expected utilities. In reality, individuals do not behave rationally in a large number of situations. Cognitive psychology has shown that agents do not properly treat all available information.

At the same time, several anomalies have not been explained by supporters of classical finance. By integrating the human aspect, behavioral finance tries to explain these anomalies. This stream of thinking integrates cognitive biases and investor preferences to explain the effect of their decisions on financial markets.

We propose in this article to find explanations for the anomalies most observed on the financial market in recent years, namely the enigma of excessive volumes, the enigma of excessive volatility and the phenomena of over and under-reaction to information.

Several models of behavioral finance based on the hypothesis of overconfidence have been proposed to contribute to the understanding of these anomalies. It is within this framework is our research whose objective is to explain the anomalies already cited through overconfidence in the French market. Among these anomalies we will focus, in our research work, on the enigma of excessive transaction volumes, the enigma of the excessive volatility of share prices as well as the phenomena of over and under-reactions to information. Since these are the most visible on the financial markets during the last decades.

1.1. Literature Review and Theoretical Framework

The theory of finance has been the subject of many recent renovations to demystify the market and seize the wheels. A panoply of theoretical research combined with a wide range of empirical work led to the genesis of the theory of financial market efficiency (EMH).

The EMH that we owe to Bachelier's work (1900) was a great success from the 1960s. The triumph of this theory lies in the definition of the fundamental principles of the functioning of markets and the behaviour of investors.

The first definition of market efficiency gives by Fama (1965). He predicts "*a financial market is said to be efficient if and only if all available information about each financial asset quoted on that market is immediately included in the price of that asset"*. From this perspective, the observed price must be at the same level as its fundamental value. As a result, the EMH stipulates that investors operating on the financial markets are rational with a normative behaviour aiming at increasing their earnings and the hypertrophy of their wealth.

EMH, a component inherent in the economies of the countries and the functioning of the financial markets, has been questioned in recent years because of its inability to prevent the events that are shaking the biggest financial like the famous Krash of 1987 or the crisis of the 2000s. That is why the economic and financial literature has renounced the hypothesis of the rationality of investors.

Based on the rationality of investors as definite by Mangot, (2008), behavioral finance favors the social psychology underlying investors who are permeable to irrational beliefs and preferences).

Indeed, the proponents of the behavioral approach show that investors subject to psychological bias systematically make mistakes during their perception and processing of information. This explains the

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widening of prices of financial assets to their fundamental values (predicted by the theory), creating certain anomalies on the markets.

Among these anomalies we will focus, in our research work, on the enigma of excessive transaction volumes, the enigma of the excessive volatility of share prices as well as the phenomena of over and under-reactions to information. Since these are the most visible on the financial markets during the last decades.

As such, Daniel, Hirshleifer and Subrahmanyam (1998), Chuang and Lee (2006) and Glaser and Weber (2009) integrate through overconfidence in explaining these phenomena.

In this frame of idea is our work whose objective is to highlight the contribution of the bias of confidence to the explanation of certain anomalies of the financial market namely the excessive volume of transactions, the excessive volatility share prices as well as the phenomena of over and under-reaction to information.

To carry out this study, we will plan it so as to find an answer to our problem:

Can we explain the enigma of excessive transaction volumes, the enigma of the excessive volatility of stock prices and the phenomena of over and under-reaction to information through overconfidence?

However, this study aims to provide information that answers the following questions:

- Try to explain the volume of transactions due to gains in the market.
- Try to understand the effect of the transaction volume component of overconfidence on volatility in its conditional and implicit measure.
- Trying to analyze the asymmetric reaction of over-confident investors to information.

In addition to the introductory in the section I; the rest of papier is organized as follows: section II present the literature review on the subject; section III: an explanation of the Enigma of Excessive volumes by overconfidence; section IV explanation of excessive volatility through overconfidence; section V attempt to explain the asymmetric reaction to information through overconfidence and conclusion.

2. Research Method

2.1. Data

The data used in this study were collected from the website of the Paris Stock Exchange and Yahoo finance. These are the monthly closing prices and the average volumes exchanged.

Operation of models will be shown from the data of the CAC40 index of the French financial market for the period extending from March 2000 until December 2012: with 154 comments.

The use of monthly variables used by Gervais and Odean (2001), Statman, Thorley, & Vorkink (2004), Barber, Lee, Liu, and Odean (2009) is justified by the fact that the change in the level of overconfidence investors will be held on monthly data.

In this section, we will analyze the CAC40 series of returns, the CAC40 trading volume series and the CAC40 index implied volatility series to study their statistical characteristics.

2.2. Specification of variables

The variables we will use are:

- The return of the CAC 40 index noted $\mathbf{R_t}$. It is measured by the following equation:

$$\mathbf{R_t = In\ (P_t / P_{(t-1)})} \qquad (1.1)$$

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Where $\mathbf{R_t}$ is the return on the CAC40 index at time t.

$\mathbf{P_t}$ and $\mathbf{P_{t-1}}$ respectively represent the CAC40 closing price at **t** and **t-1**.

- The trading volume of the CAC40 index noted $\mathbf{V_t}$: This variable defined as the average number of traded CAC40 index in a given month and is calculated in logarithm
- The implied volatility index of CAC40 denoted $VCAC_t$: this variable measures the implied volatility of option prices in a given month.
- The absolute value of the returns of the CAC40 index at time t noted $|R_t|$.
- The average of the absolute values of the deviations, in cross section, of the yields at the instant t denoted MAD_t. It is measured by the following equation:

$$\mathbf{MAD_t} = \sum_{i=1}^{N} [\![\boldsymbol{w_{it}} |\boldsymbol{R_{it}} - \mathbf{R_t}| \qquad (\mathbf{1.2})]\!]$$

Chuang and Lee (2006) use R_t and MAD_t as control variables. Indeed, in order to control the relationship between the volume of transactions and the volatility of securities returns, these authors use the absolute value of returns. In addition, Ross (1989) shows that in a frictionless market, characterized by the lack of arbitrage opportunity, the rate of diffusion of information is revealed from the degree of price volatility. On the basis of this intuition, Bessembinder and al. (1996) use the absolute value of returns as a proxy for the diffusion of common information and MAD_t as a proxy for the diffusion of firm-specific information.

2.3. Normality test

The series are normally distributed if Skewness = 0, Kurtosis = 3 and the probability associated with the Jarque-Bera statistic is greater than 5%.

Where the test hypotheses Jarque-Bera are written as follows:

H_0: Normal Distribution / H_1: Non Normal Distribution

Table 01. The test results are taken of the series.

Series: RT		**Series:VT**		**Series: VCAC**	
Sample 2000M032012M12		**Sample 2000M03 2012M12**		**Sample 2000M032012M12**	
Observation	154	Observation	154	Observation	154
Mean	- 0.003447	Mean	18.59499	Mean	24.51281
Median	0.009675	Median	18.60370	Median	22.38615
Maximum	0.120462	Maximum	19.44031	Maximum	59.30243
Minimum	- 0.145225	Minimum	17.86686	Minimum	11.46117
Std.Dev.	0.052225	Std.Dev	0.327769	Std.Dev.	9.389199
Skewness	- 0.555143	Skewness	0.054325	Skewness	1.386849
Kurtosis	3.157306	Kurtosis	2.294042	Kurtosis	5.109347
Jarque-Bera	8.068831	Jarque-Bera	6.273670	Jarque –Bera	77.91596
Probability	0.017696	Probability	0.046459	Probability	0.000000

The series of returns of the CAC40 the trading volume series of the CAC40 the implied volatility series of the CAC40 Source: Elaboration of CAC40

2.4. Stationarity study

A time series follows a stationary process when its structure remains constant over time, that is, when the series fluctuates around its mean with a constant variance.

To check the stationarity of series observations, we proceed by unit root tests.

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With the Augmented Dickey Fuller test, we will be able to test the stationarity of our series by taking into account the autocorrelation of perturbations ε_t.

"Dickey-Fuller Augmented" tests are performed on the following three autoregressive models:

Model 1: model without constant or deterministic trend:

$$\Delta x_t = \phi x_{t-1} + \sum_{j=1}^{p} \gamma_j \, \Delta x_{t-j} + \varepsilon_t$$

Model 2: model with constant without deterministic trend:

$$\Delta X_t = \phi xt\text{-}1 + \mu + \sum_{j=1}^{p} \gamma_j \, \Delta x_{t-j+} \varepsilon_t$$

Model 3: model with constant and deterministic trend:

$$\Delta X_t = \phi xt\text{-}1 + \mu + \sigma_t + \sum_{j=1}^{p} \gamma_j \, \Delta x_{t-j+} \varepsilon_t$$

Table 02. Results of R_t Augmented Dickey-Fuller Tests.

Rt			
	Model 3: constant & Trend	Model 2: constant	Model 1: none
Level	t-statistic: 10,23216***	t-statistic: -10,22845***	t-statistic: -10,22214***
Results	Stationary	stationary	stationary

***, ** and * indicate test significance at levels of 1%, 5% and 10%

Table 03. Results of Dickey-Augmented Dickey Tests of V_t and $\Delta V_{t.}$

	Model 3: constant & Trend	Model 2: constant	Model 1: None
Level	t-statistic: -2,775722	t-statistic: -1,611344	t-statistic: 0,580951
Results	Non Stationary	Non Stationary	Non Stationary
Difference First	t-statistic: -10,61968***	t-statistic: -10,65904***	t-statistic: -10,68947
Results	Stationary	Stationary	Stationary

***,**and * indicate a significance test at levels of 1%, 5%et 10%

Table 04. Results of $VCAC_t$ Augmented Dickey-Fuller Tests.

VCACt		
	Model 3: constant & Trend	Model 2: constant
Level	t-statistic: -3,459787**	t-statistic: -3,471277** Constante significativement différents de 0
Results	Stationary	Stationary

***, ** and * indicate test significance at levels of 1%, 5% and 10%

3. An Explanation of the Enigma of Excessive Volumes by Overconfidence

In order to identify the origin of the enigma of excessive volumes seen on the French stock market and given the presence of investments on trust in the latter, our objective is then to examine whether the bias of overconfidence helps explain this anomaly.

Indeed, the current trading volume of the market is positively related to delayed market returns. This assumption is justified by the fact that the stock markets increase the overconfidence and overconfident

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investors who are irrational do transactions in an aggressive manner. As a result, we expect a high trading volume as a result of market gains.

This hypothesis is also cited by Gervais and Odean (2001), Chuang and Lee (2006) and Glaser and Weber (2009). They consider that over-confident investments attribute the gains made in the market to their ability to choose stocks and to their information process. The excessive trust of this type of investor contributes to the increase in the volume of their transactions. In this context, there is the first hypothesis which assumes a causal relationship between the current volume of transactions and past market returns.

H1: Over-confident investors increase the volume of their transactions in periods subsequent to market gains.

Table 05. Bivariate causality test between the first difference in trading volume and the return of the CAC40 index.

Dependent variable	**ΔVt**		**Rt**	
Independent Variable	ΔVt-j	Rt-j	ΔVt-j	Rt-j
chi-square test 1 (P-value)	51,57619 (0,0000)	14,52724 (0,0126)	7,070323 (0,2155)	13,13452 (0,0222)
Sum of delayed coefficients	- 1,436116	1,221817	- 0,052428	0,034843
chi-square test 2 (P-value)	23,94260 (0,0000)	4,571521 (0,0325)	0,332339 (0,5643)	0,041864 (0,8379)
Ř2	0 ,339833		0,104760	

4. Explanation of Excessive Volatility Through Overconfidence Test

In order to identify the origin of the excessive volatility detected in the French stock market and given the presence of over-confident investors in the latter, our objective is then to examine whether this excessive volatility in stock market returns is due to the excess exchange of over-confident investors. The assumption we will try to verify is that the intensive trading volumes of over-confident investors increase the volatility of securities on the financial markets. The second hypothesis is:

H2: Excess trading volume of over-confident investors contributes to excessive volatility in securities markets.

Indeed, two relatively distinct categories of volatility, conditional or actual and implicit, are commonly used by stakeholders. The first measure is usually measured by GARCH-type econometric models. The second is based on the price of options, which includes a premium reflecting the evolving nature of risk aversion.

In order to test our hypothesis we will study the effect of overconfidence bias on conditional volatility as well as implicit market volatility.

Chuang and Lee (2006) study, we break down the volume of transactions into two parts. The first component is due to the over-activity of over-confident investors. The second results from the effect of other factors. The proposed model is as follows:

$$\Delta V_t = \alpha + \sum_{j=1}^{p} \beta_J R_{t-j} + \varepsilon_t$$

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$$\Delta V_t = [\ \sum_{j=1}^{p} \beta_j R_{t-j}\ ] + [\ \alpha + \varepsilon_t\ ]$$

ΔV_t = Excès de confiance$_t$ + Non excés de confiance$_t$

To examine the potential effect of overconfidence on the excessive volatility of returns, Chuang and Lee propose to incorporate the two components of transaction volume into a GARCH (p, q) model.

4.1. Excess confidence and conditional volatility

4.1.1. Modelling of the conditional expectation of market returns:

An examination of the temporal dynamics of the CAC40 series of returns yields three main specificities related to the distribution of leptonokurtic non-conditional density to the phenomenon of "clusters" and stationarity of the data. These three characteristics justify the consideration, the conditional nature of the average and the variance of the series of returns.

We can directly apply the test of Box and Jenkins.

A stationary process R_t follows a ARMA moving average autoregressive process *(p, q)* if it verifies the following relation:

$$\mathbf{R_t} = \varphi_{0+}\quad \sum_{i=1}^{p} \varphi_i R_{t-i} + \varepsilon_t + \sum_{i=1}^{p} \Theta_i \varepsilon_{t-i}$$

4.1.2. Excess confidence and conditional volatility of market returns:

In order to study the relationship between excess confidence and conditional volatility, we will examine the effect of the trading volume component of over-confident investor trading on the conditional volatility of market returns, from the asymmetric ARMA-GARCH model.

For this, Chuang & Lee (2006) we have chosen to estimate the following ARMA-EGARCH (1,1) model:

$$\mathbf{R_t} = \varphi_{0+}\quad \mathbf{Rt-1} \sum_{i=1}^{p} \varphi_i R_{t-i} + \varepsilon_t + \sum_{i=1}^{p} \Theta_i \varepsilon_{t-i}$$

$$\eta_t / (\Delta V_t, \eta_{t-1}, \eta_{t-2}, \ldots, R_{t-1}, R_{t-2}, \ldots) \rightarrow \mathrm{GED}(0, h_t)$$

$$\ln h_t = W + f_1 \left(\frac{[\eta_{t-1}] + k\eta_{t-1}}{\sqrt{\eta_{t-1}}}\right) + f_2 \ln h_{t-1} + f_3\, EC_t + f_4\, NEC_t$$

Note, finally, that the distribution of errors generalized. this choice by the ability of such a distribution to better capture the thick distribution tails of yields justify by Nelson (1991) and Chuang and Lee (2006).

4.2. Excess confidence and implicit market volatility

In order to study the relationship between overconfidence and implied volatility, we will examine the effect of the trading volume component of the over-confident investor exchange rate on the implied volatility of the CAC40 index. The proposed model is as follows:

$$\mathbf{VCAC_t} = \alpha_0 + \alpha_1 EC_t + \alpha_2 NEC_t + \varepsilon_t$$

The proposed estimation method is the ordinary least squares method.

4.3. Excess of confidence and conditional volatility

4.3.1. Modeling the conditional expectation of market returns:

We will apply the steps of Box and Jenkins to choose the most appropriate ARMA model.

4.3.2. Identification:

In order to identify the ARMA specification of the R_t series, we analyze the self-correlation coefficients noted (AC), which allow us to identify the delay order q of the MA *(q)* model, as well as the coefficients Partial autocorrelation procedure (PAC) to determine the delay number p of the model AR *(p).*

4.3.3. Estimation:

The second step is the estimation of the three previously identified processes: AR (1), MA (1) and the ARMA process (1,1).

Table 06. -Summary table of AR (1), MA (1) and ARMA (1.1) model estimates on the CAC40 index series.

Model: AR(1)			
	Coefficient	t-statistic	Rule of Decision
C	**- 0,003557**	**- 0,697322**	We retain the model
AR(1)	**0,180995****	**2,260427**	
Model: MA(1)			
	Coefficient	t-statistic	Rule of Decision
C	**- 0,003405**	**- 0,674364**	We retain the model
MA(1)	**0,221540*****	**2,800356**	
Model: ARMA(1,1)			
	Coefficient	t-statistic	Rule of Decision
C	**- 0,003505**	**- 0,719283**	We reject the model
AR(1)	**- 0,224158**	**- 0,651822**	
MA(1)	**0,433026**	**1,361983**	

***,**and* indicate a significance test at levels of 1%, 5%et 10%

4.3.4. Validation:

In this step, we are going to apply two types of residue tests: the Breusch-Godfrey residue autocorrelation test and the White marginal heteroscedity test. Thus, we will determine the appropriate model from the minimization of the selection criteria.

4.3.4.1. Auto-correlation test

The hypothesis tested is that of the autocorrelation of residues. The presence of auto-correlation is a bad specification. The protocol of the test consists of regressing the residues on all the explanatory variables of the model and on the delayed residues respectively of 1^{st} and 2^{nd} periods. If the model is globally significant or if there is a high R_2, then it can be assumed 95% that there is an auto-correlation of rank 1 and/or 2 residuals in the model.

The Breusch-Godfrey test on both AR (1) and MA (1) provides the following results:

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Table 07. Breusch-Godfrey test on AR (1) and MA (1) models.

Model	**AR(1)**	**MA(1)**
F-statistics	1,800099	0,601327
Prob	0,1689	0 ,5494

The results in the table above show that the residuals of the two estimated processes are not auto-correlated since the probability associated with F-statistic> 0.05.

Both models AR (1) and MA (1) are still candidate for the explanation of the dynamics of the R_t series.

4.3.4.2. Marginal Heterosedasticity Test

Perform White's test to test the nul hypothesis of homoscedasticity. If the probability associated with Fisher's statistic (F-statistics) is less than 5%, we say that there is a heterosedasity of residues in the model.

Table 08. White test on the models AR (1) et MA (1).

Model	**AR(1)**	**MA(1)**
F-statistics	0,529543	0,132193
Prob	0,4679	0,8763

The White test shows that the probability associated with the Fisher statistic is greater than 5% for two models. The null hypothesis of homoscedasticity is therefore retained for the two estimated processes.

We therefore just show that the residues of the two processes estimated are white noises since they are not self-correlated and homoscedasticity.

4.3.5. Choice of model:

In order to separate the two processes, compare them by means of the choice criteria of the models. The results are given in the following table:

Table 09. Model Selection criteria.

Model	**AR(1)**	**MA(1)**
Akaike	- 3,074479	- 3,087502
Schwartz	- 3,034865	- 3,048061
Hanna-Quinn	-3,058387	- 3,071481

Thus, all the criteria lead us to choose the MA (1) process to present the dynamics of the R_t series.

Before proceeding to the estimation of the MA (1) -EGARCH (1,1) model, the presence of a condition to do this test we need, first of all, to determine the number of delays to remember. In view of the correlograms of the squared residuals of the model MA (1), a number of delays equal to 9 are chosen heterosedasticity in the MA (1) process must be verified while using the ARCH test.

The test statistic is given by TR^2 = 14.21203> 5.99, so we accept the alternative hypothesis of conditional heteroscedasticity presence of errors in the MA (1) model.

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4.4. Excess confidence and conditional volatility of market returns

Table 10. Effect of overconfidence on conditional volatility of returns.

Model: MA(1)-EGARCH(1,1)			
Variable	Coefficient	z-statistic	Prob
W	**- 1,073576**	**- 9,987873**	**0,0000**
f_1	**0,048311**	**1,249881**	**0,2113**
K	**- 0,362378**	**- 7,340570**	**0,0000**
f_2	**0,826359**	**59,08857**	**0,0000**
f_3	**3,063452**	**2,341568**	**0,0192**
f_4	**1,052301**	**6,709616**	**0,0000**
Logarithm-likelihood	254,0122		
chi-square	56,33608	0,0000	

Source: Estimation method ML-ARCH (Berndt-Hall-Hall-Hausman) - Residue Distribution: GED

The estimated MA (1) -EGARCH (1,1) model is written as follows:

$R= -0,004948-0,076606\varepsilon_{t-1} +\varepsilon_t$

$\eta_t / (\Delta V_t ,\eta_{t-1}, \eta_{t-2} ,\ldots, R_{t-1}, R_{t-2} ,\ldots) \rightarrow GED(0,h_t)$

$\ln h_t = - 1,073576 + 0,048311([\eta_{t-1}]-0,362378\eta_{t-1} / \sqrt{\eta_{t-1}}) + 0,0826359 \ln h_{t-1} + 3,063452\ EC_t +1,052301\ NEC_t$.

In view of the results set out in Table 9, it appears that the effect of the bias of overconfidence is indeed present on the French market. Indeed, the positive sign of the coefficient f 3 and its statistical significance at the 5% threshold implies that the conditional volatility increases synchronously with the volume of transactions linked to the excessive trust of the players in the market.

Finally, the positive sign of f2 and its statistical significance implies that volatility has a long memory.

These results confirm our initial hypothesis that excess investor confidence contributes to the excessive volatility of returns observed on the French market. And they are consistent with those found by Chuang and Lee (2006).

4.5. Excess confidence and implicit market volatility

Table 11. - Effect of overconfidence on the implied volatility of the CAC40 index.

Dependent variable :$VCAC_t$			
Variable	**Coefficient**	**t-statistic**	**Prob**
α_0	24,24412***	33,67681	0,0000
EC_t	- 92,77273***	- 4,774663	0,0000
NEC_t	0,140182	0,039153	0,9688
R^2	**0,132705**		

Estimation Method: Ordinary Least Squares Method : ***, ** and * indicate test significance at levels of 1%, 5% and 10%

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In view of the results presented in the table above, it can be seen that the excess confidence bias has no effect on the excessive volatility of stock market returns.

Indeed, the sensitivity coefficient associated with excess confidence is negative and is significantly different from zero. Implying that implied volatility decreases synchronously with the volume of transactions associated with the behaviour of over-confident investors.

Regarding the effect of the non-overconfident variable on the implied volatility of the CAC40 index, the non-significance of the coefficient reinforces the absence of a relationship between excessive volatility and the volume of transactions.

5. Attempt to Explain the Asymmetric Reaction to Information Through Overconfidence

In order to have an explanation of the presence of an asymmetric response to the information on the French stock market and given the presence of investors over-confident in it. Our goal is then to consider whether this asymmetry is due to the bias of overconfidence. The third hypothesis is as follows:

H3: Over-confident investors over-react to private information and under-react to public information.

The hypothesis that overconfidence affects the asymmetric response to the information on the market has been at the heart of much research in behavioral finance such as the work of Hirshleifer and Subrahmanyam (1998), Odean (1998) and Chuang and Lee (2006).

The methodology within our article to test this hypothesis stems from that of Chuang and Lee (2006). Thus, Daniel, Hirshleifer and Subrahmanyam (1998) and Odean (1998) find that the volume of excessive transactions is mainly due to investors' over-reaction to their private information.

Based on these results, Chuang and Lee (2006) consider the impact on the private information has a current effect that the volume of transactions and the impact on public information does not have the same effect.

To identify each type of information (public and private) present on the French market, we use an auto-regressive vector following VAR model:

$$\Delta V_t = \alpha_{11} + \sum_{j=1}^{p} \beta_{11j} \Delta V_{t-j} + \sum_{j=1}^{p} \beta_{12j} R_{t-j} + \varepsilon_{1t}^{private}$$

$$R_t = \alpha_{21} + \sum_{j=1}^{p} \beta_{21j} \Delta V_{t-j} + \sum_{j=1}^{p} \beta_{22j} R_{t-j} + \varepsilon_{2t}^{public}$$

The estimated BVAR model can then study the impact of shocks to private and public information on returns. As the series returns to CAC40 index (R_t) and serial trading volume of the CAC40 index (V_t) are not part of the same order it is unnecessary interest checking a possible co-integration. And as there is no co-integration relationship; it then goes directly to the VAR modelling.

The first step consists in determining the order p of the VAR process to remember.

For each model, we calculated the information criteria Akaike, Schwartz and Hannan-Quinn and the LR test (see Table1) that these criteria lead us retaining a VAR process (2).

In addition, confident investors buy stocks that have risen, believing that they are not sufficiently valued relative to the private information they hold. This creates price overreactions that remove the value of the market from its fundamental value. The correction comes later and the prices of the securities tend towards equilibrium.

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However, when public information becomes very important that it can not be neglected, it will therefore weaken bias in the behaviour of informed investors.

These results confirm our initial hypothesis that investors over-confident overreact to private information and under-react to public information on the French financial market. And are consistent with those found by Chuang and Lee (2006).

6. Conclusion and Discussion

In this survey, we have tried to find explanations for the anomalies most noted in the French financial market: the enigma of excessive volumes, the enigma of excessive volatility and the phenomena of over and under-reactions to information, through overconfidence.

The empirical approach focused on the CAC40 index in the period from March 2000 until December 2012.

The econometric validation of our research hypotheses allowed us to detect the following findings:

- Empirical modelling shows a positive and significant relationship between delayed market returns and trading volume. Market gains led investors on-confident aggressive behaviour about their future trading activities. Where confirmation of H1.
- The existence of a positive effect of excess confidence bias on conditional volatility implies that the latter increases synchronously with the volume of transactions linked to excessive market confidence. While the negative effect on implied volatility through overconfidence leads to an opposite phenomenon. Such a result is justified by the incorporation of risk premium to measure the implied volatility which increases the uncertainty on the market. Therefore, hypothesis H2 was confirmed subject to conditional volatility.
- The study of the impulse responses of shock yields on private and public information has shown that private information stimulates an over-reaction of over-confident investors, however these latter under-react with respect to public information. This synthesis detected following an econometric validation allowed us to confirm H3.

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