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# What Does Matter in Economy Today: When Human Psychology Drives Financial Markets

*Abderrazak Dhaoui* \*

<sup>1</sup>University of Sousse, Faculty of Economic Sciences and Management, Tunisia

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## ABSTRACT

This paper provides the first evidence for empirical tests of the impact of rational expectations as well as behavioral biases, including among other animal spirits such as defined by Akerlof and Shiller on the variability of trading. Using a daily data for five international capital markets in developed countries, strong evidence is found. The hypothesis of rationality fails to determine the investors' trading behavior. The economy is, however, driven by behavioral biases, including more especially animal spirits summarized in investors' sentiments and beliefs.

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## 1. Introduction

During the last five decades, a point of view commonly shared by many authors is that it becomes more difficult to understand how the economy really works (Akerlof and Shiller, 2009; Dhaoui et al. (2013); Dhaoui (2013).

The efficient market and the rational expectation hypotheses loss of significance and fail in explaining the return and trading volume behavior in the major international markets in both developed and emerging countries. The authors attribute the dysfunction of economies and markets to human psychology, sentiments and feelings (Keynes, 1936); Akerlof and Shiller (2009); Dhaoui (2013). Variables such as overconfidence, (Daniel, Hirshleifer and Subrahmanyam, 2001) optimism, (Haruvy, Stahl and Wilson (1999), Weinstein (1980), Otten (1989), pessimism (De Bondt and Thaler (1985); Barberis Shleifer and Vishny (1998) or more largely animal spirits (Akerlof and Shiller, 2009) are particularly suggested to explain the disruption of evolution of the trading volumes and of the returns.

In this regard, Akerlof and Shiller (2009), attribute the economic dysfunction to human psychology and introduce the “animal spirits” as one of the factors influencing the economies and markets. To define the “animal spirits”, the authors enlarge the definition given by Keynes (1936) in his General Theory and introduce confidence, fairness, corruption and association behavior, money illusion, and stories as items of animal spirits. For Keynes (1936) the animal spirit is defined as “a spontaneous urge to action rather than inaction”.

\*Abderrazak Dhaoui. Tel.: +21622622821; fax: +0-000-000-0000.

E-mail address: [abderrazak.dhaoui@fsegs.rnu.tn](mailto:abderrazak.dhaoui@fsegs.rnu.tn)

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The main aim of this paper is to provide comprehensive empirical evidence on various implications of the psychological influences by focusing on investor behavior. Our focus on investor behavior is motivated in part by the argument of Odean (1998), Daniel, Hirshleifer and Subrahmanyam (1998), Gervais and Odean (2001) that investor behavior should be observed in market level data, and in part by that of Daniel et al. (2001), Haruvy et al., (1999) Weinstein (1980), Otten (1989), De Bondt and Thaler (1995), Barberis et al. (1998), Keynes (1936), and Akerlof and Shiller (2009) that investor beliefs and sentiments matter when making a decision in economic worlds. In this way, we provide the first evidence for empirical tests of the impact of departures and deviations from the rationality in the financial market working based on incorporating sentiments and beliefs as human psychological factors to supervise the changes in trading volume.

To empirically explore the psychological influences that can contribute to explain the variances in trading volume in most of international Stock markets, we investigate the impact of both the rational expectation and the behavioral biases with an extension to Keynes (1936) and Akerlof and Shiller (2009) on the trading volume. Expected results can give ideas about the factors likely influencing the investors' trading behavior in the major Stock Markets. The relation between these independent variables and the trading volume as a dependent variable serves to understand the factors approximately influencing the way the economy works.

In this order one question remains of a great importance, that is: How does human psychology drive economies and markets? Or in other words, in which way did the financial markets be sensitive to the investors' beliefs and sentiments?

To find some answers to this question we investigate the specific influence of the factors describing the Rational Expectation as well as the behavioral biases, including animal spirits' behavior (e.g. Overconfidence, Optimism, Pessimism and Spontaneous Reactions) on the trading volume such as considered as a financial proxy for the economy works.

In order to do this, we used a sample, including daily data for five international Stock Markets (Japan, U.S., France, U.K. and Switzerland) over the period from June 10, 2002 to November 17, 2011. Our results show that the economy is driven by non-rational expectation. Behavioral and animal spirits' biases influence significantly the evolution of trading volume in the major international Stock Markets. The presence of rational investors is, however, without impact on the process of trading in all the markets.

The remainders of this paper proceed as follows: in section 2, we present an overview of the literature on the rational expectation hypothesis and the behavioral biases, including animal spirits. Section 3 describes the methodology and the data framework of this study. In section 4, we present and discuss the principal results. Section 5 concludes.

## 2. Literature Review

For several decades, the financial and economic literature considers that investors trade rationally and that even they behave irrationally (i.e. they would trade in a random way) the deviation from the equilibrium state caused by irrational trading can be cancelled out by an opposite irrational trading of other irrational investors. This supposes naturally that markets are efficient and all isolated rare events cannot influence significantly the decision-making process. This normally induces less volatility of returns and trading on the major markets. The Efficient Markets Hypothesis (hereafter EMH) has known an impressive theoretical and empirical success since about the first decade after its conception in the mid-1960s. Especially, Michael Jensen (1978, p. 95), argues in this field that "there is no other preposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis". In spite of this success, the EMH has been, however, subject to serious challenges and critics particularly when observations have shown and confirmed the non-regular and supported the non-understandable function of economies and markets.

The incorporation of psychological factors into macro-economic models seems to confirm however the predictions of the behavioral finance theory according to which investors cannot behave totally rationally over the full time, and the economy is for the major cases driven by human psychology (Akerlof and Shiller, 2009).

Posner argues that economists have failed to understand how the economy works. The hypothesis of rationality largely associated with the efficient-market hypothesis loses its significance by failing to explain the variability between the stock prices as observed in international markets and their fundamental values and/or the excess in trading volume during about the five last decades (see, Lavoie, 2010).

The efficient markets hypothesis asserts that asset prices aggregate and reflect all relevant fundamental information. They provide, consequently, proper signals for resource allocation. The challenge of the efficient market and rationality hypotheses dressed by many authors has incited many authors to examine if human psychology may explain the way the economy really works.

The first work in the field has been realized by Keynes in 1936 who argued that about all of investors' decisions breaks with the foundation of rationality, and attributes the dysfunction of the economy to psychological factors and irrational behavior. This challenge has been confirmed more recently when Akerlof and Shiller (2009) have explained the way the economy works in terms of human psychologies' impacts. In the same framework, several authors such as Akerlof and Yellen questioned in 1985 if small deviations from rationality do not really matter. Fifteen years later, Shleifer (2000), pursued the same logic and questioned if the arbitrageurs succeed to drive irrationality out of the marketplace. Taken together these thoughts tend toward the same conclusions that the economy is driven in the major part by human psychology and irrational investors' behavior.

In the same line, Allais (1953), and Ellsberg (1961), demonstrated preferences that violate expected-utility theory. In 1986, Tversky and Kahneman (1986) articulated a direct challenge to the rationality assumption itself, based on experimental demonstrations in which preferences were affected predictably by the framing of decision problems, or by the procedure used to elicit performance. They argued that the demonstrated susceptibility of people to framing effects violates a fundamental assumption of invariance, which has also been labeled extensionality (Arrow, 1982) and consequentialism (Hammond, 1989).

Based on the aforementioned studies it is clearly documented that investors' beliefs and sentiments really matter in making decision in financial markets (trading behavior) and that investors are not fully rational. Departures from rationality are not however only random, they are in the major cases systematic. In this line, Shleifer (2000) notes, "investors' deviations from maxims of economic rationality turn out to be highly pervasive and systematic". One most problem can take place here which is, if we challenge the EMH and support the predictions of the behavioral finance, how we can

explain the equilibrium observed in the financial markets. Shleifer (2000) proposed a response to this question: “the irrational investors in the market trade randomly. When there are large numbers of such investors, and when their trading strategies are uncorrelated, their trades are likely to cancel each other out.”

Akerlof and Shiller (2009), in their recent work, substitute the investors’ behavior bias with the hypothesis of rationality in order to explain the volatility in stock returns and trading volume. They consider that the dysfunction of the economy, and more specifically financial markets, is due to the failure of the investors to expect rationally the future incomes and the behavior of stock returns. They, accordingly, attribute the dysfunction of the economy, especially, to what they call the “Animal Spirits” bias as an extension to the General Theory developed by Keynes (1936). In this sense, they argue that “it is necessary to incorporate animal spirits into macroeconomic theory in order to know how the economy really works”. This incites to introduce beliefs and sentiments, which are largely excluded from theoretical and empirical models, to explain the way in which the economy really works. Akerlof and Shiller (2009) argue in the specific framework of behavior explanation that “the current crisis bears witness to the role of such changes in thinking. It was caused precisely by our changing confidence, temptations, envy, resentment, and illusions”.

The “animal spirits” phenomenon can be comprehended as a non-rational behavior driven by investors. In the sense of Keynes (1936), argues that, “most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the results of animal spirits and not at the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities”. In this particular framework, Keynes defines the animal spirits as “a spontaneous urge to action rather than inaction”. Akerlof and Shiller (2009), enlarge, however, this same definition to incorporate optimism and pessimism. Accordingly, animal spirits include, in the sense of these authors, spontaneous behavior as well as optimistic and pessimistic beliefs.

Previous literature (De Bondt and Thaler, 1985, 1987, Barberis et al., 1998, Daniel et al., 2001) relates the volatility in stock prices and the price anomalies to the presence of under-reactions and overreactions. Under-reactions and overreactions are driven by pessimistic, optimistic, as well as overconfident investors. In this same line, earlier studies such as that of Ciccone (2003) document that investor sentiments and behaviors play a pivotal role in the stock market. The investor optimism and pessimism are especially reflected in stock prices. Optimistic investors in the sense of Haruvy, et al. (1999) are “those who tend to choose the strategy which can potentially give them the highest payoff”. These authors define optimistic investors as “those who are motivated by worst-case scenarios and hence tend to choose a secure action”. According to Weinstein (1980, 1986, 1989) and Otten (1989) optimistic investors believe that positive events are more likely to happen to them than to others and similarly that negative events are less likely to occur for them than for others. By extension, pessimistic investors consider that they are more likely exposed to negative events and less likely to positive events than the others. These beliefs induce an increase in trading driven by the optimistic investors and oppositely a decrease in trading driven by pessimistic investors. In terms of trading strategies, Chen (2013), concludes that optimistic agents trade aggressively while pessimistic ones trade conservatively.

King (2009), agrees with Akerlof and Shiller (2009), about the pivotal role that plays the “non-rational” behavior of investors such as the sentiments of optimism or pessimism or more specifically that of what they call more largely “animal spirits”. He concludes that behavior biases are able to explain a major part of fluctuations in the economic sphere.

Optimistic as well as overconfident investors are more prone to risky investments. They trade irrationally, and their irrational reaction can induce abnormal volatility in trading volumes and, consequently, in stock returns. Empirical investigations show that irrational investor behaviors did not only exist in international stock markets, but their reactions have also shown significant influences on the variability of prices (Chuang, 2010).

In the same line, Grauwe and Kaltwasser (2012), examine the impact of animal spirits on trading strategy in the foreign exchange market. When traders do not have information about the true value of the fundamental exchange rate they need to depend on beliefs about it in order to take positions in the market. The authors show that in a world in which there are only optimistic and pessimistic traders, the animal spirits can produce complex dynamics in the foreign exchange market.

Specifically, optimistic investors’ underestimate their exposure to risk and exaggerate their reaction since they expect only positive results and neglect the failure. In this vein, Shu (2010), being aware of the characteristics assigned to each type of sentiment. He argues that optimistic investors are less patient than those who are more pessimistic and react aggressively by underestimating their exposure to risk. Oppositely, the pessimistic investors display a high-level of risk aversion. They become more and more receding when they make a decision like an investment in risky assets which leads to a decrease in trading volume.

Chuang, et al. (2010), use a weekly data during the period between January 1990 and December 2004 to supervise the change in investor sentiments in Taiwan Stock Market. They find that the change in trading volume can be used as a proxy for investor sentiments. They argue that a positive deviation of trading volume implies that investor sentiment jumps to become more optimistic and vice-versa.

In the French stock market framework, Rousseau, Germain and Vanhems (2008), argue that pessimistic investors decrease their trading volume and avoid risky assets to prevent a loss. Psychological literature assimilates the pessimism to a statement of impotence or to an absurdity of human existence.

Carver (2010), suggests that optimism and pessimism sentiments focus on expectancies for the future and the way that the investors confront problems. They find that optimistic investor faces adversity differently than pessimistic one. They presume that optimistic investor uses more adaptive ways and “commit” himself to cope with the worst scenarios. In contrast, pessimism refers to fear, doubt and stress. Then, pessimistic investor tends to be hesitant and doubtful in the face of different challenges. The pessimistic investors have more aversion to risk and decrease their trading once they realize negative results. However, they don’t increase their trading when they realize an abnormal gain. In opposition, optimistic and overconfident investors increase their trading after abnormal gain, but they maintain normal trading when losses occur.

The spontaneous behavior also may play a pivotal role in explaining the volatility of trading volume and consequently, the stock returns. Without animal spirits (considered in its restrictive definition – a spontaneous urge to action rather than inaction- as well as its largest definition adopted in Akerlof and Shiller (2009), including optimistic and pessimistic beliefs) and considering only the hypothesis of absolute rationality, investors should, according to Pirosca “probably react very shy and doubtful or even they would not react at all”. In this sense and according to the Keynes (1936) General Theory, the preferred action taken by people is to react rather than not react in real-life situation. Here, we understand that, in the framework of economic life, the financial markets are driven by human sentiments and feelings such as optimism, pessimism and overconfidence.

Overconfident investors overweigh the precision of their own information and ignore the public available information (Daniel, et al., 1998). They also overestimate their judgment skills and underestimate the skills of others. As a result, they overreact to private information and under-react to public information (Odean, 1998). This asymmetric response of overconfident investors leads them to underestimate their exposition to risks and to act aggressively, which increases their trading volume.

The argument that overconfidence influences trading volume is shared by several authors such as De Long, Shleifer, Summers, and Waldmann (1991), Kyle and Wang (1997), Benos (1998), Odean (1998), Wang (1998, 2001), Daniel, Hirshleifer, and Subrahmanyam, Hirshleifer (1998), and Luo Scheinkman and Xiong (2003). Particularly, Gervais and Odean (2001) developed a model predicting that overconfident investors attribute market gain to the precision of their private information, their judgment skills and their ability to pick winning stocks, and the process of wealth accumulation leads them to overreact following market gains. For De Bondt and Thaler (1995) the overconfidence is considered as the important behavioral factor that determines the trading puzzle. In this regard, they argued, “the key behavioral factor needed to understand the trading puzzle is overconfidence”.

### 3. Data and behavioral indices

In this section, we illustrate the proxies who represent rationality, spontaneous behavior, optimism, pessimism and overconfidence and specify the model suitable for describing their impacts on trading volume.

The sample includes daily data sets covering the period spanning June 10, 2002 to November 17, 2011 with a sample of 3448 trading and non-trading days. Different markets in developed countries are considered to investigate the relationship between trading volume, on the one hand, and on the other hand, rational expectation and the proxy of animal spirits and investors’ sentiment. Five international markets are considered, which are the U.S. Stock Market (NASDAQ), the Japanese Stock Market (Nikkei 225), the U.K stock Market (FTSE100), The French Stock Market (CAC40) and the Swiss Stock Market (SMI). Data is available online on the Yahoo Finance pages and on the website of each Stock Market. The starting date of the sample period is determined by the availability of daily data serving to compute our variables for each country.

The remainder of this section presents the variables specifications and the estimated model. The proxies used are inspired from the work of Dhaoui (2013), who specified for the first time the psychological proxies describing the “animal spirits” and human psychological variables affecting the investors behavior theoretically inspired from the work of Keynes (1936), and Akerlof and Shiller (2009).

Rational expectation hypothesis asserts that investors are able to forecast the future evolution of returns considering the current state of the stock prices. Rational expectation investor formulates his expectation however based on current information while taking into account at the same time the forecast error he has committed over the last forecast period. Accordingly, the rational expectation proxy used in this study includes the previous realized returns (at the time (t-1) augmented by the error term at a previous date (the date (t-1)). Expected returns are done by the following relation:

$R_t^{Expected} = R_{t-1} + E_{t-1}$  with  $R_t^{Expected}$  the expected return at the time t,  $R_{t-1}$  the return at the time (t-1) and  $E_{t-1}$  the error of expectation in the time (t-1) which is equal to the difference between the observed return in (t-1) and the expected return at the same time:  $E_{t-1} = R_t - R_{t-1}^{Expected}$ . The  $R_t$  is computed using the following formula:  $R_t = \ln(P_t/P_{t-1})$ , and  $P_t$  is the stock Markets Index price at the time ‘t’. This relation illustrates that when expecting the future returns, investors adjusted the just last returns they realized by the error term of their last expectation.

To supervise for the overconfidence sentiment we can base our analysis on the nature of connection between current trading volume and the last stock returns. In other words, the relationship between the trading volume and overconfidence can be illustrated through the effect of previous returns ( $R_{t-1}$ ) and current trading volume ( $V_t$ ). If returns increase in the just last period investors react overconfidently and increase their trading volume. This proxy is used previously by (Khcherem and Bouri, 2009).

According to De Grauwe and Kaltwasser (2012), ‘Animal Spirits’ create waves of optimism and pessimism. The optimism about a given asset is occurring when expected prices increase abnormally. However, pessimism takes place when investors estimate a dramatic decrease in prices. There are two direct analytical methods for measuring investor sentiment. An optimistic investor expects an above average stock price level to which a standard deviation is added at any given time. He becomes pessimist when the price falls below the average level diminished by the standard deviation. Then, the average of individual stocks is used to calculate optimism and pessimism variables of the Stock index. The use of the average stock price and the standard deviation is justified by the fact that investors are attracted by the return and averse to the risk. The average prices measure the former and the standard deviation measures the latter. Following this logic, we report a strong evidence of optimistic behavior when individual stock price increases abnormally and exceeds the average level augmented by the standard deviation ( $\bar{R} + \sigma$ ). Considering the aggregate market, the average of conditional absolute price forms a good measure of optimism sentiment. The investor reacts as optimist if he realizes that the price increase over the medium level. In other words, the optimism would occur when the investor realizes a gain at a just previous date. Optimistic investors overreact when they anticipate that gain reaches a fixed level. Under this level, they react in a normal way or decide not to trade. In terms of probabilities, and with conformity to the analysis of Fischhoff et al., (1977), Svenson (1981), and Hoffrage (2004), “when the task is easy and the probability of success is reasonably high, people tend to exhibit optimism and overestimate the probabilities of good outcomes” (Chen, 2013). Let  $\bar{R}$  the average return and  $\sigma$  the standard deviation and let the lowest high return they accept equal, approximately, to the average return augmented by the simple standard deviation. Optimistic investors trade aggressively when their previous gains are higher than  $(\bar{R} + \sigma)$ . They trade normally or rather postpone trading if they realize returns under than this level in the time (t-1). Considering that they postpone trading the behavior of optimistic investors will be described by the following relation:  $F(R_t / \theta) = \text{Max}[R_{t-1} - (\bar{R} + \sigma), 0]$  with  $F(R_t / \theta)$  denotes the function describing the behavior of the investor considering his expectations for future evolution of returns giving a minimum of gain tolerated and  $\theta$  denotes the information available at time t.

Considering this function the behavior of optimistic investors can be described as follows: when  $R_{t-1} > (\bar{R} + \sigma)$  they trade, and when  $R_{t-1} \leq (\bar{R} + \sigma)$ , they postpone trading. Accordingly, their trading process will be as follows:

$$\text{Trading Behavior driven by Optimistic Investors} = \begin{cases} R_{t-1} - (\bar{R} + \sigma) > 0, & \text{Excessive Trading} \\ \text{Otherwise,} & \text{Postpone} \end{cases}$$

The pessimism belief occurs when an investor realizes losses at a previous date. Pessimistic investors decrease their trading when they anticipate that losses will reach a critical level. They react in a normal way when returns are higher than this level. They postpone, however, their trading when they anticipate that losses are higher. In the same way as it is the case for the optimism, and with conformity to the analysis of Kruger (1999), Windschitl et al. (2003), and Kruger and Burrus (2004), “when the task is very difficult with rare positive events, people often exhibit over-pessimism and overestimate the probabilities of bad outcomes” (Chen, 2013). Let  $\bar{R}$  the average return and  $\sigma$  the standard deviation and let the lowest loss they accept equal, approximately, to the average return diminished by the simple standard deviation. Pessimistic investors trade in a normal way when their previous losses are less than the target level such as done by the following:  $|\bar{R} - \sigma|$ . Oppositely, they postpone trading if their returns in time (t-1) rise more than this tolerated level. Considering these arguments, the behavior of pessimistic investors will be described by the following:  $F(R_t / \theta) = \text{Max}[R_{t-1} - (\bar{R} - \sigma), 0]$  with  $F(R_t / \theta)$  denotes the function describing the behavior of the investor considering his expectations of future evolution of returns giving a maximum of losses tolerated and  $\theta$  denotes the information available at time t.

Considering this function the behavior of pessimistic investors can be described as follows: when  $R_{t-1} > (\bar{R} - \sigma)$  they trade, and when  $R_{t-1} \leq (\bar{R} - \sigma)$ , they postpone trading. Accordingly, their trading will follow this process:

$$\text{Trading Behavior driven by Pessimistic Investors} : \begin{cases} R_{t-1} - (\bar{R} - \sigma) > 0, & \text{Excessive Trading} \\ \text{Otherwise,} & \text{Postpone} \end{cases}$$

Spontaneous reactions describe the behavior of absolute non rational investors. These latter trade in a random way without prior investigation of the behavior of stock returns. Investors with spontaneous reactions are those without optimistic, pessimistic or overconfident sentiment. Considering the function defining optimistic, pessimistic or overconfident investors the behavior of those with spontaneous reaction can be described by the following relations:  $(\bar{R} - \sigma) < R_{t-1} < (\bar{R} + \sigma)$

Our model describes the variables which can likely explain the trading volume in the major international markets in developed countries. The model includes five independent variables: **Rational expectation**, **Optimism**, **Pessimism**, **Overconfidence** and **Spontaneous reaction (ROPOS)** in order to explain the trading volume such as measured approximately by the natural logarithm of trading volume in the date t ( $\text{Ln}(TV_t)$ ). Previous study that used the same model is Dhaoui (2013), when investigating the sensitivity of trading volume to the “animal spirits” investor behavior using optimism, pessimism, overconfidence and spontaneous reaction as proxies for the human psychological variables from one hand and the rational expectation to test the efficient market hypothesis from the other hand. The estimated model is accordingly:

$$V_t = \alpha_0 + \alpha_1 \text{RatExpec}_t + \alpha_2 \text{Optim}_t + \alpha_3 \text{Pessim}_t + \alpha_4 \text{Overconf}_t + \alpha_5 \text{Spontreact}_t + \varepsilon_t \quad (1)$$

Where:

$V_t$  : represents the natural logarithm of the trading volume in the time t;

$\text{RatExpec}_t$  : represents the returns rationally expected by rational investors in the time t considering available information in the time (t-1);

$\text{Optim}_t$  : represents the returns expected by optimistic investors in the time t considering available information in the time (t-1);

$\text{Pessim}_t$  : represents the returns expected by pessimistic investors in the time t considering available information in the time (t-1);

$\text{Overconf}_t$  : represents the returns expected by overconfident investors in the time t considering the gains they realize in the time (t-1);

$\text{Spontreact}_t$  : represents the random return that have been observed in the time (t-1) and inducing a random reaction in the time t;

$\varepsilon_t$  : is the error term.

## 4. Results and discussion

In this section, we present the summary statistics and the estimates results. Table 1 shows the summary statistics of the selected variables.

**Table 1- Summary statistics for returns and trading volume.**

Market	Variables	Obs.	Mean	Max	Min	Sd	Skewness	Kurtosis
Japan	Return	2311	-0.0001266	0.1323459	-0.1211103	0.0160059	-0.5199366	10.85016
	Trading		12.3362	20.84374	8.070906	2.321057	2.932268	9.91585
US	Return	1819	0.0003845	0.1184933	-0.1111493	0.0156401	-0.044101	8.409273
	Trading		21.37196	25.56454	17.27309	0.2814666	-0.523498	67.95256
France	Return	2311	0.0001266	0.1211103	-0.1323459	0.0160056	0.5198367	9.95241
	Trading		14.33762	22.46374	9.071106	2.210156	2.823269	9.86514
UK	Return	2263	0.0001262	0.0938424	-0.0926455	0.0128501	-0.1106145	10.65903

Switzerland	<b>Trading</b>		21.00541	21.73781	18.01672	0.3774095	-1.502721	8.069739
	<b>Return</b>		0.0000531	0.1078764	-0.0810779	0.0123152	0.0241949	9.981337
	<b>Trading</b>	1786	17.9338	19.56444	16.24909	0.4080997	0.1353175	3.816379

This table shows the summary statistics for returns and trading volume. We present the summary statistics for the returns since all explanatory variables used in the model to estimate are derivatives of the return, and the measures we used make difficult to conduct descriptive statistics for them.

Table 1 presents summary statistics for returns and trading volume for all samples related to the different stock markets we studied in this paper. Results in this table indicate that in opposition to all other stock markets, the Japanese stock market is characterized on average by a negative closing return. The Swiss stock market presents, however, the lowest standard deviation of returns from all the stock we studied. The highest standard deviation of returns is observed in the Japanese stock exchange.

At the same time, results in Table 1 show that compared to the other markets, the Japanese stock market is characterized by a low volume of transaction, but a very higher volatility in trading volume. The highest trading volume is shown in the NASDAQ stock Exchange. Considering together summary statistics related to the Mean, the Max and the Min of trading volume, we note that the US stock market is the most liquid followed by the U.K stock market then successively, the Swiss Stock market, the French and finally, the Japanese stock exchange.

To estimate our model for each stock market we start by testing the stationary of dependent and independent variables. For the 5 stock markets, the outcome of ADF and Phillips-Perron unit root tests of the trading volume, optimism, pessimism, spontaneous reaction, overconfidence and rational expectations indicators are presented in Table 2.

Table 2 presents results of the Ducky Fuller unit root test for each variable by stock markets.

**Table 2- ADF and PP unit root test for dependent and independent variables.**

	Trading value	Optimism	Pessimism	Spontaneous reaction	Overconfidence	Rational expectation
<b>ADF</b>						
Japan	- 2.916**	- 45.555***	- 39.583***	- 45.209***	- 43.369***	- 28.872***
U.S.	- 15.194***	- 47.491***	- 43.981***	- 43.513***	- 45.562***	- 13.151***
France	- 8.946***	- 43.903***	- 40.161***	- 44.778***	- 45.263***	- 23.636***
UK	- 3.217**	- 38.227***	- 33.263***	- 43.726***	- 45.008***	- 13.652***
Switzerland	- 17.337***	- 39.560***	- 40.805***	- 42.753***	- 43.777***	- 43.246***
<b>PP</b>						
Japan	-3.01**	-43.11***	-37.874***	-44.171***	42.291***	-27.834***
U.S.	-14.628***	-45.407***	-42.667***	-43.318***	45.247***	-13.712***
France	-7.398***	-44.013***	-40.682***	-43.016***	44.581***	-24.307***
UK	-3.166**	-38.338***	-31.949***	-42.473***	46.001***	-12.528***
Switzerland	-17.006***	-38.481***	-39.360***	-40.852***	43.267***	-44.627***

ADF denotes Augmented Dickey-Fuller unit root tests, PP refers to Phillips-Perron unit root tests. \*\* and \*\*\* denote rejection of the null hypothesis at the 5% and 1% levels of significance, respectively The lag length in all tests has been selected according to the Akaike Information Criteria (AIC).

Results in Table 2 show that all selected variables are stationary. All variables are at a stationary level for a critical level of 1% except the variable "trading volume" for the cases of Japan, and the U.K. Stock markets where the variable is stationary at a critical level of 5%. Thus we can continue to estimate our equation 1. For the 5 stock market the outcome of the estimates results are given in Table 3.

**Table 3- Results of econometric regressions by stock market.**

Stock Market	Independent Variables	Coef.	t-statistic	R-square (Aj. R-square)
<b>Panel A:</b> Japan (optimistic population)	<b>Optimism</b>	2.813	2.36**	0.2836  (0.2817)
	Pessimism	-1.839	-1.58	
	Spontaneous reaction	-1.614	-2.23**	
	<b>Overconfidence</b>	4.779	3.19***	
	Rational expectation	-0.007	-0.16	
	Const	2.251	4.28***	
<b>Panel B:</b> US	<b>Optimism</b>	2.891	4.65***	0.3081
	<b>Pessimism</b>	-3.990	-6.65***	
	Spontaneous reaction	-0.426	-0.48	
	<b>Overconfidence</b>	1.091	2.93***	



	Rational expectation	-1.091	-0.38	(0.3058)
	Const	4.350	9.88***	
<b>Panel C:</b>	<b>Optimism</b>	0.902	0.87	
	<b>Pessimism</b>	-3.620	-3.70***	0.2279
<b>France</b>	<b>Spontaneous reaction</b>	-2.248	-3.63***	
<b>(pessimistic population)</b>	Overconfidence	-1.936	-1.34	
	Rational expectation	0.003	0.33	(0.2258)
	Const	2.995	4.31***	
<b>Panel D:</b>	<b>Optimism</b>	1.953	3.21***	
	<b>Pessimism</b>	-1.446	-2.31**	0.3707
<b>UK</b>	<b>Spontaneous reaction</b>	1.296	2.33**	
	<b>Overconfidence</b>	2.0573	2.01**	
	Rational expectation	0.001	0.08	(0.3690)
	Const	3.252	8.72***	
<b>Panel E:</b>	<b>Optimism</b>	2.127	6.86***	
	<b>Pessimism</b>	-1.896	-4.27***	0.2235
<b>Switzerland</b>	<b>Spontaneous reaction</b>	-1.725	-2.62***	
	Overconfidence	-0.817	-0.54	
	Rational expectation	-0.004	-0.78	(0.2208)
	Const_	7.871	8.11	

This table shows the regression estimates of the equation relating the trading volume as an endogenous variable to optimism, pessimism, spontaneous reaction, overconfidence and rational expectation as exogenous variables. Panel A shows the results for the sample of the 225 firms included in the Nikkei 225. Panel B shows the results for the full sample of the firms listed in the Nasdaq stock market. Panel C summarizes the results for the full sample of CAC 40 firms. Panel D shows the results for the firms listed in the FTSE100. Panel E shows the results for the firms listed in the Swiss stock market (SMI). The first column specifies the Stock markets. Column 2 is reserved to the explanatory variables. Column 3 shows the regression coefficient. Column 4 presents the "t-student". And finally, column 5 shows the R-Squared and the Adjusted R-Squared.\*\*\*, \*\* and \* indicate significance at the 1, 5 and 10 percent levels respectively.

Results in Table 3 indicate for all markets, that rational expectations fail to explain the variability of the trading volume. The hypothesis of rationality can be rejected. The rational investors are not those who control the way the economy works. The results indicate, however, that economy is influenced largely by non-rational behavior of investors. Their animal spirits play a pivotal role. We note particularly that the increase in trading volumes is due to the presence of non-absolute rational investors. Overconfident as well as optimistic and pessimistic investors influence significantly the degree of fluctuation of the trading volumes in the major international markets.

In this sense, overconfidence presents a positive impact on the trading volume for the case of the Japanese, the U.S and the U.K. Markets. In the case of the French and the Swiss Markets, the presence of overconfident investors is without effect. We notice here that these results are not surprising, especially in the case of the Japanese markets. In fact, as an Asian population, the Japanese investors are more exposed to the overconfidence bias. In this specific vein, we are reminded here that numerous psychologists have examined the behavior of populations and conclude that the Asian population exhibits overconfidence in general knowledge (see Yates, Lee and Shinotsuka (1996) and Yates, Lee and Bush (1997) for more details). This implies specifically among others that Asian investors may suffer from psychological bias from which the overconfidence bias. They underestimate their exposition to risks and make aggressive decisions, which can be reflected in their trading volumes. Japanese investors underestimate, accordingly, their exposition to risk and make aggressive reactions inducing an increase in trading volume. These results are consistent with the prediction of Odean (1998), according to which the behavior of the overconfident investors consists to underestimate their exposition to risks and to act aggressively leads to an increase in their trading volume.

The presence of investors with the spontaneous reaction influences the evolution of the trading volume significantly in the cases of the Swiss, U.K., French and Japanese Markets. In the case of the U.S. Market, their presence is without effect. The impact is, however, significantly negative for all the stock markets except for that of the U.K which is positive. These investors are generally less informed, and they react independently of the results they made at a previous date. They trade not because they anticipate a favorable evolution of stock prices, but because they prefer to act rather than not to act. Even if they are less informed, the presence of non-professional and non-rational investors induces a decrease in the trading volume. The decrease in trading can be explained in terms of reaction of the more informed investors as a reaction to the decision made by those with spontaneous reactions. The professional and more informed investors anticipate the reaction of those with spontaneous behavior and make opposite decisions rather than similar decisions. They exploit their advantage of information to realize a gain at the expense of those less informed and with spontaneous reaction. These later adjust their strategies and stop trading after the first losses they realize and wait to restart trading the following day.

The optimistic and the pessimistic sentiments are not without impact on the decision process. The presence of both the more optimistic and the more pessimistic investors induces respectively significantly positive and significantly negative impacts in the trading volumes in the case of the U.S., the U.K. and the Swiss stock markets. For the Japanese market, the presence of pessimistic investors is without effect on the trading volume. Oppositely, for the specific case of the French market, and oppositely to optimistic investors who are without effect, pessimistic investors influence significantly the

evolution of the trading volume. The result is also not surprising. In fact, the French population has no confidence in the future. This population is the most pessimistic population in the world (for more details, see the BVA-Gallup Survey, January 2011). It has no confidence in politics (Cevipof Study, January 2011), in drugs (CSA Survey, 2011), in the media (TNS Sofres-La Croix, February 2011). This implies accordingly that the French investors are more averse to risk. They react negatively after all crises or rather a simple loss. This can explain the significant negative effect of pessimistic investors on the trading volume in the case of the French market.

The optimistic investors have, however, a significant positive effect on trading volume, especially in the case of the Japanese market as well as for the other market except the French one. These investors react positively after gains they realize. They underestimate their exposition to risks and are more confident about the future. They increase their trading waiting for exploiting opportunities that can occur in the short term. Their excessive reaction induces a significant increase in the trading volume.

Taken together these arguments can spur the point of view commonly shared by authors (Posner (2009), Akerlof and Shiller (2009), Haruvy et al., (1999), Weinstein (1989), Otten (1989) according to which the hypothesis of rationality fails to explain how the economy works. The behavioral biases from which the animal spirits taken in his large definition such as given by Akerlof and Shiller (2009) including the spontaneous reaction as well as pessimism and optimism give an answer to the question of what factor explains the way the economy works.

These findings allow challenging the assumption of rationality. Human psychology exerts serious pressures on the investor's process of making decision inciting them to behave less than fully rationally. The way how investors think and how they feel, influences his process of decision-making. To determine and understand the way the economy really works, the macroeconomic models have to incorporate psychological influences and investors' cognitive and emotion. Hence, a better supervision and control of the economic variables requires seriously incorporating observable, systematic and human departures from rationality into models of financial markets and behavior.

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## 5. Policy implication and conclusion

The literature has considered that investors behave rationally, and ignores to incorporate into macroeconomic models the cognitive and emotional weaknesses that may affect the investor behavior. Financial theory supposes that markets are efficient and that if market inefficiencies may exist, they are generally not easy to exploit. In this framework, evidences do not support the ability of investors to perform the market or to produce abnormal returns. Theoretical and empirical evidences show however that psychological influences really matter in decision making. Investors are prone to psychological factors that drive their behavior and influence their decision in the level of financial markets.

Using data for 5 international stock markets, our findings show firstly that the hypothesis according to which investors execute rational expectations fails to explain the way the economy works. The increase in trading volume largely observed in the major international markets in developed countries cannot be due to the presence of absolute rational investors.

We find also that the economy is driven by behavioral biases, including especially animal spirits. In the major markets we have studied, the increase in trading volume which is due to the presence of optimistic, pessimistic investors as well as investors with spontaneous reaction. Two specificities characterize, however, the Japanese and the French markets. In the first, the fluctuation of the trading volume is due to the presence of both overconfident and more optimistic investors. In opposition, the presence of more pessimistic investors influences largely the evolution of trading in the specific case of the French market.

Taken together empirical results indicate that investors are more sensitive to psychological factors and fail to act as rational agents. The equilibrium in financial markets is not a result of a self-regulation driven by rational behavior but by heterogeneous buy and sell orders made based on heterogeneous non-rational forecasts. Investors are more prone to be affected by their own psychological states. This result is consistent with the prediction of Keynes (1936), who document that "*most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the results of animal spirits, a spontaneous urge to action rather than inaction, and not at the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities.*"

The rejection of the hypothesis of rational expectation indicates a dysfunction of the financial market and confirms that these latter are not able to react following fundamental predictions. Behavioral biases play however substantial role in determining the decision-making strategies. Markets are therefore driven by human psychological factors. This specific result is consistent with the observation shown in Dhaoui (2013), confirming the important role of behavioral components in describing the market functioning. In this vein, the authors argue that: "*the behavioral based reaction induces a distorted prevision of the price evolution given the uncertainty in investors' beliefs and sentiments. This influences significantly the evolution of the two components of financial markets namely returns and trading volumes. Accordingly, the abnormal changes in trading volumes and the low returns largely observed in the major international markets can be explained among others by the reaction of non-rational investors.*"

Based on the results of this study, investors are incited to incorporate in their forecasts models new components describing changes in thinking, human psychological states, and irrational behavior.

In extension to this study, we recommend investigating the contribution of behavioral biases and the animal spirit's behavior of investors to explain the variances in trading across the days, the weeks, the months, the years or any other unit of time. We recommend also investigating the contribution of these factors to explain the tremendous financial recession largely observed in the major international markets in developed as well as in emerging countries during the last decades.

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