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Effects of Behavioural Factors on Human Financial Decisions

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Abstract

In this article, we investigate the factors that may explain the trading volume evolution on two emerging capital markets, Romania and Brazil. We analyze the impact of both investors who ground their trading behaviour on rational expectations and investors who show psychological and emotional facets of the human decision, which we call behavioural errors, as independent variables on the trading volume as dependent variable. The results indicate that trading is influenced by the investors' irrational behaviour. Thus, the rationality hypothesis can be rejected for both capital markets.

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1. Introduction

The hypothesis that investors are fully rational agents which instantaneously process information in a correct manner is unrealistic. Rationality is hard to define because the human behaviour is often unpredictable. The rationality of investors appears as a result of the fact that orthodox economic science still remains the prisoner of the mechanical paradigm, in which values, irrationality, lack of direct interest, intuition, are not considered valuables of the economic process (Dinga, 2009).

It is necessary to introduce new factors in addition to rational expectations to explain the evolution of returns and trading volume in the capital markets. Some of the new research trends approach financial markets from a biological perspective, more precisely an evolutionary one, based on the assumption that markets, instruments, institutions and

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investors evince a dynamic interaction and evolution, according to the "laws" of economic selection. Starting from this assumption, financial actors compete and adapt, however not relying on optimum behavior.

The behavioural finance investigates the subtle facets and interactions in the human brain, faced with the uncertainty of making economic decisions. The most common human traits (fear, anger, greed, selflessness) place considerable emphasis on our decisions about money. Intellect (grasping a situation), reason (long-term consequences of the action taken) and emotion (considering a course of action) are all interrelated; they are the springs behind human decision. Human behaviour is generally reactive, not proactive; therefore, it is difficult to make predictions on the basis of narrow rules. Behavioural finances can relatively easily explain why an individual has made a decision, but have difficulty in quantifying what effects that decision will have on the individual.

Information is a public set of data, made available to everyone in an objective manner. Information can have a material impact on the asset price when it is combined with knowledge, hands-on experience and assessment of investors. Investors interpret important data and events on two cognitive levels:

- the intellectual level of ordering, processing and analyzing the actual factors (economic data);
- the level of the logical and rational understanding of how this objective identifies factors that will influence the perception of other market players.

The concept of information can be defined only by relevant data at some point on the market, but must be correlated with the amount of professional knowledge (human intellect) and interpersonal dynamics of market players (emotions and feelings). Moreover, due to uncertainty and constant change, there is a strong interdependence between experiences (autobiographical memory) and rational expectations about the future. Our experiences influence the way we view the available data based on relevance. If we add to these the decision equation (where the accuracy of the decision is recorded only ex post), time pressure, decision-related stress, we obtain the sum of the insecurities of the interactions between the rational and irrational.

Assessing market participants' psychological reasoning is very important − since other market players' decisions and actions have a decisive effect upon one's success or failure (Game Theory, J. Nash, 1950: Equilibrium points in n-person games, Proceedings of the National Academy of the USA, 36(1):48-49). In this case, building expectations is subject to time and constant insecurity pressure.

Akerlof and Shiller (2009) substitute the rationality hypothesis to the investors' behaviour to explain the volatility of market profits. They attribute economic dysfunction especially to what they call "animal spirits" and extend the General Theory (The General Theory of Employment Interest and Money, McMillan London) developed by Keynes J. M. in 1936. The latter defined animal spirit as "a spontaneous urge to action, rather than inaction". Although the author considered that most economic activities have rational economic motivations, people also have non-economic reasons, much of the economic activity being governed by these animal spirits. With this respect, the authors state that it is "necessary to incorporate animal spirits into macroeconomic theory in order to know how the economy really works." They extend Keynes's definition, the term "animal spirits" referring to the investors' irrational behaviour, as this comprises, among others, optimism, pessimism and spontaneous reaction. In modern economics, "animal spirits" have been coined into an economic term that refers to the restlessness and inconsistency existing in today's economy.

Another authors (Dhaoui, 2011) has shown in his study that the economy is behaviour driven particularly by these animal spirits. He considered that excessive volatility results from the presence of optimistic, pessimistic and spontaneous investors. The assumption that investors carry out orders rationally does not explain how the economy works.

In formulating expectations, investors rely on their ability to gather, process and comprehend a mosaic of information. This ability is systematically subject to errors. According to Akerlof and Shiller (2009), confidence is one of the most important aspects of animal spirits. They believe that confidence, signifying the behaviour beyond the rational approach to decision-making plays a major role in the economy. When people have confidence, they get down to business and buy. They make decisions spontaneously. The asset value is high and may be on the increase. But when they are distrustful, they withdraw and sell (Akerlof and Shiller, 2009).

Access to the right information may however lead to wrong decisions (wrong decisions made while being informed vs. decisions made while being uninformed). An incorrect decision may lead to under-reaction or over-reaction to relevant market information. Delayed reactions are a direct consequence of an excess of confidence in the ability to process and grasp information. The individual is mentally rooted in past choices and resistant to any new

information that is at odds with his set of beliefs. An interesting example of mental anchoring is price discount during sales periods. People buy on impulse, not because of low prices but because they are sure that they strike a great bargain. Over-reacting is a direct consequence of mental generalizations and representation. By generalizing, people tend to extrapolate existing information, often based on a single observation that they consider to be relevant (stereotomy). The most recent event has the greatest impact on autobiographical memory. Recent loss or gain is more emotionally significant and has high social impact. People tend to leave out high impact yet hardly probable negative events. Because of their low probability, these events do not happen very often. Therefore, they are disregarded, although their effects on the investment portfolio are disastrous. Events with high emotional impact, although rare, have a major impact, which cannot be erased from one's mind. Any subsequent decision will consider this momentous gain or loss.

In addition to the above presentation of behaviour errors occurring on the capital market, we may make a graphic description of their mechanism as being similar to that of a pendulum continuously oscillating between optimistic investors (who have security prices rise unfoundedly) and pessimistic investors (who have security prices fall unnecessarily). Optimistic investors, like confident ones, are more willing to make risky investments. They make irrational transactions, and their irrational reactions can lead to abnormal volatility in returns and trading volume.

Each investor's emotional make-up may in many cases annul the benefits of a rigorous scientific attitude based on calculations and intelligence. In the following, we study the effects induced by temperament on investment behaviour, influencing trading volume evolution. Elements such as investor confidence leading to over-reaction (Barber and Odean, 2001), (Daniel, Hirshleifer and Subrahmanyam, 2001), optimism (Scheier and Carver, 1985), pessimism (Barberis, Shleifer and Vishny, 1998), (Kruger and Burrus, 2004) or, broadly speaking, animal spirits (Akerlof and Shiller, 2009), are taken into account to explain the link between investor behaviour and trading volume.

The paper is structured as follows. Section 2 describes the methodology used in view of attaining the goal of this paper, the methods we used for the modelling of the following independent variables: confidence, optimism, pessimism and rational expectations. In Section 3 we describe the empirical results and we discuss the implications of the behavioural errors on trading volume evolutions. The final section concludes.

2. Modelling independent variables: confidence, optimism, pessimism, rational expectations

The purpose of the analysis is to investigate the factors that may explain the trading volume evolution on two emerging capital markets, Romania and Brazil. We want to analyze the impact of both investors who ground their trading behaviour on rational expectations and investors who show behavioural errors of the type described above as independent variables on the trading volume as dependent variable. The period under analysis covers four years, from July 2009 to December 2013, and includes the daily values of the most important indices traded on both markets, i.e. BET for Romania and IBOVESPA for Brazil, and the daily trading volume for each of the two indices.

Modelling the investors' behaviour, which is exposed to errors, is not an easy task, as no such model incorporating the investors' behavioural errors in a more comprehensive manner has been devised so far. Our approach to modelling these behaviour variables is presented below, so as to analyze them empirically.

The confidence shown by investors concerning the information they have leads to over-reaction on their part, increasing the volume of their transactions when they notice positive returns of portfolio assets. Because these investors overestimate their judgment capabilities, they undervalue their exposure to risk, acting aggressively and increasing the volume of securities traded.

In our view, a confidence-based investment behaviour will react as follows: if security returns on the previous day are positive (including zero), then overreaction implies that heavy transaction is expected on the current day; on the contrary, if security returns are negative, investors will either continue their trading strategy or refrain from trading. Thus, the relation between the independent variable and this dependent variable will be the effect of previous returns (positive or negative) on the trading volume. More specifically, the confident investors' behaviour can be described as follows:

$$\left.\begin{array}{l} if: R_{t-1} \geq 0 \rightarrow there\_will\_be\_transactions \\ if: R_{t-1} < 0 \rightarrow there\_will\_be\_no\_transactions \end{array}\right\} \quad (1)$$

Optimism occurs when on the preceding day investors reach a certain previously set level of profit, in this case actively reacting by increasing the volume of transactions. If the returns obtained are lower than that level, they will react normally or decide to refrain from trading. In our study, we considered the minimum level tolerated by optimists depending on which they decide on their trading behaviour to be the value obtained by summing the average return and its standard deviation, calculated for the entire period under analysis (R + σ) (apud [3]). Thus, optimistic investors will trade aggressively when the returns of the preceding period are equal to or greater than the value set by them, or else they will delay trading. More specifically, the behaviour of optimistic investors can be described as follows:

$$\left.\begin{array}{l} if: R_{t-1} \geq \overline{R} + \sigma \rightarrow there\_will\_be\_transactions \\ if: R_{t-1} < \overline{R} + \sigma \rightarrow there\_will\_be\_no\_transactions \end{array}\right\} \quad (2)$$

Pessimism occurs when investors incur loss the previous day. Pessimistic investors limit their trading level (or refrain from trading) when they notice that their loss reaches a certain set level. They act normally when they achieve better results than this level. In our analysis, we considered the minimum loss level tolerated by pessimists depending on which they decide on their trading behaviour to be the value obtained by subtracting from the average profitability its standard deviation, calculated for the entire period under analysis (apud [3]). Thus, pessimistic investors will not trade when the loss in the previous period is greater than the value set by them; otherwise, if the loss is smaller than the limit, they will continue to trade. Thus, the behaviour of pessimistic investors can be described as follows:

$$\left.\begin{array}{l} if: R_{t-1} \geq \overline{R} - \sigma \rightarrow there\_will\_be\_transactions \\ if: R_{t-1} < \overline{R} - \sigma \rightarrow there\_will\_be\_no\_transactions \end{array}\right\} \quad (3)$$

The theory of rational expectations was formulated by J. Muth, 1961, (Rational Expectations and the Theory of Price Movements, Econometrica, 29(3), p. 315-335) and subsequently became really influential in modelling economic phenomena. The hypothesis of rational expectations makes it possible to explain both the occurrence of the deviations in the noticed economic variables from equilibrium values and the action of forces which bring those values to their equilibrium levels (Cerna, 2004). Rational anticipation is a reaction aimed at completing the theory of adaptive expectations via Keynes-Friedman, but also a critical response to all twentieth-century rationality opponents (Pohoață, 2011).

Investors' rational expectations of the future value of a given security quotation in accordance with the efficient market hypothesis can be represented mathematically as follows:

$$P_{t+1} = E_t P_{t+1} + \varepsilon_{t+1} \quad (4)$$

where P_{t+1} is the security price at time t+1, and ε_{t+1} is the estimation error. The only term in the equation above, randomly determined by new information (unknown to any of the investors), is the residual factor. It has a normal distribution, a zero average and finite dispersion. Today's random residual factor is independent of any previous residual factors, therefore following a random path and being unpredictable on the basis of past information.

In our study, we determined the value of the returns expected by a reasonable investor $E(R_t)$ by taking into account the profitability obtained on a previous date R_{t-1} and the residual factor specific to previous moment ε_{t-1}, in accordance with the following formula:

$$E(R_t) = R_{t-1} + \varepsilon_{t-1} \tag{5}$$

After turning the initial series of returns into four data sets corresponding to each independent variable, according to the methodology described above, in order to test the influence of these factors on the dependent variable, trading volume, we calculated the following linear regression:

$$\ln(volume) = \beta_0 + \beta_1 confidence + \beta_2 optimism + \beta_3 pessimism + \beta_4 rational + \varepsilon \tag{6}$$

3. Empirical results

Using regression, we can highlight the impact of the investors' rational expectations and behaviour errors on the trading volume for the two emerging capital markets considered.

Table 1 below shows the results of regressions in trading volume as dependent variable, according to each independent variable. Among the latter, we included two classes of investors, those acting on the market on the basis of rational expectations and those acting on the basis of animal spirit behaviour (that is those who trust the available information, the optimists and the pessimists).

Table 1. Coefficients of independent variables

Capital market	Independent variables	Coefficients	t-statistic	
Romania	constant	17.64049	181.5206	R-square = 0.016
	Confidence	0.078432	1.152614	
	Optimism	0.153832	1.395220	
	Pessimism	-0.350165	-3.210506*	
	Rational	-6.17E-13	-0.044856	
Brazil	constant	14.59191	666.9603	R-square = 0.014
	Confidence	-0.006440	-0.020327	
	Optimism	0.089768	1.897672**	
	Pessimism	-0.100877	-0.318417	
	Rational	-3.36E-12	-1.081877	

Source: own calculations, using E-views software
*significant at 1%
**significant at 10%

The results in the table indicate that, on a capital market, the investors' rational expectations fail to explain trading volume variability. Thus, the rationality hypothesis can be rejected for both capital markets. However, the results indicate that trading is influenced by the investors' irrational behaviour. On the Romanian capital market, pessimistic investors have the greatest influence on the trading volume, whereas on the Brazilian capital market, it is optimistic investors who influence the market activity in the largest measure. The results are not surprising. In fact, Romania's population is distrustful of the future, politics, media, etc. This implies that these investors have

considerable aversion to risk. They react negatively after each crisis or loss, no matter how insignificant it may be. This may explain the negative effect of pessimistic investors on the trading volume for the stock market in Romania.

In the case of the stock market in Brazil, optimistic investors react positively following the profit made. They increase the volume of securities traded in anticipation of opportunities that may arise in the short term and that can be turned to the advantage of these investors. Their excessive reaction leads to a significant increase in the trading volume on the Brazilian stock market.

4. Conclusions

In conclusion, behavioural errors (optimism, pessimism, depression, anxiety, etc.) steadily win the dispute against reasonable behaviour. And when these different psychological make-ups occur in an overwhelming number of individuals, the effects are similar to those of tornadoes. For the intelligent investor, this is nothing but an opportunity. There is another important point to make with reference to the emotional factor: humans behave like animals, feeling safe in a crowd (crowd behaviour). If the others do the same, this confirms the wisdom of their decisions.

This study could be extended by analyzing the contribution of psychological factors underlying investor behaviour to the fluctuations in capital market activity over different periods of time (days, weeks, months, years, etc.). It would be interesting to analyze the contribution of these factors during the economic recession in recent years for emerging capital markets compared to developed capital markets.

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