

## STOCK MARKETS AND THEIR INFORMATIONAL INEFFICIENCIES – THE BSE CASE

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### 1. The theory of efficient markets

Starting with the sixties, the concept of efficient market represents the cornerstone of the modern financial theory, the specialized literature dealing usually with three concepts: informational efficiency, the rational behavior of market participants and the functional or organizational efficiency. These three dimensions are considered to be independent but it is often said that the existence of the informational efficiency represents one of the most important premises in order that a certain market fulfills its functions leading to an optimal allocation of the financial resources.

Theoretically speaking, such financial markets are characterized by equality between the share's price and its equilibrium value which, in the vision of E. Fama, corresponds to the fundamental value of a financial title, the significance of this value being determined by a general equilibrium model or such things as a convention between specialist traders. Later, E. Fama proposed a more sensible definition of the efficiency (“a market in which prices reflect perfectly and permanently the available information is said to be an efficient one”) and three forms (intensity degrees) of the informational efficiency hypothesis.

Regarding the quantitative description of the evolution process of financial assets speculative prices, among the models consistent with the rational expectation model two are by far the most used: the random walk and the martingale model. When the price of a financial asset  $P_t$  follows a random walk

process it can be modeled by a relation such  $P_{t+1} = P_t + \varepsilon_{t+1}$  where  $\varepsilon_{t+1}$  represents an independent random variable with a finite expectance and of the same probability distribution. The logic of the random walk model assumes that if the public information flow is available to all investors and it's instantly integrated in the shares prices then the future change of the price will reflect only future information thus being independent of the current price change. In the hypothesis in which the market reacts only in the case of unpredictable events the resulted price changes will be as well unpredictable thus random.

Due to critics concerning the non-normality of subsequent stock price changes, P. Samuelson proposed the replacement of the random walk model with the more general one of martingale which states, in terms of expectations that  $E(P_{t+1} | Inf_t) = P_t$ . It means that based on the data available at moment  $t$  ( $Inf_t$ ), the most probable future price is given by the current price. The difference between the martingale and the random walk model resides in what each of them acknowledges about to the behavior of superior moments while the former makes no restriction the latter considers them independent.. The reality of stock markets tends to show that the conditioned variance can be predicted using past variances leading to a dependent second degree centered moment rejecting thus the random walk hypothesis. Thus, the random walk represents second degree martingale normally distributed and with a constant returns' variance. Despite the repeated improvements and adapting of the

efficient market theory, even its most fervent adepts accept the fact that stock market valuation through speculative prices is not always perfect frequent cases with significant errors being recorded. Nevertheless, is still valid the opinion made in 1965 by one of the most respected stock market investors, Benjamin Graham who considered that the stock market can be a voting mechanism only at short time horizons while in the long term is a weighting mechanism leading finally to the true value.

## **2. Momentum effects and mean reversions – stock market inefficiencies**

The manifestation of trends concerning the evolution of stock prices represents one of the most fertile contestation sources of the efficient market hypothesis (informational). Thus, long periods of subsequent price rises or downfalls represents, even for the less initiated market participants proofs against a random evolutions being in exchange powerful starting points for predictions. These kinds of decisions, to buy when prices exhibits an upward trend and to sale in the case of a downward trend, are related to the so called momentum strategies. For the long term, this momentum in stock prices leads to another inefficiency called mean reversion as a need to balance the momentum effects.

### *2.1 Momentum in stock prices evolutions*

In the beginning, the random walk hypothesis was empirically backed up by studies which analyzed especially the autocorrelation phenomenon for subsequent price changes or return series. The goal was to prove that stock markets have no “memory” or that past behavior is useless for future predictions, and this goal was meant to be achieved by identifying null or insignificant

autocorrelations. Later, several studies emerged (especially [Lo and MacKinlay, 1999<sup>1</sup>]) which concluded that the autocorrelation phenomenon exhibited on speculative stock markets cannot be neglected and its frequency is sufficient in order to reject the random walk hypothesis. In these conditions, short term momentum is defined as a consequence of the short-term autocorrelation phenomenon.

In the same context, but analyzing the autocorrelation phenomenon at a higher level, the article written by [Lo, Mamaysky and Mjang, 2000<sup>2</sup>], used complex nonparametric statistical tools which allowed the identification of patterns determined by shares prices and reached the conclusion that some of the buy/sell signals used by technical analysis specialists records a certain prediction power. Some authors relate to the investors’ psychological mechanisms especially the so called feedback effect (heard behavior) as an explanation for the short term momentum.

Financial behaviorists offered another explanation for the patterns determined by the short term momentum consisting in the investors’ tendency to react insufficiently when new information arrives on the market (so called under-reaction). We can speak about a certain indecision associated with the effects of this new information or a passive attitude waiting for others to react (usually the “more informed and trained”) the effect on the stock market is a step by step integration of the events informational content which leads to the exhibit of positive autocorrelations within the returns.

In our opinion, the exhibit of autocorrelations can be the result of maintaining a constant investment position in the case of significant

<sup>1</sup> Lo, A. W. și C. MacKinlay, 1999, *A Non-Random Walk Down Wall Street*, Princeton University Press.

<sup>2</sup> Lo, A. W., Mamaysky H. și J. Wang, 2000, „Foundations of Technical Analysis: Computational Algorithms, Statistical Inference and Empirical Implementation”, *Journal of Finance*, vol. 54, pg. 1705-1765.

investors within a stock market. In this manner, if an institutional investor decides to acquire 1% from the social capital of a company via the stock market, most probably he will do it through small packages in order to avoid price rises. Operating this way, through repeated buy orders he will tend to influence the price to grow more or less steeply a direct consequence being a positive autocorrelation at least for a short period of time. By generalization, we can say that every oriented and regulated evolution of the stock price contains a clue related to its future evolution, a following of the current trend being more plausible than a random evolution.

On the other hand, there is a series of factors which should temper the interpretation of the autocorrelations found on the stock markets as a proof that these markets are inefficient. Moreover, in the premises in which the evolution of the stock market is not considered a perfect random walk, mathematically speaking, it is important to distinguish between statistic and economic significance. Thus, statistic dependencies which lead to the exhibit of short term momentum are often extremely low and they don't allow to be exploited for higher than normal returns. In this way, like [Odean, 1999<sup>3</sup>] article states, investors which use strategies based on momentum fail to obtain returns superior to a buy and hold strategy when trading costs are considered. In fact, the author states that when these kinds of fees are considered, almost every attempt to exploit the momentum leads to returns lower than the market.

Regarding the fact that departures from the idealistic informational efficiency doesn't manifest themselves

systematically, [Fama, 1998<sup>4</sup>] managed to browse the empirical literature related to event studies which analyses the influence of different information (financial results reports – different from expectations, face value splits, dividend figures, mergers and acquisitions, listing on other stock markets, initial public offers and so on) upon stock prices. The goal of this investigation was to analyze the partial and excess reaction phenomenon associated with the investors when new bits of information arrive on the market.

The conclusion of the study was that these biased reactions (under and over) are randomly distributed towards an equal proportion, abnormal returns after the event date being as much as frequent as post event adjustments. Strictly related to the use of the event study methodology, Fama showed that many of the anomalies associated with the stock returns appear only in the case of some particular models of estimating the normal returns very frequent disappearing when other models are used.

By far, the essential aspect related to the exhibit of different patterns of autocorrelations is in which way they are persistent in time. These mention is necessary because on the Nord-American stock markets the usage of the investment strategies recommending to buy shares exhibiting a positive autocorrelation led to positive returns only in a few periods in the late nineties compared to significant negative returns beginning with the year 2000. Consequently, the explanation for these phenomena could be that price patterns represent only accidental characteristics of the markets or that after a certain period of time they are assimilated by the investors and exploited to the moment in which they are no longer profitable.

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<sup>3</sup> Odean, T., 1999, „Do Investors Trade Too Much?“, *American Economic Review*, vol. 89, pg. 1279-1298.

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<sup>4</sup> Fama, E., 1998, "Market Efficiency, Long-Term Returns, and Behavioral Finance", *Journal of Financial Economics*, vol. 49, pg. 283-306.

## 2.2 The mean reversion phenomenon

As we saw in the precedent section, when a relatively short time horizon is considered for investigating stock returns (daily or weekly data), the main element analyze related to the test of efficient markets is the autocorrelation phenomenon, more precisely the existence of a positive autocorrelation. On longer time horizons the empirical studies signaled the exhibit of a negative autocorrelation which means that periods of growth are followed, sooner or later by downfall periods and vice versa.

We can quote in this direction the article of [Fama and French, 1988<sup>5</sup>] which found that 25-40% from the variation of returns aggregated on long periods of time can be explained using the negative correlations with the past returns or the article of [Poterba and Summers, 1988<sup>6</sup>] which confirmed the existence of this negative correlation phenomenon. This theory of mean reversion had and continues to have a significant influence on the way in which investment decisions are taken within the stock markets because they have a highly intuitive content. If this phenomenon manifest itself permanently within the markets, then the stocks which record high returns during a long period of time will record in the future returns mostly negative recommending their sell. These kinds of strategies which imply the selling of the stocks with a significant past of price rises respectively the buying of those which experienced long falls are known as contrarian strategies.

There are two main explanations for this kind of market behavior: stock prices tendency to react in excess (over-reaction) and a certain investors' perception regarding their special skill to

predict future stock prices (over-confidence). In the first case, because stock prices tend to react at different events more than normally it is possible to experience exaggerated appreciations or depreciations in prices, anomalies which will be balanced in time. In the second case, due to an exaggerated investors' confidence in their predictions, the buy and sell decisions will be to easily taken and thus paradox or unsupported evolutions will be ignored. When repeated signs infirm those predictions the equilibrium is reestablished through opposite positions.

In spite of a quite powerful empirical sustain, the mean reversion hypothesis is not uniformly verified but exhibited episodically only in certain periods and so a conclusion generalization being incorrect. Moreover, there are opinions in the specialized literature which say that these cyclical evolutions are the result of the inverse relation between the stock returns and the interest rate changes within the economy. Regarding this last opinion, we can state that due to the fact that stocks and bonds are competitive assets a certain variation in prices is inevitable when the general conditions within the economy changes. Thus, when the interest rates decrease the capitals will migrate from fixed income instruments (bonds) to those offering variable revenue (shares), this flux leading to a downfall in bond prices accompanied by a rise in those of stocks. When the interest rate increases, a reverse flow will result leading in the same time to depreciations in both the stock market and the bond market. In conclusion, mean reversions documented on the stock markets could be the results of cyclical evolution of the interest rate and not of excess reaction or prediction error from the part of investors.

A relatively recent empirical investigation of the possibility of exploiting mean reversion was realized by [Fluck, Malkiel and Quandt, 1997] studying a period of 13 years between 1980 and 1993 for which they simulated

<sup>5</sup> Fama, E. și K. French, 1988, „Permanent and Temporary Components of Stock Prices”, *Journal of Political Economy*, vol. 96, pg. 246-273.

<sup>6</sup> Poterba, J. și L. Summers, 1988, „Mean Reversion in Stock Returns: Evidence and Implications”, *Journal of Financial Economics*, vol. 22, pg. 25-79.

within the Nord-American stock markets the strategy of buying those financial assets which recorded low returns in the last 3-5 years. The study results showed that assets with very low returns in the last 3-5 years recorded bigger positive returns in the following period and vice versa. Still, due to the strong bullish trend of the Nord-American market, stock returns after 1993 were significantly high the previous behavior being irrelevant and thus raising serious question signs about the profitability of contrarian strategies.

As a result, following this kind of studies, adepts of the efficient market theory state that empirical studies can detect certain periods in which anomalies like mean reversion are exhibited but they have more of a statistical significance one being unable to use them currently for obtaining above the market performances and not proving itself to be a structural inefficiency of the market.

### 3. Classical stock market anomalies and their manifestation at BSE

Apart from the short term momentum and the mean reversion phenomenon, stock market reality offered some other manifestations which contravenes to the information al efficiency hypothesis, situations known in the dedicated literature as anomalies. We can talk here about different seasonal

cycles or the fact that certain trading thumb rules lead to returns over the market average but in both cases their manifestation diminished the random character of stocks price evolution. So, it can be useful to predict future price evolutions starting from a series of initial valuation indicators associated with the shares like the dividend yield or different ratios which make the connection between the market price and the financial characteristics of the issuing company.

#### 3.1 Seasonal patterns and the forecast based on the dividend yield

In this category of anomalies usually are included the returns significant different from the average value recorded in certain periods of the year or within a weak. One of the most known anomalies, repeatedly validated by stock market realities is the January effect, a month which proves it to be one with unusual high returns. Thus, numerous empirical studies confirmed the existence of high positive abnormal returns usually in the first two weeks of the year and especially in the case of issuers with a medium towards low capitalization. In the case of Bucharest Stock Exchange (BSE) we present bellow the logarithmic returns recorded during January by the BET index compared to the average monthly return of each year between 1998 and 2008.

*January returns compared with the monthly average between 1998-2008*

	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>
January	-2.54%	-2.60%	27.28%	8.19%	0.44%	3.80%
Monthly avg	-5.67%	1.17%	1.39%	2.54%	6.47%	2.00%
	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	
January	5.66%	19.98%	19.64%	7.18%	-23.00%	
Monthly avg	5.48%	3.01%	1.48%	1.41%	n/a	

As we can notice in the above table, with the exception of years 1999 and 2002, January recorded returns superior to the average monthly returns from each year even if they weren't always positive returns. Most visible, this January effect manifested itself in the years 2000, 2005 and 2006 the associated returns being highly disproportionate compared to the rest of the months. This conclusion is in concordance with the results found by [Filip, 2008<sup>7</sup>] after running a detail analysis regarding the performance of the Romanian mutual funds: "The study confirms a strong January effect, the returns recorded in this month being significantly higher than the returns generated by the rest of the months."

Despite these findings, the current year (2008) represents, for the moment being, a notable exception from this rule, January generating a strong negative return of -23%. The main explanation resides in the powerful bearish trend of stock market all over the world due mainly to the USA sub-prime mortgage crisis and indirectly and the possibility that its economy will enter soon in a long waited recession.

Speaking exclusively about the BSE case we consider that there is another explanation for the depth of the downtrend in January 2008. During November and December 2007, most of the investors from BSE believed that the future January will bring very high returns even bigger than the previous years because of the European integration. If it was the inflated gut reaction of many of the stock market participants, or the "news-flash" generated by a large number of brokers and financial services dealers each one of them armed with greater "proficiency", the rise of available revenues in the economy or overoptimistic beliefs of many investors we will never know but in the end the result was a massive and steep

depreciation of prices for the shares listed at BSE.

Between the days of the week, the specialized literature documented the existence of significantly high Monday returns the explanation being that from the end of the Friday trading session almost three days passes until Monday, a period in which there is a strong probability that more events arise compared to single day period. For the Romanian stock market [Todea, 2005<sup>8</sup>] has analyzed the manifestation of the Monday effect reaching to the conclusion that it is manifested quite significantly especially after 2000. Supplementary, conducting the analysis on categories of portfolio differentiated by size, the author showed that between 1999-2003 the portfolios formed with small and medium caps were those which recorded significantly higher returns during Mondays indicating thus as a trading strategy the acquisitions on Fridays and selling on Monday.

Among the seasonal patterns we can also include anomalies like the effect of month end or the holiday effect, both of them causing variations higher than normal for the stock prices. But, like the other seasonal patterns, the main problem from the investor point of view is that these effects are not manifesting themselves constantly and when we consider the problem of trading commissions, the associated trading strategies can lead often to negative returns. More than that, in the moment in which all the investors from the market considers that January will bring high positive returns they will proceed to buy even from the end of previous December leading to higher returns sooner than thought<sup>9</sup>.

<sup>7</sup> Filip, A., 2008, *The valuation of Romanian mutual fund performance*, Phd thesis (chair presentation), FSEGA Cluj-Napoca, pg. 171-172.

<sup>8</sup> Todea, A., 2005, *The informational efficiency of the stock market – empirical studies on the Romanian market*, Casa Cărții de Știință, Cluj-Napoca, pg. 101-108.

<sup>9</sup> Somehow in a comical way, on the Nord-American stock market, the January effect developed itself in the Santa's rally (December) to become finally the Thanksgiving day effect (November).

Concerning the usage of the dividend yield as a starting point in elaborating predictions regarding future stock prices, depending of the time horizon considered, it was found that in average, near 40% from the variation of future returns can be predicted using the initial dividend yield associated to the market index. Thus, it was found that investors buying stocks with higher than average dividend yield recorded higher than average rates of returns.

Conform to the opinion of [Malkiel, 2000<sup>10</sup>], these results does not represent necessarily an invalidation of the informational efficiency hypothesis of the stock market but as a consequence of the competitiveness between shares and bonds. As a consequence, we can assume that the ability of initial dividend yield to predict future returns reflects only the adjustments of the stock market to the general economic conditions. The reality from the Nord-American stock markets after the middle eighties has infirmed the prediction capacity of the dividend yield because, although this was situated constantly at a relatively low level of 3%, predicting thus future low returns but the average yearly returns between 1985-2002 were approximately 15% meaning a very high level.

In the context in which after 1990 a greater tendency from the part of the companies was to buy their own shares rather than growing the amounts distributed as dividends, the significance of the dividend policy and its informational content decreased making therefore the capacity of the dividend yield to predict future stocks price evolution less probable.

### 3.2 *Predictable patterns based on certain characteristics of the issuing companies*

An important category of stock prices evolution patterns are based on

different characteristics of the issuing companies among which more of the are mentioned their size and growth rate. In the case of the Romanian stock market, one can easily notice the manifestation of these two effects, the stocks quoted on the former Rasdaq market recording returns significantly higher than those associated with glamour stocks especially between 2006 and 2007. Also, companies showing a higher growth rate in equity and profits, and here we speak mainly of Transylvania Bank and Romanian Bank of Development, recorded along their way spectacular evolutions reaching relatively high levels of valuation compared with other banks from the region.

#### 3.2.1 *The size effect*

One of the most powerful effects manifested on the stock markets is the tendency exhibited by stocks issued by small companies (measured by their market value) to record returns higher than companies with a bigger capitalization. On the Romanian market, [Todea, 2008] has analyzed the manifestation of the size effect between 13.10.1999 and 31.03.2003 starting from a sample of 49 issuers grouped in three categories after their market capitalization. With this data the author then formed equally weighted portfolios and portfolios weighted after their size studying the resulted returns. As a conclusion of the study, the author stated that, regardless of the way in which returns were computed, on the Romanian Market a size effect is manifested which means that small caps tend to record a higher return compared with the medium and big caps. Using ANOVA-F decomposition, the author rejected the hypothesis of equality for the observed means of the equally weighted portfolios with a probability of 99% and 89% in the case of the portfolios weighted according to their size.

An interesting explanation of this effect was brought by E. Fama and K. French in 1993 who started from the idea

<sup>10</sup> Malkiel, B., 2000, "The Efficient Market Hypothesis and Its Critics", *Journal of Economic Perspectives*, vol. 17, pg. 59-82.

of the CAPM model conform to which the expected return and thus indirectly the one recorded by a stock depends on its market risk estimated through beta. Therefore, if beta's value grows then the investors must be supplementary rewarded through a price decrease. Using a sample of stocks monitored between 1963 and 1990, the authors reached the conclusion that individual betas didn't recorded spectacular evolution in way or the other while the returns did record some significant variations. As a consequence, was proposed an estimation of the stock risk not through beta but by the size of the capitalization value associated with the issuing company in the way in which the bigger a company is the smaller the risk. In such premises, the fact that small caps record higher returns is due to their amplified risk and not to an informational inefficiency of the market.

Again, the variability of the manifestation of the size effect determined the investors to be prudent diminishing therefore significantly its prediction capacity. As a consequence, between 1980 and 1990, on the great stock markets of the world the big caps were those which recorded higher returns. And this was possible because as a result of the deregulation and liberalization policy implemented on the stock markets, the demand for stocks increased at a global level the preferred target being the big companies which could allow the investment of significant amounts in the conditions of a reasonable liquidity.

### 3.2.2 Value and growth stocks

On the stock markets, is often used the delimitation of the shares in value and growth stocks, the first category corresponding to companies with a market price inferior to their real value while growth stocks represent companies apparently undervalued but with higher growth rate. In order to delimitate these two categories valuation multiples are usually used especially the Price to Earnings Ratio (PER) and the Price to Book Ratio (PBR). Conform to the results of several empirical studies, stocks recording low levels of these indicators (undervalued stocks), lead to returns superior to the other category. Similar results were obtained also in the case in which as a valuation multiple the price cash flow ratio was used were by cash flow we mean the sum between the net profit, depreciations and provisions.

In the case of the Romanian stock exchange, [Todea, 2008] investigated the manifestation of the PBR effect dividing the same sample of 48 stocks in seven groups according to the value of the PBR indicator. On the basis of the stocks included in these groups equally weighted portfolios were formed and their average returns were tested for equality. The analysis results led to the conclusion that the PBR effect is not manifesting itself significantly except for a single portfolio from all seven. More precisely, it had been shown that only 2.3% from the variation of the stock returns is explained by the PBR indicator.

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