

THE ANALYSIS OF THE RELATION BETWEEN THE EVOLUTION OF THE BET INDEX AND THE MAIN MACROECONOMIC VARIABLES IN ROMANIA (1997-2008)

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Abstract: Starting from the conclusions which result from conducting some similar empirical studies on the great stock markets, in this work, we have set as our goal to analyze the return series behaviour of the main index of the Bucharest Stock Exchange (BSE) - the BET index, during different periods of time, compared to the evolution of some macroeconomic variables, like interbank interest rates, inflation rate or unemployment rate. The results confirm that there is a weak relation between these variables, in what monthly data are concerned.

Keywords: stock market, macroeconomic variables, empirical study

Analysis of the evolution of the BET index between the 19th of September, 1997 and the 7th of February, 2008

The evolution of the most important index on the Romanian stock market can be looked at on several time horizons, depending on the envisaged objective. Yet, in general, a fertile image from the point of view of the information contribution with intuitive character²²¹, of the evolution of an index, is given by the graphic of point levels recorded by this one, ever since its launching. Thus, by dint of a simple graphical representation, most of the descriptive characteristics of the index and, indirectly, of the Romanian stock market, can be identified: evolution tendencies, the intensity of ascending and descending gaps, possible annualized cycles, the delimitations between the phases of the stock exchange cycle (accumulation, growth, discharge, decline), possible standard formations (patterns), etc.

Figure 1 represents, on a logarithmical scale, the evolution of the BET index, since its launch on the 19th of September, 1997, until the 21st of March, 2008, the evolution comprising a number of 2.602 daily stock exchange transactions. In the graphic, we have delimited the main subperiods of homogenous evolution, corresponding to the BET index, respectively secondary trend turning points, the main trend being obviously a growing one, starting with 1999. By looking at the graphical representation, one can talk about the existence of several distinctive periods in the evolution of the index, delimited as follows²²²:

1. September 1997 – October 1998: accelerated descending trend, with a -53 degree gap (1);
2. November 1998 - July 2001: moderated ascending trend with a 17,61 degree gap (2);
3. August 2001 – May 2005: accelerated ascending trend with a 35 degree gap (3,4);
4. June 2005 – September 2007: moderated ascending trend with a 21,41 degree gap (5);
5. October 2007 – March 2008: accelerated descending trend with a -46 degree gap (6).

²²¹ We can note that “ardent” adepts of the technical or charter analysis consider the graphic of a financial asset as a source of information which is enough to undertake the most sophisticated analyses, due to the fact that it comprises all available or not available information for the public, the past, present and future ones.

²²² At the end of the row which enumerates the subperiods, we have added in brackets the number representing those subperiods in figure 1.

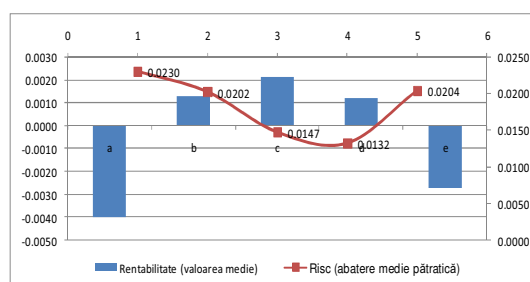
If we were to characterize the five subperiods in relation to the classical phases of a stock exchange cycle, we can very easily place subperiod *a*) into the decline phase, subperiod *b*) in the accumulation phase, and subperiod *c*) in the growth phase. Somehow more subjective would be the placing of subperiod *d*), in our opinion it represents a top discharge phase, or in the best case, a late phase of the growth period. Closely correlated to the evolution on international markets, subperiod *e*) obviously represents an adjustment tendency.

Figure 1: BET index evolution between September 1997 and February 2008



Source: Author's own manipulations in MetaStock.

Figure 2: The evolution of the risk-return relation in the case of the BET index



Source: Author's own manipulations in MS Excel

In order to quantify the differences concerning these evolution subperiods of the stock market, we will analyze the behaviour of the daily rentabilities of the index, by calculating the main characteristics of their distribution. By synthesising the values of the main characteristics

Table 1: Characteristics of the daily return series associated with the BET index on subperiods

	All	Subper. a	Subper. b	Subper. c	Subper. d	Subper. e
No. Returns	2,601	280	701	924	579	117
Average Val.	0.0007	-0.0040	0.0013	0.0021	0.0012	-0.0027
Median Val.	0.0004	-0.0033	0.0000	0.0011	0.0005	-0.0008
Maximum Val.	0.1063	0.1011	0.1063	0.0992	0.0483	0.0461
Minimum Val.	-0.1122	-0.0928	-0.0896	-0.1122	-0.0551	-0.0756
Strd. deviation	0.0179	0.0230	0.0202	0.0147	0.0132	0.0204
Skewness	0.0769	-0.0543	0.4442	-0.0362	-0.1443	-0.4567
Kurtosis	7.3870	6.2958	7.8042	11.1740	1.4051	0.8986

Source: Author's own manipulations.

of the daily logarithmic rentabilities distributions, within each evolution subperiod and on its whole, the results were the values comprised in table one.

By watching the average values presented in the mentioned table, there is also a confirmation of the delimitation in numbers of the two subperiods of adjustments/decreases (*a* and *e*) reported to those of accumulation/increase (*b,c* and *d*), also differentiated according to the intensity of the previous by gap evaluated tendencies. A decrease of the volatility of the stock market is also confirmed, it is being quantified by the evolution of standard deviation values associated to daily rentabilities, but also through the reduction of the amplitude between extreme rentabilities (maximum-minimum). At the same time, it is being observed that, in the case of market decrease subperiods (*a* and *e*) an intensification of the daily average volatility can be recorded, resulted according to the documented realities in case of most stock exchanges.

If we look at the average value and the standard deviation associated to the daily rentabilities of the five subperiods from the evolution of the BET index as estimates of return series and risk, we can analyze the evolution of the risk-return series relation, by using figure number 2.

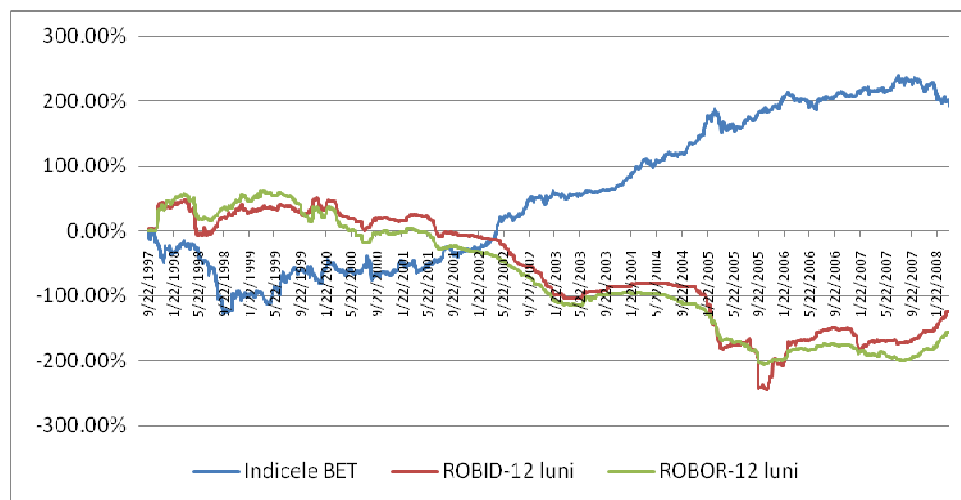
As one can notice, there is an inverse relation between the two, the subperiods *a* and *e*, which have generated significant negative rentabilities, *b* recorded the highest volatility, while in the case of the subperiods *c* and *d*, the average positive rentabilities were accompanied by small volatility values. Apparently contradictory, the inverse relation between the two concepts can be explained by dint of reasonings associated to the evaluation model of equilibrium assets (CAPM): the increase of the market risk leads to the increase of expected return series and indirectly to the fall of share prices, for shares which were overvalued.

The relation between the stock market and the interest rate level in the economy

As it resulted from the conclusions of empirical studies which investigated the relation between the stock market and macroeconomic variables, the evolution of the interest rates in economy represents a potential candidate for the role of causing factor. In this respect, we have chosen to analyze the evolution of the daily interbank interest rates in Romania, in the period between the 19th of September, 1997 and the 21st of March, 2008, on available maturities: a week (1W), a month (1M), three months (3M), six months (6M), nine months (9M) and a year (12M), both for passive rates (ROBID or P) and for active ones (ROBOR or A).

In order to be able to analyze the possible relation to the evolutions of the Romanian stock market, we will successively transform the initial chronological series of the interest rates in series of percental modifications. By estimating the correlation between the evolution of the rentabilities recorded by the BET index and the evolutions of interbank interest rates on different maturities we could notice the absence of any significant correlation. The explanation for the small degree of correlation of the two variables can consist of the fact that the relation between the two phenomena is not manifest on the level of daily data, but on longer time horizons or that the relation is, nevertheless, also manifest on the level of daily data, but in a lagging manner. Due to this reason, we have represented in figure number 3 the evolution of cumulated return series, associated to the BET index and to the ROBID and ROBOR rates, with a 1 year

Figure 3: Evolution of the cumulated return associated with the BET index and the interbank interest rates ROBID and ROBOR with a maturity of 12 months



Source: Author's own manipulations.

maturity, in order to be able to compare on the level of the entire analyzed period the possible connections between the three variables.

From the above graphic representation one can clearly see the manifestation of an inverse relation between

Table 3: Estimațiile parametrilor regresiei liniare dintre rentabilitățile zilnice ale indicelui BET și modificările relative succesive ale ratelor interbancare ale dobânzii active

	A1W	A1M	A3M	A6M	A9M	A12M
a (intercept)	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
t-stat	2.8600	2.8600	2.8500	2.8200	2.7700	2.8300
β (panta)	0.0013	-0.0043	-0.0085	-0.0249	-0.0472	-0.0227
t-stat	0.2200	-0.3400	-0.3900	-0.8600	-1.4500	-1.3900
R²	0.0000	0.0000	0.0000	0.0003	0.0009	0.0008

Source: Author's own manipulations.

the ascending evolution of the Romanian stock market and the evolution of interbank interest rates during the entire analyzed period (19th of September, 1997 - 21st of March, 2008), the graphics of the two phenomena appearing like a double mirror image. Thus, we can assert that the result obtained in the case of the other stock markets is being confirmed, that means a negative correlation of the stock market with interest rates in the economy, with the mention that this relation is not significant on the daily evolution level.

Although such a representation is extremely suggestive, stock exchange investors with a shorter investment horizon cannot use it in order to formulate forecasts based on this relation between the stock exchange and the interest rates. In order to do this, statistical modelling of these connections take place, their performance being tested.

In the following, we will analyze the utility of modelling a regression on daily data regressions level between the two variables, starting from the premise of a linear relation. Tables no. 2 and 3 contain the estimates of the regression parameters modelled between the series of daily rentabilities of the BET index and the series of relative successive modifications of the active and passive interest rates.

Table 2: Estimates of the parameters associated with the linear regression between the daily return series of the BET index and the subsequent daily changes of the passive interbank interest rate

	P1W	P1M	P3M	P6M	P9M	P12M
a (intercept)	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
t-stat	2.8500	2.8700	2.8800	2.8800	2.8800	2.8700
β (panta)	0.0014	0.0075	0.0142	0.0105	0.0090	0.0089
t-stat	0.3400	0.6900	0.7700	0.5400	0.3800	0.6100
R²	0.0000	0.0002	0.0002	0.0001	0.0000	0.0001

Source: Author's own manipulations.

Thus, it is being confirmed that, both in the case of passive, as well as in the case of active interests, very little of the daily variations associated to the BET index are applied, the most significant influences being exerted by A9M (0,09%) and A12M (0,08%). At the same time, it is being confirmed that, between the index and passive rates there is a direct relation, while in the case of active rates, excepting A1W, an inverse relation is being recorded.

On the other hand, by repeated attempts, it is being observed that, when we estimate the rentabilities of the index according to the lagged series of the interest rates, the 8 period lag is being frequently remarked as

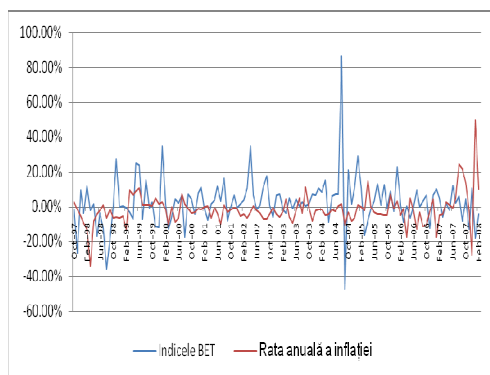
having a superior explaining power. For instance, in the case A12m(-8), the result for the gap parameter of the regression is an estimate of -0,0409, this time, a significant value (t-stat = -2,51), which leads to a coefficient of determination $R^2=0,27\%$.

The relation between the stock market, the inflation rate and the unemployment rate

Within this section, we will analyze the relation between the monthly rentabilities of the BET index and the monthly percentual modifications of the annualized inflation rate (in the period between September 1997 – February 2008, sample of 125 monthly observations) and of the unemployment rate (in the period between February 2002 – February 2008, sample of 73 monthly observations). In figure no. 4, we have represented the monthly percentual evolution of the BET index, compared to the monthly variations of the annualized inflation rate. As one can notice, there is no significant correlation between the two and, moreover, there are periods in which the high volatility, associated to a variable, cannot be found in the volatility of the other one (in the period August-September 2004, in the case of the BET index, respectively by the end of the year 2007 and the beginning of the year 2008 in what inflation is concerned).

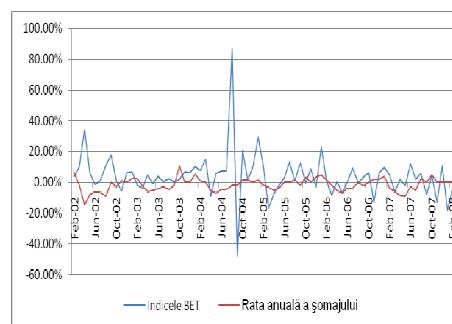
As a confirmation, the estimate of a linear regression between the BET index and the inflation rate, analyzed on monthly data ($R_{BET}=a+b*\Delta\%Rate_{of\ inflation}$) does not lead to significant results: $a=0.0245$ (t-stat=1.92), $b=-0.0677$ (t-stat=-0.46) și $R^2=0,17\%$. By extending the analysis on the lagged series of the two variables, after successive attempts, we noticed the fact that a larger part of the variation of the BET index is explained by the modifications of the inflation rate 14 months ago, there being an inverse relation between the two. By estimating the parameters of the regression, in this case we obtained the following values: $a=0.0343$ (t-stat=1.81), $b=-0.4222$ (t-stat=-2.04) și $R^2=2.80\%$.

Figure 4: Monthly percentage changes of the BET Index and the annualized inflation rate



Source: Author's own manipulations.

Figure 5: Monthly percentage changes of the BET Index and the annualized unemployment rate



Source: Author's own manipulations.

A likely situation can be found also in the case of the relation of the stock market with the unemployment rate. The comparative evolution of the variations of the two variables is being presented in figure no. 5. The estimation of a linear regression between the BET index and the unemployment rate on monthly data ($R_{BET}=a+b*\Delta\%Rate_{of\ unemployment}$) does not lead, either, to the obtaining of a significant relation. Thus, in the case of the two parameters, the following values can be found: $a=0.0413$ (t-stat=2.25), $b=0.0093$ (t-stat=0.022) and $R^2=0,17\%$. Again, trying some models by using lagged series leads to a bettering of the significance of the relation, for the unemployment rate, lagging by 10 months with regard to the rentabilities of the BET index the following parameters being obtained: $a=0.0522$ (t-stat=2,69), $b=1,1286$ (2,57) and $R^2=8,33\%$. As a result, in this situation, there is a direct relation between the two phenomena, the parameters of the linear regression being significant from the statistical point of view.

Also, the fact that the evolutions of volatility associated to the stock market cannot be found, not even lagged, in the case of the evolution of the unemployment rate, balances the scale even more in favour of the lack of a significant relation between the two variables.

By taking into account the manifestation of a first degree self-correlation within the framework of the rentabilities of the BET index, we have estimated the parameters of a model AR(1) (in this case, the BETSOM(-1) variable). to which we have added as an exogenous variable the monthly unemployment rate variation, with a 10 month lag (SOM(-10)). Table no. 9 presents the results of the estimate of this regression. In the case of this regression, the value of the adjusted determination coefficient R^2 can be remarked (19,87%), which is by far superior to all other regressions, which means that approximately a

Table 4: Estimation of the parameters of the regression between monthly differences of the BET index, its lagged series and the 10 months lagged series of the unemployment rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.065291	0.018610	3.508316	0.0009
BETSOM(-1)	-0.355525	0.113642	-3.128470	0.0027
SOM(-10)	1.162931	0.409698	2.838511	0.0062
R-squared	0.224625	Mean dependent var		0.035279
Adjusted R-squared	0.198779	S.D. dependent var		0.151257
S.E. of regression	0.135392	Akaike info criterion		-1.114836
Sum squared resid	1.099860	Schwarz criterion		-1.012782
Log likelihood	38.11735	F-statistic		8.690939
Durbin-Watson stat	1.920872	Prob(F-statistic)		0.000485

Source: Author's own manipulations in Eviews 5.

fifth of the monthly variations of the BET index are being explained by the two exogenous variables: the series of the monthly variations of the BET index, with a one-month lag, respectively the series of monthly variations of the unemployment rate, with a ten-month lag.

Conclusions

As we could see, from the three analyzed macroeconomic variables, only the inflation rate and the unemployment rate have lead to the estimation of significant relations to the variations of the stock market. Thus, between the monthly variations of the BET index at a given time and the monthly variation of the annualized inflation rate 14 months ago, an inverse relation can be observed, which results from most of empirical studies conducted in this direction. In the case of unemployment rate, the relation between the two variables is a direct one, the reduction of the unemployment rate leading to the reduction of the return series of the BET index. Apparently paradoxical, this relation can be explained by the fact that, on a stock market with a long-time growth tendency, the continuous shrinking of the unemployment rate is associated with the possibility of the over-heating of the economy and with an emergence of inflationist pressures. In any case, the two macroeconomic variables account only for 2,8%, respectively 8,33% from the variations of the BET index, significantly reducing their influence upon stock market evolution.

References

1. www.bvb.ro;
2. www.insse.ro.