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# Testing market informational efficiency of Constanta port operators

**E Roșca<sup>1</sup>, M Popa<sup>1</sup>, F Ruscă<sup>1</sup> and Ș Burciu<sup>1</sup>**

<sup>1</sup>Politehnica University of Bucharest, Spl. Independenței, 313, Bucharest, Romania  
Department of Transport traffic and logistics, Faculty of Transport

E-mail: eugen.rosca@gmail.com

**Abstract.** The Romanian capital market is still an emergent one. Following the mass-privatization process and the private investments, three of the most important handling and storage companies acting in Constantza Port (OIL Terminal, Comvex and SOCEP) are listed on Romanian Stock Exchange. The paper investigates their evolution on the market, identifying the expected rate of return and the components of the shares risk (specific and systematic). Also, the price evolution could be analyzed through the informational efficiency which instantly reflects the price relevance. The Jarque-Bera normality test regarding the shares return rate distribution and the Fama test for the informational efficiency are completed for each company. The market price model is taken into consideration for price forecasting, computing the return rate auto-correlations. The results are subject of interpretation considering additional managerial and financial information of the companies' activity.

## 1. Introduction

The Romanian capital market has been developed following the Mass Privatization Program, through which a part of the public companies shares had been freely distributed. After years of regulations, the secondary securities market is represented by Bucharest Stock Exchange (BSE) and the Romanian OTC Market (Rasdaq), which are now unified on a single trade platform. The company shares listed on BSE are traded according to their dimension, the number of shares, the atomicity of owners and the financial results. Among them, there are six companies acting in transportation, handling and storage industry, two of them being located in Constantza Port.

Oil Terminal S.A. (OIL) is connected with the oil industry, considered a very dynamic field. SOCEP Constantza (SOCP) is one of the greatest port operators. It has a container terminal and one of general wares, especially for chemicals, metallic products and cereals.

Based on the market prices evolution between August (2014) - February (2015), the present paper focuses on computing the investment performance of the two companies' shares, testing the market price model and the informational efficiency.

## 2. Formatting the title, authors and affiliations

The shares return rate is a measure of the growth in wealth, resulting from the investment in the company's equity. It is computed over a specific time interval, according to the investor trading horizon:



$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} + \frac{D_t}{P_{t-1}} \quad (1)$$

While this takes care of all the explicit payments, there are other benefits that may derive from holding a stock, including the right to vote on corporate governance, tax treatment, rights offerings, and many other things.

These extra benefits are typically reflected in the price fluctuation of the shares.

The first term in the right member of equation (1) denotes the capital gains/losses resulting from the price evolution, while the second term represents the dividend yield. Usually, the return rate on small intervals (day, month) is computed without taking into consideration the dividend yield, because the dividend repartition is followed by a long period before payment. Also, equation (1) does not consider any tax payment.

Stocks return rate may be riskier or more volatile. The associated risk with a share is denoted by the standard deviation of the return rate:

$$\sigma^2 = \frac{1}{T-1} \sum_{t=1}^T [R_t - E(R_t)]^2 \quad (2)$$

where:

T is the number of observed intervals

$E(R_t)$  - the expected return rate.

Assuming a normal distribution for the return rate, a confidence interval of it could be determined. Testing normality should be done using the Jarque-Bera test:

$$JB = \frac{T}{6} \left[ s^2 + \frac{(k-3)^2}{4} \right] \quad (3)$$

where s is the distribution skewness (asymmetry factor) and k its kurtosis (flatness factor). The JB statistics has a  $\chi^2$  distribution with two degrees of freedom.

The influence of the market on the share price could be analyzed through the market model that assumes a linear regression:

$$R_t = \alpha + \beta R_{Mt} + \varepsilon_t \quad (4)$$

where:

$R_t$  is the share return rate at the moment t

$R_{Mt}$  - the market return rate.

In equation (4),  $\alpha$  denotes the influence of the steady factors upon the return rate of the shares, excepting the market contribution.  $\beta$  represents the volatility factor, expressing the sensitivity of the return to the market evolution. The residuals  $\varepsilon_t$  quantify the stochastic influence of the random factors. Parameters  $\alpha$  and  $\beta$  are estimated using the least squares method and additional statistic tests should be made to determine the validity of the market model. The coefficient of determination is used to measure the goodness of fit. The market return rate is computed using the appropriate market index:

$$R_{Mt} = \frac{I_t - I_{t-1}}{I_{t-1}} \quad (5)$$

where  $I_t$  is the market index. Therefore, the shares risk is:

$$\sigma^2(R_t) = \beta^2 \sigma^2(R_{Mt}) + \sigma^2(\varepsilon_t) \quad (6)$$

The first term of the shares risk represents the systemic component, due to the market, while the second term is the specific component of the risk.

Securities price evolution could also be analyzed through the market efficiency perspective. Informational efficiency represents the capacity of securities prices to reflect instantly and fully all relevant available information regarding them. Thus no excess return is possible on such market. According to Fama [1], there are three levels of informational efficiency:

- *weak form* characterized by the instantly and fully reflection of all information concerning the history of securities prices in the current prices
- *semi-strong form* characterized by the integration of all public available information related to securities in their prices
- *strong form* supposing the instantly and full reflection of all information related to securities (public and private) in their prices.

The absence of short term auto-correlation in the return rate sample is translated into a high probability of market weak efficiency [2].

A random walk stochastic process for securities prices evolution is than assumed:

$$\ln(P_t) = \ln(P_{t-1}) + \varepsilon_t \quad (7)$$

where  $\varepsilon_t$  is the white noise. Since  $\varepsilon_t = \Delta \ln(P_t) \cong \frac{P_t - P_{t-1}}{P_{t-1}} = R_t$ , the weak efficiency supposes that

$R_t$  are not correlated.

Some empirical tests on Romanian capital market, completed by Preutu *et al.* [3], Dragotă & Mitrică [4], and Dragotă *et al.* [5] led to different conclusion with respect to the weak form of efficiency.

### 3. Results and discussions

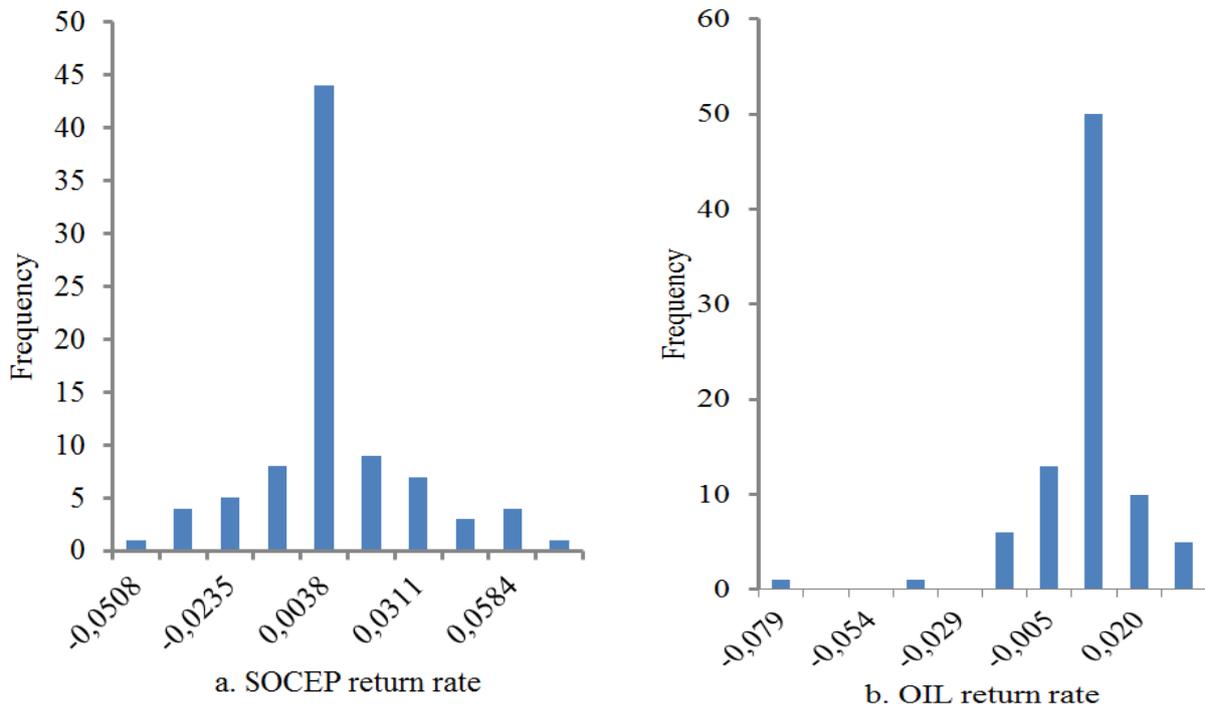
Securities daily return rate distribution of the two companies is depicted in figure 1. The main descriptive statistics are shown in table 1.

**Table 1.** Securities return rate statistics.

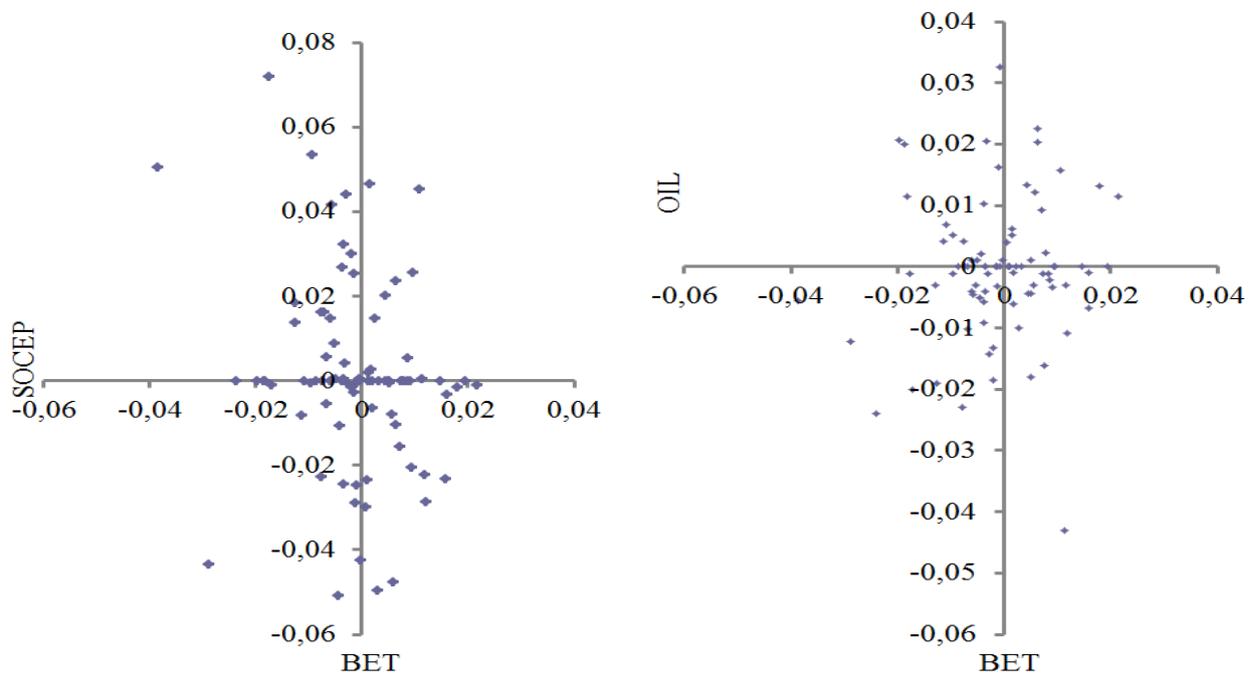
	SOCP	OIL
Mean	0.122%	-0.146%
Standard deviation	2.245%	1.408%
Kurtosis	0.347	-2.012
Skewness	1.56	10.67
Jarque-Bera test value	9.16	268.88

The Jarque-Bera normality test proves a normal distribution for SOCP return rate, with a 99% level of significance, while OIL fails the test. The OIL return rate frequency (figure 1b) shows a very sharp shape and also right-side asymmetry.

The market price model for securities is tested taking into account the appropriate BET market index in equation (4). The graphic correlations between shares return rate and market indices are depicted in figure 2. Regression statistical analysis is shown in table 2.



**Figure 1.** Securities return rate.



**Figure 2.** Market index (BET) – securities return rate correlations.

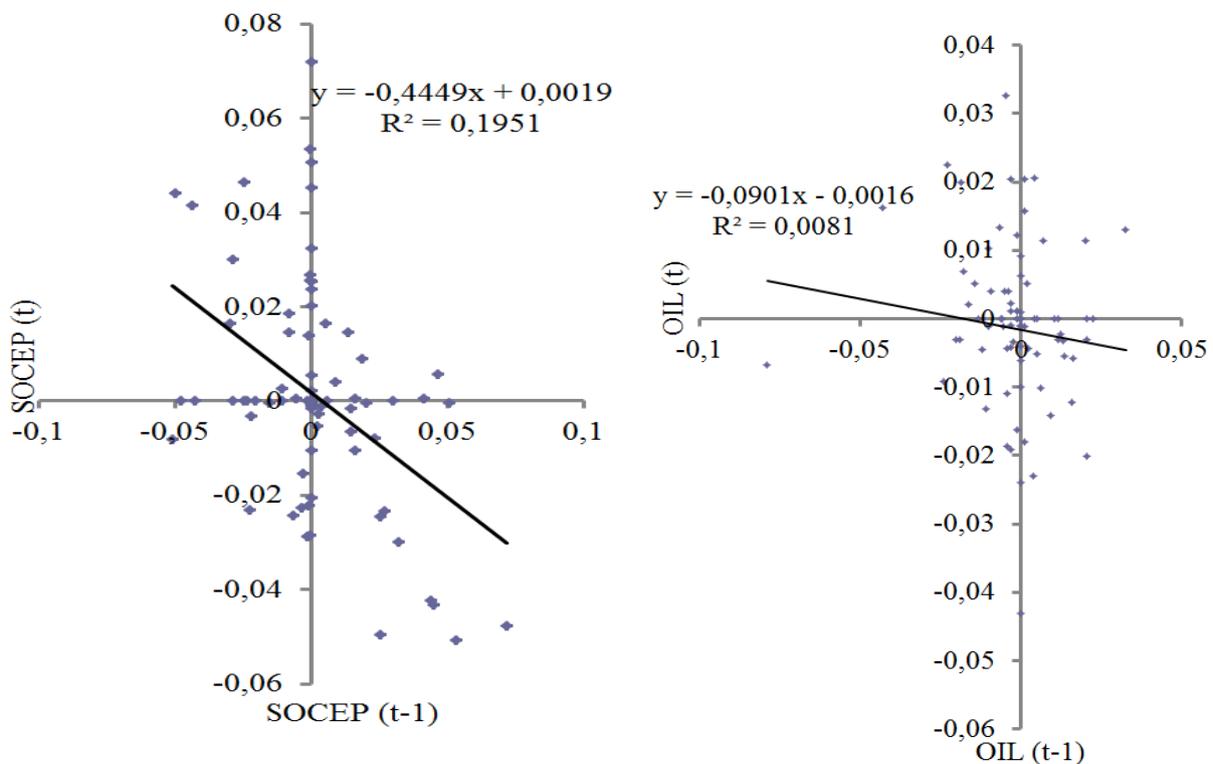
The plots show for the three securities a wide spread of the points in all the quadrants. Applying a Student t-test for coefficients  $\alpha$  and  $\beta$  one can conclude that the null hypothesis  $H_0: \hat{\alpha} = 0$  and  $H_0: \hat{\beta} = 0$  could be accepted for both OIL and SOCP. The multiple determination coefficients  $R^2$  have

small values in each case. At most 3.9% for SOCP and 1.3% for OIL return rate can be explained by the market evolution. Thus, the return rates evolution of the shares have no linear connection to the market general index and should be subject of other considerations than market generally performance. The arbitrage models could be useful in such a situation. Fama and French [6] proposed to use market equity, book-to-market ratio, price-earnings ratio or indebtedness level as correlation variables.

**Table 2.** Regression analysis.

	SOCP – BET	OIL – BET
Coeff. $\alpha$	0.00076	-0.0013
Coeff. $\beta$	-0.425	0.155
Coeff. $\alpha$ standard error	0.0024	0.0015
Coeff. $\beta$ standard error	0.229	0.146
$\alpha$ t-stat	0.317	-0.853
$\beta$ t-stat	-1.852	1.063
Multiple determination coefficient $R^2$	0.039	0.013

OIL has a quite null value of the price-earnings ratio (PER), considering the dividend for 2013 and the last price of the same year. This value could be a consequence of the stockholders expectations. The company is owned by two significant investors and 16% of shares are owned by minor stack holders.



**Figure 3.** Return rate auto-correlations.

The SOCP's PER value is 19.75. There are two major investors in SOCP, and 33 % of shares are owned by minor investors. The dividend policy is also steady, providing a 1% dividend rate which is quite smaller and reflects the major investor's policy to capitalize the gains.

Figure 3 shows the auto-correlation of the return rates with a gap of one day. There is no obvious correlation between return rates for OIL, because the points  $(R_{t-1}, R_t)$  are approximately uniformly distributed in all four quadrants of the graphs and the correlation coefficient is 0.09. One can state that there is no auto-correlation between the return rate values on short terms. Hence, the weak informational efficiency form is assumed for OIL. The correlation coefficient for SOCP is 0.44 and the weak form of the informational efficiency is rejected. Thus, peculiar information could be used by the major investors to obtain benefits.

#### 4. Conclusions

Constantza Port is a strategic point for the European core-transport network, and its importance is outlined by the political evolution around the Black Sea. Despite the importance of the Constantza Port for the national economy and particularly for the transport industry, the presence of handling, storage and transport companies on the Romanian capital market is quite feeble and the dependency to the whole market evolution (market models) is not satisfied. The evolution of the shares prices depends to a small extent on the market return rate. The arbitrage models are more appropriate to quantify the prices evolution of the shares. The random walk process for the return rates is satisfied and the weak efficiency of the market might be assumed for OIL Company. Otherwise, for SOCP Company the weak informational efficiency is rejected. Further analysis should take into consideration the equity structure, dividend policy and stakeholders expectations for explaining the market evolution of securities.

#### Acknowledgement

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