

Random walk and weak efficiency: evidence from the italian stock market

Random Walk ed Efficienza Debole: Evidenze nel Mercato Italiano

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Riassunto: In questo lavoro viene verificata l'ipotesi di efficienza debole per il mercato finanziario italiano mediante il test del rapporto delle varianze di Lo e MacKinlay (1988) ed il test del rango di Wright (2000). L'analisi viene condotta prendendo in considerazione un collettivo di 139 titoli per i quali erano disponibili le quotazioni ininterrotte dal 2001 al 2005. I risultati evidenziano, con un certo grado di certezza, che l'ipotesi di efficienza debole deve essere rifiutata.

Keywords: Stock market efficiency, Variance ratio, Rank tests, Non parametric tests.

1. Empirical verification of the EWF for the italian market

A question on which empirical financial science has concentrated in particular is whether financial markets are efficient, that is, whether stock quotations always reflect the information available at a particular time. The main consequence of this hypothesis is that future price variations cannot be predicted. As well known, three forms of efficiency are distinguished: efficiency in the weak form, the semi-strong form, and the strong form. Of these three forms, the one that has attracted most scholarly attention is efficiency in the weak form (EWF), which implies that stock prices at any moment reflect the information that can be deduced from the past history.

The numerous tests conducted have generally accepted the efficient market hypothesis in the weak form. However, recent developments in analytical modelling have cast doubt on this finding on several occasions.

With particular regard to the italian financial market, one notes not only that the EWF has been little investigated but also that the tests are somewhat outdated. It is consequently advisable to re-examine the hypothesis in light of these new and more sophisticated techniques, on the one hand in order to extend the time span of analysis, on the other to make a contribution comparable in terms of the tools used with almost all the studies that have recently appeared in the international literature.

In order to investigate the hypothesis of efficiency in the weak form for the italian financial market, the all stocks (139) for which were available the uninterrupted time series of the last 1000 quotations since 05/06/2001, were selected. For the empirical verification of the EWF, were used both the VR test of Lo A. W., MacKinlay A. C. (1988), and the non-parametric R test of J. H. Wright (2000). Moreover, the following levels of k : 2, 3, 4, 5, 10, 20 are considered.

As regards the VR test, the results obtained for the various levels of k considered, which are summarized in the first part of Table 1, are rather homogeneous. In general, the hypothesis of the EWF, for a significance level of 0.05, is rejected on mean by 28.1% of

the stocks considered. This percentage is 28.8% for $k=2$, while it diminishes to 20.9% for $k=20$. Also to be pointed out is that, as k grows so do the correlations, and that for $k=10$ and $k=20$, (data non show) the latter, in around 7% of the set, show rather high values, such to raise doubts as to the correctness of the test. In fact, an empirical verification, whose results are not given here, showed that the distribution of the M_2 statistic, for both $k=10$ and $k=20$, exhibits a right skewness.

As regards the Wright R statistic (second part of Table 1), for $k=2$ almost all of the series considered exhibit a non-random walk. For $k=20$, by contrast, this behaviour is apparent in only 24.5% of the stocks considered. In general, it seems evident that, for small value of k , the series in the set are significantly correlated and contrary to the hypothesis of weak efficiency, while as k increases the random behaviour becomes increasingly evident. However, the results obtained with the two verification methods are rather heterogeneous, especially for low values of k . This may be due to the fact that, as said, the VR statistic, for finite samples, may have a non-normal distribution. Moreover, this test considers only one form of heteroskedasticity, the linear form. But in reality it is not possible to exclude other forms and the non-parametric rank test yields better results.

In conclusion, despite the non-uniform behaviour of the two tests, it is quite clear from the analysis that, because a substantial percentage of the sample exhibits non-random behaviour for the various levels of k , the EWF must be rejected.

Table 1: *Results of the variance ratio test and the rank test.*

Level of k	Test VR						Test R					
	2	3	4	5	10	20	2	3	4	5	10	20
Percentage of non efficient stocks	28.8	29.5	28.8	30.2	30.9	20.9	97.8	83.5	72.7	59.7	66.9	24.5
Percentage of efficient stocks	71.2	70.5	71.2	69.8	69.1	79.1	2.2	16.5	27.3	40.3	33.1	75.5
Total	100	100	100	100	100	100	100	100	100	100	100	100

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