

# Thin trading, market efficiency tests and The Johannesburg Stock Exchange: a rejoinder

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## ABSTRACT

Gilbertson and Roux's reply to criticism of their tests for efficiency on The Johannesburg Stock Exchange (JSE) contains little that is new, apart from a few contrived arguments. Gilbertson and Roux have made no more than a weak attempt to allow for the impact of thin trading and are claiming more for their tests than sober analysis would permit. At best, they have shown the Efficient Market Hypothesis to be consistent with approximately half of the JSE.

## INTRODUCTION

In their response to my criticism of their tests for market efficiency on The Johannesburg Stock Exchange,<sup>1, 2, 3</sup> Gilbertson and Roux attack several straw men and provide some misplaced instruction in elementary statistics. They do correspondingly little to correct the basic weakness in their earlier report. The same test data are discussed, with virtually no account taken of wide differences in share trading activity and statistical return behaviour.

Gilbertson and Roux claim to have provided "persuasive support for the view that the JSE is an efficient market". Unfortunately, as I pointed out in my earlier critique,<sup>2</sup> at least half the shares on the JSE are traded so infrequently, that important efficiency tests are rendered useless. More specifically, thin trading has three crucial statistical side effects:

- (i) leptokurtic, or highly peaked distributions of return which preclude the use of statistical tests designed for normally distributed data;
- (ii) discontinuities, or long interruptions in the time series of measured returns which severely restrict the reliability of risk coefficient estimates; and
- (iii) distortions in the measurement of portfolio returns which complicate the use of market indices and make risk adjusted performance appraisal virtually impossible.

This brief rejoinder elaborates somewhat further on the impact of these effects. It is shown that Gilbertson and Roux have made no more than a weak attempt to allow for thin trading and are claiming more for their tests than sober analysis would permit. Although there is evidence of efficiency in the high volume sector of the JSE, nothing can be said about the efficiency, or otherwise, of the low volume sector. At best, the Efficient Market Hypothesis (EMH) has been shown to be consistent with approximately half of the JSE.

## IMPACT OF THIN TRADING

Distributions of returns are important because they determine the appropriate class of statistical tests. Most tests are designed for data which are normally distributed.

Since share returns tend to generate distributions which are more peaked than the normal distribution, special distribution functions (the stable Paretian, Student-t, Compound Normal) and tests are required, unless the deviation from normal can be shown to be insignificant. High volume JSE stocks have been shown,<sup>1, 4</sup> to have return distributions which resemble those found on the larger New York and London exchanges. Thus, for these shares the same efficiency tests are appropriate.

But there is no evidence yet, that the return distributions of low volume JSE stocks are similar to those of the high volume stocks. In fact, the only available data<sup>5</sup> suggests that thin trading may be associated with even more leptokurtic or peaked distributions. Depending on the extent of this deviation from normality, all performance appraisals based on linear regressions, for example, become almost meaningless in terms of statistical significance.

Rather than examine the impact of thin trading on statistical significance, Gilbertson and Roux attack a straw man. They make an obvious and redundant point about the lack of any *a priori* connection between a distribution type and random or non-random behaviour. What they completely ignore in this connection, is the data<sup>4, 5</sup> suggesting that leptokurtic distributions on the JSE exhibit non-random substructure; the empirical return distributions can be subdivided into subperiods of homogeneous behaviour. It is this substructure and not the leptokurtosis per se which suggests non-random behaviour.

The second important side effect associated with thin trading is that of discontinuities in the time series of observed returns. Given the correlation,<sup>6, 7</sup> between volume and discontinuous trading, this is a wide spread phenomenon on the JSE. Regression of a discontinuous series of measured returns from a low volume share against the continuous series of market returns, in order to estimate the beta risk coefficient, immediately generates problems. Two consequences are high standard errors on the beta coefficients and an empirical relationship between the betas and trading volume<sup>6, 7</sup>. As Saloner put it: "fundamentally the much lower beta coefficients of the low traded shares are due in the first instance to a larger percentage of periods having zero returns . . . as a result of there being no trading during the month (false zeroes) . . ."

Apart from attacking another straw man, by invoking a spurious reference to Lawrence Fisher\* and paraphrasing Myers, Gilbertson and Roux in their reply hardly acknowledge the extent to which discontinuous trading complicates risk adjusted performance appraisal. In a footnote they suggest that the problems can be overcome by measuring "the security return between

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\*Fisher<sup>9</sup> in his discussion of market indices computed on the basis of arithmetic and geometric return averages, makes no mention of risk coefficient estimation or discontinuous trading.

adjacent trades (perhaps even periods of unequal lengths) and to regress these against market returns over the corresponding periods". Since changes in the interval over which returns are measured result in changes in beta estimates,<sup>8</sup> the reliability of the procedure is highly questionable. The problem of beta distortion caused by discontinuous trading is not solved by merely replacing it with another type of distortion.\*\* In the JSE example analysed by Saloner and Strebel,<sup>7</sup> there were shares which exhibited as many as 40 false zeroes out of 90 monthly return measurements, that is, 40 months during which no trading occurred. The severity of the expected return distortion in such cases, combined with the number of shares on the JSE which exhibit discontinuities, also complicates the use of market indices. Since observed (ex post) returns are less relevant than expected (ex ante) returns upon which investors base their decisions, JSE market indices distorted by false zeroes are hardly representative of investor expectations about the market. These index distortions, in addition to those introduced into portfolio betas by the inclusion of low volume shares, are glibly ignored by Gilbertson and Roux.

### JSE EFFICIENCY TESTS

With respect to the serial correlation and runs tests for non-random behaviour. Gilbertson and Roux introduce no separate data for thinly traded shares. The only thing of note in their response is yet another straw man which they create this time, in the form of runs tests carried out by Saloner and Strebel<sup>7</sup> on 10 highly traded shares. They note as we did, that the data for highly traded shares are consistent with random behaviour. What they omit to mention are the results of our runs tests on 10 thinly traded shares which indicated significant non-random behaviour. Needless to say, the small sample sizes do not permit firm conclusions concerning the random or non-random behaviour of low volume shares.

As mentioned in my previous critique, the lack of a documented, successful trading rule on the JSE is the best available evidence consistent with the EMH. Since then, Gilbertson and Roux have also applied a single trading rule test to 14 of Saloner and Strebel's low volume shares. These performed "worse, if anything" than the same test on high volume shares. But, a single filter test on 14 of the more than 200 JSE shares which can be classified as thinly traded, is hardly conclusive. Even less convincing are Gilbertson and Roux's portfolio performance tests, which in effect are useless. Without an adequate correction for the beta distortion caused by discontinuous trading (section 2 above), risk adjusted performance appraisal of JSE mutual funds which include low volume shares, is meaningless. The problems of risk coefficient estimation are not limited to discontinuous trading however. Roll,<sup>11</sup> in a recent article, has questioned whether under the best of circumstances, the underlying capital asset pricing model (CAPM) is testable at all.

Gilbertson and Roux mention other less severe problems in connection with the CAPM. In this regard, they

present some typically contorted logic: "the point we wish to make is that the problem of the validity of the CAPM is common to both American and South African results. Thus, the South African findings should not be dismissed on these grounds alone". It is questionable whether U.S. researchers would be flattered by the notion that consistency with their results constitutes a reason for accepting Gilbertson and Roux's claims. It is certain that they could not support the Gilbertson and Roux logic. If the CAPM has problems, these undermine the validity of tests based on the CAPM, not only in the U.S., but in South Africa as well.

In summary, there is agreement that South African shares exhibit signs of non-random behaviour in their return series. However, it has yet to be shown that this behaviour can be profitably and consistently exploited. On the other hand, the Gilbertson and Roux mutual fund performance tests will remain irrelevant, until the distortions generated by discontinuous trading are removed. The distortions increase with thin trading and few separate tests have been performed on thinly traded shares. Gilbertson and Roux's claims with respect to the low volume half of the JSE, therefore, are hopelessly overstated.

### References

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\*\*When the return interval is reduced from a month to a single day, discontinuous trading becomes a problem even on the New York Stock Exchange. Myron Scholes<sup>10</sup> has recently devoted a substantial working paper to the theoretical and econometric ramifications of the problem.