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A test of Graham's stock selection criteria on industrial shares traded on the JSE

1. INTRODUCTION

Benjamin Graham was one of the most influential financial analysts in the United States of America. He believed in value investing, whereby he proposed that investors should purchase only those stocks that are worth significantly more than they cost. Shortly after his death an article was published in FORBES, in which he had listed ten criteria which investors could use to identify undervalued stocks (Rea, 1977; Oppenheimer, 1984).

Various tests of these criteria have been carried out in the United States of America. Portfolios set up using these criteria have exhibited superior performance compared to the relevant indices of the stock exchanges they were drawn from. This was true for *ex post* and *ex ante* tests, and remained true after the publication of the articles (Oppenheimer, 1984).

The applicability of certain combinations of Benjamin Graham's stock selection criteria were tested on the Industrial securities market in South Africa.

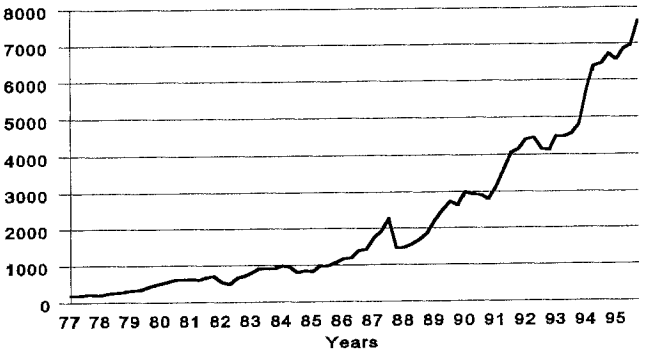
Evidence that making use of Graham's stock selection criteria to determine a portfolio, would provide one which yielded abnormal positive returns would suggest, at least, that pockets of inefficiency existed in the overall efficient market, as represented by the industrial shares traded on the JSE.

It would also provide "defensive investors" (according to Graham's definitions, those individuals without the time expertise or temperament for aggressive investment (Oppenheimer, 1981:341)), with an opportunity to establish a portfolio that could prospectively yield abnormal positive results.

An 'abnormal' return is defined in this context as the difference between the actual return and the expected return, where the expected return is dependent upon the risk of the security or portfolio and the two parameter asset pricing model (Oppenheimer and Schlarbaum, 1981:341)

The market did experience 'bull' and 'bear' phases during the period investigated, which was from 1977 to 1994, and can be seen in Figure 1, which depicts the Industrial Index for this period. Abnormal positive returns would thus not be purely as a result of either an upward or downward trend in the market.

Figure 1: Industrial Index 1977-1995



2. BENJAMIN GRAHAM'S STOCK SELECTION CRITERIA

The ten criteria developed by Benjamin Graham are listed in Table 1 (Oppenheimer, 1984:69, Rea, 1977)

According to Graham and Rea, the first five criteria measure 'reward', and are sensitive to price and earnings changes. The focus in this first group of five criteria is on stock price, earnings and dividends.

The second group of five criteria offers a measure of 'risk' and does not change rapidly with changes in price and earnings. The criteria numbered 6,7 and 8 represent the financial soundness of companies, and Graham and Rea's research showed that financial soundness was relatively much more important than earnings growth, and stability in that growth (Rea, 1977).

Selection, by using the criteria, is based on the concept of maximising the 'reward' to 'risk' ratio of the stocks selected. (Oppenheimer, 1984, Rea, 1977). To qualify for inclusion in a portfolio, a stock would need to meet at least one reward criterion, and one risk criterion.

Graham believed in 'value' investing, and based his advice on the belief that "a security's value and subsequent performance depend on acceptable operating performance and a solid (conservative) financial condition" (Oppenheimer, 1984).

Application of the criteria was thus intended to lead to the inclusion into the portfolio of undervalued, low risk stocks.

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Table 1: Graham's stock selection criteria

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1	An earnings-to-price yield at least twice the AAA bond yield.
2	A price-earnings ratio less than 40 percent of the highest price-earnings ratio the stock had over the past five years.
3	A dividend yield of at least two-thirds the AAA bond yield.
4	Stock price below two-thirds of tangible book value per share.
5	Stock price below two thirds "net current asset value".
6	Total debt less than book value.
7	Current ratio greater than two.
8	Total debt less than twice "net current asset value".
9	Earnings growth of prior 10 years at least at a 7 percent, annual (compound) rate.
10	Stability of growth of earnings in that no more than two declines of 5 percent or more in year end earnings in the prior 10 years are permissible.

During portfolio simulation, all the criteria are not applied simultaneously, and only certain combinations of criteria are used as filters, in order to determine which stocks are included in the portfolios, and which are excluded. This is mainly due to the fact that if all the criteria are applied simultaneously, no stocks qualify for the portfolio.

If combinations of the criteria are used, the question arises as to which combinations to use. Rea and Graham admitted that using all ten criteria was too complex. Graham found that the earnings yield and dividend yield criteria (i.e. the criteria numbered 1 and 3), were by far the most important performance criteria of the first five (Rea, 1977:70).

Graham's research also indicated that the use of only two criteria would yield a portfolio which would perform almost as well as a portfolio based on all ten criteria. These two criteria were that the total debt be less than the equity (criteria 6), and that the earnings yield be at least twice the average Triple-A bond yield, (criteria number 1) (Rea, 1977: 70).

Blustein (1977) suggested that the criteria numbered 1,3 and 6 were the most useful and profitable.

Because of the above reasons, it was decided to use combinations of the criteria numbered 1,3 and 6 to set up screens. An additional limitation was that in order for a stock to qualify for inclusion, it needed to pass at least one of the first five criteria, as well as at least one of the second set of five criteria. This would enable the 'return' versus 'risk' of the stock to be evaluated (Oppenheimer, 1984).

The combinations of criteria researched to create portfolios are thus: (1 and 6), (3 and 6), and (1,3 and 6).

The first criterion is: 'An earnings-to-price yield at least twice the AAA bond yield'. The RSA-long term gilt, was used as an equivalent for the American AAA bond yield.

The criterion 1 used was thus represented as : An earnings-to-price yield at least twice the RSA-long term gilt yield.

The third criterion is stated as: A dividend yield of at least two-thirds the AAA bond yield. The RSA-long term gilt was again used as an equivalent for the American AAA bond yield.

Criterion 3 is thus formulated as follows: A dividend yield of at least two thirds the RSA-long term gilt.

The first of the five criteria addressing risk, states that total debt be less than book value. For criterion 6, the definition for book value used is: the sum of assets valued at their original costs minus accumulated depreciation, minus all borrowed capital, minus preferred stockholder's claims.

3. METHODOLOGY AND PERFORMANCE EVALUATION

The available data was strained through appropriate filters in order to determine which companies, per year, passed the combinations of criteria (or screens) as stipulated for each of the portfolios indicated above. The outcome of this process was a list of company names, per year, from 1977 to 1994 that passed the screens stipulated for each portfolio. The number of companies that passed these screens, per year, are indicated in Table 2. The results are based on information available on 31 December of each year indicated.

Because of the small number of companies that passed the criteria, all the companies that passed the screens were included in the portfolios.

During the simulation of an investor's experience, equally weighted portfolios of these stocks were purchased on the last day of March of the year following the screen. This would allow the hypothetical investor enough time to collect and analyse the data available on the 31st of December of the previous year, and to arrange for the purchase of the shares. All stocks in the portfolio were held for two years and then sold.

Table 2: Number of companies meeting specific screens

Screen criteria / Screen date	(1) & (6)	(3) & (6)	(1), (3) & (6)
1977	20	28	20
1978	23	36	20
1979	22	33	18
1980	12	14	6
1981	10	16	8
1982	13	22	11
1983	2	1	0
1984	3	1	1
1985	0	1	0
1986	2	4	0
1987	1	3	1
1988	5	5	2
1989	4	11	3
1990	6	8	3
1991	4	5	2
1992	8	21	6
1993	7	24	5
1994	3	6	1
1995	3	11	1

The first screening took place at the end of December 1977, and the first shares were purchased on 31 March 1978. The last shares were purchased on the 31st of March 1993 and were sold again on the 31st of March 1995. The performances of the portfolios were then evaluated.

The performance of the portfolios could not be compared directly to that of the Industrial Index, because the risk of the portfolios vary from that of the Industrial Index, and the expected portfolio returns should be adjusted, to compensate for the different risks associated with the portfolios.

The portfolio returns were evaluated using the method of analysis first introduced by Jensen (1968). The evaluation model is:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + e_{pt}$$

R_{pt} = the month t (t = 1,...,24) return earned by a portfolio of stocks meeting the screening criteria and purchased in month 0;

R_{ft} = the "risk-free" rate of return in month t;

R_{mt} = the rate of return on the market portfolio;

β_p = $\text{cov}(R_{pt},R_{mt})/\sigma^2(R_{mt})$, or the portfolio p's risk relative to the market portfolio;

e_{pt} = an error term assumed to have expected value of zero and to be serially uncorrelated; and

α_p = a measure of monthly abnormal performance for the portfolio evaluated.

The above equation indicates that the realised portfolio return in excess of the risk-free rate is a linear function of three terms - a premium for accepting risk (namely the product of the portfolio risk and the market's return in excess of the risk-free rate), a random error term (with expected value of zero) and an estimate of portfolio performance not accounted for by either portfolio risk or market return.

It is this last parameter α_p which provides a measure of the ability of the criteria to select portfolios which provide abnormal positive returns. If α_p is significantly larger than zero, it can be concluded that the risk adjusted returns of portfolio p exceed what the asset pricing model predict them to be.

4. FINDINGS

Criteria (1) & (6)

The mean monthly return, over the sixteen year period for the portfolios was 2,61 per cent with a standard deviation of 1,65.

The mean monthly return for the Industrial index over the same period was 1,68 per cent, with a standard deviation of 1,05.

Risk adjustment was done by using regression analysis to obtain the parameters for equation (1), as discussed above. The mean monthly returns of the portfolio and index, as well as the risk adjusted

performance of the portfolio, over the sixteen two-year holding periods, from March 1978 to March 1995 are shown in Table 3 below.

Table 3: Raw and risk adjusted returns for portfolio based on criteria (1) and (6)

Raw returns		Risk adjusted measures				
Rpt (%)	Rmt (%)	α (%)	t(α)	β	t(β)	R^2
2,61	1,68	1,01	2,33	0,87	2,74	0,349

The portfolio based on Graham's criteria (1) and (6) exhibits abnormal positive returns at the 5 per cent level of significance. This is also true at the 2,5 per cent level, but is no longer true at the 1 per cent level.

Criteria (3) & (6)

The mean monthly compound return for the portfolio was 2,42 per cent, with a standard deviation of 1,76.

The mean monthly return for the Industrial index over the same period was 1,68 per cent, with a standard deviation of 1,05.

The mean monthly returns of the portfolio and index, as well as the risk adjusted performance of the portfolio, over the sixteen two-year holding periods, from March 1978 to March 1995 are shown in Table 4 below.

Table 4: Raw and risk adjusted returns for portfolio based on criteria (3) and (6)

Raw returns		Risk adjusted measures				
Rpt (%)	Rmt (%)	α (%)	t (α)	β	t (β)	R^2
2,42	1,68	0,81	1,73	0,89	2,62	0,329

Following the same process as for criteria (1) & (6) above, to determine the significance of the difference between the risk adjusted portfolio return, and the market, it was found that the difference between the two was significant at the 10 per cent level, but no longer at the 5 per cent level.

Criteria (1), (3) & (6)

The mean monthly compound return for the portfolio was 2,66 per cent, with a standard deviation of 2,23.

The mean monthly compound return for the Industrial index over the same period was 1,68 per cent, with a standard deviation of 1,05.

The mean monthly returns of the portfolio and index, as well as the risk adjusted performance of the portfolio, over the sixteen two-year holding periods, from March 1978 to March 1995 are shown in Table 5 below.

Table 5: Raw and risk adjusted returns for portfolio based on criteria (1), (3) and (6)

Raw returns		Risk adjusted measures				
Rpt (%)	Rmt (%)	α (%)	t (α)	β	t (β)	R^2
2,66	1,68	1,03	1,65	0,92	2,03	0,227

At the 10 per cent level of significance, the portfolio based on Graham's criteria (1), (3) and (6) exhibits positive abnormal returns. This is not true at the 5 per cent level of significance.

Stability of portfolio returns

The mean compound monthly return of the Industrial index over the period covered by the research is 1,68 per cent. The standard deviation of returns for this population of shares is 1,05 per cent. The smallest standard deviation exhibited by one of the portfolios over the same period is 1,65 (portfolio based on criteria (1) & (6)). The largest is 2,23, for the portfolio based on criteria (1), (3) & (6).

The standard deviations of the mean monthly compound returns of the portfolios are large in comparison to that of the Industrial index. The variability of the returns of the individual investment periods can clearly be seen in graphical form in Figures 2, 3 and 4.

Diversification

It is evident from Table 2 that for numerous two year periods, the portfolios contained fewer than six companies. The screens used to set up the portfolios have thus limited the amount of stocks that pass the associated criteria, and diversification is subsequently insufficient for many of the investment periods. This is partly responsible for the high standard deviation

figures for the monthly compound returns of the portfolios, and for the excess returns not being stable over time.

The portfolio returns are also seen to be generally below that of the market during the period 1985 to 1989, a period when the criteria allowed investment in less than five companies.

Figure 2 : Criteria (1) & (6)

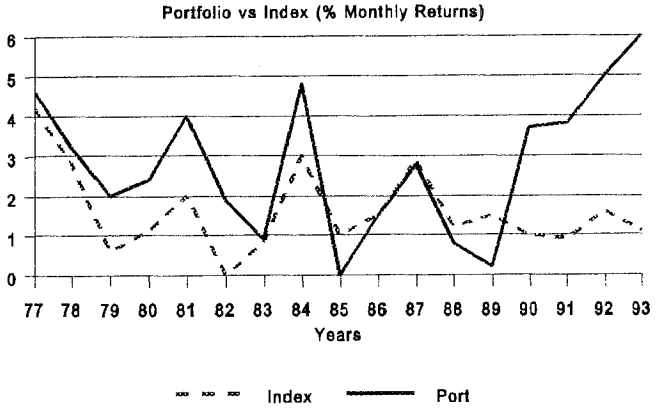


Figure 3 : Criteria (3) & (6)

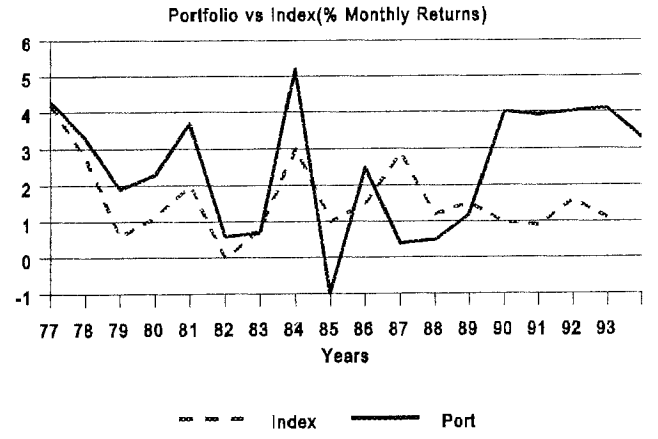
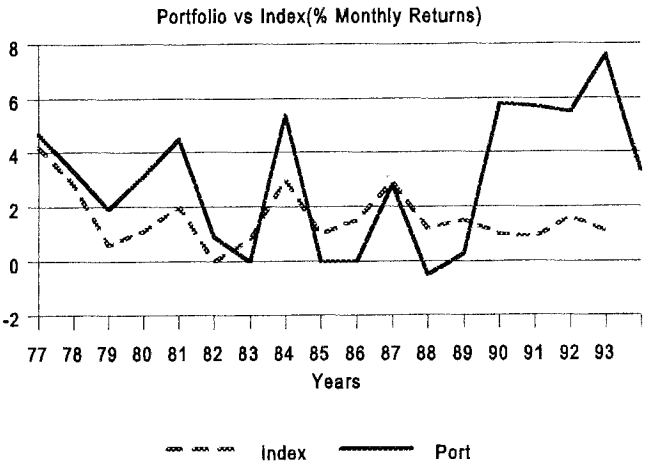


Figure 4 : Criteria (1) ,(3) & (6)



5. CONCLUSION

The results of this research indicate that an investor who made use of the combinations of Graham's criteria investigated to create a portfolio, would have achieved results better than that of the Industrial index, during the period 1977 to 1994. Not all the individual investments would have been profitable, and the overall results were also negative occasionally (for certain investment periods). However, over the longer term, at the 10 per cent level of significance, all of the portfolios investigated provided risk adjusted returns significantly above that which the asset pricing model suggests that they should have.

Mean compound monthly rates of return exceeded those of the Industrial index by between 0,74 per cent and 0,98 per cent, (or annually by between 9 per cent and 12 per cent), when a frictionless market situation was investigated. Taking transaction costs and taxes into account would affect the results.

However, indications are that during the periods researched, there were undervalued industrial stocks present on the Johannesburg Stock Exchange, and that a conscientious investor, who made use of the screens investigated, could have achieved above market returns.

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