Price adjustments on the Johannesburg Stock Exchange for unexpected and dramatic news events: an empirical analysis

N. Bhana

Graduate School of Bubiness, University of Durban-Westville, Private Bag X54001, Durban, 4000 Republic of South Africa

Accepted 12 September 1988

The objective of this study is to determine whether companies listed on the Johannesburg Stock Exchange overreacted to unexpected favourable and unfavourable company-specific news events during the period 1970 – 1984. The JSE appears to be inefficient in reacting to the announcement of unfavourable news; economically significant abnormal returns up to one year following the event are observed. The JSE does not appear to overreact to news of a favourable nature, there is only weak evidence of short-term overreaction. The selling pressure caused by panic selling could depress prices well below levels justified by the unfavourable news. The magnitude of the overreaction to unfavourable news is sufficient to enable astute investors to outperform the market by taking positions in these securities. Knowledge of the pattern of market overreaction can also be of value to investors for transactions that are to take place anyway.

Die doelstelling van hierdie ondersoek is om vas te stel of die maatskappye wat op die Johannesburgse Effektebeurs genoteer is, oorreageer het op onverwagte gunstige en ongunstige maatskappy spesifieke nuusgebeure gedurende die periode 1974 – 1984. Dit blyk dat die Johannesburgse Effektebeurs oneffektief reageer op ongunstige nuus asook op ekonomies betekenisvolle verslae van tot 'n jaar nadat die voorval opgemerk is. Dit blyk ook dat die Johannesburgse Effektebeurs nie oorreageer op nuus van 'n gunstige aard nie; daar is slegs 'n effense bewys van oorreaksie op die korttermyn. Die verkoopdruk veroorsaak deur paniekbevange verkope kan pryse afdruk tot selfs onder die vlakke wat deur ongunstige nuus geregverdig is. Die omvang van die oorreaksie op ongunstige nuus is genoegsaam om die skerpsinnige beleggers in staat te stel om beter as die mark te vorder deur belegging in hierdie effekte. In elk geval kan kennis van die patroon van markoorreaksie ook van waarde vir beleggers wees vir transaksies wat moet plaasvind.

Introduction

Investigations into stock market bahaviour related to investor overreaction to dramatic and unexpected financial news has been a popular area of research. Interest in market overreactions dates back as far as the tulip bulb craze of the 1630s in Holland. This paper will present substantial empirical evidence of stock market overreaction in various overseas countries. The notion of investor overreaction on the Johannesburg Stock Exchange (JSE) has been around for some time, but there has been no critical examination of this phenomenon. The purpose of this paper is to determine whether or not the overreaction phenomenon is applicable to shares traded on the JSE. Based on the empirical evidence, several investment strategies which might enable investors to exploit the irrationality implied by the Overreaction Hypothesis will be recommended.

The overreaction hypothesis

The suggestion that investors overreact to company-specific news of dramatic financial events has recently aroused considerable interest among researchers (Howe, 1986). Typical examples of such company-specific events include merger and earnings announcements, changes in dividend policy, company reorganization, changes in management and unexpected legal judgements. In recent years, the fall in the Rand/Dollar exchange rate resulted in many South African companies reporting substantial foreign exchange losses on offshore loans. In many instances the announcement of these unexpected losses have had a major impact on the share prices of the companies involved. The term overreaction implies a comparison with some degree of reaction that is considered appropriate. In this context, we can define overreaction as the general tendency for investors to process event-related news in an excessive, and even absurd fashion. In particular, market participants can be said to overreact when unexpectedly favourable (unfavourable) announcements cause trading behaviour that results in price appreciation (depreciation) that is excessive relative to the actual value implied by the nature of the event.

Participants in stock markets and researchers have for long been debating whether or not share prices rationally reflect the 'intrinsic' or fundamental values of the underlying companies. At one extreme is the view expressed by Keynes (1936) that stock markets are no more than casinos for transferring wealth between the lucky and the unlucky. At the other extreme is the Efficient Market Hypothesis (EMH) presented by Fama (1970), which states that share prices fully reflect all available information and are, therefore, the best estimates of intrinsic value. The majority of the empirical studies are consistent with the EMH. There is, for example, considerable evidence that, on average, individual share prices respond rationally to unexpected announcements concerning company fundamentals, such as dividend and earnings changes and that prices do not respond to 'noneconomic' events such as cosmetic changes in accounting techniques. However, Bosworth (1975) presented evidence suggesting that share prices are moved by waves of 'speculative' optimism and pessimism beyond what is reasonably justified by the fundamentals.

Until recently, the belief that share prices exhibit irrationally high volatility had not been formally tested. Shiller (1981a), (1981b) and (1983) has shown that variations in aggregate share prices are much too large to be justified by variations in subsequent dividend payments. Under the assumption that the expected real return on the market remains essentially constant over time, he concludes that the variation in share prices appear to be far too high to be attributed to new information about future dividends. Shiller (1983) concluded that the excess variation in share prices provides strong evidence against the EMH. Marsh & Merton (1986) demonstrated that share price movements conform to the EMH, and that they appear to be very volatile (relative to dividends) because companies follow a dividend payout policy that results in a 'smoothed' dividend stream.

The concept of rationality is basic to most economic analysis such as a decision to invest in securities. The rational expectations hypothesis suggests that investors being rational and risk averse, are attracted by expected return and repelled by risk. Furthermore, rational investors are expected to price securities based on their estimated future income streams rather than try to predict the short-term movement in prices. Komicke (1984) demonstrated that the vast majority of investors are not rational in their investment decisions. It was shown that an overwhelming majority of stock market investors believe that expected return is caused by short-term price changes. Tversky & Kahneman (1981) identified an important reason which leads to biases in forming judgement. It was observed that the individual judges the likelihood of a future event by the similarity of the present evidence to it. 'There is a tendency to ignore both prior information and the quality of the present evidence. Arrow (1982) observed that investors are not rational and that 'the excessive reaction to current information seems to characterise all the securities and futures markets.'

Documented evidence of market overreaction goes as far back as 1688 when the first book describing the practices on any stock exchange was published. This book by Joseph de le Vega, aptly entitled 'Confusion de Confusiones', describes dealing on the exchange in Amsterdam, which at that time was the financial centre of the world. Although the market was still in its infancy, a remarkable degree of sophistication was evident and investors were able to deal in many types of speculative securities that are found in markets today. Lambert (1986:114) reviewed this book and was surprised to find evidence of market overreaction: 'The expectation of an event creates a much deeper impression on the exchange than the event itself. When large dividends or rich imports are expected, shares will rise in price; but if the expectation becomes a reality, shares often fall; for the joy over the favourable development and jubilation over a lucky chance have abated meanwhile.'

It would seem that after 300 years very little has changed in the behaviour and motives of investors and speculators.

While evidence of market overreaction goes back many years, it is only in recent years that this phenomenon has been critically examined. The possiblity of overreaction has been suggesteed by Smidt (1968) who identified 'speculative bubbles' caused by new information causing exaggerated optimism and exaggerated pessimism. Ackley (1983) observed that security markets are characterized by periods of 'price bubbles' when security prices are unrelated to fundamentals. During such periods, price movements may develop a cumulative momentum in one direction, which can easily overshoot the long-term equilibrium price. Goldman & Sosin (1979) suggested that the speed of share price adjustment to new information is not instantaneous, rather prices move in trends which persist for long periods. It is further suggested that there is a gradual flow of information from insiders to speculators and eventually to the mass of investors and this may result in market overreaction. Bernstein (1985) suggested that investors overweight recent bad news of companies in financial difficulty and drive the share price too low. Similarly, the share price of companies having favourable prospects are pushed too high. The undue emphasis placed by investors on the most recent information was originally observed by Keynes (1936:153–154) who observed that the 'day to day fluctuations in the profits of existing investments, which are obviously of an emphemeral and insignificant character, tend to have an altogether excessive and even an absurd, influence on the market.'

In recent years there has been a proliferation of evidence in support of stock market overreaction. Niederhoffer (1977) investigated the report of 'bad news' world events in newspapers and its impact on share prices. It was observed that there was a sharp drop in share price on the day extremely bad world events were reported. On days 2 – 5 following these events, there was a tendency for sharp rises in market prices. On these occasions the market appeared to be overreacting to bad news and the initial price reaction is followed by a correction (reversal) in the opposite direction. Niederhoffer (1977:214) concluded that the market's response to world bad news can be predicted with considerable accuracy and that investors could benefit by following a strategy of postponing sales and accelerating purchases in the hectic times following adverse world events. A possible explanation of the market overreaction to bad world news is that several investors may be following an old investment maxim, 'when in doubt, sell out'.

Renshaw (1984) provided evidence that confirms the hypothesis that the run structure for large price changes will sometimes be appreciably different from the run structure for all price changes. On the basis of his evidence, Renshaw (1984:48) suggested a mechanical trading rule: 'Get out of the market after two 5% or more annual gains in a row and get back into the market after an annual loss amounting to at least 5%'. It was shown that an investor who followed this strategy would have outperformed the market average during a large part of the period 1928 – 1981 on the New York Stock Exchange (NYSE) and American Stock Exchange

(ASE). Renshaw (1984:50) found evidence suggesting that investors 'panicked' towards the end of a pronounced bear market and concluded that shares that experienced 'large losses over a two-week period subsequently outperformed the market'.

Howe (1986) investigated the market reaction to company-specific large price changes associated with favourable and unfavourable events. Using weekly share prices prevailing on the NYSE and the ASE, this study defined a 'large' price change representing a 50% appreciation or depreciation in price. Howe (1986:76) concluded that the evidence is strongly consistent with the overreaction hypothesis. Shares that experienced large positive returns (good news) performed poorly in the 50-week period following the event, with return averaging 30% below the market. This poor performance was spread out over a period of almost a year. Shares that experienced large negative returns (bad news) provided above-average returns for a period up to 40 weeks after the event. The magnitude of the 'overreaction' returns suggest that they are economically significant — that is exploitable by investors.

The most extensive study on market overreaction was undertaken by De Bondt & Thaler (1985). They base their overreaction hypothesis on the observation that most investors are poor decision makers in terms of appropriate probability revision to new information, and they overweight recent information and underweight base rate data. The investigators conjectured that, as a consequence of investor overreaction to current earnings, share prices may also temporarily depart from their underlying fundamental values. With prices initially biased by either excessive optimism or pessimism, prior 'losers' would be more attractive investments than prior 'winners'. De Bondt & Thaler (1985:799) demonstrated that the portfolio of 'losers' outperform the market by an average of 19,6%, 36 months after portfolio formation. Portfolio of 'winners' earned 5% less than the market in the later period. The difference in returns between the extreme portolios equals 24,6% and was statistically significant. De Bondt & Thaler (1985) concluded that the market does tend to overreact to extreme situations and that the long-term overreaction process is apparently asymmetric; it is much larger for losers than for winners. Furthermore, if share prices systematically overshoot their equilibrium value, then their subsequent reversal should be predictable from past share return data alone.

Brown & Harlow (1988) used the single-factor market model to determine the unsystematic residual returns associated with individual securities experiencing market overreaction. The post-event response was divided into two periods in order to distinguish the short-term and long-term response to the initial overreaction. Brown & Harlow (1988:12) observed an asymmetry of response behaviour to negative and positive events. For positive events there was only weak evidence of investor overreaction for both short and longer-term responses. On the other hand, the evidence on short-term corrections to negative events is consistent with the overreaction hypothesis. Brown & Harlow (1988) concluded that the stock market generates economically significant one-month corrections and then quickly continues to set prices according to the general trend of the original event. It was found that 'losers' tend to remain that way in the long-term, despite the presence of the short-term adjustment.

Several investigators have attempted to explain the cause of the overreaction phenomenon that appears to be widespread in securities markets. Fama & French (1986) suggested that investors habitually extrapolate recent earnings trends into the future, ignoring the many random walk elements in earnings pattern as well as ignoring the tendency of most divergences from average earnings performance to correct themselves over time by a familiar process known as reversion to the mean. It is suggested that failure by the market to recognize the tendency towards mean reversion results in overreaction to share prices.

Vermaelen & Verstringe (1986) replicated the winner and loser portfolio approach originally used by De Bondt & Thaler (1985), to test for overreaction on the Belgian Stock Market. Vermaelen & Verstringe (1986:13) found conclusive evidence of investor overreaction and suggested that the overreaction effect is a rational market response to risk changes associated with extreme share price movements. They further suggested that the 'risk-change' hypothesis offers an explanation for the existence of market overreaction. According to this hypothesis a decrease (increase) in share prices leads to an increase (decrease) in debt-equity ratios and an increase (decrease) in risk measured by beta coefficients. Vermaelen & Verstringe argued that if betas vary with changes in market value, a negative correlation between risk and market value is plausible because of the changes in financial leverage that accompany extreme movements of the value of equity. The risk-change hypothesis claims that losers are riskier than winners, and that this difference in risk is responsible for the apparent abnormal returns associated with market overreaction.

De Bondt & Thaler (1987) presented further evidence to reevaluate the overreaction hypothesis. To test the risk-change hypothesis, they constructed 'arbitrage' portfolios that finance the purchase of losers by selling winners short. De Bondt & Thaler (1987:569) concluded that while changes in financial leverage does affect the beta coefficients of shares experiencing dramatic price changes, the risk disparity is insufficient to account for the return differential between winner and loser portfolios. De Bondt & Thaler (1987) also tested the suggestion that if earnings are mean reverting, then share prices will also show mean reversion as earnings realizations systematically diverge from their earlier expectations. It was observed that both winner and loser portfolios show a predicted reversal pattern. However, the reversal of earnings is much larger for losers than for the winners. This is surprising because if the anomalous price behaviour is generated by earnings surprises, then the subsequent return pattern should be similar to the new earnings pattern.

In their pioneering work on market overreaction, De Bondt & Thaler (1985) formulated the Overreaction Hypothesis (OH) in terms of the following two propositions:
OH-1: Extreme movements in share prices will be followed by subsequent price movements in the opposite direction (the direction effect), and
OH-2: The more extreme the initial price movements, the more extreme the offsetting adjustment (the magnitude effect).

Brown & Harlow (1988) suggested that as OH-2 predicts that more extreme price changes will cause more extreme adjustments, it is possible that the magnitude of the subsequent reaction will vary inversely with the amount of time needed for the initial price change to occcur. They suggest an intensity effect associated with share market overreaction, in addition to the directional and magnitudinal effects proposed by De Bondt & Thaler (1985). The third OH prediction can be stated as:
OH-3: The shorter the duration of the initial price change, the more extreme the subsequent response (the intensity effect).

Research methodology for testing the overreaction hypothesis

In order to test whether the market displays a tendency to overreact, it is necessary to define the 'event' to be investigated. We are interested in determining whether the security returns associated with the event are consistent with the EMH. Therefore, the event and any subsequent correction must be specified in terms of the residual of the share return that we would normally expect. It is assumed that the actual period, t, return to security, j, R_{jt} can be expressed as the sum of the expected return $E(R_{jt})$, and the random error term (residual) e_{jt}. The unanticipated (residual) period t response of a security, therefore, can be written as:

$$e_{jt} = R_{jt} - E(R_{jt}) \qquad (1)$$

If security prices are set consistently with the EMH, the residual return during the 'overreaction period' equals zero, i.e. $E(e_{jt}) = 0$. On the other hand, if prices are set in accordance with the OH, the residual return will display statistically significant departures from zero. OH-1 suggests that $E(e_{jt}) > 0$ for these securities that produced large negative residual returns in the 'event formation' period. Similarly, OH-1 suggests that $E(e_{jt} <$ 0 for those securities that produced abnormally positive residual performance in the event formation period. To determine the reactions to extreme price changes in individual securities a selection technique developed by Fama & Blume (1966) is used for this investigation. An advantage of this procedure is that responses to specific levels of price change can be measured. To establish the unsystematic residual behaviour of the individual shares investigated, the Market Model developed by Bowman (1983) is used and can be formally presented by the expression:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + e_{jt} \qquad (2)$$

where: R_{jt} = the return on share j for period t; α_j, β_j = the intercept and slope respectively of the linear relationship between the return for share j and the return for the entire market; R_{mt} = the proxy for the return on the entire market represented by the JSE Overall Actuaries Index for period t; and e_{jt} = disturbance term or residual.

The unsystematic residual return is given by the expression:

$$e_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt}) \qquad (3)$$

where $\hat{\alpha}_j$ and $\hat{\beta}_j$ are the ordinary least square estimates of α_j and β_j.

To determine the effect that an event's duration has on the subsequent response (the intensity effect), the residual returns are computed over a period of n successive months. Therefore, the total excess change in the value of an individual security, S_{jn}, is represented by:

$$S_{jn} = [(1 + e_{j1})(1 + e_{j2}) \ldots\ldots (1 + e_{jt})] - 1 \qquad (4)$$

where t = 1,2,3, ... n.

By varying the length of the event, while holding the other factors constant, we obtain details of the extent to which the market incorporates short-term information.

According to OH-2, the magnitude of the residual return in the overreaction period will depend on the magnitude of the residual return in the event formation period (initial residual return). To obtain evidence on the degree of investor response following events of differing magnitudes, it was decided to measure residual return levels (λ_n) in the event formation period for each event of duration n. For this investigation, event lengths ranged from one to six months, while λ_n varies between -60% to -20% and 20% to 60% for 'negative' and 'positive' events respectively. In all cases λ_n is measured by increments of 5%. Events whose magnitude exceed -60% and 60% are not included in this study. As can be expected, the larger event levels are likely to produce very few observations, with the results being unreliable. All shares that produced residual return behaviour falling in the range specified by λ_n during the event formation period are classified as events within a two-dimensional 'matrix' comprising six columns of event duration (intensity) and 18 rows of different event magnitude (nine for negative events and nine for positive events).

To determine the existence of the Overreaction Hypothesis, the daily published share prices of all companies listed on the JSE during the period 1970 to 1984 were analysed. The daily share prices were consolidated into monthly returns. The choice of the monthly return file as a data base, is to some extent justified by the concern to avoid several measurement problems that have received considerable attention in the literature (Roll, 1984). These measurement problems are with respect to both the risk and the return variables. The 'bid-ask' effect and the distortions of infrequent trading are major problems arising from the use of daily share prices. The JSE Overall Actuaries Index was used as a surrogate to produce market-adjusted residual returns for events ranging from one to six months and for event magnitudes specified by λ_n.

The post-event response to market overreaction was divided into two groups in order to determine the existence of the short-term as well as the long-term overreaction effect. For both groups, the event month ($t = 0$) is defined as the last month in the event formation period. The short-term overreaction response is determined by calculating the market-adjusted average residuals in the first month following the completion of an event ($t = +1$). The long-term response is based on calculating the market-adjusted cumulative average residuals (CARs) for the 36-month period following the short-term response (month $t = +1$). Therefore, the interval covering the period $t = +2$ to $+37$ is the long-term overreaction response (months +2 to +13, +2 to +25, and +2 and +37). The choice of the duration of the long-term response is, in part, influenced by the observation by Graham (1973) that the interval required for a substantial overreaction to correct itself is approximately 18 – 30 months,

Empirical evidence of stock market overreaction on the Johannesburg Stock Exchange

A total of 2497 observations, satisfying the definition of an event, are analysed to determine whether the stock market generates economically significant corrections associated with investor overreaction. Table 1 analyses the direction and magnitude effects by showing the average residuals in month $t = +1$, for both positive and negative events associated with varying levels of event magnitude λ_n. The related t statistics are listed parenthetically below each average residual. Table 2 analyses the direction and intensity effects by providing the average residuals in month $t = +1$ for event durations ranging from one to six months for both negative and positive events.

In Tables 1 and 2, the signs of all the average residuals are consistent with the direction effect predicted by OH-1 (negative events produce positive average residuals and positive events generate negative average residuals in the post-event period. Except for one positive event, all the average residuals in Table 1 are significantly different from zero. In addition, all the average residuals in Table 2 are statistically significant. These results appear to provide strong evidence in favour of the direction effect. Extreme movements in share prices are followed by subsequent price movements in the opposite direction. Figures 1 and 2 provide a graphical display of the results presented in Tables 1 and 2 respectively. All the average residuals lie in the quadrant with a sign opposite to that of the event, confirming the direction of the Overreaction Hypothesis.

Figure 1 suggests that there is an apparent asymmetry in the market response to negative and positive events. The residual returns for negative events are increasing in size for different levels of event magnitude. By contrast, the residual returns for positive events, while being all negative, display an erratic pattern of increasing and decreasing size for different levels of event magnitude. This suggests that the overreaction effect is much stronger for negative events than for positive events. Nevertheless, the results provide support for the magnitude effect (OH-2) of the Overreaction Hypothesis.

Figure 2 displays the average residual response associated with the intensity of the event, n. The

Table 1 Event magnitude: Average residuals for the first month following event for companies listed on the JSE during 1970 – 1984

Event magnitude λ_n	Negative events	Positive events
0,20	0,0054[a]	-0,0084[a]
	(4,86)	(-4,61)
0,25	0,0066[a]	-0,0104[a]
	(4,48)	(-4,83)
0,30	0,0081[a]	-0,0133[a]
	(4,06)	(-3,24)
0,35	0,0154[a]	-0,0082[a]
	(5,74)	(-3,07)
0,40	0,0168[a]	-0,0101[a]
	(4,33)	(-2,73)
0,45	0,0237[a]	-0,0055
	(3,18)	(-1,55)
0,50	0,0273[a]	-0,0256[a]
	(2,97)	(-4,14)
0,55	0,0434[a]	-0,0209[b]
	(3,19)	(-1,89)
0,60	0,0668[a]	-0,0159[a]
	(2,85)	(-2,38)

t statistics are listed in parenthesis below the average residual values

Two-tailed test at the 0,05 and 0,10 level of significance denoted by [a] and [b], respectively

Total sample size is 1746 observations for negative events and 751 observations for positive events

Table 2 Event intensity: average residuals for the first month following event for companies listed on the JSE during 1970 – 1984.

	Event duration (months)					
Event	1	2	3	4	5	6
Negative	0,0321[a]	0,0189[a]	0,0207[a]	0,0078[a]	0,0121[a]	0,0092[a]
	(6,92)	(6,03)	(7,15)	(3,02)	(5,81)	(4,96)
Positive	-0,0294[a]	-0,0112[a]	-0,0069[a]	-0,0083[a]	-0,0068[a]	-0,0040[b]
	(-6,13)	(-4,17)	(-3,22)	(-3,69)	(-3,51)	(-1,91)

t statistics are listed in parenthesis below the average residual values

Two-tailed test at the 0,05 and 0,10 level of significance denoted by [a] and [b], respectively

Total sample size is 1746 observations for negative events and 751 observations for positive events

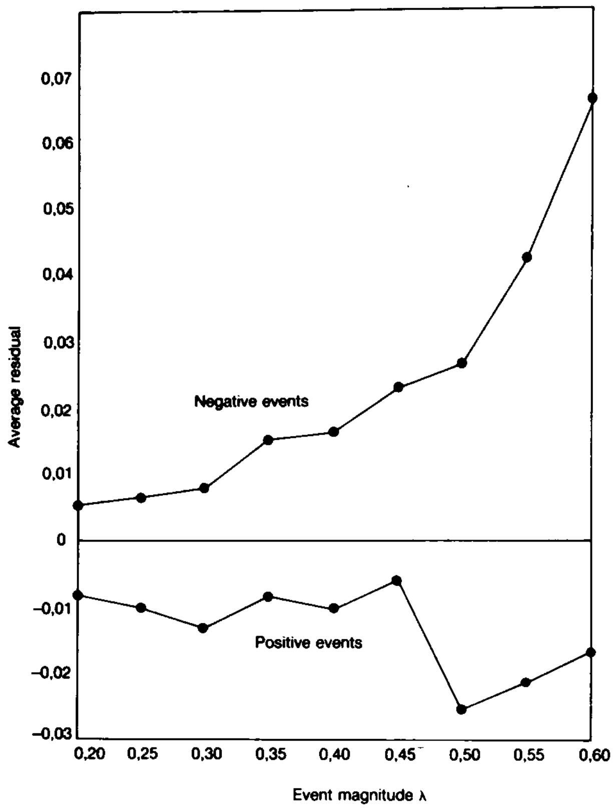

Figure 1 Event magnitude: average residuals for first month following event for companies listed on JSE during 1970–1984

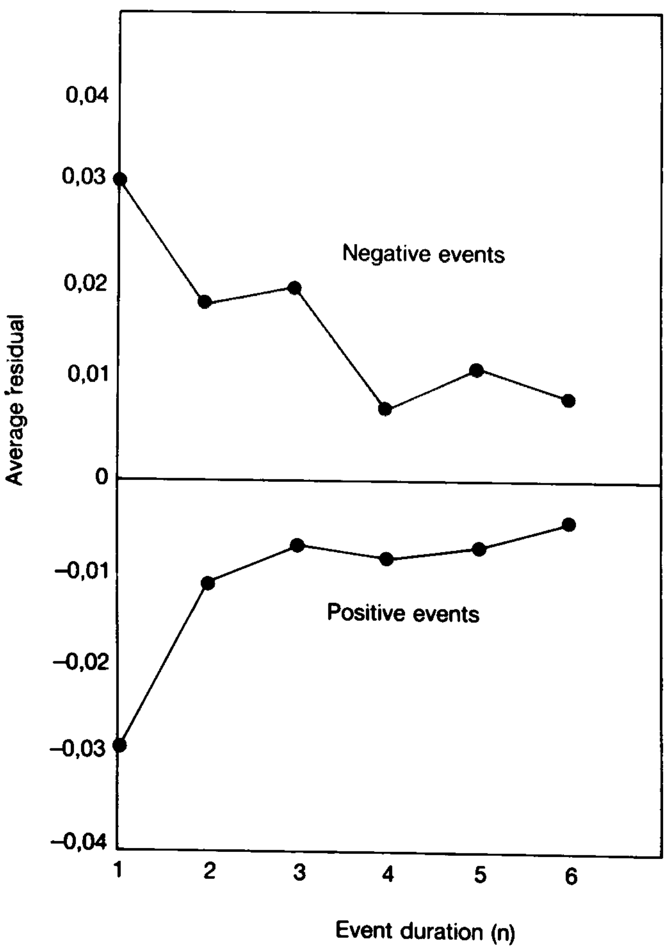

Figure 2 Event intensity: average residuals for first month following event for companies listed on the JSE during 1970–1984

intensity effect appears to be symmetric for both positive and negative events. However, the magnitudes of the average residual returns associated with negative events are slightly larger than the corresponding residual response for positive events. Nevertheless, the results clearly demonstrate that the shorter the duration of the initial price change, the more extreme the subsequent response. This confirms the intensity effect (OH-3) predicted by the Overreaction Hypothesis.

In order to obtain further insight into the short-term market behaviour associated with overreaction, a more detailed analysis is necessary. In particular, we must test for differences between the means of responses to events of differing magnitude and duration. The statistical technique for 'analysis of variance' will be used. A one-way analysis of variance is performed since only one factor (with several categories) will be considered. A computer package, the 'Statistical Package For the Social Sciences' (SPSS) is used to obtain F statistics by using the ANOVA subprogramme. The ANOVA procedure tests whether there is a significant divergence between the means of the different categories of a single factor being considered. To test for the direction effect, it is necessary to calculate the correlation coefficient (R) between the size of the initial event and the subsequent reaction. The SCATTERGRAM subprogramme of SPSS is used to calculate R.

Two different statistical tests are performed for the magnitude effect associated with the average residuals in Table 1. The ANOVA procedure computes the one-way analysis of variance to determine the equivalence of residual returns for different event magnitudes for a particular month. The resulting F statistics indicate whether gains and losses of differing amounts but similar duration produce equivalent reactions. Since the ANOVA procedure does not test for direction, it is necessary to calculate the correlation coefficient (R) between the size of the initial reaction and the size of the subsequent reaction. If a magnitude effect exists for

Table 3 Analysis of variance and correlation coefficients for overreaction events by λ_n (magnitude effect)

Month	Statistic	Negative events	Positive events
1	F	6,81[a]	1,85[b]
	R	0,13[a]	0,04[a]
2	F	5,64[a]	1,52
	R	0,09[a]	-0,01
3	F	8,21[a]	1,26
	R	0,16[a]	0,02
4	F	2,08[a]	2,26[a]
	R	0,05[a]	0,04[a]
5	F	4,82[a]	2,52[a]
	R	0,07[a]	0,05[a]
6	F	3,43[a]	1,26
	R	0,06[a]	0,01

[a] Significant at 0,05 level; [b] significant at 1,10 level

events with a particular duration, the F statistic generated by the ANOVA test should be significantly different from zero, and the correlation coefficient should be positive. The statistical tests for the magnitude effect is presented in Table 3.

An inspection of Table 3 reveals that the magnitude effect predicted by OH-2 is only partially valid. For negative events, all the F statistics for the risk-adjusted residual returns are significantly different from zero. However, only half the corresponding measures for the positive events are significantly different from zero. A similar pattern is observed for the statistical significance of the correlation coefficients associated with the negative and positive events.

Table 4 provides the statistical analysis for the intensity effect associated with market overreaction. These tests are performed to determine whether events of identical magnitude (λ) induce different event durations (n). The existence of an intensity effect suggests that the F statistics should be significantly different from zero, while the correlation coefficient should be negative for each of the nine different levels of event magnitude (λ). An inspection of Table 4 reveals that the vast majority of both the F and R statistics for the negative events are significant. However, only half the corresponding statistics for the positive events are statistically different from zero.

The results presented in Tables 3 and 4 suggests that the JSE responds differently to positive and negative events in the short-term reaction to extreme and unexpected financial events. The evidence on the short-term corrections to negative events is consistent with the magnitude, intensity, and direction effects predicted by the Overreaction Hypothesis. The evidence suggests that for positive events, investors do not show a strong tendency to overreact. The tendency to overreact in a systematic manner is much stronger and predictable when it is induced by negative events.

The long-term stock market overreaction is measured by calculating the market-adjusted CARs for holding periods for each of the three years following the event. The short-term response was obtained by measuring the average residuals in month $t = +1$. Therefore, the long-term response is obtained by calculating the CARs by starting with the average residual in month $t = +2$. To reduce the immense computational requirements, the event magnitudes are presented in increments of 10%. Therefore, the long-term response to event magnitude levels of 20%, 30%, 40%, 50% and 60% for both positive and negative events is measured. To establish the significance of the CARs, the t statistic developed by Ruback (1982) is used. Tables 5 and 6 contain the CARs and the summary of the significant tests for negative and positive events respectively.

Table 4 Analysis of variance and correlation coefficients for overreaction hypothesis by month (intensity effect)

λ	Statistic	Negative events	Positive events
0,20	F	6,42[a]	5,41[a]
	R	-0,05[a]	-0,07[a]
0,25	F	4,51[a]	4,02[a]
	R	-0,05[a]	-0,05[a]
0,30	F	4,15[a]	1,54
	R	-0,04[a]	-0,02
0,35	F	3,63[a]	1,42
	R	-0,04[a]	-0,02
0,40	F	2,86[a]	2,13[b]
	R	-0,05[a]	-0,04[a]
0,45	F	1,76	3,55[a]
	R	-0,02	-0,06[a]
0,50	F	5,29[a]	1,71
	R	-0,22[a]	-0,03
0,55	F	3,78[a]	1,22
	R	-0,17[a]	-0,02
0,60	F	2,94[a]	2,32[a]
	R	-0,07[a]	-0,03

[a] significant at 0,05 level; [b] significant at 0,10 level

Table 5 Negative events — cumulative average residuals for one, two, and three-year holding periods

	Event	CAR holding period		
λ level	duration	+2 to +13	+2 to +25	+2 to +37
-0,60	1	+0,26[a]	+0,06	-0,03
	2	+0,30[a]	-0,03	-0,05
	3	+0,21[a]	-0,05	+0,04
	4	+0,13[a]	+0,04	-0,02
	5	+0,18[b]	+0,20[a]	+0,07
	6	+0,10	-0,24[a]	-0,19[a]
-0,50	1	+0,18[a]	-0,15	+0,19[a]
	2	+0,20[a]	+0,12[a]	+0,02
	3	+0,23[a]	+0,09	-0,12
	4	+0,19[a]	-0,11	-0,09
	5	+0,17[a]	-0,07	+0,12
	6	-0,02	+0,14	-0,10
-0,40	1	+0,17[a]	+0,06	-0,04
	2	+0,15[a]	-0,03	+0,03
	3	+0,16[a]	+0,15[a]	+0,05
	4	+0,20[a]	-0,03	-0,12[a]
	5	+0,05	+0,04	-0,07
	6	-0,04	-0,02	+0,03
-0,03	1	+0,11[b]	-0,01	-0,03
	2	+0,10[a]	+0,14	+0,05
	3	+0,14[a]	-0,06	+0,02
	4	+0,12[a]	-0,16[a]	-0,01
	5	-0,02	+0,18[a]	-0,03
	6	-0,03	+0,09[a]	0,00
-0,20	1	+0,04[b]	+0,07[a]	-0,03
	2	-0,02	-0,05[b]	+0,04[b]
	3	+0,01	+0,02	-0,05[a]
	4	+0,05[a]	-0,06[a]	-0,04[b]
	5	+0,06[a]	-0,05[a]	+0,02
	6	+0,04[b]	+0,05[a]	-0,06

[a] significant at 0,05 level; [b] significant at 0,10 level

A most striking feature of the results in Tables 5 and 6 is the apparent asymmetry between the long-term market reaction to events generated by favourable and unfavourable information. The response to negative events is overwhelmingly significant for the first year following the event. Furthermore, the signs of the majority of CARs are positive and are consistent with the directional proposition in OH-1. However, the reactions for the second and third year following the event reveal very few CARs showing statistically significant departures from zero. The CARs reflect a great deal of random behaviour, with an almost equal distribution of positive and negative values. These results suggest that for negative events the JSE generates economically significant abnormal gains up to one year following the event and then adjusts prices in a random pattern.

The CARs for positive events are seldom different from zero. With the exception of the reactions to the smallest positive event, the result in Table 6 reflect a great deal of random behaviour. This finding, coupled with the observation that the short-term reaction to positive events was only weakly and unsystematically negative, suggests that the JSE does not overreact to news of a favourable nature. The market appears to be economically efficient with respect to extreme events of a positive nature. Furthermore, the JSE also appears to be economically efficient with respect to the long-term reaction to extreme negative events. This is contrary to the findings of De Bondt & Thaler (1985) who presented evidence of market overreaction up to three years on the NYSE.

The results of this investigation clearly demonstrates that the JSE reaction to extreme price changes in the short-term depends essentially on the direction of the initial change. The evidence on short-term corrections to negative events is strongly consistent with the three predictions of the Overreaction Hypothesis. For positive events, there is only weak evidence that investors overreact in the short-term. Therefore, the tendency for the JSE to overreact can best be regarded as an asymmetric and short-term phenomenon. Furthermore, the asymmetry of response behaviour to positive and negative events implies that unfavourable news attracts more attention than favourable news in the market.

The undue influence of unfavourable news can be attributed to the fact that losses affect investment decisions to a greater extent than the corresponding amount of gains. Risk-averse investors are unduly concerned with the preservation of their investment capital. Therefore, unfavourable news may well induce investors to sell quickly in an effort to minimize their losses.

This selling pressure could depress prices well below levels justified by the unfavourable news. Such a selling pressure is especially likely to occur on the JSE, which is dominated by a few large institutional investors. The absence of a large number of buyers and sellers creates a 'thin' market for the securities traded. The large institutional investors prefer to invest in large listed companies having the status of 'blue chip' investments. Furthermore, institutional investors have a tendency to take major market positions in an effort to exert some form of control over their investments. In the event of forced selling (in response to unfavourable news) by institutional investors, a major decline in the price of the affected shares can be expected because of the high volumes of shares involved.

The magnitude of the 'overreaction' returns suggest that they are economically significant, that is, exploitable by astute investors. The implications for investors are two-fold. First, after a share has experienced a large increase in price, the holdings of that share should be reduced or eliminated. High risk investors may follow a strategy of selling short the shares that have experienced large positive gains associated with favourable news. Secondly, investors may follow the strategy of 'buy on the rebound' when shares experience a large price decline associated with unfavourable news. This trading strategy is best suited for active investors because the above-average returns disappear after one year. Knowledge of the pattern of

Table 6 Positive events — cumulative average residuals for one, two, and three-year holding periods

λ level	Event duration	CAR holding period +2 to +13	+2 to +25	+2 to +37
+0,60	1	-0,11	+0,04	-0,10
	2	-0,08	-0,03	+0,06
	3	+0,06	-0,02	+0,05
	4	+0,15[b]	+0,09[b]	+0,02
	5	-0,02	-0,03	-0,17[a]
	6	-0,18[a]	+0,02	-0,08[b]
+0,50	1	+0,08	-0,04	+0,05
	2	+0,04	-0,02	+0,06
	3	-0,03	+0,05	-0,04
	4	-0,04	+0,09[a]	+0,03
	5	-0,02	+0,08[a]	-0,08[a]
	6	+0,06	-0,03	-0,07[a]
+0,40	1	+0,03	-0,04	+0,02
	2	+0,02	-0,03	+0,01
	3	-0,01	+0,01	-0,02
	4	-0,04	+0,01	-0,03
	5	+0,03	+0,02	+0,07[b]
	6	-0,02	-0,01	-0,03
+0,03	1	+0,02	-0,02	+0,02
	2	+0,01	+0,03	+0,03
	3	-0,03	+0,04	-0,04
	4	+0,02	-0,01	-0,02
	5	-0,03	-0,06[a]	-0,01
	6	-0,05[a]	-0,01	+0,07[a]
+0,20	1	-0,07[a]	+0,07[a]	-0,05
	2	-0,02	-0,05[b]	-0,03
	3	+0,07[a]	-0,04	+0,06
	4	+0,09[a]	+0,02	+0,02
	5	-0,08[a]	+0,09[a]	-0,08[a]
	6	-0,07[a]	-0,08[a]	+0,04[b]

[a] significant at 0,05 level; [b] significant at 0,10 level

market overreaction can also be of value to investors for transactions that are to take place anyway. This suggests that for companies releasing unfavourable news, the sales should be postponed and purchases should be accelerated. For companies releasing favourable news, the sales should be accelerated and purchases should be postponed.

Knowledge of the Overreaction Hypothesis may provide arbitrage opportunities to investors desiring to exploit market inefficiency associated with unexpected news announcement. It can also be stated that arbitrage opportunities should disappear quickly if sufficient arbitrageurs operated in the market. Evidence of prolonged periods of market overreaction suggests that there are not sufficient investors prepared to exploit arbitrage opportunities. Arrow (1982) suggested that having a few rational investors will not create an efficient market if the majority of the investors are responding to unexpected news in an irrational manner. Rational investors may well purchase the shares of companies experiencing unfavourable news with the expectation that the market price will gradually increase. But this gain is not realized during the gestation period in which the market price remains unchanged. The rational investor may be rewarded if the share is held long enough, but there is a loss of liquidity during the intervening period which may be long. Therefore, even rational investors may not take full advantage of overreaction market inefficiency. Only if the majority of investors revise their investment horizons and perform as true long-term investors will the overreaction market inefficiency disappear.

Conclusion

The results of the empirical evidence suggest that in the short-term reaction to extreme unexpected financial events, the JSE's response is determined by whether the event is positive or negative. The evidence on the short-term corrections to negative events is consistent with the Overreaction Hypothesis. However, for positive events only weak evidence of short-term overreaction was observed. A similar asymmetry was observed in the long-term market reaction to events generated by favourable and unfavourable information. It would appear that for negative events, the JSE generates economically significant corrections up to one year following the event and then adjusts prices in a random manner. The JSE does not display a long-term tendency to overreact to news of a favourable nature. Therefore, the tendency for the JSE to overreact can best be regarded as a short-term phenomenon. The market inefficiency associated with overreaction to company-specific unfavourable news suggests that astute investors may outperform the market by following appropriate investment strategies.

References

Ackley, G. 1983. Commodities and Capital: Prices and Quantities. *Am. Econ. Rev.*, vol. 73, 1–16.

Arrow, K.J. 1982. Risk Perception in Psychology and Economics. *Econ. Inquiry*, vol. 20, 1–9.

Bernstein, P.L. 1985. Does the Stock Market Overreact?: Discussion. *J. Fin.*, vol.40, 806–808.

Bosworth, B. 1975. The Stock Market and the Economy. *Brooking Papers on Economic Activity*, vol. 2, 257–300.

Bowman, R.C. 1983. Understanding and conducting Event Studies. *J. Bus. Fin. Account.*, vol.10, 561–584.

Brown, K.C. & Harlow, W.V. 1988. Market Overreaction: Magnitude and Intensity. *J. Portfolio Mgmnt.*, vol. 14, 6–13.

De Bondt, W.F. & Thaler, R.H. 1985. Does the Stock Market Overreact? *J. Fin.*, vol. 40, 793-805.

De Bondt, W.F. & Thaler, R.H. 1987. Further Evidence on Investor Overreaction and Stock Market Seasonality. *J. Fin.*, vol. 42, 557–581.

Fama, E.F. & Blume, M. 1966. Filter Rules and Stock Market Trading. *J. Bus.*, vol.39, 226–241.

Fama, E.F. 1970. Efficient Capital Markets: A Review of Theory and Empirical Work. *J. Fin.*, vol. 25, 383–417.

Fama, E.F. & French, K.R. 1986. Permanent and Temporary components of Stock Prices. Working Paper No 178. Graduate of School of Business, University of Chicago.

Goldman, M.B. & Sosin, H.B. 1979. Information Dissemination, Market Efficiency and Frequency of Transactions. *J. Fin. Econ.*, vol. 7, 29–61.

Graham, B. 1973. The Intelligent Investor — A Book of Pratical Counsel. 4th Edition. New York: Harper & Brothers Publishers.

Howe, J.S. 1986. Evidence on Stock Market Overreaction. *Fin. Anal. J.*, vol. 42, 74–77.

Keynes, J.M. 1936. The general Theory of Employment Interest and Money. New York: Harcourt Brace and Company.

Komicke, R. 1984. The contradiction between Keynes and the EMH. *J. Portfolio Manage.*, vol. 10, 41–43.

Lambert, R. 1986. Do we ever learn? *Fin. Mail*, vol. 102, 114.

Marsh, T.A. & Merton, R.C. 1986. Dividend Variability and Variance Bounds Tests for the Rationality of Stock Market Prices. *Am. Econ. Rev.*, vol. 76, 483–498.

Nie, N.H., Hull, C.D., Jenkins, J.G., Steinbrenner, K. & Bent, D.H. 1975. *Statistical Package for the Social Sciences*. 2nd Edition. New York: McGraw-Hill, Inc.

Niederhoffer, V. 1977. The Analysis of World Events and Stock Prices. *J. Bus.*, vol. 50, 193–219.

Renshaw, E.F. 1984. Stock market Panics: A Test of the Efficient Market Hypothesis. *Fin. Anal. J.*, May-June, 48–51.

Roll, R. 1984. A Simple Implicit Measure of the Effective Bidask Spread in an Efficient Market. *J. Fin.*, vol. 39, 1127–1139.

Ruback, R. 1982. The Effect of Discriminatory Price Control Decisions on Equity Values. *J. Fin. Econ.*, vol. 10, 83–105.

Shiller, R.J. 1981a. Do Stock Prics Move Too Much to be Justified by Subsequent Changes in Dividends? *Am. Econ. Rev.*, vol. 71, 421–436.

Shiller, R.J. 1981b. The Use of Volatility Measures in Assessing Market Efficiency. *J. Fin.*, vol. 36, 291–311.

Shiller, R.J. 1983. Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?: Reply. *Am. Econ. Rev.*, vol. 73, 236–237.

Smidt, S. 1968. A New Look At The Random Walk Hypothesis. *J. Fin. Quant. Anal.*, vol. 3, 235–261.

Tversky, A. & Kahneman, D. 1981. The Framing of Decisions and the Psychology of Choice. *Sci.*, vol. 211, 453–458.

Vermaelen, T. & Verstringe, M. 1986. *Do Belgians Overreact?* Working Paper. Catholic University of Louvain, Belgium.