Do share prices fully reflect the information about future earnings in accruals and cash flow?

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This article follows the methodology employed by Sloan to evaluate whether share prices fully reflect the information about future earnings contained in the cash flow and accruals components of current earnings. The first hypothesis predicted that the persistence of earnings attributable to the cash flow component of earnings is greater than the persistence of earnings attributable to the accrual component of earnings. The results indicate that this is indeed the case. The second hypothesis predicted that share prices would react as if investors fixate on earnings, and fail to distinguish between the different properties of the cash flow and the accrual components of earnings. In all cases investigated, the null hypothesis of market efficiency was rejected. However, investors did appear to distinguish between the different properties of cash flow and accruals. Market efficiency was rejected as the influence of both components of earnings was underestimated. Thus, although investors were not successful in unscrambling the earnings data, they did not appear to display an earnings fixation.

Hierdie artikel volg die metodologie wat deur Sloan gebruik is om te bepaal of aandeelpryse die inligting in verband met toekomstige verdienste, wat in die kontantvloei- en toevallingskomponente van die huidige verdienstesyfer vervat is, weerspieël. Twee hipoteses is getoets. Die eerste hipotese stel dit dat die volhoubaarheid van verdienste, toeskryfbaar aan sy kontantvloei-komponent, groter is as die volhoubaarheid wat aan sy toevallingskomponent toegeskryf kan word. Die resultate dui dan ook inderdaad dat dit die geval is. Die tweede hipotese stel dit dat aandeelpryse reageer asof beleggers op verdienste fikseer en nie onderskeid tref tussen die verskillende eienskappe van kontantvloei en toevallings nie. In al die gevalle wat ondersoek is, is die nulhipotese van markdoeltreffendheid verwerp. Dit wou tog voorkom asof beleggers onderskei tussen die eienskappe van kontantvloei en toevallings. Markdoeltreffendheid is verwerp omdat beide komponente van verdienste se invloed onderskat is. Hoewel beleggers dus nie suksesvol was om die verdienstedata te ontsyfer nie, het hulle nie 'n fiksering op verdienste geopenbaar nie.

Introduction

Earnings and cash flow are two totally different concepts. While earnings are derived from applying accounting techniques, according to accounting conventions, cash flow is based on the timing of cash receipts and disbursements. The net earnings figure is of particular interest to investors and other decision makers, as is indicated by the following facts:

- earnings figures are published shortly after the close of the fiscal year, but not so its components,
- managers often select projects based on earnings,[1]
- managers' explicit compensation schemes are typically based on earnings, and
- there are considerably more earnings than cash flow forecasts (Wilson, 1987: 297).

However, what investors are actually interested in, are the dividends they will receive and the market value of their investments. They are therefore more interested in the cash flow than in the earnings of their investment. There thus exists a dichotomy in so far as investors are interested in the cash flow of their investments, but appear to fixate on earnings.

Development of the hypotheses

Ball & Brown (1968) investigated whether there is any useful information in the announcement of earnings. The usefulness of information was determined by evaluating the significance of the share price response at the time of the information entering the market. In an efficient market, changes in the share price will indicate the flow of useful information to the market. The results of their research indicated that the annual income number is useful in that should actual income differ from expected income, the market would react in the same direction.

Chambers & Penman (1984) investigated the effect of the reporting lag on the share price. They found no significant relationship between the reporting lag and the variability of share returns which is consistent with the notion that accounting reports contain some information about specific firms which is not provided by other sources, regardless of the time lag of the reports (Chambers & Penman, 1984: 22).

While earnings are reported in the media, its components are only later released through the company financial statements. Wilson (1987) found a reaction to the release of cash flow data, indicating that the market recognises the release of financial statements as an information event, and that cash from operations has information content beyond earnings.

Bernard & Stober (1989) and Lev & Thiagarajan (1993), in separate studies, concluded that cash flow does not have any value relevance over earnings in predicting future earnings, while Dechow (1994) refers to cash flow as a 'noisy' measure of firm performance. According to her research, the ability of cash flow to reflect firm performance is poor over the intervals used to report the performance of a firm.

From these conflicting studies Sloan developed his first hypothesis.

Hypothesis 1: The persistence of current earnings performance decreases with an increase in the accrual component of current earnings and a decrease in the cash flow component of current earnings.

In an efficient capital market, share prices reflect all available information. An impressive body of theory supports the proposition that capital markets are both efficient and unbiased in that if information is useful in the forming of capital asset prices, then the market will adjust asset prices to that information quickly and without leaving any opportunity for abnormal gain (Ball & Brown, 1968: 160). The constant fluctuation of share prices is an indication of this information flow, as investors are constantly bombarded with new information.

The functional fixation hypothesis takes an opposing view, namely that individual investors fail to unscramble the information contained in a firm's financial statements. They therefore arrive at biased assessments of the probability distributions of future cash flows (Hand, 1990: 741). According to research by Bernard & Thomas (1990), share prices appear not to respond completely and immediately to information that is as freely available as reported earnings. 'Thus, the data is consistent with stock prices failing to reflect fully the implications of current earnings for future earnings ...' (Bernard & Thomas, 1990: 321). They found that a disproportionately large portion of the post-announcement drift is delayed until the next quarter's earnings announcement.

> 'It is difficult to understand why stock prices would appear not to respond completely and immediately to information as visible and freely available as publicly announced earnings' (Bernard & Thomas, 1990: 306).

Hand (1990) suggested the Extended Functional Fixation Hypothesis, whereby the share price would either reflect all available information, or it would be based on naive expectations, depending on the sophistication of the marginal investor.

From these studies, Sloan (1996) postulated that the association between earnings and share returns may reflect investors' naive fixation on earnings, rather than earnings' ability to summarise value revelant information.

From this follows the second hypothesis:

Hypothesis 2: The market is not efficient in that the share prices fail to fully reflect the higher persistence attributable to the cash flow component of earnings and the lower earnings persistence attributable to the accrual component of earnings.

Tests for hypothesis 1

Sloan (1996) expressed the relationship between current earnings and future earnings as:

$$\text{Earnings}_{t+1} = \alpha_0 + \alpha_1 \text{Earnings}_t + \upsilon_{t+1} \quad (1)$$

Sloan aimed to determine whether the persistence of earnings attributable to the cash flow component of earnings is greater than the persistence of earnings attributable to the accrual component of earnings. The coefficient of Earnings_t (α_1) measures the persistence of earnings. As earnings is scaled by total assets, it measures the persistence of the accounting rate of return on assets. Accounting rate of return is defined as operating income divided by an investment number (Horngren, Harrison & Robinson, 1996: 1105). The investment number in this case is end of the year total assets. According to Sloan (1996: 297), as accounting rate of return is slowly mean reverting, α_1 is less than one. However, Hypothesis 1 predicts that equation (1) is misspecified, as it constrains the coefficients on the cash flow and the accrual components of earnings to be equal. Sloan thus tested his first hypothesis with a multiple regression equation that did not constrain the coefficients on accruals and cash flow to be equal.

$$\text{Earnings}_{t+1} = \gamma_0 + \gamma_1 \text{Accruals} + \gamma_2 \text{ Cash Flow} + \upsilon_{t+1} \quad (2)$$

Sloan predicted that $\gamma_1 < \gamma_2$, indicating a lower persistence of earnings performance attributable to the accrual component of earnings.

Tests for hypothesis 2

In his second hypothesis, Sloan tested whether share prices reflect the different properties of the cash flow and accrual components of earnings. To investigate this, the test Mishkin (1983) developed to test the rational expectations hypothesis in macro-econometrics was employed. This test assumes market efficiency, implying that abnormal returns are zero in expectation.

The rational expectations hypothesis asserts that the market's subjective probability distribution of any variable is identical to the objective probability distribution of that variable, conditional on all available past information (Mishkin, 1983: 9). For any variable, X

$$E_m(X_{t+1} | \phi_t) = E(X_{t+1} | \phi_t) \quad (3)$$

where

ϕ_t = the set of information available at time t;
$E_m(\ldots|\phi_t)$ = the objective expectations assessed by the market; and
$E(\ldots|\phi_t)$ = the objective expectation conditional to ϕ_t.

Tests for market efficiency often tend to focus on either holding period returns or share prices. Following Sloan, let r_t denote the return to holding a security from t-1 to t. The return includes both capital gains and cash income such as dividends. Rational expectations then implies that

$$E[r_{t+1} - E_m(r_{t+1} | \phi_t | \phi_t] = 0, \quad (4)$$

thus

$$E(r_{t+1} - \tilde{r}_{t+1} | \phi_t) = 0, \quad (5)$$

where $\tilde{r}_{t+1}$ is the market's subjective expectations of the normal holding period return from time t to t+1. This is in line with market efficiency, which implies that investors cannot expect to find unexploited profit opportunities in the market.

A model that satisfies the efficient-markets condition in (5) is

$$(r_{t+1} - \tilde{r}_{t+1} | \phi_t) = \beta(X_{t+1} - X^e_{t+1}) + \varepsilon_{t+1} \quad (6)$$

ε_{t+1} = a disturbance with the property that $E(\varepsilon_{t-1}|\phi_t) = 0$;
χ_t = a variable(s) relevant to the pricing of a security at time t;
χ^e_{t+1} = a one-period ahead rational forecast of X_{t+1} at time t; and
β = a valuation multiplier.

In the context of the study, X, the value relevant variable, is earnings performance, while β is the earnings response coefficient. The model is then estimated using the different definitions of earnings as defined in equations (1) and (6).

$$\text{Earnings}_{t+1} = \alpha_0 + \alpha_1\text{Earnings}_t + \upsilon_{t+1} \quad (7)$$

$$(r_{t+1} - \tilde{r}_{t+1} \mid \phi_t) = \beta(\text{Earnings}_{t+1} - \alpha_0 - \alpha_1{}^* \text{ Earnings}_t) + \varepsilon_{t+1} \quad (8)$$

In an efficient market $\alpha_1 = \alpha_1{}^*$. This implies that the share prices correctly assess the average persistence of earnings performance.

The earnings forecasting model in equation (2) is combined with equation (6).

$$\text{Earnings}_{t+1} = \gamma_0 + \gamma_1 \text{ Accruals}_t + \gamma_2\text{CashFlow}_t + \upsilon_{t+1} \quad (9)$$

$$(r_{t+1} - \tilde{r}_{t+1} \mid \phi_t) = \beta(\text{Earnings}_{t+1} - \gamma_0 - \gamma_1{}^* \text{ Accruals}_t - \gamma_2{}^* \text{ CashFlow}_t) + \varepsilon_{t+} \quad (10)$$

Market efficiency imposes the dual constraints $\gamma_1 = \gamma_1{}^*$, and $\gamma_2 = \gamma_2{}^*$.

To test the second hypothesis, equations (7) through (10) were estimated separately, using non-linear least squares.

The abnormal returns were determined by finding the difference between the realised return and the return on a size-matched portfolio, using decile rankings. Firms were ranked annually according to firm size, as this was chosen as the risk proxy to be used. Firms were then divided into ten approximately equally sized portfolios. The average returns for each portfolio were determined and subtracted from each company in the portfolio's realised return for the year.

Market efficiency is tested using a likelihood ratio statistic distributed asymptotically $\chi^2(q)$:

$$2n \log(SSR^C / SSR^U) \quad (11)$$

where:

q = the number of constraints imposed by market efficiency;
n = the number of observations;
SSR^C = the sum of the squared residuals from the constrained system; and
SSR^U = the sum of the squared residuals from the unconstrained system.

Sloan's research found that the coefficient on cash flow is smaller than the coefficient on accruals, indicating that share prices appear not to anticipate rationally the greater persistence of earnings attributable to the cash flow component of earnings, but rather expect the opposite. Thus, the conditions for an efficient market were not met.

The main conclusions of Sloan's research, which will also be tested in this article, were:

- The persistence of earnings performance depends on the relative magnitudes of the cash and accrual components of earnings.
- Share prices react as if investors fixate on earnings, and fail to correctly identify the properties of the earnings components.

Sample formation

The data for the empirical tests have been obtained from the database of the Graduate School of Business of the University of Stellenbosch. The data set includes company data from 1974 to 1996. The data suffer from survivorship bias, as all companies delisted over the period of analysis have been excluded from the sample. All overseas companies, except Namibian companies, as well as all pyramid companies, have been excluded from the sample. A pyramid company is defined as a company whose predominant or only asset is shares in another company.

The data of some firms are incomplete as a result of the unavailability of data, and thus could not be used in the tests. This resulted in a final sample of 3 244 firm years over the period 1974 to 1996.

Definition of key concepts

The financial variables of interest in this study are earnings, accruals and cash flow (cash from operations).

Two definitions of earnings are employed. Following Sloan (1996), earnings (Earnings_1) is defined as profit before tax, exclusive of interest paid. It excludes non-recurring items, such as extraordinary items and non-operating income.

Ball & Brown (1968) found that using operating income or net income before nonrecurring items, was not as successful in predicting the signs of share returns as was net income. The tests will therefore be repeated using profit after tax (Earnings_2)

The accrual component of earnings is computed as follows:

$$\text{Accruals} = \Delta\text{Inventories} + \Delta\text{Deblors} - \Delta\text{Creditors} - \text{Depreciation} \quad (12)$$

Three different definitions of cash flow will be used. In the first instance, cash flow is defined as the difference between Earnings_1 and accruals. This is similar to the Sloan definition.

$$\text{Cash Flow}_1 = \text{Earnings}_2 - \text{Accruals} \quad (13)$$

In the second instance, the cash flow number (Cash Flow_2) is defined as earnings before interest and tax (EBIT) plus non-cash items, interest received and dividends received, less the changes in working capital.

In the third instance, cash flow is defined as the difference between Earnings_2 and accruals.

$$\text{Cash Flow}_3 = \text{Earnings}_2 - \text{Accruals} \quad (14)$$

In order to be able to compare firms of different sizes in cross-sectional comparisons, all variables are standardised by firm size. The measure of firm size employed is the end of the year book value of total assets.

Descriptive statistics

Table 1 provides descriptive statistics on the characteristics of the data of firms, ranked on the magnitude of the accrual component of earnings. Firm years are ranked annually, and firms are assigned in approximately equal numbers to decile portfolios.

There is a strong negative relationship between accruals and cash flow, which is consistent with Sloan's findings, and other prior research (Dechow, 1994). There is a strong positive relationship between the earnings and accrual means, with a disturbance of this linear trend in the third decile.

Panel B investigates the importance of the components of accruals in explaining the variation in the accrual component of earnings. From Table 1 it is apparent that the changes in stock and debtors are mainly responsible for the variation in accruals. This is compatible with Sloan's findings that the variation in current assets is mainly attributable to the variation in receivables and inventory (Sloan, 1996: 297).

Panel C reports the statistics on the risk factor. The risk proxy used is firm size, which is measured as the natural logarithm of the market value of equity. The shape of a plotted line of the means of the risk proxy appears as an inverted U-shape. This is similar to Sloan's findings, and indicates that the extreme portfolios contain the smaller, riskier shares.

Empirical analysis: hypothesis 1

The first hypothesis states that the earnings performance attributable to the cash flow component of earnings is more persistent than the earnings performance attributable to the accrual component of earnings.

Results from the regression of equation 1

Table 2 reports the results from the estimation of equations (1) and (2), using $Earnings_1$ and $Earnings_2$ as the earnings number. A single pooled regression is performed for both definitions of earnings. According to Lev (1983), as reported in Sloan (1996), the time-series properties of earnings differ as a function of industry characteristics. It is therefore possible that the pooled regression results suffer from a varying parameters problem (Sloan, 1996: 298). Industry level regressions were therefore performed to ensure that the results are robust to this problem. To overcome the possible effect of outliers on the regression results, the regressions were also estimated using decimal rankings of the variables in place of their actual values. This approach was followed to stay in line with Sloan's methodology. However, the value of the results obtained from the decimal rankings must be questioned. By restricting the regressors to a value between zero and one (or between one and ten, as Sloan did), much information is lost, while it is questionable whether the effect of outliers on a large sample is that significant. A more useful option might have been to Windsorise outliers, thus restricting their influence, without affecting the information content in the other data. Although the results of both the actual values and decimal rankings are reported in the tables, the discussion will be restricted to the results obtained using the actual values.

Section A of Table 2 reports the results from the estimation of equation (1) in pooled form. From Panel A it can be seen

Table 1 Mean values of selected characteristics for ten portfolios, formed by ranking the firms annually, based on the magnitude of accruals. The sample consists of 3244 firm years between 1974 and 1996

	Portfolio accrual ranking									
Panel A: Components of earnings										
	Low	2	3	4	5	6	7	8	9	High
Accruals	–0.161	–0.076	–0.046	–0.029	–0.014	0.001	0.017	0.039	0.073	0.162
CFO_1	0.254	0.188	0.175	0.146	0.141	0.133	0.114	0.099	0.069	–0.011
CFO_2	0.263	0.210	0.200	0.171	0.163	0.157	0.140	0.124	0.097	0.024
CFO_3	0.215	0.147	0.129	0.105	0.096	0.086	0.068	0.050	0.016	–0.067
$Earnings_1$	0.093	0.112	0.129	0.116	0.126	0.134	0.130	0.138	0.143	0.151
$Earnings_2$	0.053	0.071	0.082	0.075	0.081	0.087	0.085	0.089	0.090	0.095
Panel B: Components of accruals										
Stock	–0.016	0.002	0.010	0.015	0.027	0.030	0.033	0.047	0.058	0.102
Debtors	–0.018	0.007	0.016	0.017	0.024	0.028	0.040	0.053	0.072	0.117
Creditors	0.065	0.042	0.031	0.025	0.031	0.026	0.029	0.033	0.032	0.038
Depreciation	0.401	0.352	0.342	0.359	0.347	0.389	0.363	0.383	0.368	0.358
Panel C: Risk proxy										
Size	7.455	7.904	8.431	8.510	8.566	8.424	8.341	7.910	7.567	7.271

The firm characteristics are computed as follows:

Accruals = Change in stock plus change in debtors, less the change in creditors, less depreciation, divided by end of the year total assets.

$Earnings_1$ = Earnings before interest and tax, divided by end of the year total assets.

$Earnings_2$ = Profit after tax, divided by end of the year total assets.

CFO_1 = The difference between $Earnings_1$ and Accruals, divided by end of the year total assets.

CFO_2 = Sub2, the cash flow number before interest and tax, from the USB database, divided by end of the year total assets.

CFO_3 = The difference between $Earnings_2$ and Accruals, divided by end of the year total assets.

Stock = The change in stock, divided by end of the year total assets.

Debtors = The change in debtors, divided by end of the year total assets.

Creditors = The change in creditors, divided by end of the year total assets.

Depreciation = The sum of the two depreciation numbers from the USB database, depreciation and additional depreciation, divided by end of the year total assets.

Size = The natural logarithm of the market value of equity (in millions of rends), divided by end of the year total assets.

Table 2 Results of pooled ordinary least squares regressions of future earnings performance on current earnings performance, or components of current earnings performance

$$Earnings_{t+1} = \alpha_0 + \alpha_1 Earnings_t + \upsilon_{t+1}$$

$$Earnings_{t+1} = \gamma_0 + \gamma_1 Accruals_t + \gamma_2 CashFlow_t + \upsilon_{t+1}$$

Panel A		**Section A**		**Section B**			**F-test**
		α_0	α_1	γ_0	γ_1	γ_2	$\gamma_1=\gamma_2$
$Earnings_1$	Actual	0.016	0.834	0.015	0.765	0.844	30.02
with CFO_1	values	(8.03)	(77.48)	(7.15)	(46.07)	(77.66)	
as the cash	Decimal	0.112	0.776	0.121	0.749	0.798	19.01
flow number	ranking	(16.68)	(66.84)	(15.04)	(50.92)	(71.42)	
Panel B		**Section A**		**Section B**			**F-test**
		α_0	α_1	γ_0	γ_1	γ_2	$\gamma_1=\gamma_2$
$Earnings_1$,	Actual	0.016	0.834	–0.006	0.715	0.838	63.03
with CFO_2	values	(8.03)	(77.48)	(–2.29)	(41.10)	(70.95)	
as the cash	Decimal	0.112	0.776	–0.189	0.535	0.836	409.09
flow number	ranking	(16.68)	(66.84)	(–12.80)	(33.18)	(51.88)	
Panel C		**Section A**		**Section B**			**F-test**
		α_0	α_1	γ_0	γ_1	γ_2	$\gamma_1=\gamma_2$
$Earnings_2$,	Actual	0.018	0.737	0.017	0.697	0.748	17.70
with CFO_3	values	(11.21)	(56.67)	(10.43)	(43.21)	(56.62)	
as the cash	Decimal	0.127	0.747	0.143	0.701	0.750	16.24
flow number	ranking	(17.91)	(61.08)	(16.31)	(43.49)	(61.18)	

t-statistics in parenthesis

that the estimate of α_1 is 0.834 and again confirms that earnings performance is slowly mean reverting. Although the t-statistic (77.48) is not as large as that reported by Sloan, the sample used is much smaller and the null hypothesis that $\alpha_0 = 0$ is still strongly rejected. Earnings performance is thus not transitory. The null hypothesis that α_1 is equal to one, thus that earnings performance follows a random walk, is rejected with a t-statistic[2] of –15.96.

The industry level regressions (Tabel 3) confirm that accounting rates of returns are mean reverting, with an average persistence parameter of approximately 0.8. The results are similar to those obtained by Sloan.

Panel C of Table 2 and Tabel 3 show similar results for $Earnings_2$, with an average persistence parameter of approximately 0.7.

Results from the regression of equation 2

Section B of Table 2 provides parameter estimates for equation (2). In Panel A, CFO_1 is the cash flow number. The coefficient on accruals, γ_1, is 0.765, while the coefficient on CFO_1 is 0.844. An F-test rejects the hypothesis that $\gamma_1 = \gamma_2$ at the 0.01 level of significance. In industry specific comparisons γ_1 is smaller than γ_2 in 70% of the cases. These compare favourably to the results obtained by Sloan. He also found that the coefficient on the accrual component of earnings, γ_1, to be 0.765, while the coefficient on the accrual component of earnings, γ_2, was 0.855. However, he found that γ_1 is smaller than γ_2 in 99% of the cases.

Panel B of Table 2 provides parameter estimates for equation (2), with CFO_2 as the cash flow number. The coefficient on accruals, γ_1, is 0.715, while the coefficient on CFO_1, γ_2, is 0.838. An F-test rejects the hypothesis that the $\gamma_1 = \gamma_2$. In industry specific comparisons, γ_1 is smaller than 72 in 76% of the cases.

The results that were obtained from the regressions with $Earnings_1$ as the earnings number and CFO_1 and CFO_2 respectively as the cash flow number, provide strong evidence in support of the hypothesis that the persistence of earnings performance attributable to the cash flow component of earnings is greater than the persistence of earnings performance attributable to the accrual component of earnings.

Panel C of Table 2 reports the results that were obtained when earnings is profit after tax ($Earnings_2$) and the cash flow number is the difference between $Earnings_2$ and accruals. The reported coefficient on accruals (γ_1) is 0.697, while the coefficient on cash flow (γ_2) is 0.748. Both these coefficients appear to be smaller than in the case of Earnings (Panel A). However, in the case of net income the persistence of earnings attibutable to the cash flow component is also greater than the persistence attributable to the accrual component of earnings. In industry specific comparisons, γ_1 is smaller than γ_2 in 70% of the cases.

Time series plots

Figure 1 provides time series plots of earnings for firm years in the extreme deciles when ranked by $Earnings_1$, accruals and CFO_1. It attempts to illustrate the lower persistence of

Table 3 Results of industry level ordinary least squares regressions of future earnings performance on current earnings performance, or components of current earnings performance

Panel A		Earnings$_1$ and CFO$_1$ as the cash flow number				
		α_0	α_1	γ_0	γ_1	γ_2
Mean	Actual values	0.031	0.697	0.031	0.660	0.708
	Decimal ranking	0.134	0.729	0.141	0.709	0.747
Q1	Actual values	0.015	0.559	0.015	0.534	0.594
	Decimal ranking	0.102	0.652	0.111	0.642	0.666
Median	Actual values	0.027	0.765	0.026	0.701	0.791
	Decimal ranking	0.125	0.772	0.141	0.727	0.783
Q3	Actual values	0.047	0.831	0.049	0.798	0.847
	Decimal ranking	0.152	0.802	0.153	0.768	0.824
Panel B		Earnings$_1$ and CFO$_2$ as the cash flow number				
		α_0	α_1	γ_0	γ_1	γ_2
Mean	Actual values	0.031	0.697	0.014	0.630	0.686
	Decimal ranking	0.134	0.729	–0.150	0.499	0.776
Q1	Actual values	0.015	0.559	0.000	0.450	0.571
	Decimal ranking	0.102	0.652	–0.221	0.441	0.752
Median	Actual values	0.027	0.765	0.015	0.613	0.690
	Decimal ranking	0.125	0.772	–0.173	0.503	0.783
Q3	Actual values	0.047	0.831	0.026	0.750	0.827
	Decimal ranking	0.152	0.802	–0.099	0.541	0.881
Panel C		Earnings$_2$ and CFO$_3$ as the cash flow number				
		α_0	α_1	γ_0	γ_1	γ_2
Mean	Actual values	0.027	0.610	0.027	0.594	0.621
	Decimal ranking	0.146	0.702	0.164	0.659	0.701
Q1	Actual values	0.017	0.433	0.017	0.467	0.476
	Decimal ranking	0.107	0.659	0.121	0.602	0.660
Median	Actual values	0.025	0.660	0.024	0.629	0.678
	Decimal ranking	0.137	0.717	0.164	0.664	0.715
Q3	Actual values	0.034	0.764	0.035	0.752	0.767
	Decimal ranking	0.174	0.780	0.188	0.750	0.786

earnings attributable to the accrual component of earnings, compared to the cash flow component of earnings. Year zero represents the year in which the firms were ranked. Earnings performance is plotted five years on either side of year zero.

The first graph shows that earnings are slowly mean reverting, as was reported in Table 2. Mean reversion is slow, and not yet completed by the fifth year. The second graph, showing mean earnings when ranked by accruals, has a more confusing pattern. It appears as if mean reversion is completed by the third year. It would thus appear that the slow reversion to the mean by earnings is not attributable to accruals. As with the first graph, the high cash flow portfolio also indicates that earnings is slowly mean reverting, with the reversion being far from complete by the fifth year.

All the results reported in this section would thus suggest that the persistence of earnings attributable to the cash flow component of earnings is greater than the persistence of earnings attributable to the accrual component of earnings.

Empirical analysis: hypothesis 2

The second hypothesis tests whether share prices reflect the different properties of the cash flow and accrual component of earnings, thus whether share prices react as if investors realise the greater persistence of earnings attributable to the cash flow component of earnings.

From Panel A of Table 4 it can be seen that the value of earnings coefficient, α_1, is 0.834, which is the same as was reported in Table 2, using ordinary least squares. The value of the earnings coefficient α_1^* in the share price equation is 0.802. This is relatively close to the coefficient obtained from estimating the forecasting equation. The likelihood ratio statistic, which tests for market efficiency, is 0.355, with a marginal significance level of 0.551. The null hypothesis of market efficiency is therefore not rejected. Share prices thus appear to correctly anticipate the persistence of future earnings attributable to current earnings.

The results correspond with those obtained by Sloan (1996: 303), namely that share prices correctly reflect the implications of current earnings for future earnings. However, the marginal significance level obtained by Sloan was 0.933. This very confident result (compared to a marginal significance level of 0.551 obtained in this study) is most likely as a result of the very large sample used by Sloan.

Panel C of Table 4 investigates the same situation, but uses net income (profit after tax) as the earnings number. Although the persistence of net income is lower than that of operating income, the hypothesis of market efficiency is still not rejected. Using actual values, the earnings coefficient, α_1 is 0.737, as in Table 2, while α_1^* is 0.593. The likelihood ratio statistic is 0.823, with a marginal significance level of 0.364.

As a whole, it would thus appear as if the investors on the JSE are efficient in their assessment of the persistence of future earnings attributable to current earnings. The same conclusion was drawn by Sloan about investors on the NYSE.

Panel A of Section B, Table 4, reports the results, fom the estimation of equations (9) and (10), obtained with CFO_1 as the cash flow number. Market efficiency implies that the coefficients of the share price equation should be equal to the coefficients of the forecasting equation. Although the accrual coefficient on the share price equation appears to be much smaller than the coefficient on the forecasting equation, the null hypothesis, that $\gamma_\cdot = \gamma'_\cdot$ and $\gamma_2 = \gamma_2^*$, is not rejected. The coefficient on cash flow γ_2^* is 0.819, while the coefficient on accruals γ_1^* is 0.272. The likelihood ratio statistic is 4.389, with a marginal significance level of 0.111, accepting the null hypothesis of market efficiency at the 0.1 level of significance. The results obtained here represent the first major departure from the results obtained by Sloan. Sloan found that the null hypothesis was rejected, and that the coefficient on cash flow γ_2^* was 0.826, while the coefficient on accruals, γ_1^* was 0.911. Market efficiency was rejected and Sloan concluded that investors appear to treat the accrual component as if it is more persistent than the cash flow component.

Panel B, Section B, of Table 4, reports the results obtained with CFO_2 as the cash flow number. The coefficient on accruals, γ_1 is 0.715 and the coefficient on cash flow, γ_2 is 0.838. The coefficient on cash flow, γ_2^*, is 0.749, while the coefficient on accruals γ_1^* is –0.023. The likelihood ratio statistic is 4.645, with a marginal significance level of 0.098, rejecting the null hypothesis of market efficiency at the 0.1 level of significance.

Panel C of Table 4 reports the results obtained with CFO_3 as the cash flow number and profit after tax as the earnings number. In the forecasting equation (9) the coefficient on accruals, γ_1, is 0.697 and the coefficient on cash flow, γ_2, is 0.748. In the share price equation (10) the coefficient on cash flow, γ_2^*, is 0.643, while the coefficient on accruals, γ_1^*, is 0.222. The likelihood ratio statistic is 4.815, with a marginal significance level of 0.090, rejecting the null hypothesis of market efficiency at the 0.1 level of significance.

From the results it is clear that share prices react as if investors correctly assess the persistence of future earnings attributable to current earnings. Investors also appear to realise that the persistence of earnings attributable to the cash flow component of earnings is greater than the persistence of earnings attributable to the accrual component of earnings. However, in all cases using actual values, the influence of both components are underestimated. Market efficiency is thus rejected.[3]

Table 4 Results from the non-linear least squares estimation of the share price reaction to information in current earnings and its components about future earnings (t-statistics in parenthesis)

$Earnings_{t+1} = \alpha_0 + \alpha_1 Earnings_t + \upsilon_{t+1}$

$(r_{t+1} - \tilde{r}_{t+1} | \phi_t) = \beta(Earnings_{t+1} - \alpha_0 - \alpha_1^* Earnings_t) + \varepsilon_{t+1}$

$Earnings_{t+1} = \gamma_0 + \gamma_1 Accruals_t + \gamma_2 CashFlow_t + \upsilon_{t+1}$

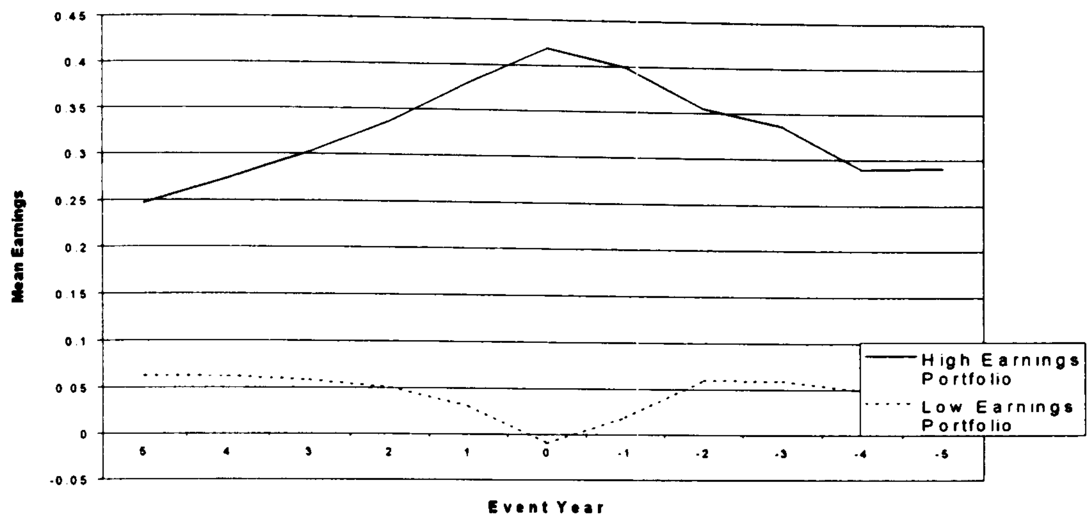
$(r_{t+1} - \tilde{r}_{t+1} | \phi_t) = \beta(Earnings_{t+1} - \gamma_0 - \gamma_1^* Accruals_t - \gamma_2^* CashFlow) + \varepsilon_{t+1}$

		Section A				Section B					
Panel A		β	α_1	α_1^*	$\alpha_1 = \alpha_1^*$	β	γ_1	γ_1^*	γ_2	γ_2^*	$\gamma_1 = \gamma_1^*$ and $\gamma_2 = \gamma_2^*$
$Earnings_1$, with	Actual	2.373	0.834	0.802	0.355[a]	2.275	0.765	0.272	0.844	0.819	4.389[a]
CFO_1 as the	values	(1.61)	(77.47)	(4.46)	0.551[b]	(2.95)	(46.06)	(1.02)	(77.66)	(7.09)	0.111[b]
cash flow	Decimal	1.732	0.792	0.780	0.688[a]	1.325	0.749	0.681	0.798	0.791	0.857[a]
number	ranking	(3.25)	(71.25)	(12.80)	0.407[b]	(4.50)	(50.92)	(9.38)	(71.42)	(7.37)	0.652[b]
Panel B		β	α_1	α_1^*	$\alpha_1 = \alpha_1^*$	β	γ_1	γ_1^*	γ_2	γ_2^*	$\gamma_1 = \gamma_1^*$ and $\gamma_2 = \gamma_2^*$
$Earnings_1$, with	Actual	2.373	0.834	0.802	0.355[a]	2.260	0.715	–0.023	0.838	0.749	4.645[a]
CFO_2 as the	values	(1.61)	(77.47)	(4.46)	0.551[b]	(3.00)	(41.09)	(–0.06)	(70.94)	(4.86)	0.098[b]
cash flow	Decimal	1.732	0.792	0.780	0.688[a]	1.112	0.535	0.402	0.836	0.925	1.541[a]
number	ranking	(3.25)	(71.25)	(12.80)	0.407[b]	(4.52)	(33.17)	(3.85)	(51.88)	(9.06)	0.463[b]
Panel C		β	α_1	α_1^*	$\alpha_1 = \alpha_1^*$	β	γ_1	γ_1^*	γ_2	γ_2^*	$\gamma_1 = \gamma_1^*$ and $\gamma_2 = \gamma_2^*$
$Earnings_2$, with	Actual	2.752	0.737	0.593	0.823[a]	2.893	0.697	0.222	0.748	0.643	4.815[a]
CFO_3 as the	values	(3.56)	(56.67)	(3.84)	0.364[b]	(3.74)	(43.21)	(0.90)	(56.61)	(4.44)	0.090[b]
cash flow	Decimal	1.142	0.743	0.644	1.420[a]	1.175	0.701	0.604	0.750	0.652	1.422[a]
number	ranking	(4.27)	(61.04)	(7.93)	0.233[b]	(4.38)	(43.49)	(7.28)	(61.18)	(5.29)	0.491[b]

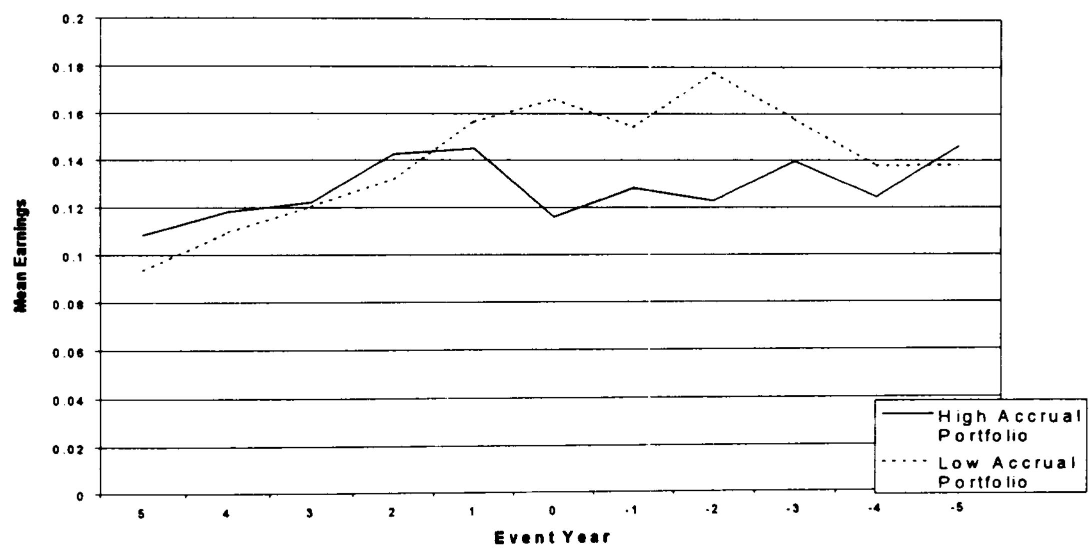
a = Likelihood ratio statistic

b = Marginal significance level

Time series plot of $Earnings_1$ when ranked according to earnings



Time series plot of $Earnings_1$ when ranked according to accruals



Time series plot of $Earnings_1$ when ranked according to cash flow

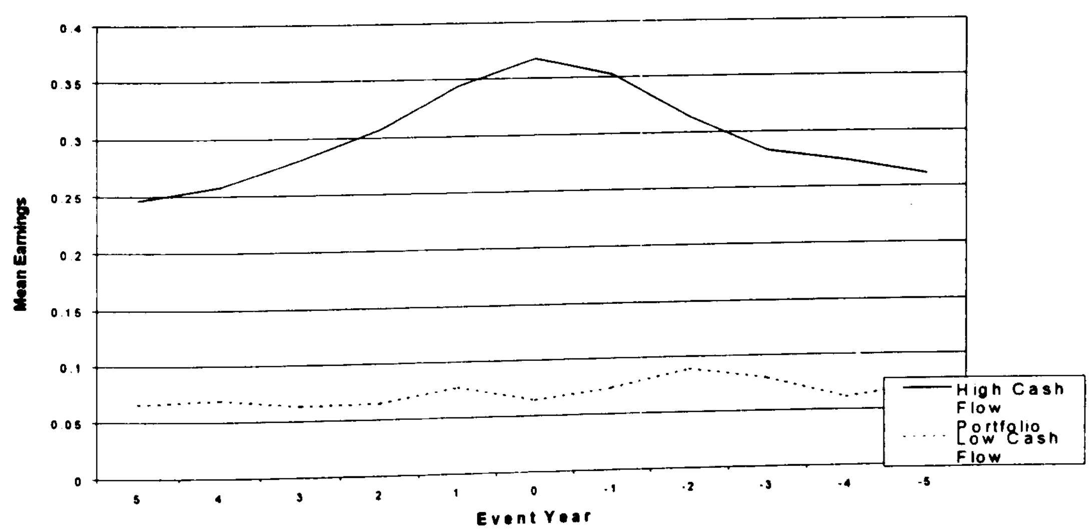


Figure 1 Time series properties of earnings in extreme portfolios, when ranked according to $Earnings_1$, accruals and cash flow (CFO_1)

Accordingly it is normal practice to expand the period of interest beyond the actual date of interest. So in an analysis using daily data the period of interest would include the day of the event and several days before and after the event. If the study uses weekly data (as we do in this), then the event window for analysis will include the week of the announcement and several weeks before and after the week in which the event is announced. The main reason for this approach is that the market may gain information before the event takes place and therefore it is possible to investigate this by examining the stock price over periods prior to the event announcement.

The next step in the event study is to determine the criteria for the selection of industry sectors and firms for investigation. Sometimes as is the case in the empirical exercise contained herein this is dictated by the availability of data.[3] This is not the case with regard to research on stocks in well developed capital markets where there are several extensive data bases.[4]

Brief review of different models used in event studies

The impact of announcements is measured by estimating the abnormal return. An abnormal return is the actual ex-post return of a security over the event window minus the normal return of the firm over the event window. The normal return is the return in the expected return in the absence of the event taking place. The abnonmal return for firm i on event date t is

$$AR_{it}R_{it} - E(R_{it}\backslash X_t) \quad (1)$$

where AR_{it}, R_{it} and $E(R_{it}|X_t)$ are the abnormal, actual, and normal returns for time period t. X_t is the conditioning information for the normal return model and is determined by the choice of normal return selected. Usually either the constant mean return model or the market model is used. In the former X_t is a constant and the assumption is that the mean return of a stock is constant through time. In the market model X_t is specified as the market return and here the assumption is that there is stable relationship between the market return and the specific stock return.

Thus statistical models are based on statistical assumptions about the behaviour of asset returns and are not dependent on economic assumptions. Statistical models assume that asset returns are jointly multi-variate normal and independently and identically distributed. This asset-returns assumption allows for both the constant mean return model and the market model to be correctly specified. Although this is a strong assumption, this approach is used primarily because the inferences derived from the model are robust to deviations from this assumption. Furthermore by using a general method of moments approach the statistical assumptions can be modified for consistency in auto-correlation and heteroskedasticity in the analysis of abnormal returns. The statistical constant-mean return model can be specified as follows:

$$R_{it} = \mu_i + \lambda_{it}$$
$$E(\lambda_{it}) = 0 \qquad var(\lambda_{it}) = \sigma^2_{\lambda_i} \quad (2)$$

The constant-mean return model is a simple model and has proved popular to earlier researchers because the variance of the abnormal return is not much reduced by the specification of more sophisticated models. Indeed Brown & Warner (1985) find that it provides similar estimates to those derived from more complex models. When the model is applied to daily data then nominal returns are usually specified. However when monthly data is used, the model can be used to estimate real or excess returns – returns in excess of the risk-free rate proxied as the yield of the one month to maturity treasury bond or gilt instrument.

Another statistical model is the market model. It is an improvement on the constant mean return model because it removes the part of the return which is related to variations in the market return. This leads to a reduction in the variance in the abnormal return and leads to an increase in the model's ability to detect the effect of events. It is specified as follows

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$
$$E(\varepsilon_{it} = 0) \qquad var(\varepsilon_{it}) = \sigma^2_{\varepsilon} \quad (3)$$

where R_{it} and R_{mt} are the firm i and market m returns for period t respectively and ε_{it} is the zero mean disturbance term and α_i, β_i and σ are the parameters of the market model.

Other statistical models are also used in event studies. These include factor models such as the market model which uses portfolios of traded securities to reduce the variance of the abnormal returns by defining more of the variation in the normal return. The market model is a one-factor model but multi-factor models which utilize industry sector indices in addition to the market have been developed. However there are no significant benefits in using multi-factor models in event studies. This is because the marginal explanatory power derived by including additional factors to the market factor is small, and there is only minor reduction in the variance of the abnormal return

Variance reduction is largest where the sample of firms have a common characteristic – as in the empirical exercise (which follows) where all the stocks are classified into two industry sectors: retail stores and banking and financial services.

In situations of limited data the market-adjusted return model can be used. This is particularly so when the pre-event estimation period for the normal model parameters is unknown or not feasible. In such instances the market-adjusted return model is a restricted market model with $\alpha 1$ constrained to zero and $\beta 1$ constrained to one. Since the model parameters are pre-specified it is not necessary to specify an estimation period to get parameter estimates.

On the other hand economic models are dependent on assumptions regarding the behaviour of investors and not only statistical assumptions. The two main economic models are the capital asset pricing model (CAPM) (Sharpe, 1964 and Lintner, 1965) and the multi-factor normal performance arbitrage pricing theory (APT) model developed by Ross (1976).

The CAPM develops an equilibrium framework in which the expected return of an asset is a function of its covariance with the market portfolio. The debate on the efficiency of CAPM rages on. Several studies have identified that deviations from the linear CAPM risk-return trade-off is dependent on other variables: firm size (Banz, 1981), earnings yield (Basu, 1983) and leverage (Bhandari, 1988). The ratio of the firm's book value of equity to its market value has also highlighted certain difficulties with CAPM. On the one hand Fama & French (1992) examined the cross-section of average returns and beta and find only a weak relationship for a 50-year period and no relationship for a 27-year period. They also find as Banz (1981) had done earlier that firm size and book-to-market equity effectively capture cross-sectional variation in average returns over the same 27-year period. Their book-market results are further reinforced in Fama & French (1995). However, other studies, in particular Kothari, Shanken & Sloan (1995) support CAPM and find ex-post returns compensation for the same 50-year period examined by Fama & French. This suggests that book-to-market equity is at best weakly related to average stock returns and implies that the findings of Fama & French (1995) are the result of survivorship bias. However while the debate rages on, CAPM is being used less frequently in event studies because of questions raised regarding the validity of the restrictions imposed by it on the market model. Accordingly results of studies based on CAPM may be affected by these restrictions. Although this sensitivity to restrictions may be overcome by using the market model, the CAPM is rarely used without extensive relaxation of assumptions.[5]

With regard to multi-factor normal performance APT models the general conclusion is that the major factor is analogous in behaviour to the market model and that the addition of further factors does not increase explanatory power. Accordingly the benefits of using the APT as opposed to the more simple market model are small. A possible benefit of using the APT model is that it removes the biases of the CAPM. However this is something which the statistical models do as well with less complexity and is probably why statistical models are used more frequently in event studies.

However since the market model is used for the empirical exercise which follows herein it is useful to clearly explain how measurement and analysis of abnormal returns are carried out. The standard methodology is as follows: firstly returns are measured in event time t. The event date is $t = 0$ and $t = T_1 + 1$ to $t = T_2$ is the event window. The estimation window is $t = T_0 + 1$ to $t = T_1$. Accordingly $L_1 = T_1 - T_0$ and $L_2 = T_2 - T_1$ are the length of the estimation window and the event window. The event window length should normally be larger than one so as to allow for analysis of abnormal returns around the event day. If the event window is included in estimation of the normal model parameters the event returns might bias the normal return measure. A further effect would be that the normal returns and the abnormal returns would capture the event impact. This is contrary to the epistemology of event studies in that the basic assumption is that the event is captured only by the abnormal returns. To ensure that this does not happen and to ensure further that there are estimators of the parameters of the normal return model which are not influenced by the returns around the event, specifications ensure that the estimation window and the event window do not overlap. The post-event window data is used with the estimation window data to estimate the normal return model. This assess the validity of the normal market return measure as its parameters are changed. See Campbell, Lo & Mackinlay (1997: 157–163) for further details.

Description of the data and the three markets

A data base of banks and retail stores sector firms listed on the Botswana Stock Exchange (BSE) and the Zimbabwe Stock Exchanges (ZSE) and the Johannesburg Stock Exchange (JSE) has been developed. The primary sources of data are the Stock Brokers Botswana Ltd, Data World Zimbabwe (Pty) and I-Net RSA (Pty) Ltd. The data base consists of weekly stock price observations and earnings announcements that covers a sixty-week period from September 1996 to September 1997. Due to insufficient relevant data, the analysis for ZSE and the JSE are for 52 and 43 weeks of the 60-week period respectively.

Having started operations in 1989 the total market capitalization of the BSE is approximately t P2.000 million (US $520 million). For retail firms the market capitalisation values range from P67.2 million to P118.1 million with a mean of approximately P88.7 million and a total of approximately P1595.91 million. Clearly there is substantial size variation between the retail sector and the banking sector as listed on the BSE. Data for the BSE analysis is based on three retail stores and three banking sector stores.

The ZSE started operating in 1896 and now has a total market capitalization of approximately Z$75.8 billion (±US$ 3.5 billion). The maximum market capitalization for the retail sector is similar to that of all firms, but the means are different; the mean value for the retail stores sector is Z$3.0 billion and the total market capitalization is given at Z$56.5 billion. That for banks range from Z$1.0 billion to Z$4.8 billion with a mean of Z$1.9 billion and a total of Z$19.3 billion. There are ten market makers on the ZSE. The level of total ZSE capitalization is approximately seven times larger than the total level of BSE capitalization. Data for the ZSE analysis is based on six banking sector stocks and seven retail sectors stocks.

The JSE started operations in November 1887. It is now capitalised at approximately R1.130 billion (±US $240 billion). Over the period June 1996 to June 1997 the value of shares traded on the JSE was R92.3 billion. This is an increase of 68.8% in comparison to the same period the year before. In terms of market capitalization the JSE is the world's 12th largest stock market, by turnover the JSE is ranked 25th in the world, but given the relative high level of illiquidity it is in 39th place in terms of liquidity. Data for this analysis of the JSE is based on 17 bank sector stocks and 13 retail stores sector stocks.[6]

An empirical exercise

An event study is now carried out to gain insight into the efficiency of three stock markets in the southern Africa region.[7] The aim is to evaluate the efficiency of the regional markets so as to determine the extent to which they may be integrated. Two tests are carried out. Firstly we use the market model (as described earlier) to evaluate the response of each of the three markets to new information. This is done by using weekly data to calculate abnormal returns over a six-month event window. Secondly, analysis and evaluation of cumulative abnormal returns is carried out The study tests two hypothesis;

Hypothesis 1:

The BSE and the ZSE are inefficient with respect to earnings announcements.

Hypothesis 2:

The JSE is efficient in the semi-strong form and if so, the level of efficiency of the two small markets makes the likelihood of integration unlikely.[8]

Estimation

Firstly, the standard market model (described in the second section above) has been used to test the asset pricing efficiency of the three markets. The constant and slope of the regression were evaluated by weekly data. To estimate the distribution of abnormal returns over time we have estimated cumulative abnormal returns (CAR). CAR are aggregated average abnormal returns calculated over the event window. To capture the residuals between actual stocks returns and returns to the market indexes, we estimated the market model as described above.

For the market model residual returns we assumed that the nominal stock returns are generated by the following process:

$$R_{it} = \alpha + \beta_i R_{mt} + e_{it} \qquad (4)$$

R_{it} is the natural logarithm of the return for firm i in week t, and R_{mt} is the natural logarithm of the return on the relevant market index. α and β are the parameters to be estimated for the 60-week period. The benefit of using the market model is dependent on the R^2 of the market model regression. The higher the R^2 the greater is the variance reduction of the abnormal return, and the larger is the gain.

Stock pricing characteristics of the BSE

A sixty-week period data obtained from the BSE on three firms each from the retail and banking sectors is used to estimate the BSE model parameters. The estimation of the parameters is done for each firm and the results obtained are reported in Table 1.

The R^2-bar obtained are fairly consistent and the DW-values show that there is no first order serial auto-correlation.

All the beta coefficients obtained are positive and greater than one. This means that when market returns increase by a unit, earnings on the stocks will increase by more than that proportion. The highest beta coefficient in this sample is 1.79. The beta coefficients are significant, implying that the earnings on the stocks depend significantly on the returns to the market.

Analysis of Cumulative Abnormal Returns (CAR): BSE

The regression results used for generating the abnormal returns are shown in Appendix 1. The Cumulative Abnormal Returns (CAR) is obtained by aggregating the average AR calculated over the event window generated from '1 good news', '26 bad news' and '38 no news'. The CAR shows the earnings growth for the classification into good, bad and no news, as given in Table 2.[9]

The CAR plot of Figure 1 shows that the market responds to all categories of news items. The CAR for the good news decrease from event week –2 to the announcement week, week 0. It continues to fall up to event week +1 but increases on week +2.

The CAR for the bad news and no news also decrease from week –2 through the announcement week to event week +2. This implies that the market reacts to earnings announcements even two weeks after the announcement was made. Not only is this counter intuitive to expectations, it is a disingenuous result since at the least, good news should increase CAR not decrease them. This is an indication that the market is inefficient because this observation is inconsistent with the conditions for any of the EMH forms of efficiency.

Table 1 Estimation of the BSE model parameters using equally weighted market returns for 60 weeks (1996–1997)

FIRM	αi	Seαi	t-ratio αi	βi	Se βi	t-ratio βi	R^2-bar	DW
Barclays	3.223	3.201	0.791	1.192	0.081	1.59	0.695	1.453
FNB	1.913	2.622	0.022	1.142	0.088	1.712	0.694	1.514
Stanchart	1.792	4.513	1.143	1.314	0.092	1.221	0.698	1.911
Pep	1.414	1.722	1.377	1.723	0.171	1.714	0.690	1.922
Sefalana	1.712	4.817	1.311	1.79	0.399	1.321	0.691	1.914
Engen	1.301	2.653	0.971	1.273	0.132	1.422	0.711	1.921

Table 2 CAR shows the earnings growth for the classification into good, bad and no news

Event week	Good news		Bad news		No news	
	AR	CAR	AR	CAR	AR	CAR
–2	–9.5	–9.5	–9.65	–9.65	–8.41	–8.41
–1	–9.5	–19.2	–11.79	–23.35	–8.92	–16.39
0	9.5	–27.9	–11.66	–29.41	–8.65	–25.22
+1	–9.5	–34.3	–11.14	–37.55	–8.72	–32.15
+2	2.87	–35.9	–10.74	–54.17	–8.42	–42.7

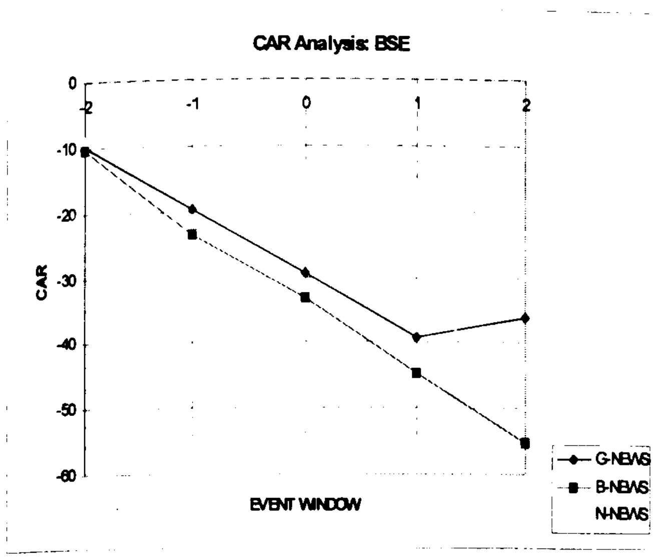


Figure 1 CAR plot for the BSE

Stock pricing characteristics of the ZSE

A fifty-two week period database of retail stores and banks listed on the ZSE has been developed for analysis of the ZSE. Six banks and seven retail stores listed on the ZSE are analysed. The results are presented in Table 3. The R^2-adjusted values ranges from –0.0095 for Finh to 0.306 for Fmb. This implies that only a small percentage of the variations in stock earnings is explained by the market returns. The DW values show that our estimated results do not suffer from auto-correlation problems.

All firms indicate positive betas. This implies that there is a positive correlation between stock earnings and market returns for these firms.

Analysis of Cumulative Abnormal Returns (CAR): ZSE

The parameters of the abnormal returns (AR) and subsequently the cumulative abnormal returns (CAR) are shown in Appendix 2. The AR and CAR are analysed by 67 good news, 84 bad news and 5 no news and is presented in Table 4.

The CAR plot in Figure 2 shows evidence that the ZSE respond to both favourable and unfavourable earnings announcements. The CAR for good-news firms increases from event week –2 to the announcement week, event week 0. There is a sharp increase from week 0 to week +1 and then a gradual increase from event week +1 to event week +2. The CAR for bad-news firms dropped from event week –2 to event week 0. There is a sharp drop after week 0 up to event week +2. This observation is inconsistent to instantaneous and unbiased reaction to new information. The CAR for no news firms dropped continuously from event week –2 to event week +2.

Stock pricing characteristics of the JSE

A fourty-three-week period data obtained on some retail stores and banking sector firms listed on the JSE was used to estimate the standard market model. The exercise is done for 13 listed banks and 17 listed retail stores. The results are presented in Table 5.

The R^2-adjusted values ranges from 0.003 for Saambou to 0.792 for Edgars. The R^2-adjusted implies that on the average more than 40% of the variations in the stock earnings is explained by the market returns. The DW indicate no severe auto correlation problem.

Analysis of Cumulative Abnormal Returns (CAR): JSE

The results of the ARs are given in Appendix 3. The AR and CAR for the thirty firms considered on the JSE, analysed from 106 good news, 112 bad news and 11 no news are presented in Table 6.

The CAR plots for the good-news firms show that, initially the CAR increases gradually from event week –2 to the announcement week. It then increased sharply up to event week +1 and then falls sharply in event week +2.

Table 3 Estimation of the ZSE model parameters using equal weighted market returns for 52-weeks (1997)

FIRM	αi	Seαi	t-ratio αi	βi	Se βi	t-ratio βi	R^2-bar	DW
Barclays	3.725	5.063	7.35	0.124×10^{-6}	0.111×10^{-6}	1.113	0.012	1.943
DCZ	2.081	2.865	7.264	0.804×10^{-7}	0.914×10^{-7}	0.880	0.114	1.956
Finh	6.836	8.346	8.191	0.344×10^{-6}	0.546×10^{-6}	0.631	0.009	1.931
Fmb	6.921	1.162	5.951	0.324×10^{-5}	0.124×10^{-5}	2.599	0.306	2.105
Nmbz	2.772	7.485	3.704	0.599×10^{-6}	0.819×10^{-6}	0.732	0.002	2.006
UDC	2.013	5.706	3.528	0.261×10^{-6}	0.172×10^{-6}	1.514	0.103	2.015
Delt	2.154	3.238	6.653	0.225×10^{-7}	0.228×10^{-7}	0.983	0.027	2.012
Dunl	1.198	1.639	7.305	0.890×10^{-7}	0.103×10^{-6}	0.867	0.037	1.947
Edga	7.247	8.147	8.895	0.762×10^{-8}	0.505×10^{-7}	–0.151	0.020	1.977
Hadd	6.454	1.231	5.239	0.907×10^{-5}	0.578×10^{-5}	1.570	0.032	1.971
Meik	3.712	3.785	9.808	-0.202×10^{-6}	0.887×10^{-7}	2.274	0.082	1.939
Tedc	1.884	2.999	6.283	0.106×10^{-6}	0.501×10^{-7}	2.126	0.094	2.020
Truw	9.914	5.756	1.731	0.964×10^{-6}	0.246×10^{-6}	3.927	0.281	2.019

Table 4 Analysis of the AR and CAR

Event	Good news		Bad news		No news	
week	AR	CAR	AR	CAR	AR	CAR
-2	124.31	124.31	-89.49	-89.49	-10.75	-10.75
-1	89.51	213.82	-87.21	-176.70	-9.50	-20.25
0	30.76	244.58	-111.29	-288.99	-10.75	-31.00
+1	64.32	308.70	-101.69	-391.68	-12.00	-43.00
+2	54.98	363.68	-110.99	-502.67	-7.27	-50.27

The CAR plots for the bad-news firms depicts an initial sharp drop from event week –2 up to the announcement week. There is a gradual drop from week 0 to week +1 and then a drastic increase in week +2. The CAR for the no-news firms increases from week –2 to week –1. It falls sharply in week 0, gradually in week +1 and finally improved in week +2.

Findings and conclusions

We have analysed three stock markets; the Botswana Stock Exchange (BSE), the Zimbabwe Stock Exchange (ZSE) and the Johannesburg Stock Exchange (JSE). Two main objectives were accomplished. Using a sample of data of stocks from the retail and banking sectors we have analysed the earnings characteristics and tested the semi-strong efficiency of these markets. Specifically, we have used a semi-strong efficiency test (price responses to earnings announcements) to test the hypotheses that, (1) both the BSE and ZSE are inefficient and (2) the JSE is efficient. The exercise is performed for retail stores and banks listed on these markets.[10] The analyses of the pricing characteristics of the three markets reveals that the betas are consistently positive, although in some instances they are not statistically significant.

The CAR analyses supports *hypothesis 1* that both the BSE and the ZSE are *not* semi-strong efficient because they are inconsistent to instantaneous reaction to new earnings announcement releases. We use the term 'support' guardedly because since some of the CAR are not significant, the price variations (as pointed out by a referee) may not be related to earnings announcements.

With regard to *hypothesis 2* the JSE data provides statistically significant analysis which indicates that this market is more efficient than the other two markets and supports the findings of Atkins & Ward (1996), amongst others, that the JSE is semi-strong efficient. This market tends to normalise after the event week +1. From the outset (and as a stated part of *hypotheses 2* tested herein), we have had as an underlying premise that earnings changes have systematic economic determinants (events) – see for example Ball, Kothari & Watts (1991) which are likely to be associated with variation in unexpected returns across markets and as such might suggest the extent to which these markets are integrated. The results herein suggest that the relationship between market cross-section returns variability is probably due to the presence of differential information and the information variability of returns is higher for the ZSE than it is for the BSE – see Okeahalam & Jefferis (1999). However, the relative (cross-market) behaviour of cumulative abnormal returns make conclusions regarding the integration of the three markets questionable. The differences in the level of efficiency (as deduced from the CAR analysis) between the JSE and the two other markets makes the likelihood of integration low.

However some caveats to our results exist. Firstly, the infrequency of trading on the BSE and the ZSE and the paucity of stock price and cross section data on earnings and dividend announcement data in Botswana and Zimbabwe means that

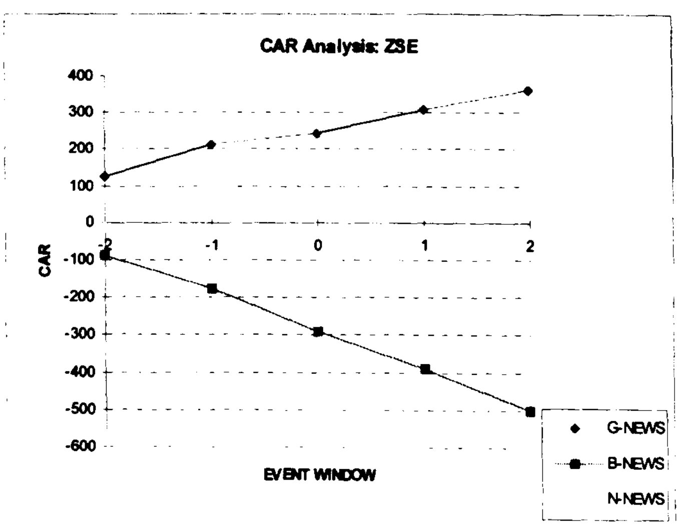


Figure 2 CAR plot for the ZSE

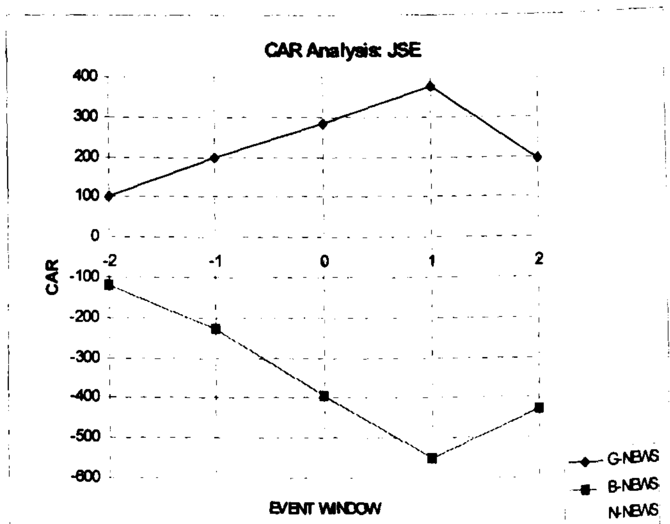


Figure 3 CAR plot for the JSE

Table 5 Estimation of the JSE model parameters using equal weighted market returns for 43 weeks (1997)

FIRM	αi	Seαi	t-ratio αi	βi	Se βi	t-ratio βi	R^2-bar	DW
Adcorp	1.978	8.659	2.84	0.953×10^{-6}	0.268×10^{-6}	0.35	0.064	1.957
ABSA	7.394	7.598	0.973	0.113×10^{-6}	0.415×10^{-7}	2.74	0.753	1.899
BDZ	1.5828	4.907	32.25	0.194×10^{-6}	0.105×10^{-6}	1.84	0.512	1.993
Fidelity	5.071	3.111	16.29	0.646×10^{-6}	0.344×10^{-6}	1.87	0.563	1.911
First Bank	2.993	3.081	9.71	0.737×10^{-7}	0.209×10^{-7}	3.52	0.468	2.044
Gensec	5.239	1.323	3.96	0.354×10^{-7}	0.193×10^{-6}	0.183	0.698	2.028
NRB	4.821	9.112	5.29	0.489×10^{-6}	0.275×10^{-6}	1.77	0.711	1.952
Orion	8.592	6.945	1.337	0.211×10^{-7}	0.698×10^{-8}	3.03	0.593	1.867
PSG	1.179	5.359	2.02	0.162×10^{-6}	0.869×10^{-7}	1.87	0.534	1.893
Stanbic	1.992	2.241	8.88	0.542×10^{-7}	0.917×10^{-7}	0.59	0.158	1.995
Saambou	1.088	3.147	3.45	-0.451×10^{-8}	0.270×10^{-7}	0.17	0.003	1.873
Sasfin	1.829	1.527	1.197	-0.820×10^{-6}	0.701×10^{-6}	1.17	0.57	1.983
Tigon	1.144	1.699	6.73	-0.189×10^{-7}	0.124×10^{-6}	0.15	0.703	1.966
Bearman	2.061	4.737	4.34	0.110×10^{-6}	0.139×10^{-6}	0.79	0.567	1.977
Chariot	4.265	3.047	1.399	-0.839×10^{-7}	0.538×10^{-7}	1.55	0.640	1.939
Ittile	2.092	6.016	3.477	0.127×10^{-6}	0.213×10^{-6}	0.60	0.319	1.957
Invicta	6.798	5.050	1.346	-0.152×10^{-6}	0.116×10^{-6}	0.11	0.743	1.975
Foschini	1.540	1.936	7.96	-0.123×10^{-7}	0.555×10^{-7}	0.22	0.699	1.989
Homechoice	5.033	3.536	1.423	-0.394×10^{-7}	0.887×10^{-7}	0.44	0.629	2.005
Edgars	7.511	4.159	1.80	0.371×10^{-6}	0.645×10^{-6}	0.57	0.792	2.015
LA Stores	7.836	7.987	9.81	-0.508×10^{-6}	0.600×10^{-6}	0.84	0.605	1.939
Mcarthy	1.285	6.180	2.08	-0.630×10^{-7}	0.336×10^{-6}	0.18	0.790	2.001
Metcash	5.286	4.704	1.124	-0.173×10^{-6}	0.119×10^{-7}	1.45	0.418	2.031
Mathomo	4.849	8.672	5.59	-0.175×10^{-6}	0.346×10^{-6}	0.51	0.753	1.989
Nuclicks	5.039	6.809	7.400	0.845×10^{-7}	0.520×10^{-7}	1.625	0.526	1.899
Oceania	1.195	1.531	7.810	-0.665×10^{-6}	0.514×10^{-6}	1.302	0.714	1.946
Pep	9.880	1.111	8.888	0.790×10^{-7}	0.441×10^{-7}	1.791	0.606	1.897
Shoprite	9.073	1.039	8.727	0.136×10^{-8}	0.272×10^{-7}	0.049	0.679	1.979
Specialty	3.497	6.081	5.751	0.861×10^{-7}	0.129×10^{-6}	0.665	0.661	1.965
Wooltru	2.167	5.631	3.848	-0.485×10^{-7}	0.139×10^{-6}	0.348	0.667	2.01

Table 6 Analysis of the AR and CAR for the thirty firms considered on the JSE

Event week	Good news		Bad news		No news	
	AR	CAR	AR	CAR	AR	CAR
−2	102.87	102.87	−119.15	−119.15	−3.49	−3.91
−1	97.48	200.35	−139.22	−225.65	2.42	−1.49
0	84.50	284.85	−134.22	−392.87	−6.12	−7.61
+1	91.72	376.57	−157.92	−550.79	−2.21	−9.82
+2	−182.80	193.77	−121.51	−429.28	−3.47	−8.03

the results are subject to returns estimation bias. This is in keeping with the findings of Rouwenhorst (1999). Secondly, it has also been established that JSE market efficiency is also affected by infrequency of trading. Indeed, although their methodology was criticised by Gilbert & Roux (1978) and Clark (1979), Saloner & Strebel (1978) have identified the impact of infrequent trading on beta values of stocks listed on the JSE. Their findings (Saloner & Strebel, 1978) suggest that the EMH only fits the behaviour of shares with average annual trading volumes in excess of 250.000 per year, at the time equivalent to half the shares listed on the JSE. We did not analyse the volume of trades of the JSE listed stocks which we used in our analysis. This could be an area for future research.

In other future work it may also be possible to use the methodology of Scholes & Williams (1977), Dimson (1979) and Shanken (1987) – which although recently criticised by Hillier & Yadav, 1997 – to reduce estimation error of betas in markets with infrequent trading and nonsynchronous data, particularly for the BSE, ZSE and the other small markets of the region.[11] Furthermore, given that as suggested herein, the JSE is not integrated – a point which is also made in the co-integration work of Jefferis, Okeahalam & Matome (1998)[12] – with the regional emerging stock markets of southern Africa, another important area of future work is to test the level of JSE integration with other emerging markets – perhaps in South East Asia – and to test the extent to which the more plausible conjecture that the JSE is integrated with the major markets (London, New York and Tokyo) holds. Finally, the regulatory authorities, particularly in the small recently established markets which are springing up in various sub-Saharan African countries, can also play a useful role in improving the efficiency of these markets by supporting the provision of timely, consistently prepared and accurate information.

Acknowledgement

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Notes

1. The efficient-market hypothesis (EMH) implies that stock prices fully represent all available information and that any new information is instantaneously included into the stock price. The more sophisticated and quick the flow of information; the more speedily stock prices will adjust to new information. This hypothesis is supported by evidence at varying levels or forms, weak, semi-strong, and strong. In the weak form, tests of the EMH test the extent to which historic stock prices can be used to predict future prices. In general the evidence is that historic prices can not be used to predict future prices. Semi-strong form tests measure the extent to which stock prices fully reflect all publicly available information. The broad consensus in this regard is that it is very difficult to earn excess returns using publicly available information. Strong form tests evaluate whether stock prices reflect all information, even information which is not available to the public. Here the evidence is that professional market participants do not have access to techniques which enable them to earn higher returns than returns expected for the level of accepted market risk. In general three factors can influence the impact of announcements on the markets. Firstly, market expectations regarding the timing and content of the new information – generally, the greater the suprise in timing and content the larger the revision of returns and the less likely it is that the market would have discounted the information. Secondly, the significance of the new information on the distribution of ex-ante security returns – in general the larger the revision in expected cash flows, the larger the securities price revision and *vice versa*. Thirdly, the reputation of the source and therefore the credibility of the information – the more reliable the source, the more credible the information content value and the more significant the securities price effect and *vice versa*.
2. Therefore in the context of a two-period model the impact of an announcement as measured by the size of the returns reaction is a function of the persistence of earnings. We can postulate the following joint hypothesis. Firstly, the stock price is equal to the present value of the expected future benefit accruing to equity holders. Secondly, the present value of the revisions in expected future earnings approximates the present value of the revisions in these expected future benefits and thirdly a univariate time series model of earnings approximates market expectations. Accordingly the magnitude of the ERC to announcements should be positively related to measures of persistence of earnings across firms. For more on announcements and earnings persistence see Kormendi & Lipe (1987).
3. Okeahalam (1994) uses asymptotic estimation in an attempt to overcome the difficulties which the absence of data has on carrying out event studies on capital markets in Africa.
4. An extensive list and description of the major data bases for event studies is provided in Board, Pope & Skerratt (1991).
5. CAPM assumes that firstly the market portfolio is efficient and that secondly the expected returns are linearly related to betas. These two assumptions are not separate because either implies the other. However Kandel & Stambaugh (1995) have shown that either can hold nearly perfectly while the other fails grossly. Their argument is that there is an exact linear relationship between expected returns and betas of a given portfolio if and *only* if the portfolio lies exactly on the minimum variance boundary. If the portfolio is inefficient, for example it does not lie on the minimum-variance boundary, then a plot of expected returns *versus* betas bears no relation to the position of the portfolio in mean-variance space. It is possible to have an OLS slope and R^2 close to zero when the portfolio is close to the minimum variance boundary. At the same time however a near perfect linear relation can occour with any desired intercept and slope if the portfolio is grossly inefficient. Such findings add to the growing disquiet regarding CAPM.
6. Inanga (1996) provides a detailed description of the evolution and potential resource mobilization role of stock markets in Africa.
7. Since we are studying the price response to earnings announcements which is a semi-strong test, the term 'event study' is being used in the Fama's (1991) sense who suggests that the term should be used to refer specifically to tests which are designed to test for semi-strong efficiency.
8. There has been much debate on this. Several CAPM studies of the efficiency of the JSE have been carried out. For example Bradfield, Barr & Affleck-Graves (1988) find that the JSE is consistent with CAPM and Koker & Brummer (1997) find the JSE to be efficient in the weak form. Furthermore in a study of the effect of block trades on share prices on the JSE, Atkins & Ward (1996) find evidence to support both the weak form and the semi-strong form of the EMH.
9. To obtain real returns we used the Fisher equation which adjusts returns for inflation. The rates of inflation used for the three countries are: Botswana 9.8%, Zimbabwe 12%, and the Republic of South Africa (RSA) 7.4%. Using the above inflation rates we calculated real percentage earnings growth. We then used the following news classification criteria as in Osei (1997). A 0–5% real increase in earnings announcement equals no news. A greater than 5% increase in earnings announcements equals good news and an earnings announcement less than 0% (or a negative earnings announcement) is bad news.
10. We have evaluated the price response to earnings announcements. We wish to thank a referee who rightly points out that this is a semi-strong EMH test. Thus we have not shown that the markets are not weak-form efficient – since they may not be

semi-strong efficient but might still be weak-form efficient. We did not carry out weak form tests.

11. Specifically it might be possible to estimate a market adjusted model as in Dunn, Hillier & Marshall (1999). This specification controls the impact of thin trading by incorporating lead and lagged market terms in the return generating model.

12. Jefferis, Okeahalam & Matome (1998) use co-integration time-series econometrics to test this.

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Appendix 1 Estimates of the BSE abnormal returns using equal weighted market returns

Firm	αi	Seαi	t-ratio αi	βi	Se βi	t-ratio βi	R^2-bar
Barclays	−10.17	46.9	−0.19	1.12	0.43	.695	0.61
FNB	−8.19	5.37	−3.11	0.91	0.11	.711	0.577
Stan Chart	0.78	29.8	0.09	1.32	1.62	.209	0.582
Pep	0.38×10^{-11}	0.311×10^{-12}	0.15	1.03	1.86	.233	0.631
Sefalana	−13.73	25.43	−0.37	1.32	0.47	.341	0.533
Engen	−6.132	15.3	−0.44	2.96	0.13	.260	0.702

Appendix 2 Estimates of the ZSE abnormal returns using equal weighted market returns

FIRM	αi	Seαi	t-ratio αi	βi	Se βi	t-ratio βi	R^2-bar
Barclays	5.421	641.9	8.44	0.506×10^{-6}	$0.143*10^{-6}$	3.5387	0.5615
DCZ	2.723	43.5	6.25	0.255×10^{-6}	$0.126*10^{-6}$	2.0236	0.2559
FINH	4.451	106.6	4.17	0.789×10^{-6}	$0.631*10^{-6}$	1.2512	0.0388
FND	3.865.	3928.6	0.98	0.171×10^{-6}	$0.420*10^{-5}$	$0.407*10^{-1}$	0.1248
NBMZ	2.543	1513.3	1.68	0.830×10^{-6}	$0.165*10^{-5}$	0.50239	0.0564
UDC	3.428	61.9	0.55	0.718×10^{-6}	$0.183*10^{-6}$	3.9071	0.5646
Delt	2.865	637.4	4.49	0.648×10^{-7}	$0.424*10^{-7}$	$0.424*10^{-7}$	0.1286
DUNL	2.258	92.1	2.45	0.416×10^{-6}	$0.587*10^{-6}$	1.04	0.0111
EDGARS	7.232	138.3	5.22	0.458×10^{-8}	$0.901*10^{-7}$	$0.508*10^{-1}$	0.076
HADD	7.641	320.1	2.38	$0.123*10^{-4}$	$0.147*10^{-4}$	0.837	0.0342
MEIK	3.669	1304.4	2.81	$0.94*10^{-4}$	$0.292*10^{-4}$	0.665	0.066
TEDC	1.777	66.4	2.67	$0.126*10^{-6}$	$0.109*10^{-6}$	1.1582	0.0238
TRW	1.411	807.9	1.74	$0.272*10^{-5}$	$0.353*10^{-5}$	0.783	0.0448

Appendix 3 Estimates of JSE abnormal returns using equal weighted market returns

FIRM	αi	Seαi	t-ratio αi	βi	Se βi	t-ratio βi	R^2-bar
Adcorp	1.993	264.42	7.537	0.120×10^{-8}	0.952×10^{-6}	0.126	0.075
ABSA	8.305	900.88	0.922	0.116×10^{-6}	0.496×10^{-7}	2.352	0.1926
BDZ	1.4	737.22	18.99	0.662×10^{-6}	0.185×10^{-6}	3.571	0.566
Fidelity	5.109	240.62	21.24	0.660×10^{-6}	0.282×10^{-6}	2.339	0.242
First Bank	2.689	393.89	6.82	0.955×10^{-7}	0.267×10^{-7}	3.27	0.456
Gensec	4.273	522.26	8.18	0.236×10^{-6}	0.719×10^{-6}	3.57	0.522
NRB	4.58.3	83.65	5.48	0.602×10^{-6}	0.289×10^{-6}	2.08	0.193
Orion	1.01	46.93	21.54	0.986×10^{-9}	0.543×10^{-8}	0.182	0.07
PSG	1.108	27	41.03	0.363×10^{-7}	0.421×10^{-7}	863	0.02
Stanbic	1.862	3045.2	6.114	0.975×10^{-7}	0.126×10^{-6}	0.773	0.03
Saambou	1.104	64.68	17.07	0.361×10^{-7}	0.562×10^{-7}	0.17	0.04
Sasfin	1.176	33.24	53.08	0.497×10^{-6}	0.389×10^{-6}	12.76	0.81
Tigon	1.602	181.37	0.83	0.394×10^{-6}	0.123×10^{-6}	3.2	0.327
Bearman	1.517	181.37	0.836	0.326×10^{-6}	0.561×10^{-6}	0.58	–0.08
Chariot	4.83	22.27	21.68	0.221×10^{-6}	0.413×10^{-7}	5.35	0.664
Ittile	2.112	81.21	26.02	0.21×10^{-6}	0.268×10^{-6}	0.78	0.02
Invicta	6.451	27.24	23.68	0.110×10^{-6}	0.812×10^{-7}	1.63	0.11
Foschini	2.56	231.57	11.06	0.334×10^{-6}	0.703×10^{-7}	4.75	0.607
Homechoice	4.506	29.99	15.03	0.114×10^{-6}	0.812×10^{-7}	1.409	0.065
Edgars	–7.431	1111	–0.066	0.164×10^{-5}	0.170×10^{-5}	0.96	0
LA Stores	7.924	68.27	11.61	0.840×10^{-6}	0.579×10^{-6}	1.45	0.073
Mcarthy	4549	636.66	–5.06	0.174×10^{-5}	0.345×10^{-6}	5.06	0.733
Metcash	4.859	42.94	11.31	0.826×10^{-8}	0.106×10^{-7}	0.77	0.02
Mathomo	7.485	36.94	20.26	0.150×10^{-5}	0.156×10^{-6}	9.58	0.866
Nuclicks	7.591	34.06	22.28	0.112×10^{-6}	0.259×10^{-7}	4.345	0.665
Oceania	1.168	69.58	16.79	0.747×10^{-6}	0.259×10^{-6}	3.077	0.714
Pep	1.375	72.64	18.93	0.87×10^{-7}	0.314×10^{-7}	-2.76	0.322
Shoprite	1.058	72.64	18.93	0.87×10^{-7}	0.314×10^{-7}	2.77	0.322
Specialty	3.346	53.95	6.2	0.176×10^{-6}	0.137×10^{-6}	1.283	0.067
Wooltru	4.176	892.35	4.67	0.112×10^{-6}	0.259×10^{-7}	4.345	0.665