The current issue and full text archive of this journal is available at
www.emeraldinsight.com/0307-4358.htm

Received 5 June 2013
Revised 2 October 2013
23 December 2013
Accepted 10 February 2014

The relative information content of cash flows and earnings affected by their extremity

UK evidence

Wael Mostafa
Ain Shams University, Cairo, Egypt and Colleges of Applied Sciences, Sultanate of Oman

Abstract

Purpose – Many studies examine the relative information content of earnings and cash flows from operations. Most studies find that earnings have higher information content than cash flows. An interesting question that follows is whether these findings hold after controlling the extremity of earnings and cash flows. The purpose of this paper is to examine the relative information content of earnings and cash flows in the following four different cases: first, moderate earnings vs moderate cash flows, second, extreme earnings vs moderate cash flows, third, moderate earnings vs extreme cash flows, and fourth, extreme earnings vs extreme cash flows.

Design/methodology/approach – To assess the relative information content of earnings and cash flows for each of the four cases mentioned above, the authors compare the explanatory power for regression of returns on unexpected earnings relative to regression of returns on unexpected cash flows. Therefore, the author compares the adjusted R^2 of the model with earnings variables and the model with cash flows variables using Vuong's test, that examines the statistical significance of the difference between adjusted R^2s of the rival (non-nested) models, and interpret a statistically higher adjusted R^2 as an indicator for higher relative information content.

Findings – The results show that: first, when both earnings and cash flows are moderate, earnings are more highly associated with stock market price changes than cash flows, second, when both earnings and cash flows are extreme, earnings also have greater relative information content than cash flows, third, when the extremity differs between earnings and cash flows, the moderate variable is superior to the other extreme variable in explaining security returns. These results suggest that earnings are definitely more value relevant than cash flows. However, only in cases when cash flows from operations are moderate and earnings are extreme, cash flows possess higher information content than earnings.

Practical implications – The explanatory power for stock returns will be higher for earnings or cash flows depending on which is more highly persistent. This result reverses the conventional finding of the superiority of earnings over cash flows in explaining security returns.

Originality/value – In contrast to previous studies, the authors control for the extremity of earnings and cash flows when evaluating the relative information content of earnings and cash flows from operations.

Keywords Stock returns, Relative information content, Moderate earnings, Extreme earnings, Moderate cash flows, Extreme cash flows

Paper type Research paper

1. Introduction

Accrual accounting facilitates the evaluation of a firm's performance and is essential to the matching of revenues and expenses. However, accrual-based accounting earnings have been criticised because of its historical emphasis, and the flexibility inherent in generally accepted accounting principles (GAAP) provide managers with the opportunity to use accruals to manipulate income to suit their own purposes (Cheng *et al.*, 1997).

Managerial Finance
Vol. 40 No. 7, 2014
pp. 646-661

0307-4358
DOI 10.1108/MF-06-2013-0128

Self-interested managers might use accounting discretion opportunistically and manipulate accruals, which would distort earnings as a measure of the firm's performance (Kothari, 2001). Accrual accounting also suffers from allocation problems where the measurement of net income involves judgments about accruals, allocation and valuations. The proponents of cash flow accounting view that cash flow accounting avoids the problem of asset valuation and income measurement. They also argue that it is less distortion or manipulation by management than in accrual information. Therefore, it can provide a reliable guide regarding the past performance of the firm and how the firm is likely to perform in the future (Ashton, 1976). Moreover, the accrual method of financial reporting is not sufficient to provide critical information about the liquidity and solvency of the firm. Dividends, debt, interest, and all cash expenses are paid with cash, not profit. Hence, the users of financial statements need additional cash flows information to judge a firm's liquidity and solvency.

The measurements of cash flows from operations are unaffected by accounting accrual and deferrals. Cash flows from operations are thus seen as a more reliable firm performance measure (Cheng *et al.*, 1997). If a firm is to continue operating effectively over several years, the operating activities must generate sufficient cash flows from operations so that inventory can be replaced, creditor's claims can be paid, and plant and equipment can be replaced as they wear out. Cash flows provided (or used) by operation are therefore an important indicator of the firm's financial health, particularly when such cash flows from operations are assessed over several years.

Cash flow accounting and accrual accounting should be regarded as complementary to each other rather than as alternative (Ashton, 1976). Cash flows information focuses on liquidity, whereas, accrual accounting focuses on profitability. For example, there is no conflict between cash flows from operations and net income where each one of them is designed to meet precise needs of the users of financial statements. The net income in accrual accounting depends on recognising the revenues earned and the expenses incurred. Cash flows from operations report revenues received and expenses incurred. The point here is that we should assess the health and predict the death of the firm depending upon both net income and cash flows from operation where each one performs a specific role in evaluating the performance of the firm (Lee, 1992).

Relative information content studies compare measures to determine which ones have greater information content than others. Questions of relative information content are raised, for example, regarding: whether accounting disclosures based on Foreign GAAP are more informative than those based on US GAAP; and when evaluating alternative performance (Biddle *et al.*, 1995).

Relative information content studies of cash flows and earnings seek to investigate the superiority of either cash flows or earnings in explaining security returns. This approach examines the relative information content of cash flows and earnings through their association with stock returns. Moreover, this approach relies on two assumptions: first, market efficiency and second, adequate control for risk. It focuses on the role of either earnings or cash flows in the formulation of stock prices. Because market value of the firm is defined as the present value of expected future net cash flows, examining the association between accounting information (such as earnings or cash flows) and the market value of the firm can demonstrates the degree to which earnings or cash flows can convey new information about the amount, timing, and/or uncertainty of future cash flows.

Examples of relative information content studies of cash flow and earnings include: (e.g. in the USA, Ball and Brown, 1968; Beaver and Dukes, 1972; Dechow, 1994;

Gore and Stott, 1998; and in the UK, Board and Day, 1989; Board *et al.*, 1989; Ali and Pope, 1995; Clubb, 1995; Charitou, 1997; other studies include Kinnunen and Niskanen, 1993; Plenborg, 1998; Bartov *et al.*, 2001; Haw *et al.*, 2001). The empirical question in relative information content studies of cash flow and earnings is which measure, cash flows or earnings, provides greater information content?

Previous research studying the relative and information content of earnings and cash flows in the USA and the UK and some other countries (such as Australia and New Zealand) generally found support for the hypothesis that earnings were more highly associated with stock market price changes than cash flows (e.g. Board and Day, 1989; Dechow, 1994; Ali and Pope, 1995; Haw *et al.*, 2001). In other words, earnings are superior to cash flows in explaining security returns.

Subsequent research has shown that extreme earnings have less information content than moderate earnings (e.g. Freeman and Tse, 1992; Ali and Zarowin, 1992a; O'Hanlon *et al.*, 1992; Das and Lev, 1994) and extreme cash flows also have less information content than moderate cash flows (e.g. Ali, 1994; Cheng and Yang, 2003). As argued by Cheng and Yang (2003), since extreme earnings and extreme cash flows affect their information content adversely, we would expect to observe changes in the relative explanatory power of earnings vs cash flows in explaining stock returns. Specifically, the US study of Cheng and Yang (2003) finds that extreme earnings possess less explanatory power for returns than moderate cash flows do. However, the USA is more litigious and more rules-based than the UK, which would affect factors such as the timely recognition of losses and, hence, the effect of extreme earnings. For example, Leuz *et al.* (2003) show that the variance of earnings relative to cash flows is much higher for the USA than the UK. Therefore, it might be interesting to determine if similar results to the USA, namely; that the market places higher weight on moderate cash flows than on extreme earnings, hold in a country with fewer extreme earnings events such as the UK.

Based on UK data, this study, therefore, examines the relative information content of cash flows from operations and earnings with controlling for the extremity of earnings and cash flows. Unlike prior studies, we follow the US study of Cheng and Yang (2003) and add control for the extremity of earnings and cash flows. To control for the extremity of earnings and cash flows, we form four groups based on both earnings and cash flows extremities:

(1) moderate earnings/moderate cash flows;

(2) extreme earnings/moderate cash flows;

(3) moderate earnings/extreme cash flows; and

(4) extreme earnings/extreme cash flows.

Extremity of earnings (cash flows) is determined by the distribution of earnings (cash flows) to market value ratios.

Relative information content of earnings and cash flows is examined for the entire sample and for each of the four groups. To assess the relative information content, we compare the explanatory power for regression of returns on unexpected earnings relative to regression of returns on unexpected cash flows. A model producing relatively high explanatory power would be considered superior.

The results show that: first, when both earnings and cash flows are moderate, earnings have a higher association with security returns than cash flows. Second, when both earnings and cash flows are extreme, earnings also have the higher relative

information content than cash flows. Third, moderate cash flows are superior to extreme earnings in explaining security returns. Specifically, we find that moderate cash flows explain returns more than twice as do extreme earnings (19 vs 9 per cent). Fourth, moderate earnings are superior to extreme cash flows in explaining security returns. Specifically, we find that moderate earnings explain returns 13 times higher than do extreme cash flows (13 vs 1 per cent). These results are consistent with the US study of Cheng and Yang (2003) except for the fact that extreme earnings have higher information content than extreme cash flows. Cheng and Yang (2003) found that both extreme earnings and extreme cash flows are equally informative. The reasons behind that result demand further investigations. One possible interpretation for that result is that extreme earnings are more extreme in the USA than in the UK. In general, the results of this study are twofold. First, earnings generally have higher information content than cash flows. Second, when earnings or cash flows are more extreme, they have less information content (since they are more likely to be transitory).

2. Previous research and hypotheses

Ball and Brown (1968) found that cash flows were not as successful in predicting the signs of the mean abnormal stock returns as net income[1]. Beaver and Dukes (1972) compared the relative information content of three measures: earnings as currently reported (called deferral earnings), earnings before deferral of income taxes (called non-deferral earnings), and cash flows. Their findings supported Ball and Brown's (1968) results where they found that unexpected earnings had a higher association with unexpected returns than cash flows[2]. In the UK, Board and Day (1989) and Board *et al.* (1989) examined the relative information content of net income, funds flow, and cash flows from operations. The results showed that earnings dominate cash flows measures in explaining security returns.

Dechow (1994) investigated the role of accrual to improve earnings' ability to measure firm performance. She considered earnings and cash flows as competing performance measures and her objective was to determine which measure, earnings or cash flows, is the best summary for evaluating firm performance. Her results supported the view that earnings are a better measure of a firm's performance than cash flows. She showed the conditions that make earnings relatively more superior to cash flows regarding a firm's performance. These conditions were: shorter performance measurement interval; greater volatility of the firm's working capital requirement and investments and financing activities; and longer firm's operating cycle. Under these circumstances, cash flows are predicted to suffer more severely from timing and matching problems that reduce their ability to reflect a firm's performance.

Another example from the UK of relative information content studies is Ali and Pope's (1995). They examined the relative information content of three performance measures: earnings, funds flow, and cash flows from operations. They employed three innovations which have been used in earnings return relation. First: using the current level of earnings, together with the change in earnings as a proxy for its unexpected components. Second: using time-varying parameters in the earnings-return relation instead of constraining the parameters to be constant across years. Third: using a specific non-linear regression for the relation between returns and earnings instead of a linear relation. Their results indicated that earnings have the higher relative information content than funds flow and cash flows.

Based on UK Data, Charitou (1997) partially replicated Dechow's (1994) study. He found that earnings is shown to be the dominant explanatory variable in the

marketplace and cash flows play a more important role in the marketplace in the following situations: the smaller the absolute magnitude of aggregate accruals; the longer the measurement interval; and the shorter the firm's operating cycle. In the emerging capital market, in China, Haw *et al.* (2001) investigated the relative information content of earnings and cash flows from operations. Their results showed that earnings have greater relative information content than cash flows.

Bartov *et al.* (2001) explored the relative information content of cash flows and earnings for equity valuation within five countries: the USA, the UK, Canada, Germany, and Japan. They found that the superiority of earnings over cash flows is not universal. It depends on the national regime and attendant institutional factors. More specifically, their results indicated that: in the three Anglo-Saxon countries, where capital is traditionally raised in public markets and reporting rules are unencumbered by taxation requirements, earnings are more important than cash flows in equity valuation; and conversely, in the two other non-Anglo-Saxon countries, where capital is traditionally raised from the private sector, earnings are not superior to cash flows in equity valuation.

Since prior research in general, as shown above, concluded that earnings are superior to cash flows in explaining security returns (e.g. Board and Day, 1989; Dechow, 1994; Ali and Pope, 1995), the first hypothesis is as follows:

H1. The relative information content of earnings is higher than that of cash flows from operations.

The relation between earnings and returns is affected by extreme earnings. Specifically, extreme (transitory) earnings have lower information content than moderate (permanent) earnings (e.g. Kormendi and Lipe, 1987; Collins and Kothari, 1989). Earnings may contain extreme items with limited valuation implications. Examples of extreme items in earnings include current and long-term accruals such as gains or losses on marketable securities, or the foreign currency translation adjustment, losses due to restructuring, current recognition (through asset sales) of previous periods (or the current period) increases in market value, and one-time gains and losses from change in accounting standards (Cheng *et al.*, 1996; Christensen *et al.*, 2005). Moreover, because compensation contracts and debt covenants are often based on reported accounting earnings, managers may attempt to introduce extreme gains and losses in earnings (Kothari, 2001). Cash flows may also contain extreme components. This is because managers may intentionally defer or front-load the recognition of cash accompanying revenues or expenses. Therefore, the smaller effect of extreme earnings on stock returns can also be applied to extreme cash flows as well.

Freeman and Tse (1992) showed that earnings return relation is non-linear and extreme earnings have lower persistence than moderate earnings. They documented a high marginal price response after controlling for extreme components in earnings financial analysts forecast errors. Scott (2003) argued that the reason for the expectation of a higher earnings response coefficient (ERC) in the case of moderate earnings is that the increase in the revenue or cost saving will persist, whereas the expectation of a lower ERC in the case of extreme earnings exists because there is no reason for these unexpected earnings to recur.

There are several ways for measuring the extreme components in earnings. Collins and Kothari (1989), O'Hanlon *et al.* (1992), and Donnelly and Walker (1995) used the time-series estimates to measure earnings persistence. Ali and Zarowin (1992a) and

Ou and Penman (1989) used earnings to price ratio to measure extreme components in earnings. Freeman and Tse (1992) used the absolute change in earnings financial analysts forecast errors deflated by the beginning of the period price to isolate extreme components in earnings apart from moderate components. In general, Freeman and Tse (1992) showed that the ERC is more sensitive to forecast error magnitude than to firm-specific average persistence. They concluded that measuring earnings permanence using the absolute change in earnings is better than the time-series estimates because "investors may assign each earnings surprise a unique persistence measure that depends on the absolute magnitude of the surprise" (p. 187).

In summary, many studies have documented that moderate earnings have more information content than extreme earnings (e.g. in the USA, Freeman and Tse, 1992; Ali and Zarowin, 1992a, b; Das and Lev, 1994; in the UK, O'Hanlon *et al.*, 1992; Donnelly and Walker, 1995). In addition, other studies have reported that moderate cash flows have more information content than extreme cash flows (Ali, 1994; Cheng and Yang, 2003).

In this study, earnings are considered to be the primary profitability measure and cash flows from operations are the secondary profitability measure. We argue that investors will face the following four different cases:

(1) moderate earnings and moderate cash flows from operations;

(2) extreme earnings and moderate cash flows from operations;

(3) moderate earnings and extreme cash flows from operations; and

(4) extreme earnings and extreme cash flows from operations.

In case 1, when both earnings and cash flows from operations are moderate and possess information content, the market will depend upon the primary profitability measure which is earnings. This leads to the second hypothesis:

H2. The relative information content of moderate earnings is higher than that of moderate cash flows.

In case 2, when earnings are extreme and have less information content, the market will look for another measure that has more information content and a good surrogate measure for earnings is moderate cash flows from operations (Cheng and Yang, 2003). As such, the third hypothesis is developed:

H3. The relative information content of moderate cash flows is higher than that of extreme earnings.

In cases 3 and 4, when cash flows from operations are extreme and have less information content, the market will depend upon the primary profitability measure, which is earnings, irrespective of whether earnings themselves are moderate or extreme. As such, the fourth and fifth hypotheses are set as follow:

H4. The relative information content of moderate earnings is higher than that of extreme cash flows from operations.

H5. The relative information content of extreme earnings is higher than that of extreme cash flows from operations.

3. Research method

As indicated before, this study investigates the relative information content of earnings and cash flows from operations whilst controlling for the extremity of earnings and cash flows. To control for the extremity of earnings and cash flows, following the US study of Cheng and Yang (2003), we divide the whole sample into four groups based on both persistence of earnings and cash flows. The entire sample for each year has been divided into two groups based on earnings persistence (moderate earnings vs extreme earnings) and based on cash flows persistence (moderate cash flows vs extreme cash flows). For each year, we further match and group the total samples into four groups:

(1) moderate earnings/moderate cash flows;

(2) extreme earnings/moderate cash flows;

(3) moderate earnings/extreme cash flows; and

(4) extreme earnings/extreme cash flows.

Following Cheng and Yang (2003), the ratios of earnings to market value of equity at the end of year t are used to determine moderate and extreme earnings. In each year, we rank firms with positive earnings into nine groups by their ending-of-year earnings-market value of equity ratios with an approximately equal number of firms per group, where the tenth group includes firms with only negative earnings. We classify firms in the middle six groups as moderate earnings and firms in the remaining four groups as extreme earnings.

Following Cheng and Yang (2003), the ratios of cash flows from operations to market value of equity at the end of year t are used to determine moderate and extreme cash flows from operations. In each year, all firms with positive cash flows from operations are ranked into nine groups by their ending-of-year cash flows from operations-market value of equity ratios with an approximately equal number of firms per group, where the tenth group includes firms with only negative cash flows from operations. The middle six groups are classified as moderate cash flows from operations and the remaining four groups are classified as extreme cash flows from operations.

To test our research hypotheses, as stated in Section 2, we examine the relative information content of reported earnings and cash flows for the entire sample and for each of the four groups, using the following two pooled[3] regressions (Models 1 and 2). This is to estimate the association between annual stock returns and the level and change of earnings (Model 1), and the association between annual stock returns and the level and change of cash flows from operations (Model 2), respectively:

$$Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta E_{it} + \alpha_{2t}E_{it} + \varepsilon_{it} \qquad \text{Model 1}$$

$$Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta CF_{it} + \alpha_{2t}CF_{it} + \varepsilon_{it} \qquad \text{Model 2}$$

where Y_{it} is annual market adjusted returns or annual raw returns (where the two models are estimated under both market adjusted returns and raw returns as a dependent variable) for firm i in year t accumulated from the fifth month of fiscal year t to the fourth month of fiscal year $t+1$. ΔE_{it} is the change in earnings and E_{it} is the

level of earnings for firm i in year t. ΔCF_{it} is the change in cash flows from operations and CF_{it} is the level of cash flows from operations for firm i in year t. Change and level of earnings and cash flows are deflated by the beginning-of- the fiscal year market value of equity as suggested by Christie (1987) to reduce the potential problems of heteroskedasticity.

To test whether earnings or cash flows from operations are associated with higher information, we use Vuong's (1989) test that examines the statistical significance of the difference between adjusted R^2s of the rival (non-nested) models. Therefore, we compare the adjusted R^2 of Models (1) and (2) using Vuong's test, and interpret a statistically higher adjusted R^2 as an indicator for higher relative information content[4].

4. Data of the study

Consistent with previous research, the variables employed in this study are defined as follows[5]. First, earnings are defined as net income before extraordinary items and dividends (Worldscope item WC 01551)[6]. This item represents income before extraordinary items and preferred and common dividends, but after operating and non-operating income and expenses, reserves, income taxes, minority interest and equity in earnings. Second, cash flows are defined as net cash flows from operating activities (WorldScope item WC 04860). This item represents the net cash receipts and disbursements resulting from the operations of the company. Third, we use a long window (12 months) for calculating market adjusted returns ending four months after the fiscal year-end assuming that UK listed firms have to release their financial statements within four months from the fiscal year-end (a four-month lag period[7]). The annual market adjusted return equals the annual firm's return minus the annual Financial Times All Share Index (FTALLSH) return and both are measured over the 12-month period beginning on the fifth month of each fiscal year-end[8]. Fourth, the market value of equity is defined as the Market closing Price-Year End multiplied by the number of common shares outstanding (Worldscope item WC 08001).

Data of the study is obtained from DataStream database. The sample consists of the 2002 list of all firms quoted on London Stock Exchange and from the 2002 list of all dead firms in DataStream database covering the period 1995-2002[9]. The initial sample consists of 5,489 firms (1,351 surviving firms and 4,138 dead firms). The following data requirements are applied to determine the sample of this study: firms should have accounting data or return index for at least one year over the period of the study (1995-2002); firms do not operate within the financial sector; and firms have not changed their financial year-end during the period 1995-2002[10]. Table III presents the sample selection procedures (Table I).

	Number of firms
Initial sample	5,489
Less	
(i) Firms with accounting or share prices data missing over all the period 1995-2002	(3,039)
(ii) Financial firms	(263)
(iii) Firms that changed their financial year-ends in the period 1995-2002	(271)
Sample size before excluding firms with insufficient data to calculate the study variables	1,916

Table I. Sample size over the period 1995-2002 before excluding firms that have insufficient data to calculate the study variables

The above criteria produce a sample of 1,916 British firms in each year; with a total of 13,412 firm-year observations over the period from 1996 to 2002 sample period (1995 is "lost" due to the first differencing of earnings and cash flows from operations). We further exclude 6,170 firm-year observations because of the lack of the required data for calculating the variables of the study. After considering missing observations, the two extreme percent of observations that lie above 99 per cent and below 1 per cent of the distribution of changes in earnings or changes in cash flows or annual market adjusted return are considered as outliers and are excluded from the sample. This results in a loss of 391 firm-year observations. After removing outliers, the final study sample comprises 6,851 of firm year observations for a sample of 1,634 British firms over a seven-year period from 1996 to 2002.

5. Results[11]

5.1 Relative information content of cash flows and earnings

Table II presents test results for relative information content of earnings and cash flows from operations for the entire sample. In column (2) of Table II, with market adjusted returns as a dependent variable, the Vuong's test indicates that the earnings regression (Model 1) has a significantly higher adjusted R^2 (0.0853) than does the cash flows from operations regression (Model 2) (0.0649) at the 0.0000 level. In column (3), the results of estimating Models 1 and 2 with raw returns as a dependent variable were similar to those for market adjusted returns. These results suggest that earnings dominate cash flows from operations. These findings support hypothesis *H1*. Hence, the hypothesis that the information content of earnings is higher than that of cash flows from operations is accepted. These results are consistent with Dechow (1994), Ali and Pope (1995) and Haw *et al.* (2001).

	Dependent variable					
	Market adjusted returns			Raw returns		
	Model 1		Model 2	Model 1		Model 2
Adjusted R^2	0.0853	>	0.0649	0.1151	>	0.0726
Vuong's Z-statistics		8.746			12.832	
p-value		0.0000			0.0000	

Notes: Y_{it} is the annual market adjusted returns or annual raw returns of firm i in year t, both are measured over the fifth month of year t to the fourth month of year $t+1$, where Models 1 and 2 are estimated under both market adjusted return and raw return as a dependent variable. ΔE_{it} (E_{it}) is the change (level) in earnings and ΔCF_{it} (CF_{it}) is the change (level) in cash flows from operations for firm i in year t. These variables are deflated by the market value of equity at the beginning of year t. The sample size is 6,851 of firm year observations for a sample of 1,634 British firms over seven-year periods from 1996 to 2002. White cross-section method is employed to control for the potential effects of heteroskedasticity and autocorrelation in the errors. Vuong's Z-statistics for the comparison between the explanatory power of Models 1 and 2 are presented centered below the adjusted R-squares. Two-tailed p-values are obtained by Vuong's Z-statistics from "Z" distribution (the standard normal cumulative distribution). These two-tailed p-values represent tests of the null hypothesis of no difference between adjusted R^2s of Models 1 and 2. Models of changes in and levels of earnings and cash flows from operations. Model 1: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta E_{it} + \alpha_{2t}E_{it} + \varepsilon_{it}$; Model 2: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta CF_{it} + \alpha_{2t}CF_{it} + \varepsilon_{it}$

Table II.
Pooled sample results for relative information content of cash flows from operations and earnings for the entire sample

5.2 Relative information content of moderate cash flows and moderate earnings

Table III presents test results for relative information content of moderate earnings and moderate cash flows from operations. In column (2) of Table III, with market adjusted returns as a dependent variable, the earnings regression (Model 1) has a significantly larger adjusted R^2 (0.1710) than does the cash flows from operations regression (Model 2) (0.1250) at a conventional level (0.0000) as evidenced by statistically significant Vuong's statistics. In column (3), estimation results for Models 1 and 2 with raw returns as a dependent variable generate similar results to those for market adjusted returns. These results suggest that moderate earnings significantly outperform moderate cash flows from operations. These findings support hypothesis *H2*. Hence, the hypothesis that the relative information content of moderate earnings is higher than that of moderate cash flows from operations is accepted. These results are consistent with the US study of Cheng and Yang (2003).

	Dependent variable					
	Market adjusted returns			Raw returns		
	Model 1		Model 2	Model 1		Model 2
Adjusted R^2	0.1710	>	0.1250	0.2131	>	0.1104
Vuong's *Z*-statistics		8.479			13.011	
p-value		0.0000			0.0000	

Notes: Y_{it} is the annual market adjusted returns or annual raw returns of firm i in year t, both are measured over the fifth month of year t to the fourth month of year $t+1$, where Models 1 and 2 are estimated under both market adjusted return and raw return as a dependent variable. ΔE_{it} (E_{it}) is the change (level) in earnings and ΔCF_{it} (CF_{it}) is the change (level) in cash flows from operations for firm i in year t. These variables are deflated by the market value of equity at the beginning of year t. White cross-section method is employed to control for the potential effects of heteroskedasticity and autocorrelation in the errors. Vuong's *Z*-statistics for the comparison between the explanatory power of Models 1 and 2 are presented centered below the adjusted R^2. Two-tailed *p*-values are obtained by Vuong's Z-statistics from "Z" distribution (the standard normal cumulative distribution). These two-tailed *p*-values represent tests of the null hypothesis of no difference between adjusted R^2s of Models 1 and 2. We divide the whole sample into four groups based on both persistence of earnings and cash flows. The entire sample for each year has been divided into two groups based on earnings persistence (extreme vs moderate earnings) and based on cash flows persistence (extreme vs moderate cash flows). For each year, we further match and group the total samples into four groups: first, moderate earnings/moderate cash flows; second, extreme earnings/moderate cash flows; third, moderate earnings/extreme cash flows; and fourth, extreme earnings/extreme cash flows. The sample in the above table represents observations of the group moderate earnings/moderate cash flows. It consists of 2,590 firm year observations over a seven-year period from 1996 to 2002. This sample examines the relative information content of moderate earnings vs moderate cash flows. The ratios of earnings (cash flows from operations) to market value of equity at the end of year t are used to determine moderate and extreme earnings (cash flows). In each year, all firms with positive earnings (cash flows) are ranked into nine groups by their ending-of-year earnings (cash flows) market value of equity ratios with an approximately equal number of firms per group, where the tenth group includes firms with only negative earnings (cash flows). The middle six groups are classified as moderate earnings (cash flows) and the remaining four groups are classified as extreme earnings (cash flows). Models of changes in and levels of earnings and cash flows from operations. Model 1: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta E_{it} + \alpha_{2t}E_{it} + \varepsilon_{it}$; Model 2: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta CF_{it} + \alpha_{2t}CF_{it} + \varepsilon_{it}$

Table III.
Pooled sample results for relative information content of moderate cash flows from operations and moderate earnings

5.3 Relative information content of moderate cash flows and extreme earnings

Table IV reports results for relative information content of extreme earnings and moderate cash flows from operations. In column (2) of Table IV, with market adjusted returns as a dependent variable, cash flows from operations (Model 2) have higher explanatory power (0.1997) than earnings (Model 1) (0.0963). The difference is significant at the 1 per cent level based on Vuong's *Z*-statistic test. In column (3), the same results are obtained when using raw returns as a dependent variable. These results suggest that moderate cash flows from operations have greater value relevance than extreme earnings. These findings support *H3*. Therefore, the hypothesis that the relative information content of moderate cash flows from operations is higher than that of extreme earnings is accepted. These results are consistent with the US study of Cheng and Yang (2003).

5.4 Relative information content of extreme cash flows and moderate earnings

Table V reports results for relative information content of moderate earnings and extreme cash flows from operations. In column (2) of Table V, with market adjusted returns as a dependent variable, earnings (Model 1) have higher explanatory power (0.1392) than cash flows (Model 2) (0.0176). The difference is significant at the 1 per cent level based on Vuong's *Z*-statistic test. In column (3), the same results are obtained when using raw returns as a dependent variable. These results suggest that moderate earnings have greater information content than extreme cash flows from operations. These findings support *H4*. Therefore, the hypothesis that the relative information content of moderate earnings is higher than that of extreme cash flows from operations is accepted. These results are consistent with the US study of Cheng and Yang (2003).

5.5 Relative information content of extreme cash flows and extreme earnings

Table VI presents test results for relative information content of extreme earnings and extreme cash flows from operations. In column (2) of Table VI, with market adjusted

	Dependent variable					
	Market adjusted returns			Raw returns		
	Model 1		Model 2	Model 1		Model 2
Adjusted R^2	0.0963	<	0.1997	0.1138	<	0.1769
Vuong's *Z*-statistics		8.356			6.430	
p-value		0.0000			0.0000	

Notes: Y_{it}, ΔE_{it}, E_{it}, ΔCF_{it} and CF_{it} are defined as in Table III. White cross-section method is employed to control for the potential effects of heteroskedasticity and autocorrelation in the errors. Vuong's *Z*-statistics for the comparison between the explanatory power of Models 1 and 2 are presented centered below the adjusted R^2. Two-tailed *p*-values are obtained by Vuong's *Z*-statistics from "Z" distribution (the standard normal cumulative distribution). These two-tailed *p*-values represent tests of the null hypothesis of no difference between adjusted R^2s of Models 1 and 2. To control for the extremity of earnings and cash flows, we divide the whole sample into four groups based on both persistence of earnings and cash flows. For more details about this point, see the notes below Table III. The sample in the above table represents observations of the group extreme earnings/moderate cash flows. It consists of 1,079 firm year observations over a seven-year period from 1996 to 2002. This sample examines the relative information content of extreme earnings versus moderate cash flows. Extremity of earnings (cash flows) is determined by the distribution of earnings (cash flows) to market value ratios as explained in the notes below Table III. Models of changes in and levels of earnings and cash flows from operations. Model 1: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta E_{it} + \alpha_{2t}E_{it} + \varepsilon_{it}$; Model 2: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta CF_{it} + \alpha_{2t}CF_{it} + \varepsilon_{it}$

Table IV.
Pooled sample results for relative information content of moderate cash flows from operations and extreme earnings

	Dependent variable					
	Market adjusted returns			Raw returns		
	Model 1		Model 2	Model 1		Model 2
Adjusted R^2	0.1392	>	0.0176	0.1759	>	0.0130
Vuong's Z-statistics		7.970			9.435	
p-value		0.0000			0.0000	

Notes: Y_{it}, ΔE_{it}, E_{it}, ΔCF_{it} and CF_{it} are defined as in Table III. White cross-section method is employed to control for the potential effects of heteroskedasticity and autocorrelation in the errors. Vuong's Z-statistics for the comparison between the explanatory power of Models 1 and 2 are presented centered below the adjusted R^2. Two-tailed p-values are obtained by Vuong's Z-statistics from "Z" distribution (the standard normal cumulative distribution). These two-tailed p-values represent tests of the null hypothesis of no difference between adjusted R^2s of Models 1 and 2. To control for the extremity of earnings and cash flows, we divide the whole sample into four groups based on both persistence of earnings and cash flows. For more details about this point, see the notes below Table III. The sample in the above table represents observations of the group moderate earnings/extreme cash flows. It consists of 898 firm year observations over a seven-year period from 1996 to 2002. This sample examines the relative information content of moderate earnings vs extreme cash flows. Extremity of earnings (cash flows) is determined by the distribution of earnings (cash flows) to market value ratios as explained in the notes below Table III. Models of changes in and levels of earnings and cash flows from operations. Model 1: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta E_{it} + \alpha_{2t}E_{it} + \varepsilon_{it}$; Model 2: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta CF_{it} + \alpha_{2t}CF_{it} + \varepsilon_{it}$

Table V.
Pooled sample results for relative information content of extreme cash flows from operations and moderate earnings

	Dependent variable					
	Market adjusted returns			Raw returns		
	Model 1		Model 2	Model 1		Model 2
Adjusted R^2	0.0550	>	0.0426	0.0773	>	0.0519
Vuong's Z-statistics		3.867			5.609	
p-value		0.0000			0.0000	

Notes: Y_{it}, ΔE_{it}, E_{it}, ΔCF_{it} and CF_{it} are defined as in Table III. White cross-section method is employed to control for the potential effects of heteroskedasticity and autocorrelation in the errors. Vuong's Z-statistics for the comparison between the explanatory power of Models 1 and 2 are presented centered below the adjusted R^2. Two-tailed p-values are obtained by Vuong's Z-statistics from "Z" distribution (the standard normal cumulative distribution). These two-tailed p-values represent tests of the null hypothesis of no difference between adjusted R^2s of Models 1 and 2. To control for the extremity of earnings and cash flows, we divide the whole sample into four groups based on both persistence of earnings and cash flows. For more details about this point, see the notes below Table III. The sample in the above table represents observations of the group extreme earnings/extreme cash flows. It consists of 2,284 firm year observations over a seven-year period from 1996 to 2002. This sample examines the relative information content of extreme earnings vs extreme cash flows. Extremity of earnings (cash flows) is determined by the distribution of earnings (cash flows) to market value ratios as explained in the notes below Table III. Models of changes in and levels of earnings and cash flows from operations. Model 1: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta E_{it} + \alpha_{2t}E_{it} + \varepsilon_{it}$; Model 2: $Y_{it} = \alpha_{0t} + \alpha_{1t}\Delta CF_{it} + \alpha_{2t}CF_{it} + \varepsilon_{it}$

Table VI.
Pooled sample results for relative information content of extreme cash flows from operations and extreme earnings

returns as a dependent variable, the earnings regression (Model 1) has a significantly larger adjusted R^2 (0.0550) than does the cash flows from operations regression (Model 2) (0.0426) at a conventional level (0.0000) as evidenced by statistically significant Vuong's statistics. In column (3), estimation results for Models 1 and 2 with raw returns as a dependent variable generate similar results to those for market adjusted returns. These results suggest that extreme earnings significantly outperform extreme cash

flows from operations. These findings support *H5*. Hence, the hypothesis that the relative information content of extreme earnings is higher than that of extreme cash flows from operations is accepted. These results are not consistent with the US study of Cheng and Yang (2003). Cheng and Yang (2003) found that when both earnings and cash flows are extreme, the difference between adjusted R^2s of earnings and cash flows is not significant. The discrepancy may be attributable to the extremity embedded in earnings and cash flows in the US relative to the UK. Specifically, this contradiction suggests that the extremity of earnings is much higher for the USA than the UK.

6. Summary and conclusions

Based on UK data, this study examines the relative information content of earnings and cash flows from operations after controlling for the extremity of earnings and cash flows. The results indicate that earnings are definitely more value relevant than cash flows. Only when we compare the noisiest elements of the earnings series with the best components of cash flows, we find the opposite, i.e. cash flows potentially have higher explanatory power than earnings. Therefore, similar to the US study by Cheng and Yang (2003), we find that earnings do not always have higher value relevance than cash flows. Specifically, we find that moderate cash flows have greater relative information content than extreme earnings. This result suggests that investors and researchers should pay attention to both earnings extremity and cash flows extremity in firm valuation. We would expect our results are not specific to UK data, but data from other countries must be tested to verify that expectation.

Notes

1. Ball and Brown (1968) approximated cash flows by operating income which was defined as net income before depreciation and amortisation.
2. Beaver and Dukes (1972) defined cash flows by simply adding back depreciation, depletion, and amortisation to earnings before deferral of income taxes.
3. The main reason behind estimating our regression models in this study by pooling data over all years of the study instead of performing our tests year by year is that the number of observations of each year is reduced in each group during matching and grouping the total samples into four groups.
4. The comparison between the explanatory power of Models 1 and 2 is as follows:

$$Vuong's\ Z - Statistics = \frac{1}{\sqrt{n}}\frac{LR}{\omega}$$

where LR is the likelihood-ratio and ω is an estimate of the standard deviation related to LR. Both parameters are computed as follows:

$$LR = \frac{n}{2}\left[\log\left(\sigma^2_{Model\ 2}\right) - \log\left(\sigma^2_{Model\ 1}\right)\right] + \sum_{i=1}^{n}\left[\frac{1}{2}\frac{e^2_{i_{Model\ 2}}}{\sigma^2_{Model\ 2}} - \frac{1}{2}\frac{e^2_{i_{Model\ 1}}}{\sigma^2_{Model\ 1}}\right]$$

$$\omega^2 = \frac{1}{n}\sum_{i=1}^{n}\left[\frac{1}{2}\log\left(\sigma^2_{Model\ 2}\right) - \frac{1}{2}\log\left(\sigma^2_{Model\ 1}\right) + \frac{1}{2}\frac{e^2_{i_{Model\ 2}}}{\sigma^2_{Model2}} - \frac{1}{2}\frac{e^2_{i_{Model\ 1}}}{\sigma^2_{Model\ 1}}\right] - \left[\frac{1}{n}LR\right]^2$$

where (1) n is the sample size and log is the logarithms to the base e (natural log), (2) ω^2 is an estimate of the variance related to LR (3) $\sigma^2_{Model\ 1}$ is the sum of squares of the residuals of Model 1 divided by n, (4) $\sigma^2_{Model\ 2}$ is the sum of squares of the residuals of Model 2 divided by n, (5) $e^2_{i_{Model\ 1}}$ is the square of the individual error of Model 1 for observation i, (6) $e^2_{i_{Model\ 2}}$ is the

square of the individual error of Model 2 for observation *i*. Then, we use Vuong's-Z statistics to compare between Models 1 and 2. If Model 1 is better than Model 2, the *Z*-score should be positive and statistically significant and if Model 2 is better than Model 1, the *Z*-score should be negative and statistically significant; where two-tailed *p*-value is obtained by Vuong's *Z*-statistics from "Z" distribution (the standard normal cumulative distribution). This two-tailed *p*-value represents test of the null hypothesis of no difference between adjusted R^2s of Models 1 and 2. See tests of differences between the explanatory power for non-nested models in Vuong (1989) and Dechow (1994).

5. The definitions of these variables are according to the Worldscope items. Worldscope company accounts system has been adopted by DataStream database since April 2003 onwards as a replacement of DataStream company accounts data.
6. (WC + Number) is the code of Worldscope item.
7. Information content studies use a lagged return window as an attempt to best match the stock returns with the period over which accounting information is potentially to be disclosed in the annual report. A four-month lag period assumes that accounting information news for year *t* (for a December year end firm, for example) is released no earlier than May of year *t* and no later than April of year $t+1$.
8. DataStream Return Index (RI) for each firm's share and for the Financial Times All Share Index (FTALLSH) is used to compute the returns instead of share price because it is adjusted for dividends and capital actions such as share repurchases and share splits.
9. Dead firms are those which have merged, liquidated or become privately held. They are included in the study in addition to quoted (surviving) firms to avoid survivorship bias.
10. Firms that experience greater than ten days' difference between two consecutive year ends are excluded.
11. For robustness checks, we reran the pooled regressions using year dummies. The empirical results are identical to those reported on the results section.

References

Ali, A. (1994), "The incremental information content of earnings, working capital from operations, and cash flows", *Journal of Accounting Research*, Vol. 32 No. 1, pp. 61-74.

Ali, A. and Pope, P.F. (1995), "The incremental information content of earnings, funds flow and cash flow: the UK evidence", *Journal of Business Finance & Accounting*, Vol. 22 No. 1, pp. 19-34.

Ali, A. and Zarowin, P. (1992a), "The role of earnings levels in annual earnings-returns studies", *Journal of Accounting Research*, Vol. 30 No. 2, pp. 286-296.

Ali, A. and Zarowin, P. (1992b), "Permanent versus transitory components of annual earnings and estimation error in earnings response coefficients", *Journal of Accounting and Economics*, Vol. 15 Nos 2-3, pp. 249-264.

Ashton, R. (1976), "Cash flow accounting: a review and critique", *Journal of Business Finance & Accounting*, Vol. 3 No. 4, pp. 63-81.

Ball, R. and Brown, P. (1968), "An empirical evaluation of accounting income numbers", *Journal of Accounting Research*, Vol. 6 No. 2, pp. 159-178.

Bartov, E., Goldberg, S.R. and Kim, M.-S. (2001), "The valuation-relevance of earnings and cash flows: an international perspective", *Journal of International Financial Management and Accounting*, Vol. 12 No. 2, pp. 103-132.

Beaver, W.H. and Dukes, R.E. (1972), "Interperiod tax allocation, earnings expectations, and the behavior of security prices", *The Accounting Review*, Vol. 47 No. 2, pp. 320-332.

Biddle, G.C., Seow, G.S. and Siegel, A.F. (1995), "Relative versus incremental information content", *Contemporary Accounting Research*, Vol. 12 No. 1, pp. 1-23.

Board, J.L.G. and Day, J.F.S. (1989), "The information content of cash flow figures", *Accounting and Business Research*, Vol. 20 No. 77, pp. 3-11.

Board, J.L.G., Day, J.F.S. and Walker, M. (1989), *The Information Content of Unexpected Accounting Income, Funds Flow and Cash Flow*, Institute of Chartered Accountants in England and Wales, London, pp. 1-16.

Charitou, A. (1997), "The role of cash flows and accruals in explaining security returns: evidence for the UK", *The European Accounting Review*, Vol. 6 No. 4, pp. 629-652.

Cheng, C.S.A. and Yang, S.S.M. (2003), "The incremental information content of earnings and cash flows from operations affected by their extremity", *Journal of Business Finance & Accounting*, Vol. 30 Nos 1/2, pp. 73-116.

Cheng, C.S.A., Liu, C.-S. and Schaefer, T.F. (1996), "Earnings permanence and the incremental information content of cash flows from operations", *Journal of Accounting Research*, Vol. 34 No. 1, pp. 173-181.

Cheng, C.S.A., Liu, C.-S. and Schaefer, T.F. (1997), "The value-relevance of SFAS no. 95 cash flows from operations as assessed by security market effects", *Accounting Horizons*, Vol. 11 No. 3, pp. 1-15.

Christensen, P.O., Feltham, G.A. and Sabac, F. (2005), "A contracting perspective on earnings quality", *Journal of Accounting and Economics*, Vol. 39, pp. 265-294.

Christie, A.A. (1987), "On cross-sectional analysis in accounting research", *Journal of Accounting and Economics*, Vol. 9 No. 3, pp. 231-258.

Clubb, C.D.B. (1995), "An empirical study of the information content of accounting earnings, funds flows and cash flows in the UK", *Journal of Business Finance & Accounting*, Vol. 22 No. 1, pp. 35-52.

Collins, D.W. and Kothari, S.P. (1989), "An analysis of intertemporal and cross-sectional determinants of earnings response coefficients", *Journal of Accounting and Economics*, Vol. 11 Nos 2-3, pp. 143-181.

Das, S. and Lev, B. (1994), "Nonlinearity in the returns-earnings relation: tests of alternative specifications and explanations", *Contemporary Accounting Research*, Vol. 11 Nos 1-II, pp. 353-379.

Dechow, P.M. (1994), "Accounting earnings and cash flows as measures of firm performance: the role of accounting accruals", *Journal of Accounting and Economics*, Vol. 18 No. 1, pp. 3-42.

Donnelly, R. and Walker, M. (1995), "Share price anticipation of earnings and the effect of earnings persistence and firm size", *Journal of Business Finance & Accounting*, Vol. 22 No. 1, pp. 5-18.

Freeman, R.N. and Tse, S.Y. (1992), "A nonlinear model of security price responses to unexpected earnings", *Journal of Accounting Research*, Vol. 30 No. 2, pp. 185-209.

Gore, R. and Stott, D.M. (1998), "Toward a more informative measure of operating performance in the REIT industry: net income vs funds from operations", *Accounting Horizons*, Vol. 12 No. 4, pp. 323-339.

Haw, I.-M., Qi, D. and Wu, W. (2001), "The nature of information in accruals and cash flows in an emerging capital market: the case of China", *The International Journal of Accounting*, Vol. 36 No. 4, pp. 391-406.

Kinnunen, J. and Niskanen, J. (1993), "The information content of cash flows and the random walk: evidence from the Helsinki stock exchange", *Accounting and Business Research*, Vol. 23 No. 91, pp. 263-272.

Kormendi, R. and Lipe, R. (1987), "Earnings innovations, earnings persistence, and stock returns", *Journal of Business*, Vol. 60 No. 3, pp. 323-345.

Kothari, S.P. (2001), "Capital markets research in accounting", *Journal of Accounting and Economics*, Vol. 31 Nos 1/3, pp. 105-231.

Lee, T. (1992), "Making cash flow statements useful", *Accountancy*, Vol. 109 No. 1184, p. 35.

Leuz, C., Nanda, D. and Wysocki, P.D. (2003), "Earnings management and investor protection: an international comparison", *Journal of Financial Economics*, Vol. 69, pp. 505-527.

O'Hanlon, J., Poon, S. and Yaansah, R.A. (1992), "Market recognition of differences in earnings persistence: UK evidence", *Journal of Business Finance & Accounting*, Vol. 19 No. 4, pp. 625-639.

Ou, J.A. and Penman, S.H. (1989), "Accounting measurement, price-earnings ratio, and the information content of security prices", *Journal of Accounting Research*, Vol. 27, pp. 111-144.

Plenborg, T. (1998), "The operating cycle and the information content of earnings and cash flow", *Scandinavian Journal of Management*, Vol. 14 No. 3, pp. 273-287.

Scott, W.R. (2003), *Financial Accounting Theory*, 3rd ed., Prentice Hall, Toronto.

Vuong, Q.H. (1989), "Likelihood ratio tests for model selection and non-nested hypotheses", *Econometrica*, Vol. 57 No. 2, pp. 307-333.

About the author

Associate Professor Wael Mostafa holds a PhD in Accounting and Finance from the University of Durham, UK. He held the position of an Associate Professor at the Colleges of Applied Sciences, Oman. He has published several research papers in international referred journals such as *Review of Accounting & Finance*, *International Research Journal of Finance and Economics*, and *Middle Eastern Finance and Economics*. Associate Professor Wael Mostafa can be contacted at: waelsedik@hotmail.com