



Droughts and big baths of Australian agricultural firms

Australian
agricultural
firms

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215

Abstract

Purpose – The purpose of this paper is to examine whether Australian agricultural firms display big bath behaviour during droughts by recognising extraordinary and abnormal losses. It is hypothesised that Australian agricultural firms are more likely to report big bath losses in drought years than in non-drought years and, in a given drought year, agricultural firms are more likely to report big bath losses than firms in other industries.

Design/methodology/approach – The authors analyse 405 firm-years data for agricultural firms over 1980-1995. For comparison, they also analyse matched-pair samples of 17 and 30 non-agricultural firms for the drought years of 1983 and 1995, and matched-pair samples of 19 non-agricultural firms for the non-drought years of 1986 and 1990, respectively. Both univariate and multivariate analyses are used to test the hypotheses.

Findings – It is found that agricultural firms are more likely to take big baths in drought years than in non-drought years. Further, in a given drought year, agricultural firms are more likely to take big baths than non-agricultural firms. Further analyses of sales, profitability, and extraordinary and abnormal items support the idea that big baths reflect managerial opportunism rather than the economic consequences of droughts.

Originality/value – Previous studies have not investigated the impact of natural calamities like flood and drought on accounting choices. This paper makes an original contribution to the accounting literature by documenting evidence on the extent to which an act of nature, over which management has little or no control, can influence accounting choices.

Keywords Common Agricultural Policy, Natural disasters, Australia

Paper type Research paper

1. Introduction

This paper investigates big bath losses of Australian agricultural firms during drought periods. In particular, we examine whether:

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- Australian agricultural firms take big baths during drought periods;
- agricultural firms are more likely to take big baths than non-agricultural firms in drought periods; and
- the big baths are induced by managerial opportunism.

Positive accounting theory provides explanations for managers' choice among accounting methods and has established the existence of incentives for earnings management (Beattie *et al.*, 1994). Earnings management has been defined as a process of taking deliberate steps within the constraints of accounting standards and generally accepted accounting principles to bring about a desired level of reported earnings (Beattie *et al.*, 1994). It is management intervention in the financial reporting process to obtain some private gain (Schipper, 1989).

Earnings management occurs in the form of a big bath, income smoothing or maximising current period income. Big bath is about minimising current period income whereas income smoothing requires understatement or overstatement of current period income to keep reported earnings to a particular level or to exhibit some trend. Both notions are consistent with positive accounting theory in that they recognise accounting choice as being associated with agency costs of information asymmetry and opportunistic behaviour. Smoothing of reported earnings is defined as the intentional dampening of fluctuations about some level of earnings that is currently considered to be normal for a firm (Beidleman, 1973). Smoothing moderates year-to-year fluctuations in income by shifting earnings from more-successful periods to less-successful periods.

Big bath accounting is implemented by charging large write-offs that significantly reduce profits or even lead to a reported loss or making income decreasing discretionary accounting charges and accruals. Firms usually engage in big bath activities in years of poor firm or industry performance. Hence, the bath is described as a "clean up" of balance sheet accounts which is expected to result in increased profitability in future periods when trading conditions improve. This follows from the idea that when trading conditions are poor, reducing profit further through the recognition of accumulated losses does little harm to either reputation or prospects (Walsh *et al.*, 1991). A big bath is not viewed as an unfortunate admission of corporate failure, but as a positive step towards removing from the books unprofitable operations or obsolete assets, which reflect economic impairments of prior years, and to prepare for future improvement in earnings. We focus on whether big bath accounting as a form of earnings management can be induced by natural calamities like droughts. To test our proposition we select Australian agricultural firms.

Prior research on big bath accounting focused mainly on managerial opportunism associated with management changes or capital market incentives (e.g. Riedl, 2004; Elliott and Hanna, 1996; Francis *et al.*, 1996; Zucca and Campbell, 1992; Elliott and Shaw, 1988; Strong and Meyer, 1987). To our knowledge, no prior study has addressed the impact of natural calamities like flood and drought on accounting choices. Thus, this paper makes a contribution to the accounting literature by documenting evidence on the extent to which an act of nature, over which management has little or no control, can influence accounting choices.

In Australia, an important source of uncertainty in the agricultural production process is the unpredictability of rainfall and consequent droughts (Quiggin and

Chambers, 2004). Although drought is an event in the natural environment, its effects on Australia's industries and the economy are far reaching. For example, the drought of 2002 had a direct, downward impact on Australia's GDP growth rate of 1.0 percentage point between 2001-2002 and 2002-2003 (Australian Bureau of Statistics, 2004). In recent decades, Australia experienced two severe episodes of drought: one in the early 1980s and the other in the early 1990s. The drought of 1979-1983 was the most intense in the history of European settlement in Australia, when very large areas of central and eastern Australia had record low rainfall. The total impact of the drought was estimated at A\$7 billion (1997 values) due to an average drop of almost 40 per cent in cereal grain, cotton and sugar production, and the loss of millions of livestock as well as tonnes of topsoil blown away in dust storms (Charles Sturt University, 2001). The 1990s drought mostly affected north-eastern New South Wales and most of Queensland from 1991 until late 1995. It led to huge agricultural losses and cost A\$5 billion in 1997 values (Charles Sturt University, 2001).

The negative impact of drought permeates throughout many industries in Australia with possible international consequences including reduced supply of agricultural exports and fluctuating prices of produce. Globally, the agricultural industry is a politically sensitive industry. Because agricultural production requires, inter alia, water and stable weather conditions, when a country experiences drought, its agricultural industry is easily identified by politicians, investors and the public as an industry requiring assistance.

The Australian agriculture industry is a natural laboratory for testing big bath accounting. This is because Australian agriculture is very susceptible to drought and agricultural firms can use the drought as an excuse for engaging in earnings management. In particular, agricultural firms have substantial discretion over the timing and magnitude of recognition of drought-related losses. Agricultural firms are likely to use a natural disaster (drought) as an opportunity to book past losses, impaired assets and shield future incomes against expenses. Firms are affected differently by the drought (positive consequences could flow to some sections of the industry) and some regions are not drought effected when drought is officially declared by government officials. We argue that agricultural firms, during a drought, are likely to recognise losses in scales much larger than required by the economic impact of the drought. Thus, the recognition of losses during droughts amounts to big bath behaviour.

To test our propositions, we consider the two most severe drought periods of the 1980s and 1990s and develop a model that considers the factors associated with discretionary loss recognition via extraordinary and abnormal items. We analyse 405 firm-years data for agricultural firms over 1980-1995. For comparison, we also analyse matched-pair samples of 17 and 30 non-agricultural firms for the drought years of 1983 and 1995, and matched-pair samples of 19 non-agricultural firms for the non-drought years of 1986 and 1990, respectively. Empirical analyses support our hypotheses. Agricultural firms display big bath behaviour during drought periods by employing extraordinary and abnormal items. More importantly, these big baths are likely to be induced by managerial opportunism rather than the economic consequences of droughts. Furthermore, agricultural firms are more likely than non-agricultural firms to display big bath behaviour during drought periods.

The rest of the paper is organised as follows. Section 2 provides a brief overview of prior research on big bath accounting and develops the hypotheses. Section 3 explains research design, sample selection, and measurement of variables. Section 4 discusses the descriptive statistics and empirical results. In section 5, we offer a summary of the paper and draw conclusions.

2. Prior research and hypotheses development

2.1 *Prior research on big bath accounting*

Prior research on big bath accounting has mainly focused on the USA and on discretionary asset write-offs. Researchers have sought to identify the firm-specific and industry-wide factors that explain firms' decisions to make these large and frequent asset write-offs referred to as big bath accounting.

Prior research reveals that big bath and earnings smoothing can co-exist as part of a firm's equilibrium reporting strategies (Kirschenheiter and Melumad, 2002) and firms reporting large discretionary write-offs are larger in terms of revenues and assets than other firms in their industries and are more highly leveraged (Elliott and Shaw, 1988). Further, firms with larger write-offs substantially under-perform their industries in terms of return on assets and return on equity in the years preceding and including the write-off year (Elliott and Shaw, 1988).

Published research also investigated whether big bath behaviour is associated with asset impairment or incentives to manipulate earnings. Francis *et al.* (1996) find that both factors are important in asset write-offs: inventory, and property, plant and equipment-related write-offs are driven by asset impairment, and write-offs related to goodwill and restructuring charges are driven by incentives to manipulate earnings. Further, asset write-offs are more frequent and larger in magnitude when there has been a change in management (Francis *et al.*, 1996).

Riedl (2004) examines the characteristics of asset write-offs reported prior and subsequent to the issuance of SFAS No. 121. His results indicate a greater association between write-offs and big bath behaviour after the standard's implementation, and that this big bath behaviour appears to be opportunistic rather than signalling managers' private information. Evidence also indicates that discretionary asset write-downs occur usually in the fourth quarter of the fiscal year, in a year of below "normal" performance (Zucca and Campbell, 1992).

Walsh *et al.* (1991) is one of the earliest Australian studies investigating big bath accounting using extraordinary items. They document that big bath accounting is associated with large extraordinary items adjustment. However, Walsh *et al.* (1991) focus on the operational definition of big bath and do not offer any test for identifying the economic or management incentives for big bath accounting.

In this paper, we extend the work of Walsh *et al.* (1991) in two ways. First, we focus on extraordinary and abnormal items in a particular industry (agricultural industry). Second, we investigate whether big bath behaviour in the agricultural industry during drought periods reflects the economic consequences of droughts or managerial opportunism. Thus, our study extends the big bath literature and more importantly, provides evidence of big bath induced by a natural calamity such as drought.

2.2 Hypotheses development

The negative economic impacts of droughts on the agricultural industry as a whole are well known. However, what is not observable by investors and other stakeholders of the firm (such as regulators and standard setters) is the magnitude of the impact of a drought on a particular firm. Thus, although droughts have a definite negative impact on a firm's economic performance, management can have substantial discretion as to the timing and magnitude of recognition of the losses related to droughts. This creates an opportunity for management to take a big bath during the drought period by recognising past losses, impairment of assets, and accelerating recognition of future expenses.

Taking a big bath in a drought period suits agricultural firms for two reasons. First, society in general is likely to be sympathetic to the drought-stricken agricultural industry and as a result, reporting large losses is likely to qualify an agricultural firm for subsidies, tax rebates, tariff protection, and easy credit. Second, the one-off loss suffered by a firm is likely to have virtually no effect on investors' perception of firm performance (Kirschenheiter and Melumad, 2002). Shareholders attribute the additional losses to the effects of drought and consider the effects of drought to be transitory, and consequently, any additional effect on the value of equity is minimal (Zucca and Campbell, 1992).

For Australian firms, a likely instrument for taking a big bath is the treatment of extraordinary and abnormal items. During the sample period of 1980-1995, Australian firms had substantial discretion as to the definition, timing and magnitude for recognising extraordinary and abnormal items. We argue that agricultural firms are likely to use extraordinary and abnormal items to report losses that are both related to drought and not related to drought (Walsh *et al.*, 1991). As droughts are likely to have a sharp, negative impact on firm performance, it is convenient for management to take a big bath and make a fresh start at the end of the drought. Further, as agricultural firms are expected to be more severely affected by drought than non-agricultural firms, it is likely that agricultural firms take big baths with higher frequency and magnitude than non-agricultural firms in drought periods.

The above discussion leads to the following hypotheses:

- H1.* Agricultural firms are more likely to take big baths in drought years than in non-drought years.
- H2.* In a given drought year, agricultural firms are more likely to take big baths than non-agricultural firms.

3. Research design, sample selection and measurement of variables

3.1 Research design

We conduct both univariate and multivariate analyses to test our hypotheses.

We test *H1* in a multivariate context using Binary Logistic regression analysis with "big bath" (BATH) as the dependant variable. The regression model also controls for other reporting incentives and variables that are likely to induce agricultural firms' decisions to report gains or losses via extraordinary and abnormal items. *H2* is tested by comparing extraordinary and abnormal items between agricultural firms and a matched-pair sample of non-agricultural firms both in drought and non-drought years. Firms are matched on size and return on assets.

3.2 Research model

To implement multivariate analysis, we use the following regression model:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta_1 \text{DROUGHT}_t + \beta_2 \text{GROWTH}_t + \beta_3 \text{LEVERAGE}_{it} + \beta_4 \text{SALES}_{it} \\ + \beta_5 \text{AUDIT_QLTY}_{it} + \beta_6 \text{MGT_CHANGE}_{it} \\ + \beta_7 \text{DROUGHT_SALES}_{it} + \xi_i$$

where p_i is the probability of firm i being engaged in big bath accounting where big bath is considered to exist if both operating profit before tax < 0 and extraordinary and abnormal items < 0 or (operating profit after tax + extraordinary and abnormal items) < 0 :

DROUGHT _t	= an indicator variable equal to one if the year t is a drought-year, and 0 otherwise;
GROWTH _t	= annual growth rate of GDP expressed as a percentage for year t ;
LEVERAGE _{it}	= total liabilities divided by total assets of firm t at the end of year t ;
SALES _{it}	= sales revenue in dollars reported by firm i in year t ;
AUDIT_QLTY _{it}	= an indicator variable for audit quality for firm i in year t (1 if the auditor is a Big Six accounting firm; zero otherwise);
MGT_CHANGE _{it}	= an indicator variable equal to 1 if there is a management change for firm i in year t ;
DROUGHT_SALES _{it}	= an interaction variable to test whether big bath is responsive to sales revenue during drought periods; and
ξ_{it}	= error term.

GROWTH is included as the annual percentage change in Australia's gross domestic product (GDP) to control for overall movements in the economy. This data is collected from the United Nation's publication on GDP growth rate across nations.

Agency costs are higher for companies with proportionally more debt in their capital structures since potential wealth transfers from bondholders to shareholders and managers increase with leverage. The restrictive covenants included in debt agreements are intended to reduce management's ability to create wealth transfers between shareholders and bondholders and reduce companies' accounting choices (DeFond and Jiambalvo, 1991, 1994). Leverage is included as the ratio of total debt to total assets at the end of the year to control for the debt-covenant hypothesis.

The variable SALES_{it} is incorporated in the model as a proxy for the firm's economic prospects. Although sales revenue is related to firm size, in periods of volatile economic conditions (such as droughts) sales revenue is more likely to capture the firm's economic prospects than firm size. This is because a drought is likely to have a

major impact on a firm's sales revenues. If the big baths taken by agricultural firms are induced by the economic consequences of drought then we would observe a strong negative association between sales revenue and extraordinary and abnormal losses.

External auditors play a key role in ensuring their clients comply with accounting standards and other regulations. Larger audit firms usually have more resources and expertise to ensure they are accustomed with new accounting requirements (Kent and Stewart, 2008). It is also assumed that the Big Six (now four) audit firms have a greater incentive to protect their reputation because of their larger client base (Francis *et al.*, 1999). As a result they are expected to be more conservative and allow their clients less discretion in choosing accounting alternatives. AUDIT_QLTY is therefore included as an indicator variable for audit quality (one if the auditor is a Big Six accounting firm; zero otherwise).

We include MGT_CHANGE (management changes) in year t as a control variable and expect a negative association between management changes and the dependent variable as per prior research (e.g. Riedl, 2004; Strong and Meyer, 1987; Francis *et al.*, 1996). Management change is deemed to occur when there is a change in the Chairperson, Managing Director or the Chief Executive Officer (Chia, 1994).

Sales are expected to reduce in time of drought so that DROUGHT_-SALES is included as an interaction variable to test whether big bath is responsive to sales revenue during drought periods.

3.4 Sample selection

Recall that Australia experienced two severe episodes of drought in recent decades: one in the early 1980s and the other in the early 1990s. We use a sample of agricultural firms during the period 1980-1995 because our objective is to examine the big bath behaviour of agricultural firms during drought periods. Hence, a list of all Australian companies involved in either agricultural production or directly supplying the industry was taken from the Business Classification Index of Business Who's Who of Australia for the years 1980 through 1995. Companies which were included were classified under such headings as:

- crops, including wheat, cotton and sugar cane;
- livestock, including beef cattle and sheep;
- agricultural services and farm supplies;
- flour and grain mill products;
- wines and grapes;
- agricultural chemicals, including fertilisers and pesticides;
- stockfeeds; and
- farm and garden machinery and equipment.

The sample was matched to the firms listed on the Australian Stock Exchange and included in the AGSM Top 500 microfiche collection.

The principal activities section of each annual report was examined to ensure that each company was either primarily or substantially involved in the agricultural industry. A number of companies were subsequently dropped from the sample as a result.

The above procedures yielded a sample of 42 Australian companies, which are considered to be substantially engaged in the agriculture industry. Some 22 companies

are classified as producers, 16 as suppliers, and the remaining four as direct consumers of agricultural raw products. As expected, only a few of the 42 firms existed over the entire 16-year period. A survivorship bias is potentially a problem with ten of the 42 companies no longer existing in 1995.

Each year between 1980 and 1995 has a minimum of 20 observations, with an average of 24.5 and a maximum of 32 in 1994. The final pooled sample for testing *H1* consists of 405 firm-year observations. *H2* requires cross-sectional tests and a matched-pair design was employed to identify a sample of non-agricultural control firms. The control firms were also taken from the AGSM Top 500 collection. The control firms were selected from non-agricultural firms and matched on asset size and profitability (measured by return on assets) so that for each pair, asset size and profitability did not vary by more than 10 per cent. These restrictions reduced the sample sizes for cross-sectional tests. Thus, we were able to match 17 and 30 non-agricultural firms for the drought years of 1983 and 1995, and 19 non-agricultural firms for each of the non-drought years of 1986 and 1990, respectively. The years 1983, 1986, 1990 and 1995 were selected for cross-sectional tests as these years had the highest mean level of drought-related disclosure in the annual reports. Drought-related disclosure was measured by counting the words in the annual reports that were used in describing the effect of droughts on the firms' performance.

3. 5 Extraordinary and abnormal items

In our research design, big bath (BATH) is considered to exist if the operating profit before tax for the year and extraordinary and abnormal items are negative, or the negative amount of extraordinary and abnormal items more than offsets the positive amount of operating profit before tax. The focus is on profit and discretionary extraordinary and abnormal items as a measure of big bath accounting for three reasons. First, the manipulation of extraordinary and abnormal items is one of the most readily available of a wide variety of strategies and practices used to facilitate big bath accounting (Walsh *et al.*, 1991). In particular, one asset write-down classified as an extraordinary item generates a greater decrease in income than several above the line manipulations using accruals. Second, it is unlikely that the auditor or shareholders would accept a regular switch between accounting methods across years to facilitate big bath accounting. Third, a widespread belief exists that big bath accounting is motivated by a desire to publicly display a dramatic shift to conservative accounting practices. A peculiarity of the big bath phenomenon, when executed by extraordinary item adjustments, is that there appears to be little attempt to disguise. The positioning of the extraordinary items adjustment and its often ample description suggest a conscious effort to provide signals regarding restructuring or the quality of past and future reported profits (Walsh *et al.*, 1991).

Extraordinary and abnormal items are measured as the sum of extraordinary and abnormal items for the year scaled by total assets at the beginning of the year to adjust for firm size. The extraordinary item is taken from the profit and loss statement where it is stated as a separate line adjustment below the bottom line. In Australia, abnormal items are typically disclosed as separate items above the line in financial statements after 1990. For annual reports prior to 1990 the notes to the accounts were inspected for disclosures of abnormal items. Each item was taken before tax.

3.6 *The impact of the change in ASRB 1018*

The Australian accounting standard governing the recognition of extraordinary and abnormal items during the sample period was ASRB 1018 (Australian Standards Review Board, 1989). The definition of extraordinary and abnormal items under ASRB 1018 was changed in 1990. Under the old regime, extraordinary items were only vaguely defined to be outside the ordinary operations of the business. Paragraph 4 of AAS1 defined extraordinary items as “items of revenue and expense, and other gains and losses, brought into account in the period, which are attributable to events or transactions *outside the ordinary operations* of the business entity.” Hence, many firms reported extraordinary items of the same nature each year, using the justification that, although such items did occur frequently, they were outside the firm’s ordinary operations.

The amendment of ASRB 1018 shifted the focus of the definition of extraordinary items from a subjective concept of “outside ordinary operations” to the more objective concept of “not of a recurring nature” (Horton, 1994, p. 60). However, it could be argued that determining whether something recurs or not is no less subjective than determining whether it falls within ordinary operations.

ASRB 1018 also provided a new definition applied to abnormal items. Paragraph 4 of the old AAS1 defined abnormal items as “items of revenue and expense, and other gains and losses, brought into account in the period, which although attributable to the ordinary operations of the business entity are considered abnormal by reason of their size and effect on the results for the period.” The first aspect in which the ASRB 1018 definition differs from AAS1 is in its omission of “gains and losses.” A second aspect is that the AAS1 definition required abnormal items to be attributable to the ordinary operations of the business entity whereas the ASRB 1018 definition required that they be included in the operating profit or loss. In other words, AAS1 required abnormal items to be ordinary whilst ASRB 1018 requires merely that they be treated as if they were ordinary. The ASRB 1018 definition, therefore, allows non-operating items to be classified as abnormal provided that they are included in operating profit (Henderson and Wills, 1991, p. 14).

Horton (1994) examined the classification of extraordinary or abnormal items for the years 1988 to 1991 for gains and losses reported by Australia’s top 100 listed companies. Prior to the change, the number of extraordinary items was in the order of 50 per year. This number was approximately halved after the 1990 change. In contrast, the number of abnormal items doubled to 30 from the pre-change years. This evidence suggests that the change in definition made extraordinary items a less frequent record but concurrently abnormal items were reported more frequently. Therefore, extraordinary and abnormal items are added together for the study to reduce the effect of the standard change.

3.7 *Drought*

The drought years were identified using the official government drought declarations as indicated by the Australian Bureau of Agricultural and Rural Economics. Most companies included in the sample have financial years ended 30th June. Upon this basis, the financial years 1982 to 1984 and 1991 to 1995 are defined as drought years, whereas the financial years 1980 to 1981 and 1985 to 1990 are defined as non-drought years. The financial years ending 30th June 1984 and 1995 are included as drought years even though widespread drought breaking rains occurred during the last six

months of each year. This is because the year of “coming out” of drought is considered the most ideal time to take a bath for reasons outlined earlier in the paper.

4. Results

4.1 Descriptive statistics

Table I provides yearly averages for each year from 1980 to 1995 for extraordinary and abnormal items scaled by total assets (EXAB), return on assets (ROA), and management change (MGT_CHANGE). Table I shows that the largest negative extraordinary and abnormal write-downs were recognised in 1992, a drought year, when agricultural firms on average reported extraordinary and abnormal losses equal to 3.20 per cent of their total assets. The highest average extraordinary and abnormal gains were reported in 1985, a non-drought year, at 1.42 per cent of total assets. The average return on assets is highest in 1981 (prior to the drought in the 1980s) at 11.21 per cent and lowest in 1992 (during the drought of the 1990s) at 3.34 per cent. The highest average management change occurred in 1982 with 28.60 per cent change compared to no management change in 1980.

Tables II and III provide additional descriptive statistics for the pooled sample of 405 firm-years for 42 agricultural firms over a 16-year period (1980-1995). The largest extraordinary and abnormal loss reported by a single firm was almost 55 per cent whilst the largest extraordinary and abnormal gain was almost 25 per cent of total assets. The mean extraordinary and abnormal items (scaled by total assets) EXAB of -0.39 per cent illustrates that these items are typically used to report losses as opposed to gains. Over the sample period, 53 per cent firm-years fell in drought periods whereas 8 per cent firm-years were related to big bath behaviour. Some 76 per cent of the sample firms used a Big 6 auditor while 17 per cent experienced a management change.

Year	Drought status	EXAB (%)	ROA (%)	MGT_CHANGE (%)
1980	Non-drought	-0.03	10.79	0
1981		-0.10	11.21	5.00
1982	Drought	0.13	8.37	28.60
1983		-0.46	5.03	09.50
1984		-0.06	8.17	22.70
1985	Non-drought	1.42	9.79	28.00
1986		0.33	6.09	25.00
1987		0.42	7.53	24.00
1988		0.90	7.32	13.00
1989		0.42	7.37	7.40
1990		-1.50	5.89	18.50
1991	Drought	-1.67	4.29	14.80
1992		-3.20	3.34	24.10
1993		-1.39	7.92	12.90
1994		-0.02	7.90	25.00
1995		-0.38	7.77	12.90

Table I.
Yearly averages of key continuous variables from 1980 to 1995

Notes: EXAB = the amount of extraordinary and abnormal items of firm i for year t scaled by total assets at the beginning of t ; ROA = return on assets = Operating profit before extraordinary and abnormal items divided by total assets at beginning of year; MGT_CHANGE = an indicator variable equal to 1 if there is a management change for firm i in year t

Table IV presents a bi-variate Pearson's correlation matrix for agricultural firms' variables included in the model. The highest significant correlation is negative at 0.48 between BATH and EXAB. These correlations indicate that there is limited threat that multicollinearity biases results (Gujarati, 1988, p. 299).

4.2 Multivariate tests – H1

Table V reports the results of a binary logistic regression for 405 firm-years data for Australian agricultural firms. The Nagelkerke R^2 suggests that the model explains 28.60 per cent of the variability in the dependent variable BATH.

The hypothesised variable DROUGHT has the predicted positive sign, and the coefficient is statistically significant with *wald*-statistic = 11.22 (*p*-value = 0.00). Thus, the results support *H1* that Australian agricultural firms take a big bath in times of drought. The first control variable is GROWTH estimating the economic environment faced by all firms in the sample. This variable is negatively, significantly associated with BATH (*wald*-statistic = 4.04, *p* = 0.04). The remaining control variables are significant and positive in explaining BATH. LEVERAGE measures the debt covenant hypothesis and adds significant explanatory power to the model (*wald*-statistic = 3.22, *p* = 0.07) while SALES estimating the firm's economic conditions also adds significant explanatory power (*wald*-statistic = 4.04, *p* = 0.04). AUDIT_QLTY (*wald*-statistic = 2.81, *p* = 0.09) is positively associated with BATH in the opposite direction predicted. This indicates that higher quality auditors are

	Mean	Median	Std. dev.	Minimum	Maximum
EXAB (%)	-0.39	0.00	4.55	-54.94	24.56
GROWTH (%)	1.79	2.00	2.13	-4.00	4.00
LEVERAGE (%)	33.77	29.32	29.66	0.00	197.16
SALES (\$)	1,289,958	131,417	9,694,142	2,400	186,981,000

Notes: EXAB = the amount of extraordinary and abnormal items of firm *i* for year *t* scaled by total assets at the beginning of *t*; GROWTH = annual growth rate of national gross domestic product in year *t*; LEVERAGE = the ratio of total liabilities to total assets at the end of the year; SALES = the sales revenue in dollars reported by firm *i* in year *t*

Table II.
Descriptive statistics for the pooled sample of 405 firm-years – continuous variables

Variables	Proportion of firm-years with value of 1 (%)
BATH	8.00
DROUGHT	53.00
AUDIT_QLTY	76.00
MGT_CHANGE	17.00

Notes: BATH = an indicator variable used as a proxy for “big bath” accounting, equal to 1 when the operating profit before tax for the year *t* and EXAB are both negative or negative amount of extraordinary and abnormal items more than offsets positive amount of operating profit before tax, 0 otherwise; DROUGHT = an indicator variable equal to 1 if the year *t* is a drought-year, and 0 otherwise; AUDIT_QLTY = a dummy variable that takes a value of 1 for Big Six auditors and zero otherwise; MGT_CHANGE = an indicator variable equal to 1 if there is a management change for firm *i* in year *t*

Table III.
Descriptive statistics for the pooled sample of 405 firm-years – binary variables

	EXAB	DROUGHT	GROWTH	BATH	LEVERAGE	SALES	AUDIT_QLTY
DROUGHT	-0.13** (0.01)						
GROWTH	0.06 (0.26)	0.04 (0.43)					
BATH	-0.48** (0.00)	0.01 (0.81)	-0.09 (0.09)				
LEVERAGE	-0.23** (0.00)	0.05 (0.37)	0.02 (0.71)	0.12* (0.02)			
SALES	-0.13** (0.01)	-0.10 (0.08)	0.05 (0.30)	0.22** (0.00)	0.11* (0.03)		
AUDIT_QLTY	-0.05 (0.28)	0.08 (0.10)	0.01 (0.80)	0.10 (0.05)	-0.07 (0.18)	0.04 (0.43)	
MGT_CHANGE	-0.15** (0.01)	0.04 (0.42)	-0.03 (0.53)	0.11* (0.02)	0.00 (0.98)	0.15** (0.01)	0.01 (0.80)

Notes: Two-tailed significance levels are provided in parentheses; ** (*) – the correlation is statistically significant at 1 per cent (5 per cent) level (two-tailed test). Where: EXAB = the amount of extraordinary and abnormal items of firm i for year t scaled by total assets at the beginning of t ; DROUGHT $_t$ = an indicator variable equal to 1 if the year t is a drought-year, and 0 otherwise; GROWTH = annual growth rate of national gross domestic product in the year t ; BATH = an indicator variable used as a proxy for “big bath” accounting, equal to 1 when the operating profit before tax for the year t and EXAB are both negative or negative amount of extraordinary and abnormal items more than offsets positive amount of operating profit before tax, 0 otherwise; LEVERAGE = the ratio of total liabilities to total assets at the end of the year; SALES = the sales revenue in dollars reported by firm i in year t ; AUDIT_QLTY = an indicator variable taking a value of 1 for Big Six auditors and 0 otherwise; MGT_CHANGE = an indicator variable equal to 1 if there is a management change for firm i in year t

Table IV.
Pearson correlations for
the pooled sample of 405
firm-years

unlikely to constrain their clients taking baths. Results for the control variable MGT_CHANGE variable (*wald*-statistic = 2.84, p -value = 0.05) is statistically significant and consistent with prior research (e.g. Riedl, 2004; Francis *et al.*, 1996; Elliot and Shaw, 1988; Strong and Meyer, 1987). That is, agricultural firms take a bath when there is a management change. Finally DROUGHT_SALES is positively significant with a *wald*-statistic of 5.93 and $p = 0.02$ suggesting that big bath is associated with increased sales revenue. This suggests that big bath is associated with the existence of drought rather than a decrease in sales due to the drought.

4.3 Univariate tests – H2

Hypothesis two predicts that in a given drought year, agricultural firms engage in big bath more than non-agricultural firms. Two cross-sectional tests are employed for testing hypothesis two, one for each of the two droughts being investigated. The year 1983 (1995) was selected for the 1980s (1990s) drought. Two control samples were employed for the years 1986 and 1990 to examine whether there is any significant industry-specific difference in big bath write-downs in non-drought years.

Extraordinary and abnormal items of 1983 (a drought year) are compared with that of 1986 (a non-drought year) as both years are prior to the amendment in ASRB 1018. Similarly, extraordinary and abnormal items of 1990 (a drought year) are compared with that of 1995 (a non-drought year) as both years are after the amendment in ASRB

Independent variables	Expected sign	Coefficient	Wald statistic	Two-tailed significance*
Intercept	?	-4.01	34.07	0.00
DROUGHT	+	1.69	11.22	0.00
GROWTH	?	-0.17	4.04	0.04
LEVERAGE	-	0.01	3.22	0.07
SALES	-	0.01	4.04	0.04
AUDIT_QLTY	-	1.09	2.81	0.09
MGT_CHANGE	+	0.83	2.84	0.05
DROUGHT_SALES	?	0.01	5.93	0.02
Correct classification percentage by model				93.10%
- 2 log likelihood of model				167.26
Nagelkerke (1991) R^2 (%)				28.60

Notes: p_i is the probability of firm i being engaged in big bath accounting where big bath is considered to exist if both operating profit before tax < 0 and extraordinary and abnormal items < 0 or (operating profit after tax + extraordinary and abnormal items) < 0 ; DROUGHT = an indicator variable equal to 1 if the year t is a drought-year, and 0 otherwise; GROWTH = annual growth rate of GDP expressed in percent; LEVERAGE = total liabilities divided by total assets; SALES = The sales revenue in dollars reported by firm i in year t ; AUDIT_QLTY = an indicator variable taking a value of 1 for Big Six auditors and 0 otherwise; MGT_CHANGE = an indicator variable equal to 1 if there is a management change for firm i in year t ; DROUGHT_SALES = an interaction variable to test whether big bath is responsive to sales revenue during drought periods; * One-tailed p -value when direction predicted. $N = 405$ firm-years

$$\ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \beta_1 \text{DROUGHT}_t + \beta_2 \text{GROWTH}_t + \beta_3 \text{LEVERAGE}_{it} + \beta_4 \text{SALES}_{it} + \beta_5 \text{AUDIT_QLTY}_{it} + \beta_6 \text{MGT_CHANGE}_{it} + \beta_7 \text{DROUGHT_SALES}_{it} + \xi_i$$

Table V.
Results of binary logistic regression on 405 firm-years data for agricultural firms: 1980-1995

1018. A t -test is used to determine whether the mean extraordinary and abnormal items of agricultural firms are lower than that of the non-agricultural firms.

The results for hypothesis two are reported in Tables VI and VII. In 1983, the mean extraordinary and abnormal loss of 0.20 per cent of total assets for agricultural firms was statistically significantly lower than a 1.00 per cent extraordinary and abnormal gain for non-agricultural firms (t -statistic = -1.76, p -value = 0.05). However, as expected, there was no significant difference between the items reported across the industries in the non-drought year of 1986 (t -statistic = -1.05, $p = 0.31$). Significant results were found for the 1995 drought year between agricultural and non-agricultural firms, with agricultural firms having greater negative extraordinary and abnormal losses (t -statistic = -2.33, p -value = 0.01). However, counter to prediction, a significant difference also exists for the non drought year of 1990 ($t = -2.28$, $p = 0.04$).

Further cross-sectional tests are employed for any significant difference in the levels of extraordinary and abnormal items between drought and non-drought years for the control sample of non-agricultural firms. As these firms are not expected to be affected by drought, it is predicted that there is no statistical difference in the magnitude of big bath accounting between drought and non-drought years. This test is necessary because if firms from all industries are more likely to take a bath in drought years, then

Table VI.
A matched-pair comparison of extraordinary and abnormal items between agricultural and non-agricultural firms

Year	Status of ASRB1018	Number of pairs	Agricultural firms mean (Std. Dev.)	Matched non-agricultural firms mean (Std. Dev.)	T-test (Two-tailed significance *)
1983	Prior to amendment	17	-0.002 (0.020)	0.010 (0.028)	-1.76 (0.05)
1986		19	-0.002 (0.022)	0.005 (0.045)	-1.05 (0.31)
1990	After amendment	19	-0.017 (0.054)	0.045 (0.108)	-2.28 (0.04)
1995		30	-0.003 (0.068)	0.007 (0.017)	-2.33 (0.01)

Notes: * One-tailed *p*-value when direction predicted

Table VII.
Analysis of extraordinary and abnormal items of non-agricultural firms for any difference between drought and non-drought years

Year	Status of ASRB 1018	<i>n</i>	Mean (std. dev.)	Mean (std. dev.)	<i>t</i> -statistic (two-tailed significance *)
1983 vs 1986	Prior to amendment	45	2.390 (4.600)	0.810 (0.890)	1.48 (0.15)
1995 vs 1990		58	0.180 (1.830)	0.390 (2.170)	0.47 (0.64)
(1983 + 1995) vs (1986 + 1990)		103	1.070 (3.160)	0.590 (2.010)	0.93 (0.35)

Notes: Drought years are 1983 and 1995. Non-drought years are 1986 and 1990

there may be a number of omitted economy wide factors in addition to drought, which are not captured in the regression model by firm-specific variables. However, it should be noted that other industry-specific factors may induce big bath accounting at various times in different industries which make up the control group of non-agricultural firms.

Tables VI and VII report the results of three cross-sectional tests based on samples on the levels of extraordinary and abnormal items between the drought and non-drought years for non-agricultural firms. The first test compares 1983, a drought year, against 1986, a non-drought year with both years prior to the amendment in ASRB 1018. The second test compares 1995, a drought year against 1990, a non-drought year with both years subsequent to the amendment in ASRB 1018. The third test combines the drought years and compares against the combined non-drought years. As expected, the results suggest that drought has no significant relation between the level of extraordinary and abnormal items for the sample of non-agricultural firms. The *t*-statistics are not significant at conventional levels in all three tests ($t = 1.48, 0.47, 0.93$ for 1983 vs 1986, 1995 vs 1990, and the combined sample, respectively).

4.4 Are the big baths opportunistic?

In this section we undertake three separate analyses to test whether the big baths documented in Table V are opportunistic or simply reflect the economic effects of

drought. First, we examine whether the sales revenue declines of the big bath firms are significantly larger than that of the non-big bath firms during drought periods. Assuming that the big bath losses simply reflect the adverse economic effects of droughts, then the decline in sales revenue of the big bath firms (i.e. firms with $EXAB < 0$ and $OP/TA < 0$) after controlling for firm size should be significantly larger than that of non-big bath firms during drought periods. This should hold true because the most direct effects of drought on an agricultural firm occur through crop failure and live-stock mortality, which directly reduce sales revenue[1].

Second, we test whether the profitability of the big-bath firms in the post-drought years declined compared to that in the pre-drought years. A drought is like an exogenous shock to the agricultural firms. As droughts reduce the productive capacity of agricultural firms through unfavourable soil condition and reduce the size of the live-stock, profitability of the big bath firms should decline in the post-drought years compared to their profitability in the pre-drought years. Finally, we analyse the individual extraordinary and abnormal items reported by the sample firms during the drought periods.

We subtract sales at year $t-1$ from the sales at year t and divide the difference by total assets at year $t-1$ to compare the decline in sales during drought periods between the big bath firms and non-big bath firms. The sales decline is divided by total assets to eliminate any scale issues. The t -test suggests that the sales declines of big bath firms are not significantly larger than that of the non-big bath firms during the drought periods (t -statistic = -1.12 , two-tailed significance = 0.29). Thus, it does not appear that the big-bath firms were more severely affected by droughts than non-big bath firms.

We take the average ROA of two years immediately preceding a drought period and compare that against the two-year average ROA immediately subsequent to that drought to compare between pre-drought and post-drought profitability for each big bath firm. Thus, the average ROA of 1980 and 1981 (1989 and 1990) for each big bath firm is compared against the average ROA of 1985 and 1986 (1996 and 1997) of that firm. We take a two-year average for pre-drought (post-drought) performance to avoid focusing excessively on the year proceeding (following) a drought. The paired-sample t -test suggests that the big-bath firms improved their performance from the two-year pre-drought average ROA of 7.56 per cent to the two-year post-drought average ROA of 8.00 per cent, although this improvement is not statistically significant (t -statistic = 0.19 , two-tailed sig. = 0.85). If the big bath losses during drought periods were driven by the adverse economic effects of droughts, it was unlikely for big bath firms to maintain or improve profitability within a short period of two years. This suggests that the big bath losses were likely to be opportunistic.

Finally, we analyse extraordinary and abnormal items of the sampled firms. During the drought years (1982-1984 and 1991-1995) in the sample period, there were 205 extraordinary and abnormal items reported by the sample firms. Table VIII provides an illustrative list of such transactions, their frequency and magnitude. As panel A suggests, extraordinary and abnormal items reported by big bath firms were mainly income-decreasing and involved recognition of losses in relation to some external transactions and writing down of assets. To the contrary, non-big bath firms reported both gains and losses on extraordinary and abnormal items during the same drought periods. Arguably, loss recognition through creation of provisions or writing down assets is subject to more management discretion than gain or loss recognition in external transactions. The relative prevalence of loss recognition by big bath firms

Description of transactions	Frequency (%)	Size relative to total assets ^a (%)
<i>Panel A: Big bath firms</i>		
Write off of inventory items	1.46	-2.68 to -3.01
Write down of freehold property held for resale	1.46	-2.89 to -14.05
Provision for doubtful debts and investments	0.98	-2.80 to -7.77
Prepaid crop expenditure written off	0.49	-3.81
Litigation defence costs	0.49	-1.83
Loss incurred due to the buy back of forward sales contracts	0.49	-3.78
Loss on disposal of assets	0.49	-3.12
Profit on disposal of cattle station	0.49	2.43
Write down of property, plant and equipment (PPE)	0.49	-16.10
Write off goodwill on consolidation	0.49	-6.83
Write off of holding costs	0.49	-6.16
<i>Panel B: Non-big bath firms</i>		
Profit from sale for business segments, controlled entities or investments	19.51	0.64 to 5.00
Write down of inventory, PPE and investments	7.32	-0.24 to -3.19
Provision for diminution in value of investments, PPE and doubtful debts	5.88	-4.29 to 0.62
Restructuring and rationalisation	4.39	-0.41 to -2.67
Loss on disposal of assets and investments	3.90	-0.17 to -9.32
Goodwill written off/ written down	3.90	-1.32 to -4.36
Realised/unrealised losses/profits arising from exchange	3.41	-0.27 to 0.22
Loss on interest rate swaps and exchange translation	2.44	-0.09 to -1.13
Revaluation increments of PPE and investments	0.98	2.17 to 7.51
Amortisation of the leased asset	0.49	-3.72
Capital reconstruction-cancellation of shares	0.49	-21.26
Deferred profit on sale and leaseback arrangements	0.49	2.99
Interest expense	0.49	-1.25
Loss incurred on assignment of receivables	0.49	-9.32
Non-current tooling written off	0.49	-4.22
Non-recurring adjustment from prior years (Net of tax)	0.49	2.05
Non-recurring tax benefit on investment allowance	0.49	2.31
Proceeds from legal settlement	0.49	37.93
Reversal of provision for non-recovery raised in prior year	0.49	9.32
Write back of accumulated depreciation	0.49	2.84

Notes: ^a This column shows the range in case of multiple transactions

Table VIII.
Analysis of 205
extraordinary and
abnormal items reported
in the sample firms
during drought periods
(1982-1984 and
1991-1995)

during drought periods should be considered also in combination with no significant difference in sales decline between big bath and non-big bath firms during the drought periods.

The big bath firms and non-big bath firms do not appear to be significantly different in size during the drought years with mean total assets of \$1,317 millions and \$1,136 millions ($t = 0.25$, p -value = 0.80), respectively. The two groups, however, significantly differ in terms of sign and the magnitude of extraordinary and abnormal items relative to total assets. During the drought periods, the mean extraordinary and abnormal items of -4.28 per cent (scaled by total assets) for big bath firms was

significantly different from that of 0.06 per cent for non-big bath firms ($t = -4.11$, p -value = 0.00).

In summary, a comparison of decline in sales revenue during drought periods between big bath and non-big bath firms, a comparison between pre-drought and post-drought profitability for big bath firms, and an analysis of extraordinary and abnormal items reported by the big-bath firms and the non-big bath firms, all tend to suggest that the big baths taken by the sample firms were likely to be driven by managerial opportunism rather than economic consequences of the droughts.

5. Summary and conclusions

This paper examines whether Australian agricultural firms display big bath behaviour during drought periods by recognising extraordinary and abnormal losses and whether agricultural firms are more likely to take big baths than non-agricultural firms during drought periods. It also examines whether the big baths are induced by managerial opportunism rather than the economic consequences of droughts.

We analyse 405 firm-years data for 42 agricultural firms and 85 firm-years data of matched- pair non-agricultural firms. Both univariate and multivariate tests provide support for the two hypotheses. First, agricultural firms are more likely to take big baths during drought periods than non-drought periods and these big baths are more likely to be driven by managerial opportunism rather than the economic consequences of droughts. Second, Australian agricultural firms are more likely to take big baths than non-agricultural firms during drought periods.

To our knowledge, no prior research has provided any evidence of big bath behaviour in relation to a natural calamity such as drought. Thus, this paper makes a unique contribution to the accounting literature by providing evidence of big bath behaviour in a specific industry (agricultural industry) and by demonstrating that this big bath behaviour is more likely to be induced by managerial opportunism rather than the economic consequences of droughts.

In analysing the contributions of this paper, readers must consider several limitations of the paper. First, the nature of drought makes it difficult to identify a single and objective definition of drought. Thus, some subjectivity is involved in identifying drought periods. Second, hypothesis two requires agricultural firms to be matched on size and return on assets with a sample of non-agricultural firms in drought and non-drought years. This matching process limits the sample sizes and reduces the power of the tests used. Third, the implications of the standard change on the classification of extraordinary and abnormal items are not statistically examined in the study. However, any change in practices would bias the study against finding significant results, as it reduces the level of extraordinary losses during the drought period of 1991 to 1995. Finally, as with any time series analysis, a number of omitted variables may have also caused the level of extraordinary and abnormal items to vary with time.

The present study has several important implications. First, since big baths affect both interperiod and intercompany comparisons, corporate managers, accountants, financial analysts and shareholders ought to be concerned. Second, policymakers and standard setters should be legitimately concerned about the timeliness and the accuracy of big bath disclosures.

There are several ways this research can be extended in the future. For instance, big bath phenomenon, which is specific to other industries remains to be documented. In

particular, big bath behaviour may occur more frequently in some industries as opposed to others. Further, future studies may benefit from factoring uncontrollable environmental factors into research designs. Other natural disasters such as floods, cyclones and earthquakes could be examined for evidence of discretionary asset write-offs in addition to those attributable to the disaster. Finally, future research could probe further into what other organisational and environmental factors induce big bath accounting.

Note

1. Crop failure or live stock mortality can have an increasing effect on output price but it is assumed that the price increase will not be large enough to offset the loss of revenues through the drastic reduction in sales volume.

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