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Vergoossen, R.G.A.

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## **Serie Research Memoranda**

### **Accounting Changes and Investment Analysts' Fixation on Accounting Numbers**

**Drs. Ruud G.A. Vergoossen**

**Research Memorandum 1994-12**

**April 1994**



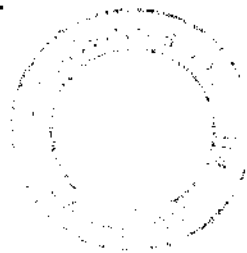


**Accounting Changes and Investment Analysts' Fixation  
on Accounting Numbers**

*Drs. Ruud G.A. Vergoossen*

*Vrije Universiteit Amsterdam*

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Vrije Universiteit,  
Faculty of Economics and Econometrics,  
Department of Financial and Management Accounting,  
De Boelelaan 1105 (room 3A-30),  
1081 HV Amsterdam,  
The Netherlands.  
(telephone: (+)31-20-5484638, fax: (+)31-20-6462645)



## 1 Introduction

The present paper contains some preliminary findings on the extent investment analysts discuss accounting changes in their investment reports. Putting it more specifically, to what extent do investment analysts appear to be fixated on accounting numbers? We distinguish two levels of fixation, viz., fixation at the strong and weak level. Furthermore, we discuss four (possible) determinants of the fixation of investment analysts on accounting numbers. By examining existing investment reports, we have put our study in a real world setting. Most research with respect to the incidence of fixation is done in an experimental setting.

In section 2 we discuss the concept of functional fixation. Section 3 contains an overview of similar research. In section 4 the research design is set out. We present the research findings in section 5. The final section contains a summary.

## 2 The Concept of Functional Fixation

The functional fixation hypothesis has its roots in the psychology. Psychologists found that individual's prior use of an object in a function dissimilar to that required by a present problem would prevent the individual from discovering an appropriate new use for the object.<sup>1</sup> The hypothesis was introduced in the accounting literature by Ijiri, Jaedicke and Knight (1966). The authors placed functional fixation in an accounting context as follows: "If the outputs from different accounting methods are called by the same name, such as profit, cost, etc., people who do not understand accounting well tend to neglect the fact that alternative methods may have been used to prepare the outputs. In such cases, a change in the accounting process clearly influences the decisions" (p. 194). As Ashton (1976, p. 4) properly observed, the analogy with the psychology literature is not an exact parallel. Functional fixation in psychology is concerned with fixation on the functions of objects, whereas Ijiri, Jaedicke and Knight suggested the occurrence of fixation on accounting outputs ignoring the underlying accounting methods. Chang and Birnberg (1977, p. 300) therefore consider the choice of the term functional fixation not wholly appropriate. The concept brought to the accounting literature by Ijiri, Jaedicke and Knight is labelled by them as data fixity.

For the purpose of the current study we distinguish the following two levels of fixation:

- (1) fixation at the strong level: investment analysts do not note accounting changes in their investment reports at all;
- (2) fixation at the weak level: investment analysts note accounting changes in their investment reports but omit a discussion of its effects on accounting numbers.

We consider investment analysts who discuss the effects of accounting changes on accounting numbers in their investment reports as being not at all fixated.

However, it should be emphasized that if an investment analyst refrains from a discussion of an accounting change in his investment report this not necessarily means that he is not aware of the accounting change and its effects on accounting numbers, i.e., he is not necessarily behaving irrationally. Thus actually we do not know if the investment analyst in

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<sup>1</sup> Ashton (1976, pp. 2-3) discusses some experiments done in this field.

that case is really functionally fixated. The decision not to discuss the accounting change in his investment reports might be due to the fact that the accounting change relates to a piece of data which the investment analyst considers to be irrelevant to his decision or the investment analyst may decide that the benefits of a better judgment will not outweigh the costs of learning how to process the accounting change. In that case the investment analyst is acting consciously and from his point of view also rationally with regard to the accounting change. The role of the investment analyst as an intermediary, however, should be borne in mind. If an investment analyst does not discuss the accounting change in his investment reports explicitly, i.e., he acts as if he is functionally fixated, this could reinforce the functional fixation of users of the investment reports written by that investment analyst.

In the current study we do not provide the term 'fixation' with the adjective 'functional', because in the accounting literature *functional* fixation is often associated with irrational behaviour. On the basis of the investment reports it is not possible to distinguish unambiguously between the rational form and irrational form of fixation.

### 3 Similar Studies

In the psychology literature the experiments to test the functional fixation hypothesis were time-series oriented, dealing with the behaviour of individuals trying to discover an alternative function for a certain object after undergoing pre-utilization training (Ashton, 1976, p. 3). In the accounting literature, however, functional fixation is given both a time-series and cross-sectional orientation. With respect to the time-series oriented studies the influence of changes in accounting methods over time are examined, whereas with respect to the cross-sectional oriented studies the influence of alternative accounting methods at a certain time are examined. Most accounting studies on functional fixation have a cross-sectional orientation.

Studies concerning the influence of accounting changes on users' judgments or decisions can be of the market reaction type or the behavioural type. In the studies of the market reaction type the aggregated response of a group of users on accounting changes is examined, whereas in the studies of the behavioural type the interface between accounting changes and the behaviour of individual users is paramount. Most of the research on the effects of accounting changes is of the market reaction type, whereas the behavioural type studies are scarce. Studies of the behavioural type can be classified as examinations on the field of management accounting or financial accounting. In the former category the influence of accounting changes on the judgments or decisions of *internal* users (like managers) is examined and in the latter category this is done concerning *external* users (like investment analysts). The following table gives an overview of studies on these fields.

Table 1: Overview Time-Series Oriented Behavioural Type Studies

Research methodology	Management accounting	Financial accounting
Experiment with non-professional participants	Ashton (1976) Swieringa, Dyckman and Hoskin (1979) Dyckman, Hoskin and Swieringa (1982) Bloom, Elgers and Murray (1984) Marchant (1990)	Feenstra (1985)
Experiment with professional participants	Barnes and Webb (1986)	Feenstra (1985) Abdel-khalik and Keller (1979)
Field study: examination in real world setting		

It is obvious from table 1 that the studies were all put into an experimental setting. As far as we know there are no studies that were put into a real world setting up to the time of writing. The number of time-series oriented behavioural type studies among external users is very limited, viz., Abdel-khalik and Keller (1979) and Feenstra (1985).

An important consideration to put studies into an experimental setting is to ensure a high degree of internal validity, i.e., arranging dependent and independent variables in such a way that it is possible to detect unequivocally the influence of manipulations of a certain independent variable (e.g., the inventory valuation method) on the dependent variable (e.g., the recommendation of investment analysts). However, a high degree of internal validity is often accompanied by a low degree of external validity. This means that the conclusions drawn in an experiment are not simply valid in a real world setting, i.e., the conclusions are not generalizable beyond the experimental setting. It is obvious that the use in experiments of non-professional participants might be a major drawback. Wilner and Birnberg (1986, p. 75) properly consider the use of subjects capable of understanding the status quo and the accounting change to be introduced as a necessary condition for fixation studies. Failure to understand the situation can lead to inappropriate information processing, but this is not true fixation. As Wilner and Birnberg (1986, p. 78) further notice experiments which use professionals as participants have also raised other issues, e.g., with respect to the extent the participants do care about the progress of the study and the extent the task is realistic enough to evoke 'on-the-job' behaviour. In other words, the investment analysts might act in a way different from the way they would act in a real world situation.

The problems addressed above could be overcome by abandoning experiments and examining the real world situation instead. In a field study the researcher simply observes and records the behaviour. In our study we do that through the examination of the investment reports written by investment analysts with respect to individual companies that adopted changes in accounting principles. However, there are problems concerning the internal validity of field studies. It might be difficult to isolate the effects of an accounting change on the judgments of investment analysts, because these judgments are determined by a range of variables. The investment analysts' judgments are a function of the expectations formed about the future performance of a company, e.g., the company's financial and business history, its size, its financial structure, its contractual commitments (such as leases), its investment programs and other variables of relevance to the future operation of the company could affect the judgments made by investment analysts. Thus compared to experiments



there is an increase in realism, but a decrease in control over the study. The latter means that the possibility of testing the functional fixation hypothesis in a real world setting by just looking at the changes in the investment analysts' judgments (or recommendations) is questionable.

#### 4 Research Design

In this section we discuss the selection of accounting changes, the collection of investment reports, the index of fixation and the developed hypotheses.

##### 4.1 Selection of Accounting Changes

The accounting changes examined in the present study meet the following criteria:

- they are, at least to some extent, disclosed in the annual reports;
- they have a material effect on net income or shareholders' equity, i.e., net income or shareholders' equity is affected by at least 5 per cent.

The disclosure criterion is of importance, because without any announcement of the accounting change the failure of the investment analysts to note the change would not be a consequence of fixation but ignorance. With respect to each accounting change an index of disclosure is calculated based on the information concerning the accounting change provided in the annual report of the year of the accounting change. The formula runs as follows:

$$\frac{\sum_{i=1}^6 R_i V_i}{\sum_{i=1}^6 R_i}$$

$R_i$     -    1 if applicable  
               0 if not applicable  
  
 $V_i$     -    1 if yes  
               0 if no  
  
 (1)-(6):    disclosure elements

Based on the legislation (section 384, paragraph 6 and section 363, paragraph 5, Civil Code Book 2) and Annual Reporting Guidelines (guideline 1.06), we distinguish the following disclosure elements regarding the information provided in the annual reports with respect to accounting changes:

- (1) the fact that a change in accounting principles is adopted (this is mentioned explicitly under the heading 'accounting change' or something similar);
- (2) a description of the differences between the new and old accounting method;
- (3) the reason(s) for the accounting change;
- (4) the cumulative effect of the accounting change;
- (5) the year effect of the accounting change on net income and shareholders' equity of the current financial year;

(6) the figures of the preceding year adjusted to the new accounting method.

When determining the level of disclosure with respect to a certain accounting change we do not consider the extent the multi-annual summaries are adjusted and the extent information is provided concerning the (possible) influence of the accounting change on subsequent financial years. These (additional) disclosure elements are required by the Annual Reporting Guidelines only. They are not directly an outcome of the applicable sections in the law. Furthermore, it is often very difficult to provide that kind of information.

The materiality criterion is of importance, because accounting changes with an immaterial effect on net income or shareholders' equity are not expected to be relevant in investment analysis. The effects on net income and shareholders' equity are calculated according to the next formulae:

$$\text{net income: } \left| \frac{E_{i,t}}{I_{e,t}} \right| \quad \text{shareholders' equity: } \left| \frac{E_{s,t}}{S_{e,t}} \right|$$

- $E_i$ : effect of the accounting change on net income  
 $E_s$ : effect of the accounting change on shareholders' equity at the end of financial year  
 $I_e$ : net income exclusive of  $E_i$   
 $S_e$ : shareholders' equity exclusive of  $E_s$   
 $t$ : financial year the accounting change was adopted

In addition, it should be noted that the accounting changes considered in the present study all occurred in the 1987-1991 financial statements of the 40 most actively traded companies on the Amsterdam Stock Exchange. The latter restriction is introduced because these companies are analyzed more intensively and on a more regular basis by investment analysts than the other listed companies. Banks, insurance companies and investment companies are excluded in the current study, because of financial reporting differences.

On the basis of the criteria discussed above, we have selected 16 accounting changes divided among the following categories:

- (1) changes in the treatment of investment grants;
- (2) capitalization of publishing rights;
- (3) changes from current cost to historical cost accounting;
- (4) miscellaneous accounting changes.

Generally, the first affect net income, the second shareholders' equity and the third both net income and shareholders' equity.

#### 4.2 Collection of Investment Reports

After the selection of accounting changes we had to collect proper investment reports. They had to meet the following criteria:

- (1) written in the relevant period, i.e., from the first announcement of the accounting change by the company up to and including the ultimate disclosure of the accounting change in its annual report. Sometimes these events coincide;
- (2) accounting information should be used, i.e., investment analysts should refer explicitly to accounting information. Clearly, accounting changes and their influence on accounting numbers are irrelevant if that is not the case.

With the help of the annual reports, interim reports and press releases of the companies we have determined the first announcement dates of the accounting changes. We have also taken into consideration that in some instances companies announced accounting changes for the first time verbally, e.g., at press conferences. It appeared that in six cases companies announced the accounting changes for the first time in their annual reports, whereas in four cases this was done earlier at the release of the preliminary or final annual returns. In six cases the first announcement was even done in the preceding annual report or at the release of the final annual returns of the preceding financial year. Because accounting changes are announced at different occasions and because investment analysts do not analyze the companies involved in our study with the same regularity, we have examined all the investment reports published from the moment the accounting change was announced for the first time up to and including the ultimate disclosure of the accounting change in the annual report.

In the investment reports, generally, fundamental analysis was applied combined with ratio analysis. Sometimes the investment reports also contained a technical analysis section.  $\beta$ -analysis, on the other hand, was hardly ever applied. That  $\beta$ -analysis was hardly ever applied in the investment reports is explicable because they in principle are related to one company only. We have excluded from our examination the investment reports that did not refer to accounting information at all.

#### 4.3 Index of Fixation

With the help of the investment reports we have examined whether changes in an accounting principle are noted by the investment analysts and, if that is the case, to what extent these changes are taken into account by them when analyzing companies. As discussed earlier we distinguish two levels of fixation:

- (1) investment analysts that do not note the accounting change in their reports at all are considered to be fixated at the strong level;
- (2) investment analysts that note the accounting change but omit a discussion of its effects on accounting numbers in whole or in part are considered to be fixated at the weak level.

Investment analysts are considered not to be fixated if the effects of the accounting change on accounting numbers are discussed fully in their reports. The level of fixation of an investment analyst is based on all relevant reports made by that investment analyst.

With regard to each accounting change we calculate an index of fixation according to the following formula:

$$\frac{\sum_{i=1}^n W_i}{n}$$

$$W_i = \begin{cases} 1.0 & \text{if fixated at strong level} \\ 0.5 & \text{if fixated at weak level} \\ 0.0 & \text{if not fixated} \end{cases}$$

n : number of investment analysts

An index value equal to 1.0 means that all investment analysts appear to be

fixated at the strong level and an index value equal to 0.0 means that no investment analyst appears to be fixated at all. Thus the index of fixation is designed to be an indicator of the overall level of fixation of the investment analysts with respect to a certain accounting change.

Contrary to the experiments discussed in section 3, we are not able to isolate the influence of changes in accounting principles on the judgments or recommendations of investment analysts, i.e., we cannot control all the other variables that might affect their judgments (or recommendations). However, the likelihood that the judgments (or recommendations) of investment analysts are affected might depend on their level of fixation.

#### **4.4 Developed Hypotheses**

The central hypothesis in our study, stated in the null-alternative form, is as follows:

*Investment analysts do not appear to be fixated on accounting numbers. They take into consideration accounting changes with a material effect on net income or shareholders' equity. Consequently it is not plausible that accounting changes influence their judgments.*

With the help of the investment reports we are able to examine the following possible determinants of the individual investment analyst's level of fixation:

- (1) the level of disclosure of the accounting change;
- (2) the moment the accounting change is announced or disclosed for the first time;
- (3) the kind of accounting change;
- (4) the type of organization that employs the investment analyst.

The related hypotheses, stated in the null-alternative form, run as follows:

- (1) *The level of fixation of investment analysts does not depend on the level of information supply concerning the accounting change.*
- (2) *The level of fixation of investment analysts does not depend on the moment the accounting change is announced for the first time.*
- (3) *The level of fixation of investment analysts does not depend on the kind of accounting change.*
- (4) *The level of fixation of investment analysts does not depend on the type of organization that employs the investment analysts.*

Other possible determinants of the individual investment analyst's level of fixation include the materiality of the accounting change, the level of education of the investment analyst, the experience in company analysis of the investment analyst and the time spent by the investment analyst composing the investment report. The first-mentioned determinant is not applicable to our study, because we confine ourselves to accounting changes with a material effect on net income or shareholders' equity. The other determinants cannot be examined satisfactorily on the basis of the available investment reports.

## 5 Research Findings

In this section we discuss the different accounting changes divided among four categories and test the hypotheses that we have formulated above.

### *5.1 Accounting Changes and the Level of Fixation*

With respect to each accounting change we have determined the level of fixation according to the formula given in subsection 4.3. However, it should be noted that in three cases the accounting changes solely affected extraordinary income. In these instances we have calculated also a 'corrected' index of fixation. Then investment analysts, although fixated at the strong or weak level according to our definition, consider the effect of the accounting change implicitly if they consider extraordinary income in their analyses. Thus for the calculation of the 'corrected' indices of fixation we consider the strongly and weakly fixated investment analysts as being not fixated if they take into account extraordinary income in their analyses.

#### *Changes in Accounting Policy on Investment Grants*

The changes in accounting policy concerning investment grants were generally induced by changes in the Investment Incentives Act (*Wet op de Investeringsrekening; WIR*). This act dates from 1978. Originally, WIR premiums were granted by the government irrespective of whether the company receiving those premiums had to pay any income tax. The WIR premium consisted of a basic premium and a number of possible additional premiums, such as the small-scale premium and environmental premium. However, the Investment Incentive Act was changed twice. As a consequence of the first change the WIR premiums changed into tax credits; from 1 May 1986 on the grants formed deductions from the income taxes payable with the provision to carry back and carry forward for a limited number of years. The second change implied that from 29 February 1988 on the basic premium was reduced to zero.

The Annual Reporting Guidelines allow either deducting investment grants from the cost of the related fixed assets or treating them as deferred credits (Guideline 3.01, paragraph 108). When applying the last alternative the investment grants generally should be amortized to net income over the assets' useful life. Investment subsidies in the form of tax credits should be presented in the income statement as deductions from income taxes (Guideline 2.53, paragraph 521-521b). However, with respect to WIR premiums granted after 30 April 1986 it was also tenable to continue the application of Guideline 1.03, paragraph 108 (see Bosman *et al.*, 1993, pp. 211-212). Because the basic premium was reduced to zero the guideline allowed accelerated release of investment grants treated as a deferred credit (Guideline 3.01, paragraph 111).

Table 2: Changes in Treatment of Investment Grants <sup>2</sup>

Name of company and year of accounting change	Level of disclosure	Effect of change on		Total number of analysts <sup>Ⓢ</sup>	Fixation			Index of fixation
		Net income	Equity		Strong	Weak	No	
KKK 1987	0.833	+ 43.3%	Ä	12	1	5	6	0.292
CCC 1988/89	0.200	- 6.8%	Ä	14	9	1	4	0.679
FFF 1989	0.100	+ 15.2%	Ä	21	15	5	1	0.833
PPP 1989	0.800	+ 7.4%	Ä	13	3	0	10	0.231
VVV 1990*	0.800	+ 20.4%	Ä	20	11	3	6	0.625
				(20)	( 3)	( 2)	(15)	(0.200)
Changes in treatment of investment grants				80	39	14	27	0.575
				(80)	(31)	(13)	(36)	(0.469)

Ä: not applicable

\* Accounting change solely affected extraordinary income. The 'corrected' figures are in parentheses.

Ⓢ Actually, it concerns the total number of organizations of which we have examined investment reports that dealt with the respective companies. Then, sometimes the investment reports are written by more than one investment analyst. Furthermore, in certain cases we had to examine more than one investment report in order to determine the level of fixation.

Table 2 shows five accounting changes concerning the treatment of WIR premiums with a material effect on net income. With respect to each accounting change we give the level of disclosure, the effect on net income and the level of fixation of the investment analysts.

Before the accounting changes went into effect, each company treated the WIR premiums as deferred credits putting them on an equalization account. The amounts periodically released in favour of the results, generally depended on the useful life of the related assets. The accounting policies concerning WIR premiums were changed as follows:

- the WIR premiums were deducted from income taxes on ordinary results in the year the premiums were granted by KKK. The balance of the equalization account at the end of the preceding financial year was accounted for in the income statement as an extraordinary item;
- the release was directly added to the equity by CCC;
- the release in favour of the results was accelerated by FFF and PPP;
- the balance of the equalization account at the end of the financial year was accounted for in the income statement as an extraordinary item by VVV.

It appears that the level of disclosure among the companies differs considerably with FFF and KKK at the extremes. The annual report of CCC and FFF did not explicitly state that an accounting change was made, contrary to the other three cases. PPP and VVV, on the other hand, even quantified the influence of the accounting change on subsequent financial years. None of the companies involved adjusted the figures of the preceding year to the new accounting method.

The overall level of fixation amounts to 0.586. It appears that the level of fixation ranges from 0.842 concerning the FFF case to 0.200 concerning the VVV case. We have recalculated the index of fixation with respect to the VVV case, because the accounting change adopted by VVV solely affected

<sup>2</sup> We have disguised the names of the companies. They will be released in the Autumn of 1994 at the publication of the final results of our study.

extraordinary income. As explained earlier, investment analysts who take into account extraordinary income in such a case are actually not fixated even if they do not note the accounting change in their analyses at all.

#### *Capitalization of Publishing Rights*

The three largest Dutch publishers revised with retrospective effect the accounting principles concerning publishing rights. As a consequence, significant portions of goodwill - charged directly to shareholders' equity in the past - were reinstated as publishing rights. Furthermore, the companies adopted an approach under which the publishing rights will not be subject to systematic amortization (anymore). The purpose of the accounting change was to give a more realistic view of the shareholders' equity and to come into line with international developments regarding the accounting treatment of publishing rights.

According to Dutch law intangible fixed assets should be valued at acquisition cost (section 384, paragraph 1 and section 385, paragraph 4, Civil Code Book 2). Furthermore, the law states that fixed assets with a limited useful life should be depreciated systematically (section 386, paragraph 4). In a discussion memorandum the Council on Annual Reporting interpretes the law to say that only purchased intangibles which are identifiable and separable should be capitalized. Specifically, with respect to publishing rights it discusses the pros and cons of systematic amortization, without offering its own view (Appendix to Guideline 2.01). The discussion memorandum was issued in June 1991, after the accounting changes were made by the publishers.

Table 3: Capitalization of Publishing Rights <sup>3</sup>

Name of company and year of accounting change	Level of Disclosure	Effect of change on		Total number of analysts*	Fixation				Index of fixation
		Net income	Equity		A	Strong	Weak	No	
XXX 1989	1.000	A	+ 46.9%	23	7	4	3	9	0.344
YYY 1989	1.000	A	+ 63.8%	14	2	3	1	8	0.292
ZZZ 1990	0.833	A	+ 86.4%	16	1	5	1	9	0.367
Capitalization of publishing rights				53	10	12	5	26	0.337
A: not applicable * Actually, it concerns the total number of organizations of which we have examined investment reports that dealt with the respective companies. Then, sometimes the investment reports are written by more than one investment analyst. Furthermore, in certain cases we had to examine more than one investment report in order to determine the level of fixation.									

The changes under consideration in this subsection are remarkable in that the three publishers agreed upon the updating and harmonization of their accounting policies with regard to publishing rights. Thus it is not surprising that the information supplied by the three publishers is quite similar. In addition to the notes to the financial statements, the publishers discussed the accounting changes in their management reports rather extensively. Contrary to XXX and YYY, ZZZ did not give full disclosure of the accounting change. Then ZZZ did not disclose the year effect of the accounting change. However, with respect to XXX and YYY the year effect was nil, because they did not capitalize newly acquired

<sup>3</sup> See note 2.

publishing rights in the year of the accounting change.

The accounting changes only affected shareholders' equity. This means that the examination of the level of fixation is only applicable to investment analysts who discuss in their reports, at least in some degree, the financial position or shareholders' equity of the companies. Then if they do not, the problem of fixation does not arise. The A-column of table 3 contains the number of analysts who did not discuss at all the financial position or shareholders' equity of the companies in question. It concerns seven of the 21 XXX analysts, two of the fourteen YYY analysts and one of the sixteen ZZZ analysts. We do not consider the reports of these investment analysts further. This corresponds to the condition, formulated in subsection 4.2, that only investment reports in which investment analysts use accounting numbers are relevant to us.

Table 3 shows that the differences between the three cases concerning the level of fixation are small. This finding is consistent with the fact that the accounting changes and the accompanying information supply were coordinated by the companies involved. Furthermore, it appeared that within a certain organization (bank or firm of stockbrokers) often the same investment analyst(s) analyzed the three publishing companies.

A problem that emerges from the investment reports is that the investment analysts do not believe the balance sheet of the publishing companies reflect adequately the financial position of these companies. A number of investment analysts, discussing the financial position of the publishers, even stated that despite the accounting change the financial position is not reflected well in the balance sheets. By way of illustration the investment analysts often made comparisons between the shareholders' equity and the market value of the publishers. Approximately half of the not strongly fixated investment analysts referred to the possible economic benefits of the accounting change, especially with respect to acquisition policy.

#### *Changes from Current Cost to Historical Cost Accounting*

According to section 384, paragraph 1 the choice of accounting principles should be guided by the prescriptions of section 362, paragraph 1-4. The accounting principles which may be applied are the acquisition or construction cost and, with respect to tangible fixed assets, financial fixed assets and stocks current value as well. Section 362 is concerned with the insight the financial statements should provide into the financial position and results of the company. If necessary in order to provide a good insight into its financial position and results the company should include information supplementary to that required by the Act or even diverge from the legal requirements. On the basis of section 384, paragraph 1 and the explanatory memorandum to this section three situations can be distinguished:<sup>4</sup>

- (1) the balance sheet and the income statement are prepared at current cost. However, in this case the revaluation of fixed assets must be stated, which means that information on the book value at historical cost is provided (section 368, paragraph 2a). This is not mandatory with respect to stocks;
- (2) the balance sheet and the income statement are prepared at historical cost, with current cost information provided in the footnotes;
- (3) the balance sheet and the income statement are prepared at historical cost, with no current cost information in the footnotes. The omission

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<sup>4</sup> See Bosman et al., pp. 58-59.



of this information must be justified by the circumstances. In case of current cost accounting the difference between the book value before and after the revaluation must be added to a revaluation reserve (section 390, paragraph 1).

Table 4: Changes from Current Cost to Historical Cost Accounting <sup>5</sup>

Name of company and year of accounting exchange	Level of Disclosure	Effect of change on		Total number of analysts*	Fixation			Index of fixation
		Net income	Equity		Strong	Weak	No	
KKK 1988	1.000	+ 11.5%	Å	9	0	3	6	0.167
BBB 1990	1.000	+ 4.0%	Å	14	2	0	12	0.143
GGG 1991	1.000	+ 2.6%	- 13.6%	14	2	6	6	0.357
Changes from current cost to historical cost accounting				37	4	9	24	0.230
Å: not applicable * Actually, it concerns the total number of organizations of which we have examined investment reports that dealt with the respective companies. Then, sometimes the investment reports are written by more than one investment analyst. Furthermore, in certain cases we had to examine more than one investment report in order to determine the level of fixation.								

Table 4 shows three changes from current cost to historical cost accounting with a material effect on net income or shareholders' equity. The companies adopted these changes in accounting principles particularly to conform with international accounting practices. Before the companies made the accounting changes, their income statements were based on current cost. However, with respect to their balance sheets, current cost accounting was applied only partly. KKK and BBB did not value their tangible fixed assets at current cost, whereas GGG did not value its stocks at current cost. Though KKK and BBB did not value tangible fixed assets at current cost, they provided current cost information about this balance sheet item in the explanatory notes. In addition to the current cost information included in the primary financial statements, each company provided similar information based on historical cost, whether or not in the form of (condensed) secondary financial statements.

According to Dutch accounting standards, the cumulative effect should be directly reflected in shareholders' equity in case of changes from current cost to historical cost accounting. In consequence of the partial application of current cost accounting the cumulative effect of the accounting change (on shareholders' equity) was not material in case of KKK and BBB. For that reason the cumulative effect was not quantified and comparative balance sheet figures were not adjusted to the new accounting method in these cases. After the accounting changes were made, the primary financial statements of all companies were based on historical cost with additional information based on current cost, whether or not in the form of (condensed) secondary financial statements. Thus actually each company changed from situation (1) to situation (2).

In all three cases the companies announced the accounting change for the first time in March or April of the financial year in which the accounting change was adopted. Subsequently, KKK and BBB discussed the accounting changes rather extensively in their 1988 and 1990 interim reports respectively. They based these interim reports already on historical cost.

<sup>5</sup> See note 2.

GGG, on the other hand, did not discuss the accounting change in its 1991 semi-annual report which was still based on current cost. Finally, all three companies fully disclosed the accounting change and its effects on accounting numbers in their annual reports.

Table 4 shows low indices of fixation with respect to KKK and BBB. This could be due to the fact that these companies discussed the accounting changes already in their interim reports, whereas GGG did not. Another explanatory variable could be the relatively limited influence of the accounting change on the 1991 net income of GGG (2.6 per cent). However, it should be recognized that ordinary income increased by almost 7 per cent, because net income for the most part was composed of extraordinary items.

#### Miscellaneous Accounting Changes

The five accounting changes given in table 5 could not be classified among the categories dealt with above. All of them were induced particularly because of international developments. Table 5 gives an overview of the accounting changes in terms of the level of disclosure, the effects on net income and in each case the level of fixation of the investment analysts.

Table 5: Miscellaneous Accounting Changes <sup>6</sup>

Name of company and year of accounting change	Level of disclosure	Effect of change on		Total number of analysts <sup>®</sup>	Fixation			Index of fixation
		Net income	Equity		Strong	Weak	No	
PPP 1989(a)	0.600	+ 14.0%	Ä	15	9	2	4	0.667
PPP 1989(b)	0.500	+ 6.4%	Ä	15	12	2	1	0.867
LLL 1989/90*	1.000	+ 16.1%	Ä	11 (11)	4 ( 2)	2 ( 1)	5 ( 8)	0.455 (0.227)
UUU 1990	1.000	(f) + 6.7% (£) - 5.9%	Ä	19	0	9	10	0.237
KKK 1991*	0.800	+ 14.9%	Ä	19 (19)	19 ( 0)	0 ( 0)	0 (19)	1.000 (0.000)
Miscellaneous accounting changes				79 (79)	44 (23)	15 (14)	20 (42)	0.652 (0.380)

Ä: not applicable  
\* Accounting change solely affected extraordinary income. The 'corrected' figures are in parentheses.  
<sup>®</sup> Actually, it concerns the total number of organizations of which we have examined investment reports that dealt with the respective companies. Then, sometimes the investment reports are written by more than one investment analyst. Furthermore, in certain cases we had to examine more than one investment report in order to determine the level of fixation.

#### 5.2 Testing of Hypotheses

In this subsection we test the hypotheses as formulated in subsection 4.4. In the preceding subsection we have distinguished strongly, weakly and non-fixated investment analysts. On the basis of this distinction we calculated indices of fixation, which indicate the overall level of fixation with respect to the different accounting changes. However, in order to test the hypotheses we have put together the weakly and not fixated investment analysts. Then it is not unlikely that weakly fixated investment analysts

<sup>6</sup> See note 2.

take into consideration the effects of accounting changes on accounting numbers, although they omit in whole or in part a discussion of these effects in their investment reports. The decision of weakly fixated investment analysts not to discuss (fully) the effects of the accounting change explicitly is probably done consciously.

*Hypothesis (1):*

*The level of fixation of investment analysts does not depend on the level of information supply concerning the accounting change.*

In order to apply a  $\chi^2$ -test we have divided the accounting changes into the following two groups:

- (1) accounting changes with a high level of disclosure. The level of disclosure amounts to 0.800 or more, i.e., none or only one disclosure element was omitted;
- (2) accounting changes with a low level of disclosure. The level of disclosure amounts to less than 0.800, i.e., more than one disclosure element was omitted.

We have classified the accounting changes adopted by CCC, FFF and PPP as accounting changes with low levels of disclosure. The remaining accounting changes have high levels of disclosure.

In table 6 we find with respect to both groups the number of investment analysts who appeared to be strongly fixated and not strongly fixated.

*Table 6: Level of Disclosure and Level of Fixation*

Level of disclosure	Fixation		Row total
	Strong	Not strong	
High	25	149	174
Low	45	20	65
Column total	70	159	239

$\chi^2: 68.776; p: 0.000$

Based on the results of the  $\chi^2$ -test we can reject the hypothesis that the level of fixation does not depend on the level of information supply concerning the accounting change. Although the results might be convincing, it should be borne in mind that different types of accounting changes are involved. The type of accounting change as a possible determinant of the investment analyst's level of fixation is discussed later in this subsection (hypothesis (3)).

In order to control for the type of accounting change we have done the same test exclusively with respect to the changes in the treatment of investment grants. In this category the level of disclosure was high with respect to three accounting changes (KKK 1987, PPP, VVV 1990) and low with respect to two accounting changes (CCC, FFF). The test results confirmed the findings from above ( $\chi^2: 24.071; p: 0.000$ ). However, notwithstanding the fact that the cases in this test are all concerned with changes in the treatment of investment grants that have a material effect on net income, there are some differences left that could influence the investment analyst's level of fixation, e.g., the sense in which the treatment of investment grants changed, whether ordinary income is affected or not and the direction of

the effect on income. In order to reinforce our findings, we have drawn a comparison between the two cases which look alike most, viz., FFF and PPP. The similarities between the two cases are:

- the amortization of the investment grants in favour of the results was accelerated;
- ordinary income was affected positively;
- compared to the former financial year net income increased;
- the accounting change was adopted in 1989.

We have also taken into account the organizations the investment analysts are employed with, because this could also be an explanatory variable of their level of fixation (see later in this subsection at the discussion of hypothesis (4)). A  $\chi^2$ -test confirmed the earlier conclusion, i.e., again the hypothesis that the level of fixation does not depend on the level of disclosure can be rejected ( $\chi^2$ : 7.500; p: 0.006). Thus the different levels of fixation concerning the FFF and PPP case are most probably due to the different levels of disclosure on the accounting changes. In the FFF case net income was even affected twice as much as in the PPP case. Thus from a materiality perspective it would be expected that the difference between the two cases concerning the level of fixation would be in the opposite direction.

*Hypothesis (2):*

*The level of fixation of investment analysts does not depend on the moment the accounting change is announced for the first time.*

In order to test hypothesis (2) we distinguish the following two groups of accounting changes:

- (1) early announcements: the first announcement occurred in the course of the financial year the accounting change was made, e.g., at the release of the preliminary/final annual returns or in the annual report of the preceding financial year;
- (2) late announcements: the first announcement occurred at the release of the preliminary/final annual returns or in the annual report of the financial year the accounting change was made.

We have classified the accounting changes adopted by FFF, ZZZ, KKK (1988), BBB and GGG as early announcements and the accounting changes adopted by KKK (1987), CCC, PPP, YYY (1989), XXX, VVV (1990), PPP, LLL, UUU and KKK (1991) as late announcements.<sup>7</sup>

In table 7 we find with respect to the early as well as the late announcements the number of investment analysts who appeared to be strongly fixated and not strongly fixated.

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<sup>7</sup> We consider the accounting change adopted by UUU beginning in 1990 as a late announcement notwithstanding the fact that UUU gave full disclosure of the accounting change and its effects a year before at the release of the 1989 final annual returns and in the 1989 annual report. However, the attention paid to the accounting change in the 1990 annual report was limited.

Table 7: Moment of Announcement and Level of Fixation

Moment of announcement	Fixation		Row total
	Strong	Not strong	
Early	24	49	73
Late	46	120	166
Column total	70	169	239

$\chi^2$ : 0.653; p: 0.419

The results of the  $\chi^2$ -test show that we cannot reject the hypothesis that the level of fixation does not depend on the moment the accounting change is announced for the first time.

In order to control for the level of disclosure, which is a determinant of the level of fixation, we have done the same test excluding the accounting changes with low levels of disclosure (lower than 0.800). The test results confirmed the findings from above ( $\chi^2$ : 0.521; p: 0.470). It could be expected that the level of fixation of investment analysts with respect to early announcements would be lower than with respect to late announcements, because investment analysts are confronted with information about the accounting change at several points in time during the 'transition period' (i.e., the moment the accounting change is announced for the first time up to and including the moment of (full) disclosure in the annual report). According to the test results, however, this seems not to be the case.

*Hypothesis (3):*

*The level of fixation of investment analysts does not depend on the kind of accounting change.*

As indicated in subsection 4.1, we have divided the accounting changes among the following four categories:

- (1) changes in the treatment of investment grants;
- (2) capitalization of publishing rights;
- (3) changes from current cost to historical cost accounting;
- (4) miscellaneous accounting changes.

In order to test whether the type of accounting change is an explanatory variable of the level of fixation of investment analysts we have applied a  $\chi^2$ -test. Table 8 shows with respect to each type of accounting change the total number of investment analysts who appeared to be strongly fixated and not strongly fixated.

Table 8: Kind of Accounting Change and Level of Fixation

Kind of accounting change	Fixation		Row total
	Strong	Not strong	
Investment grants	31	49	80
Publishing rights	12	31	43
Current/historical cost	4	33	37
Miscellaneous	23	56	79
Column total	70	169	239

$\chi^2: 9.598; p: 0.022$

On the basis of the findings presented in table 8 we can reject the hypothesis that the level of fixation does not depend on the kind of accounting change. Because the level of disclosure appears to be a determinant of the level of fixation, we have also done a  $\chi^2$ -test exclusive the accounting changes with low levels of disclosure (lower than 0.800). The test results confirmed the findings from above ( $\chi^2: 11.052; p: 0.011$ ). The relatively low number of strongly fixated investment analysts with respect to the changes from current cost to historical cost accounting (10.8 per cent) might be due to the fact that investment analysts consider them as fundamental changes. The relatively high number of strongly fixated investment analysts with respect to the capitalization of publishing rights (27.9 per cent), on the other hand, might be due to the fact that these changes did not affect income numbers. In order to determine the level of fixation we have only considered investment reports that contain information about the shareholders' equity or financial position of the company. However, the investment analysts generally paid more attention to the company's income numbers. Thus the strongly fixated investment analysts possibly did not notice the accounting change, because it was actually concerned with information that they considered to be of less importance.

*Hypothesis (4):*

*The level of fixation of investment analysts does not depend on the type of organization that employs the investment analysts.*

We have examined investment reports issued by 41 banks or firms of stockbrokers and articles published in three financial magazines and one financial newspaper. However, most banks/firms of stockbrokers did not analyze all companies involved in our study. Furthermore, it appeared that although they did analyze companies involved in our study, they did not issue investment reports in the required periods or they did not have the required investment reports anymore.

Up till now we have put journalists of the financial press and their articles on a par with investment analysts employed with banks or firms of stockbrokers and their investment reports respectively. In table 9 we present separately the organizations (banks/firms of stockbrokers, financial magazines and the financial newspaper) of which we could determine the level of fixation with respect to at least half of the sixteen accounting changes. We have put together the banks and firms of

stockbrokers that did not meet this criterion. The table contains also the (aggregate) index of fixation with respect to each organization.

Table 9: Employers of the Investment Analysts and Level of Fixation <sup>6</sup>

Name of employer	Total number of cases	Fixation			Index of fixation
		Strong	Weak	No	
AA	14	4	2	8	0.357
BB	14	4	3	7	0.393
CC	13	6	3	4	0.577
DD	10	4	1	5	0.450
EE	11	2	3	6	0.318
FF	16	5	3	8	0.406
GG	15	3	3	9	0.300
HH	9	6	1	2	0.722
Other banks/firms of stockbrokers (33)	75	20	16	39	0.373
Subtotal banks/firms of stockbrokers	177	54	35	88	0.404
RR	16	4	2	10	0.313
SS	15	5	1	9	0.367
TT	15	6	2	7	0.467
UU	16	1	1	14	0.094
Subtotal financial press	62	16	6	40	0.306
Grand total	239	70	41	128	0.379

In table 9 we have made a distinction between the investment analysts employed with banks or firms of stockbrokers and the journalists of the financial press. The level of fixation of the former category appears to be 0.404 with the investment analysts of GG (0.300) and HH (0.722) at the extremes. The high level of fixation concerning HH might be a consequence of the fact that one and the same investment analyst analyzed eight of the nine companies. In none of the cases that investment analyst paid attention to the accounting changes at all. However, with respect to two accounting changes, which merely affected extraordinary income, we had to qualify him as not being fixated. Then because he considered extraordinary income in his analyses, he took into account the effects of these accounting changes implicitly.

The level of fixation of the latter category, the journalists of the financial press, amounts to 0.306. Within this category the extremely low index of fixation with respect to the journalists of UU (0.094) is notable.

In order to test the hypothesis that the level of fixation does not depend on the type of organization that employs the investment analysts (banks/firms of stockbrokers versus financial press) a  $\chi^2$ -test was

<sup>6</sup> We have disguised the names of the employers. They will be released in the Autumn of 1994 at the publication of the final results of our study.

performed. Again we have put together the weakly and not fixated investment analysts when applying the  $\chi^2$ -test. Then although weakly fixated investment analysts omit in whole or in part a discussion of the effects of accounting changes on accounting numbers, it is not unlikely that they take into account these effects.

Table 10: Category of Organizations and Level of Fixation

Category of organizations	Fixation		Row total
	Strong	Not Strong	
Banks/firms of stockbrokers	54	123	177
Financial press	16	46	62
Column total	70	169	239

$\chi^2$ : 0.490; p: 0.484

As can be read from table 10 this hypothesis cannot be rejected. As also appears from the indices of fixation in table 9 the differences between the two categories are small. However, not strongly fixated investment analysts employed with banks/firms of stockbrokers appear to be more often fixated at the weak level than not strongly fixated journalists of the financial press, 28.5 and 13 per cent respectively. Thus journalists of the financial press often discuss accounting changes more extensively than investment analysts employed with banks/firms of stockbrokers do. This could be explained by the fact that articles of the financial press are mainly directed towards private investors, whereas investment reports of banks/firms of stockbrokers are mainly directed towards professionals, such as portfolio managers. If we apply a  $\chi^2$ -test not putting together the weakly and not fixated investment analyst, as we have done in table 10, we find a p-value of 0.084 ( $\chi^2$ : 4.953).

*Central hypothesis:*

*Investment analysts do not appear to be fixated on accounting numbers. They take into consideration accounting changes with a material effect on net income or shareholders' equity. Consequently it is not plausible that accounting changes influence their judgments.*

On the basis of the four hypotheses tested before we can neither accept nor reject the central hypothesis. Then the level of disclosure is an important determinant whether investment analysts appear to be fixated or not. Furthermore, the fixation of investment analysts depends on the type of accounting change. The moment the accounting change is announced for the first time, on the other hand, does not appear to be a determinant of the fixation of investment analysts. Finally, the fixation of investment analysts employed with banks or firms of stockbrokers does not differ significantly from that of journalists of the financial press. Although the journalists of the financial press, generally, pay more attention to accounting changes than investment analysts employed with banks or firms of stockbrokers do.



## 6 Summary

In the current paper we have examined to what extent individual investment analysts appear to be fixated on accounting numbers in a real world setting. Previous studies in this research area were all put into an experimental setting. However, the high degree of internal validity, which experiments might have, is often accompanied by a low degree of external validity. Thus the conclusions drawn in an experiment are not simply generalizable beyond the experimental setting. The external validity could be enlarged by abandoning experiments and examining the real world situation instead. In our study we do that through the examination of the investment reports written by investment analysts with respect to individual companies that adopted changes in accounting principles. However, it might be difficult to isolate the effects of an accounting change on the judgments (or recommendations) of investment analysts, because these judgments (or recommendations) are determined by a range of variables. Thus compared to experiments there is an increase in realism, but a decrease in control over the study. The latter reduces the possibility of testing the influence of functional fixation on the judgments of investment analysts considerably. However, the likelihood that the judgments of investment analysts are affected might depend on their level of fixation. Furthermore, it should be noted that the level of fixation of investment analysts might influence the decisions of investors who rely on their judgments and interpretations.

In our study we have examined how investment analysts dealt with sixteen material accounting changes adopted by companies listed at the Amsterdam Stock Exchange. We distinguished two levels of fixation, viz., fixation at the strong and weak level. It appeared that the level of fixation differed among the various accounting changes. With the help of the investment reports we have examined whether the level of fixation of investment analysts could be explained by the following variables:

- (1) the level of disclosure of the accounting change;
- (2) the moment the accounting change is announced for the first time;
- (3) the kind of accounting change;
- (4) the type of organization that employs the investment analyst.

The level of disclosure and the type of accounting change appeared to be important determinants of the fixation of investment analysts. The moment the accounting change was announced for the first time, on the other hand, did not appear to be a determinant of the fixation of investment analysts. Although journalists of the financial press, generally, paid more attention to accounting changes than investment analysts employed with banks or firms of stockbrokers did, the fixation on accounting numbers did not differ significantly between the two groups. On the basis of these findings we could neither accept nor reject the central hypothesis.

## References

- Abdel-khalik, A.R., and T.F. Keller, *Earnings or Cash Flows: An Experiment on Functional Fixation and the Valuation of the Firm*, American Accounting Association, 1979.
- Ashton, R.H., Cognitive Changes Induced by Accounting Changes: Experimental Evidence on the Functional Fixation Hypothesis, *Journal of Accounting Research*, Vol. 14, Supplement, 1976, pp. 1-17.
- Barnes, P., and J. Webb, Management Information Changes and Functional Fixation: Some Experimental Evidence from the Public Sector, *Accounting, Organizations and Society*, Vol. 11, No. 1, 1986, pp. 1-18.
- Bloom, R., P.T. Elgers, and D. Murray, Functional Fixation in Product Pricing: A Comparison of Individuals and Groups, *Accounting, Organizations and Society*, Vol. 9, No. 1, 1984, pp. 1-11.
- Bosman R.G., S.L.J. Graafsma, J. Klaassen, M.P. Timmers, and G.H. Zevenboom, *Jaarboek externe verslaggeving '93/'94*, KPMG Klynveld Accountants, 1993.
- Chang, D.L., and J.G. Birnberg, Functional Fixity in Accounting Research: Perspective and New Data, *Journal of Accounting Research*, Vol. 15, Autumn 1977, pp. 300-312.
- Dyckman, T.R., R.E. Hoskin, and R.J. Swieringa, An Accounting Change and Information Processing Changes, *Accounting, Organizations and Society*, Vol. 7, No. 1, 1982, pp. 1-11.
- Feenstra, D.W., *Oordeelsvorming rond de externe berichtgeving*, Wolters-Noordhoff, Groningen, 1985.
- Ijiri, Y., R.K. Jaedicke, and K.E. Knight, The Effects of Accounting Alternatives on Management Decisions, In *Research in Accounting Measurement*, R.K. Jaedicke et al. (eds.), American Accounting Association, 1966, pp. 186-199.
- Marchant, G., Accounting Changes and Information Processing: Some Further Empirical Evidence, *Behavioral Research in Accounting*, Vol. 2, 1990, pp. 93-103.
- Raad voor de Jaarverslaggeving, *Richtlijnen voor de jaarverslaggeving/ Richtlijnen voor de jaarverslaggeving vanaf 1990*, Kluwer, Deventer, November 1993.
- Swieringa, R.J., T.R. Dyckman, and R.E. Hoskin, Empirical Evidence about the Effects of an Accounting Change on Information Processing, in T.J. Burns (ed.), *Behavioral Experiments in Accounting II*, Ohio State University, College of Administrative Science, 1979, pp. 225-259.
- Wilner, N., and J. Birnberg, Methodological Problems in Functional Fixation Research: Criticism and Suggestions, *Accounting, Organizations and Society*, 1986, pp. 71-80.

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