

MONASH UNIVERSITY



DEPARTMENT OF ACCOUNTING AND FINANCE

# The Use and Representational Faithfulness of Graphs in Australian IPO Prospectuses

by

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October 1998

**WORKING PAPER NO. 62**

**Not for quotation  
Comments welcome.**

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We acknowledge the Centre for Research in Accounting and Finance, Monash University and the Faculty of Business and Economics, Monash University for funding support. We thank the two anonymous referees, Rob Brown and workshop participants at Monash University, Clayton and AAANZ Conference 1997. We are grateful to Dean Hanlon for assistance with data collection and Dineli Mather for assistance with the design of the data base.

## 1 INTRODUCTION

This paper investigates the use of graphs, selection of variables to graph and construction of graphs in prospectuses issued by Australian companies making their initial public offering (IPO) of shares to the Australian capital market. The paper formulates and tests hypotheses concerning selectivity in the use of graphs and distortion in the construction of graphs presented in IPO prospectuses, as well as providing descriptive evidence of the extent of use of graphs, the types of graphs and the types of information graphed in prospectuses issued by companies making IPOs in Australia. As far as we are aware, this is the first study to investigate the use of graphs in prospectuses and represents a significant extension of the previous literature. Given the importance of prospectus information to IPO investors, the results of this study may have policy implications for the Australian Securities and Investments Commission (ASIC) which is charged with the regulation of prospectus disclosure in Australia.[1]

The content of communication between companies and their various stakeholders has been the subject of considerable research. (for example, Gibbins, Richardson and Waterhouse, 1990; Graves, Flesher and Jordon, 1996; Preston, Wright and Young, 1996). One branch of this literature is concerned with the communication of financial and other information via graphs. The selective inclusion of graphs and distortion in the construction of graphs have been studied extensively in the context of the use of graphs in annual reports. (in the US, Johnson, Rice and Roemmich, 1980; Steinbart, 1989; in the UK, Beattie and Jones, 1992; in Australia, Mather, Ramsay and Serry, 1996; and a six country comparative study, Beattie and Jones, 1996). In general, these studies have found evidence of significant use and “abuse” of graphs in annual reports. It has been argued that selectivity in the use of graphs and distortion in the construction of graphs could lead to

sub-optimal decisions by users of financial information (Taylor and Anderson, 1986; Beattie and Jones, 1992).

An IPO or unseasoned issue is the first issue of shares to the public by a company. IPOs differ from subsequent debt and equity issues in that there is greater uncertainty about the market clearing price of the offering and greater reliance on the prospectus for information about the firm. (Aharony, et al, 1993). Research conducted by the ASIC found that 78% of retail investors interviewed relied on the prospectus as a source of information when investing in new issues. The prospectus is thus an important communication between the company and potential investors. Despite the importance of prospectuses, the use of graphs in prospectuses has previously not been the subject of systematic study.

Managers of companies making an IPO have economic incentives to manage their earnings in order to maximise the proceeds of the share issue (Aharony, Lin and Loeb, 1993). Independent of any earnings management, managers of companies involved in making IPOs have incentives to present the underlying information in the most favourable light possible - that is, 'impression management' (Neu, 1991) is used by management to select the information to display and to present this information (for example, using graphs) in order to enhance corporate achievements. Notwithstanding the strict legislative controls over the content of prospectuses, biased selection of variables to graph (selectivity) and/or incorrect construction of graphs (distortion) may result.

The results show that graph usage in prospectuses is substantially less than that found in annual reports, but increased significantly following regulatory and institutional changes which occurred in 1991. Significant industry differences in graph usage are also observed.

Results also show that firms enjoying improving profit performance are significantly more likely to include graphs of key financial variables in their prospectuses than firms suffering deteriorating profit performance. Thus, similar to studies of graphs in annual reports, evidence of selectivity in the inclusion of graphs is found. Further analysis revealed significant industry and sub-period differences in selectivity.

No significant relationship between performance on the variable being graphed and distortion in the construction of the graph was found when all graphs were considered. When the graphs were split between those covering key financial variables and other, a significant relationship was found for both categories. However, the relationship for key financial variables was in the opposite direction to that suggested by impression management. Further analysis identified significant sub-period differences in distortion.

The remainder of the paper is structured as follows: section 2 develops the theory by considering management's incentives to disclose information in prospectuses, the regulatory and institutional framework governing such disclosure and the principles of graph construction and presentation. Section 3 reviews prior research into the presentation and construction of graphs in annual reports, leading to the specification of testable hypotheses. Section 4 outlines the data collection procedures. The results are outlined and discussed in section 5, while section 6 contains conclusions.

## **2 THEORY DEVELOPMENT**

### **2.1 Financial reporting incentives**

The financial disclosure literature emphasises the incentives that management has for 'selective financial representation' (Revsine, 1991). One strand of this literature focuses on management manipulation of the underlying accounting numbers. Earnings management (for example, Schipper, 1989; Dechow, Sloan and Sweeney, 1995) considers the issue of

whether, in certain circumstances, management uses the discretion afforded to it by the financial reporting process to 'massage' reported earnings. A possible context for earnings management is an initial public offering (IPO) of shares. Aharony, et al (1993) found no evidence of significant earnings management in their overall sample of IPOs, whereas Friedlan (1994) found significant, positive earnings management in the reporting period immediately prior to the IPO. Some studies of earnings management have tested whether the investment opportunity set facing the firm may affect management's incentives and/or ability to manage earnings (Skinner, 1993). Godfrey and Koh (1997) use the industry classification of Australian companies (broadly classified into two categories: industrial/mining) as a proxy for attributes of the firm's investment opportunity set.

Another strand of the financial disclosure literature emphasises the disclosures rather than the underlying accounting numbers. One theory of the management of corporate financial disclosure (Gibbins, et al, 1990) sees a firm's disclosure outputs (in our case, the prospectus and use of graphs in that prospectus) as a function of five variables. The first is the firm's disclosure position, which is categorised as either ritualistic (a propensity towards uncritical adherence to prescribed norms) or opportunistic (a propensity to seek firm-specific advantage in the disclosure of financial information). The second is the antecedents to the firm's disclosure position. These antecedents are classified as either internal or external. Among the external antecedents are legislation, accounting standards and regulations which apply to the firm and its disclosure outputs. Changes in the firm's regulatory and institutional environment may result in changes to the firm's disclosure outputs. Another external antecedent is industry membership which may also influence the firm's disclosure position. Gibbins et al suggest that industry norms for disclosure may affect the firm's disclosure outputs. "The effect of such norms may be indirect ... through an underwriting firm's use of the prospectus of a similar company as a model for writing

other firms' prospectuses" (Gibbins et al, 1990, p.131). This indicates that industry-based differences in disclosure outputs are likely.

The third variable is disclosure issues, which in this study is the initial public offering of shares. The prospectus captures a large part of the firm's disclosure outputs on this disclosure issue. The fourth variable is external consultants and advisers, these individuals help identify disclosure issues and related norms and opportunities. The final variable is the firm's internal structure and politics.

Impression management is a further strand of the financial disclosure literature which tries to explain managements' attempts to manage the interpretation of disclosed financial data. From this viewpoint, management uses the corporate annual report or prospectus to present a self-interested view of corporate performance. Communications between management and shareholders are designed to legitimise management's actions and convince shareholders that the company is being run competently and efficiently. As a result, management has an incentive to represent its company's performance in the best possible light, potentially resulting in biased financial reporting.

Whichever strand of this literature is considered, the conclusion is that, in the context of an IPO, management has an incentive to present the company's performance in the best possible light. A countervailing force, controlling or limiting management's actions, is the regulatory and institutional requirements governing prospectuses.

## **2.2 Regulatory requirements for IPOs**

In Australia, equity raisings from the public are regulated by the provisions of the Corporations Law, ASIC requirements and Australian Stock Exchange Ltd (ASX) listing requirements. The aim of these requirements is to ensure the disclosure of relevant

information by the issuing company so that investors can make informed investment decisions.

Until 1990, the legislation regulating the form and content of prospectuses in Australia had sought to establish minimum levels of disclosure of information likely to be of interest to investors. The Companies Act 1981 and the earlier Companies Act 1961 prescribed in detail information to be included in the prospectus. Institutional arrangements at this time focused on 'pre-vetting' of prospectuses by ASIC officials, whereby the contents of all prospectuses had to be reviewed and approved prior to being issued.

Following the collapse of a number of high profile companies in the late 1980's, a different approach to the regulation of prospectuses was taken by the revisions to the Corporations Law effective in 1991. Rather than a detailed list of specific inclusions, Section 1022(1) requires that prospectuses contain "all such information as investors and their professional advisers would reasonably require, and reasonably expect to find in the prospectus, for the purpose of making an informed assessment of

- (a) the assets and liabilities, financial position, profits and losses, and prospects of the corporation; and
- (b) the rights attaching to the securities".

This approach relies on what a reasonably informed investor would expect to find in a prospectus. The philosophy underlying this provision is that the adequacy of prospectus disclosure is regulated by the market. Capital market forces exert pressure on firms engaged in capital raising to voluntarily disclose the optimal amount of information.

While there are no specific legislative requirements relating to graphs or charts in prospectuses, the legislation imposes heavy penalties on companies, managers, underwriters and advisers for the inclusion of false or misleading information in prospectuses and for misleading or deceptive conduct in dealing with securities. The 1991 revisions to the Corporations Law also introduced a 'due diligence' defence against liability. Parties who could show that they had taken reasonable precautions and exercised due diligence to ensure that the prospectus was true and not misleading would be defended from actions for damages arising under the prospectus provisions of the Corporations Law. Institutional arrangements also changed with prospectuses no longer being subject to the 'pre-vetting' process. According to several advisers, there was a radical change in approach to prospectuses by managers and their advisers. Prior to 1991, preparation of a prospectus focused on satisfying a detailed list of requirements and of gaining the approval of ASIC officials. After 1991, managers and their advisers had to determine the information to be disclosed. Managers and advisers were extremely concerned about the heavy penalties imposed if the contents of the prospectus were deemed to be false or misleading.[2]

The legislative and institutional changes appear to have encouraged a more flexible approach to the selection and presentation of information in prospectuses, while the due diligence defence increased the likelihood that the parties involved in preparing the prospectus would exercise greater care and give closer scrutiny to all aspects of the prospectus. Following Gibbins et al (1990), changes in these external antecedents and changes in the attitudes of external consultants and advisers are likely to result in changes in disclosure outputs (prospectuses).

The complex legislative requirements governing prospectuses virtually ensure that prospectuses are long and complex documents. Market research conducted by ASIC cites

length and complexity of language as the two main reasons for retail investors not reading prospectuses (ASC, 1994, p.12). These are precisely the reasons for using graphs. Graphs can present data in a more efficient and effective manner. But effective communication via graphs relies on them being constructed properly.

### **2.3 Principles of graphic construction and presentation**

The graphics literature has provided a number of descriptively derived principles of graph construction and presentation. One such exposition is that of Tufte (1983). Tufte (p.57) states that graphic integrity and hence fair presentation of data in graphs would follow if six principles were employed. Tufte's first principle is as follows:

The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numeric quantities represented (p.77).

This principle was operationalised by Tufte (1983, p.57) with a measure called the 'lie factor'. This was amended slightly in an accounting setting (Taylor and Anderson, 1986, p.135 and Steinbart, 1989, p.61) to produce the graph discrepancy index which is calculated as follows:

$$\text{graph discrepancy index} = 100 * [(a/b)-1] \quad (1)$$

where

a = percentage change depicted in graph

b = percentage change in data

This graph discrepancy index (GDI) is employed in this study.

A GDI of zero per cent indicates that the graph has been properly constructed. Factors which may cause the GDI to deviate from zero include non-zero vertical axis, (Sugden, 1989, p.101), non-arithmetic scales (Johnson, Rice and Roemmich, 1980) and incorrectly scaled vertical axis, in which the distance shown on the graph is not proportional to the numbers (Leach, 1988, p.93). Tufte (1983, p.57) argued that GDI values greater than +5% or less than -5% indicate that the graph is distorted.

Tufte's first principle was relied on because this study focuses on investment decisions in which the assessment of rates of growth is most important. The GDI is an operational measure of the extent to which growth in time-series data is distorted and is therefore appropriate for this purpose.[3] In addition, graphs in prospectuses are primarily used to present data. It is argued that, in these circumstances, the existence of measurement distortion is of prime importance (Beattie and Jones, 1992, p.293).

Factors other than distortion may cause misperception of graphs. The Canadian Institute of Chartered Accountants (CICA, 1993) identified fifty three aspects of graphs which, if not correctly constructed, could be misleading. However, many of these factors are not precisely specified and are difficult, if not impossible to measure. It is for these reasons that prior academic accounting research into graph construction has relied on the GDI (Steinbart, 1989; Beattie and Jones, 1992; Mather et al, 1996).

### **3 PRIOR RESEARCH AND HYPOTHESIS DEVELOPMENT**

Prior empirical research has considered the presentation of graphs in annual reports. This research has focused on two main issues : selectivity in the choice of variables graphed and distortion in graphs presented. Each of these issues is outlined below.

#### **3.1 Selectivity**

Selectivity refers to the use of graphs and the choice of variables graphed. In particular, selectivity is concerned with whether the decision to include a graph (or variable) is related to the company's performance. Steinbart (1989) found that US companies were more likely to include graphs of key variables when profit had increased. Beattie and Jones (1992) found that graphs of key financial variables (sales, profit, earnings per share, dividends per share) were significantly more likely to be included in the annual reports of UK companies with 'good', rather than 'bad' performance. Mather, et al, (1996) found evidence of selectivity in presentation of graphs in annual reports of Australian companies, but only for smaller companies in their sample. As selectivity relates the presence of graphs to the company's financial performance, only graphs of the company's financial performance (key financial variables) were studied in assessing selectivity. This is consistent with prior research.

#### **3.2 Distortion**

Distortion in graphs is concerned with whether the portrayed magnitude matches the numerical magnitude and is measured by the GDI. In the US, Steinbart (1989) investigated distortion in graphs of key financial variables (identified as sales, profits and dividends) of 319 companies from the Fortune 500. Steinbart found that "on average, graphs of the three variables exaggerated the magnitude of change by about 11%" (p.63). An absolute distortion of more than 10% was found in approximately 26% of the graphs of key financial variables in the sample, with overstatement and understatement being equally prevalent.

In the UK, Beattie and Jones (1992), found that 30% of graphs of key financial variables (which included EPS as well as the three variables used by Steinbart) were distorted by more than 5%, (mean distortion +10.7% GDI), with exaggeration (22%) being more prevalent than understatement (8%). Beattie and Jones also found that favourable distortion (overstatement of a positive trend or understatement of a negative trend) was significantly more likely than unfavourable distortion (understatement of a positive trend or overstatement of a negative trend).

In Australia, Mather et al (1996) using a 5% cut-off found 29.7% of graphs of key financial variables to be distorted, (mean distortion +16.4% GDI) with exaggeration being very slightly more prevalent than understatement. Mather et al also found that favourable distortion was significantly more likely than unfavourable distortion.

Annual reports communicate the financial performance of the firm in the preceding financial reporting period. Prospectuses have a much broader focus. They communicate information about a firm's past financial performance (if it has any), expected future financial performance and any factors (for example, market share, market growth, prices and costs) that are likely to impinge on these. Because of the broader focus of prospectuses, limiting the measurement of distortion to graphs of key financial variables seemed too narrow. Thus, in an extension of the prior literature, measurement of distortion was extended to a sample of all graphs.

### 3.3 Hypotheses

From the theory developed in section 2 and the prior empirical research outlined above, the following hypotheses are developed. Due to the exploratory nature of research into graphs in prospectuses, all hypotheses are stated in the null form.

#### **H<sub>1</sub> : Selectivity**

*There is no association between the presence of graphs of key financial variables in the prospectuses of companies in the sample and the profitability of those companies.*

#### **H<sub>2</sub> : Distortion**

*There is no association between the effect of graphical distortion (favourable/unfavourable) in the graphs presented in the prospectuses of companies in the sample and the performance portrayed in those graphs.*

Using the framework developed by Gibbins et al (1990), it is proposed that analysis of results for the above hypotheses should also consider:

- a Sub-period analysis: changes in the antecedents to the firm's disclosure position, including the regulatory environment and institutional arrangements for registering prospectuses, suggest that there might be differences in disclosure outputs between the pre-1991 and post-1991 periods.
- b Industry analysis : industry disclosure norms and differences in the level of assets in place suggest differences in disclosure outputs between companies classified as industrial and companies classified as mining and oil.[4]

## **4 DATA COLLECTION AND SAMPLE**

### **4.1 Sample**

The sample consists of 484 Australian IPO prospectuses, issued before 31 December 1993. 323 prospectuses were issued under the prospectus requirements of the Companies Act 1981 (prior to 1991) and 161 prospectuses were issued under the Corporations Law (after 1991). The prospectuses were obtained from Corporate Adviser and the libraries of Australian stockbroking firms including ANZ McCaughan, Potter Warburg and JB Were. As per Mustow (1994), the sample includes IPOs that are defined as new public companies or private companies going public.[5] The sample was not randomly selected, but it is extensive and represents a large proportion of the population of IPOs in Australia during the sample period.

### **4.2 Data collection and variables**

For all prospectuses in the sample, data were collected on the name of the company, the year the prospectus was issued, and whether it contained graphs. All prospectuses were checked for any time-series financial information (either historical or prospective) which could have been graphed. Three years of data was considered to be the minimum capable of being sensibly graphed. If such information were found, the trend (increasing/decreasing) portrayed in the information was recorded. Using the *Stock Exchange Journal* or *Personal Investor*, the industry classification (industrial = 0, mining = 1) of the company issuing the prospectus was determined.

For those prospectuses containing graphs, further data were collected on the amount of the share issue, the name of the principal underwriter(s), the number of graphs, the type of each graph (classified into bar, line, pie and other) and the name of each variable on each graph. For all graphs of key financial variables (1. TURNOVER, 2. PROFIT, 3. EARNINGS PER SHARE (EPS) or 4. DIVIDENDS), the graph discrepancy index (GDI) relevant to that

variable was calculated and recorded.[6] The trend of performance of this variable over the period of the graph was recorded as either increasing or decreasing. For graphs of other than key financial variables, the variables included were classified (ex post) into : 5. MARKET (information about the size, growth or composition of the market in which the company operates); 6. PRICES/VALUES (information about current or anticipated prices or values for the company or the market, for example, share price indices); 7. COSTS (information about current or anticipated costs for the company or industry); 8. ASSETS/FUNDS (information about the size, composition or growth of assets or funds under the company's control) 9. PRODUCTION (information about the company's past, present or future production); 10. OTHER (examples include information about the number of employees or technical comparisons of the company's product compared to that of its competitors).

Prior research has measured distortion in graphs of key financial variables only. An objective of this study is to measure distortion in graphs other than those of key financial variables. However, to limit the time and cost involved, a maximum of three (3) graphs from these categories per prospectus were selected and the GDI calculated. If more than three such graphs existed, then the first three graphs in the prospectus were chosen.

## 5 RESULTS

### 5.1 Descriptive results

**Table 1 : Graph usage in prospectuses classified by time and industry**

Regulatory environment	Industry classification			
	Industrial		Mining	
	Graphs	No Graphs	Graphs	No Graphs
Pre-31 December 1990 (n = 323)	51	171	0	101
Post-1 January 1991 (n = 161)	80	40	6	35
Grand totals (n = 484)	131	211	6	136
	342		142	

Table 1 shows the breakdown of the sample of IPO prospectuses classified by industry (industrial/mining), regulatory environment (pre/post 1991) and whether graphs were included in the prospectus. Graph usage in prospectuses is much lower than that found in annual reports. Overall, 28.3% of prospectuses sampled included graphs, which compares to 83% of the top 150 Australian companies that included graphs in their annual reports, (Mather et al, 1996, p.59).

The industry breakdown, however, shows that 38.3% of all industrial company prospectuses included graphs, whereas only 4.2% of mining company prospectuses included graphs. The use of graphs in prospectuses of industrial companies was significantly higher than that of mining companies at the .0000 significance level, using a chi-square test ( $\chi^2 = 57.68$ ). The percentage of prospectuses including graphs increased substantially to 53.4% after 1 January 1991, compared to 15.8% prior to 31 December 1990. This difference is again significant at the .0000 level using a chi-square test ( $\chi^2 = 74.96$ ). Dividing the pre-1991 period into two sub-periods (up to 1986, and 1986-1990) showed 15.9% of prospectuses contained graphs in the earlier sub-period, compared to 15.7% in the latter sub-period.[7] This indicates a sudden, rather than a gradual, increase in

graph usage which occurred following the revisions to the legislative requirements governing prospectuses. Discussions with advisers involved in the preparation of prospectuses indicate that regulatory changes in 1991, together with changes in institutional arrangements for registering prospectuses were major factors affecting the selection and presentation of information included in prospectuses. More specifically, the move away from specific disclosure requirements and pre-vetting encouraged greater innovation, such as the use of graphs as a means of communication.

The increased usage of graphs in prospectuses after January, 1991 could not be attributed to a change in the industry composition of IPOs over time. A chi-square test of association between industry and year showed that they were not significantly associated ( $\chi^2 = 1.746$ ,  $p = 0.19$ ). Use of graphs in prospectuses of industrial companies increased from 23.0% prior to 1 January, 1991 to 66.7% after that date. For mining companies, the increase is from 0% prior to 1 January, 1991 to 14.6% after that date.

Other factors that may be associated with the increased usage of graphs in the post 1 January 1991 period include the rationalisation of the Australian underwriting and share broking industry in the late 1980s and early 1990s and the amount of the issue. Proportionally more prospectuses containing graphs were issued by major underwriters in the post-1 January 1991 period.[8] For prospectuses including graphs, the average amount of IPOs was \$48.1m (median \$12m) and the standard deviation \$99.8m. The minimum issue amount was \$0.7m and the maximum was \$600m. While the average size of issue was larger for industrial companies than mining companies and for post-1991 prospectuses compared to pre-1991 prospectuses, none of the differences were statistically significant.

For those entities that include graphs in prospectuses, an average of 4.25 graphs were included (for all prospectuses the average is 1.2 graphs). This compares to an average of

8.92 graphs included in the annual reports of top 150 companies surveyed by Mather et al (1996). In prospectuses, as for annual reports, the most frequently employed graphs are bar or column graphs (58.8%), with line and pie graphs constituting 19.4% and 21.3% respectively. The figures are similar to those found by Mather et al (1996) for graphs in annual reports of listed companies.

**Table 2 : Variables graphed in prospectuses[9]**

<b>Variable</b>	<b>Number</b>	<b>%</b>
1 TURNOVER	160	18.0
2 PROFIT	90	10.1
3 EARNINGS PER SHARE	3	0.3
4 DIVIDENDS	3	0.3
(TOTAL : KEY FINANCIAL VARIABLES)	256	28.7
5 MARKET	399	44.8
6 PRICE/VALUES	77	8.7
7 COSTS	37	4.2
8 ASSETS/FUNDS	55	6.2
9 PRODUCTION	24	2.7
10 OTHER	42	4.7
(TOTAL : OTHER VARIABLES)	634	71.3
GRAND TOTAL	890	100.0

Table 2 shows that the most frequently graphed variables in prospectuses were information about the company's markets. Graphs of the total size of the company's market or the company's market share (for example, TV ratings or newspaper circulation) make up 44.8% of the variables graphed. Key financial variables, turnover (18.0%) and profit (10.1%) were the next most common variables graphed. However, compared to annual reports, graphs of turnover are more common than graphs of profit.

The composition of variables graphed in prospectuses is very similar to that found in annual reports. Steinbart (1989, p.65) found that 72.5% of all variables graphed in US annual reports were variables other than key financial variables. Beattie and Jones (1992, p.297) reported 69.3% for graphs in UK annual reports on the same issue.

## **5.2 Hypotheses testing**

### *Selectivity*

**H<sub>1</sub>** : *Selectivity* is concerned with whether the inclusion of graphs and the choice of variables graphed is related to company performance. Company performance is treated as a classificatory variable. It is classified as either good (an increasing trend in profit either before or after tax over the period of the data) or bad (a decreasing trend in profit either before or after tax over the period of the data). Consistent with prior studies, H<sub>1</sub> is tested using the chi-square test.

Many company prospectuses did not disclose performance data. In section 5.1, it was noted that mining companies are significantly less likely to include graphs in prospectuses than industrial companies. Part of the explanation for this is that mining companies are significantly ( $\chi^2 = 81.87$   $p=.0000$ ) less likely to have key financial information to graph. Many of the mining company IPOs are exploration companies. These are high risk and their ability to raise equity is unrelated to their prior financial history (79% of mining companies had no prior financial history, compared to 33% for industrial companies). Companies with no financial history were, therefore, excluded from this test.

<b>Table 3 Selectivity</b> <b>Chi-square tests of the relationship between the presence of graphs of key financial variables in the prospectuses of companies and the profitability of those companies</b>	
<b>Panel A</b>	
Total sample n = 253 <span style="float: right;"><math>\chi^2 = 7.536^{***}</math></span>	
<b>Panel B</b>	
Sample : Pre-1991 n = 163 $\chi^2 = 6.42^{**}$	Sample: Post-1991 n = 90 $\chi^2 = 0.85$
<b>Panel C</b>	
Sample : Industrial Companies n = 224 $\chi^2 = 4.44^{**}$	Sample : Mining Companies n = 29 $\chi^2 = \text{see note below}$
<p>** = significant at 5% level, two tailed  *** = significant at 1% level, two tailed</p> <p>Note: no mining companies presented any graphs of key financial variables, hence no chi-squared test was possible for mining companies.</p>	

Panel A of table 3 shows that for the overall sample, inclusion of graphs of any key financial variable is significantly more likely when the company's profit trend is positive.[10] Thus  $H_1$  can be rejected.

Panel B of table 3 shows whether changes in the regulatory environment affect selectivity. In the pre-1991 period, IPO firms with a positive profit trend are significantly more likely to include graphs of any key financial variable in their prospectuses. Thus  $H_1$  can be rejected for this sub-period. Analysis of prospectuses in the post-1991 period finds no significant relationship between profit trend and the inclusion of graphs of any key financial variables.

Panel C of table 3 shows whether the companies' industry classification affects selectivity. For companies classified as industrial, a significant relationship between the profit trend and inclusion of graphs of key financial variables exists. Thus  $H_1$  can be rejected for this industry category. Of the 29 mining companies whose prospectuses included key financial information capable of being graphed, not one chose to do so. Hence no test of  $H_1$  was

possible for mining companies. For mining companies, the industry norm is clearly not to focus on disclosure of key financial information.

### *Distortion*

Distortion is concerned with the extent to which the graphs in prospectuses faithfully represent the underlying data. In operationalising H<sub>2</sub>, the GDI was used to measure distortion. Values of GDI above +5% are classed as exaggeration and values below -5% are classed as understatement. This follows Tufte (1983) and is consistent with Beattie and Jones (1992).

Descriptive results on measurement of distortion are presented in Table 4. The major conclusion from Table 4 is that taken over all graphs presented in prospectuses, there is a considerable degree of distortion (mean GDI = +55.5%). Distortion is far lower when only key financial variables are considered (mean GDI value -2.0%).

The mean GDI for graphs of key financial variables in prospectuses of -2.0% can be contrasted to that found in graphs of key financial variables in annual reports in the US of +11%, (Steinbart, 1989), in the UK of +10.7% (Beattie and Jones, 1992) and in Australia of +16.4% (Mather et al, 1996).[11]

**Table 4 Distortion of graphs in prospectuses**

Variables	Mean GDI	Proportion (number) of distorted graphs	
		5% cut-off	
		Positive	Negative
1 TURNOVER	1.8%	17.5%(14)	28.8%(23)
2 PROFIT	-8.6%	11.1%(5)	42.2%(19)
3 EPS	-1.4%	-	-
4 DIVIDENDS	-4.1%	-	50%(1)
TOTAL : KEY	-2.0%	14.6%(19)	33.1%(43)
5 MARKET	76.4%	37.6%(47)	28.8%(36)
6 PRICES/VALUES	264.4%	46.4%(13)	17.9%(5)
7 COSTS	1.7%	16.7%(1)	16.7%(1)
8 ASSETS/FUNDS	41.5%	28.6%(6)	33.3%(7)
9 PRODUCTS	1.4%	14.3%(1)	14.3%(1)
10 OTHER	38.4%	7.7%(1)	53.8%(7)
TOTAL : OTHER	86.4%	34.5%(69)	28.5%(57)
GRAND TOTAL	55.5%	26.7%(88)	30.3%(100)

However, the frequency of distorted graphs of key financial variables is higher than that found in annual reports. Mather et al (1996, p.60) found 29.7% of graphs of key financial variables in annual reports of Australian companies to be distorted. Table 4 shows that the percentage for graphs of key financial variables in Australian prospectuses is 47.7%. In prospectuses, graphs of key financial variables are more likely to be understated 33.1% than overstated 14.6%. This is in contrast to findings in relation to graphs in Australian annual reports, where overstatement was slightly more common than understatement.[12]

This paper is the first to measure distortion in graphs of variables other than key financial variables. Distortion is measured for a sample of these graphs (200 of 634), the results show the mean level of distortion for these graphs is +86.4% with 63.0% distorted at the 5% level. These results indicate that more graphs of these variables are distorted than are graphs of key financial variables, and the extent of distortion is larger and more likely to be positive. Overall, exaggeration occurs 34.5% of the time compared to 28.5% for understatement. The mean distortion was greatest for the PRICES/VALUES category with several graphs showing very large, positive GDI figures.[13]

Analysis revealed no significant differences in mean GDI values or proportions of distorted graphs between the pre-1991 and post-1991 sub-periods and these results are not reported here. Analysis of distortion based on industry classification was also not informative as no mining company prospectuses contained graphs of key financial variables and only six had graphs of other variables.

### **H<sub>2</sub> : Distortion**

H<sub>2</sub> is concerned with whether distortion of graphs is related to performance. To test H<sub>2</sub>, the distortion measured in the graph (exaggeration/understatement) must be linked to the performance being graphed. The effect of graphical distortion is described as favourable if an improving performance is exaggerated **or** if a declining performance is understated. The effect is classed as unfavourable in opposite circumstances. Consistent with prior studies, the results for H<sub>2</sub> are tested using the binomial test. Results are shown in table 5.

<b>Table 5 Distortion</b> <b>Binomial tests of the relationship between graph distortion and performance measured as the trend on the variable being graphed</b>			
<b>Panel A</b>			
<b>Total Sample</b>			
total number (n) of distorted ( $\pm 5\%$ GDI) graphs in sample = 183			
number favourably distorted (T) = 94			
p = .89			
<b>Panel B</b>		<b>Sample : Other variables</b>	
<b>Sample : Key financial variables</b>		number of distorted graphs (n) = 125	
number of distorted graphs (n) = 58		number favourably distorted (T) = 72	
number favourably distorted (T) = 18		p = .075*	
p = .01***			
<b>Panel C</b>			
<b>Sample : Key</b>	<b>Sample Key</b>	<b>Sample : Other</b>	<b>Sample : Other</b>
<b>Pre-91</b>	<b>Post-91</b>	<b>Pre-91</b>	<b>Post-91</b>
n = 19	n = 39	n = 37	n = 88
T = 6	T = 12	T = 25	T = 47
p = .17	p = .025**	p = .02**	p = .45
* = significant at 10% level, two tailed			
** = significant at 5% level, two tailed			
*** = significant at 1% level two tailed			

As table 5 shows, 183 graphs in prospectuses were classified as favourably or unfavourably distorted using Tufte's  $\pm 5\%$  cut-off.[14] Considering the sample as a whole, favourable distortion is shown to be as likely as unfavourable (Panel A). Thus  $H_2$  cannot be rejected.

In order to allow comparison with prior research which had measured GDIs only for key financial variables, results were subdivided into distortion on key financial variables and other variables. Panel B shows that, for graphs of key financial variables,  $H_2$  can be rejected. Unfavourable distortion is significantly more likely than favourable distortion (1% level). This contrasts with the results of prior research into distortion of graphs of key

financial variables in annual reports. For example, Beattie and Jones (1992, p.298) found that favourable distortion is significantly more likely than unfavourable. An explanation for significant, unfavourable distortion of graphs of key financial variables is not readily apparent.

Panel B also shows that, in relation to graphs of other variables,  $H_2$  can be rejected. Favourable distortion is significantly more likely than unfavourable (10% level). Evidence of favourable distortion could be considered to support Gibbins et al (1990). Firms favourably distorting graphs in prospectuses could be demonstrating an opportunistic disclosure position. Management may be attempting to gain firm-specific advantage from the methods of presenting the data in the prospectuses. Such evidence would also be consistent with the impression management literature.

Results were analysed by key financial/other variables and sub-period (Panel C). For other variables,  $H_2$  is rejected as favourable distortion is significant at the 5% level in the pre-1991 sub-period. The insignificant result in the post-1991 sub-period is consistent with the view that regulatory and institutional changes and the ensuing increase in risks to the preparers resulted in greater care in the preparation of prospectuses. For key financial variables,  $H_2$  can be rejected only for the post-1991 sub-period. Significant unfavourable distortion is found. An explanation for this is not readily apparent. Separate analysis of results for mining and industrial companies was not possible due to the very small number of mining companies including graphs in their prospectuses.

## **6 CONCLUSIONS**

Results show significant selectivity ( $H_1$  is rejected) overall and for the pre-1991 sub-period, but not for the post-1991 sub-period. These results are consistent with the view that the regulatory and institutional changes outlined reduced the extent of bias in selection of

variables to graph in IPO prospectuses in the post-1991 period. While industrial companies exhibited significant selectivity, no analysis was possible for mining companies as no mining company chose to include graphs of key financial variables in its prospectus. These results are consistent with differing industry norms for disclosure between industrial and mining companies (Gibbins et al, 1990). Mining companies typically have little or no financial history and their ability to raise equity is not dependent on having a successful trading history.

Analysis of results on all graphs for which distortion was measured found no significant relationship between performance and distortion in the graphs ( $H_2$  could not be rejected). However, when the graphs were split between key financial variables and other,  $H_2$  was rejected. For graphs of other variables, overall and in the pre-1991 sub-period a significant positive association between performance and distortion was found. The insignificant result for the post-1991 sub-period is consistent with the view that regulatory and institutional changes affected disclosure outputs (graphs in IPO prospectuses) in the post-1991 sub-period. For graphs of key financial variables, overall and in the post-1991 sub-period, significant unfavourable distortion was found that is, graphs of key financial variables in prospectuses tend to understate favourable trends or overstate unfavourable ones. This appears inconsistent with the theory developed earlier.

The paper is the first to research the use and presentation of graphs in IPO prospectuses. Further research is needed into issues such as defining the trend of firm performance in the presence of both historical and projected financial information, the GDI used to measure distortion, industry classifications and industry norms for disclosure and the role of external consultants and advisers.

- [1] Until 1997, this body was known as the Australian Securities Commission (ASC). The acronym ASIC will be used throughout this paper.
- [2] The authors had discussions with several partners of a Big-Six Accounting firm involved in prospectus preparation during the period. In the words of one adviser "Thanks to the legal profession, directors were paranoid about potential liability".
- [3] Tufte's other five principles are as follows:
- 2 Clear, detailed, and thorough labeling should be used to defeat graphical distortion and ambiguity. Write out explanations of the data on the graphic itself. Label important events in the data.
  - 3 Show data variation, not design variation.
  - 4 In time-series displays of money, deflated and standardised units of monetary measurement are nearly always better than nominal units.
  - 5 The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data.
  - 6 Graphics must not quote data out of context.
- Tufte operationalised his first principle using the 'lie factor, (GDI). For Tufte's other principles, no operational basis of measurement was proposed nor has any been developed in the subsequent literature.
- [4] The ASX divides Australian listed companies into two broad categories : Industrial and Mining and Oil. The Mining and Oil category includes explorers and producers but many of the prospectuses for companies in this sector are for exploration companies. These companies typically have little or no financial history and their ability to raise equity is not dependent on having a successful trading history. The industrial/mining and oil dichotomy has been used in Australian studies on earnings management, for example, Godfrey and Koh, 1997.
- [5] Relisting or refloats, companies which were listed once but went private then floated again, were excluded. Companies listing via the issue of an Information Memorandum were removed as no shares are issued. Explanatory memorandums, debt issues, issues of convertible notes, transfers to the main board from the second board, listings as a result of capital reconstructions and seasoned issues were also excluded. Further, like How and Low (1993) the issues of the following were excluded; (1) those issues which are not independent of other listed and/or foreign companies (2) companies listed/registered on a foreign stock exchange before being admitted to the ASX official list, and (3) companies formed through a scheme of arrangement.
- [6] The GDI was not calculated for pie graphs which are not useful for portraying time-series data.
- [7] Of the sample of 484 prospectuses, 107 were issued before 31 December 1985, 216 were issued between 1 January 1986 and 31 December 1990, and 161 were issued between 1 January 1991 and 31 December, 1993.
- [8] In the post-1 January 1991 period, thirteen major underwriters were involved in 70% of the prospectuses using graphs. However, in the pre-1 January 1991 period these thirteen (or their predecessors) were involved in only 47% of the prospectuses using graphs.
- [9] On average  $\frac{890}{582} = 1.53$  variables were included in each graph.
- [10] Similar tests but based on the trend in turnover as the measure of performance were not possible as virtually all companies' prospectuses which disclosed turnover data showed a positive trend on turnover. This is consistent with IPO firms going through rapid growth. (Aharony, et al,1993). Very few prospectuses provided information on earnings per share (EPS) or dividends per share (EPS), therefore these performance measures were not considered.

[11] Comparison of mean GDI values allows comparison with the results of prior research, but mean GDI is not conceptually valid as an overall measure of distortion as, in calculating the mean GDI, negative and positive values of GDI are offset. The authors are in the process of developing a mean absolute log GDI which overcomes this problem with the GDI.

[12] Steinbart (1989) proposed and used a 10% cut-off for measuring distorted graphs. Based on this cut-off, Steinbart found 26% of graphs of key financial variables in US annual reports to be distorted. Using a 10% cut-off, 29.2% of graphs of key financial variables in Australian prospectuses are distorted.

[13] The GDI has an arithmetic scale ranging from -100 to  $+\infty$ . The asymmetric scale is likely to bias the mean GDI in the presence of outliers (large, positive values). The mean absolute log GDI, referred to in endnote 10, overcomes this problem. It is the subject of separate research.

[14] Discrepancies between the total in table 5 (183) the total in table 4 (188) arose because for some graphs where distortion was measured, no trend was recorded, hence it was not possible to determine whether the distortion was favourable or unfavourable.

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