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Editorial: Special Issue on Financial Planning

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Abstract

The special edition presents current research in the area of financial planning. With the continual upheaval in global financial markets (including Australia), the general trend towards self-funded retirement and less reliance on the state, financial crises and the continual regulatory changes in the financial markets, this issue is timely and topical. This is the third special edition on financial planning, providing an excellent outlet for quality research in financial planning.

Keywords

Editorial, Financial Planning



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JEL Classifications: D14

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Editorial

The special edition presents current research in the area of financial planning. With the continual upheaval in global financial markets (including Australia), the general trend towards self-funded retirement and less reliance on the state, financial crises and the continual regulatory changes in the financial markets, this issue is timely and topical. This is the third special edition on financial planning, providing an excellent outlet for quality research in financial planning.

Financial planning is emerging as a discipline and profession in its own right. It still may take some time for financial planning to emerge as a profession and be recognised as a standalone discipline, but the journey has begun. Within the higher education sector we see more universities offering specialised courses and/or degree programs catering to the professional needs of the market. Industry bodies such as Financial Planning Association are actively engaging with the higher education sector to enhance and develop curriculum that will support the developing profession. This issue of the journal presents leading research in financial planning and wealth management.

The lead paper in this special edition (Samkin, Low & Taylor 2012) deals with the issue of financial literacy and how best the financial literacy element can be incorporated within the secondary school curriculum. The findings suggest that financial literacy can be best included within accounting courses. Using a sample of secondary schools in New Zealand results indicate that the most appropriate place for inclusion of financial literacy is in accounting courses.

The second paper, Knutsen and Cameron 2012, is an exploratory study that looks at the financial coaching advice model and provides valuable future research directions within the financial planning arena. Continuing with the theme of behavioural aspects of financial planning the third paper (Irving 2012) provides insight into the psychological benefits of comprehensive financial planning. Findings of this in-depth study suggest benefits of appropriate financial planning are not only limited to the financial wellbeing for individuals but extend to overall wellbeing of individuals.

The fourth paper, (MacDonald, Bianchi & Drew 2012) presents evidence on the sufficiency of the retirement support provided by the KiwiSaver in New Zealand. This study suggests that in most scenarios tested KiwiSaver will not be able to achieve the target retirement savings for individuals. The fifth paper (Brimble, Cameron, Freudenberg, Fraser & MacDonald 2012) examines the benefits that accrue to the students, industry and the university is derived from collaboration between universities with the industry in the development and delivery of financial planning education. The study finds that students, universities and industry may be better served by such collaboration.

The last paper of the issue (Sappey, Hicks, Basu, Keogh, & Gupta 2012) deals with the issue of succession planning within the farming sector in Australia. Farming is one of the most important business sectors and is primarily dominated by family business and the succession planning is an under-developed issue within the farming industry in Australia. This paper evidences the expanding nature of financial planning research.

Overall, the diversity and quality of financial planning is evident in the papers and are confident that you will find these papers interesting and will add to your understanding of some of the issues within the financial planning area. We commend you this special issue of the Australasian

Accounting Business and Finance Journal and would like to thank all of the contributors, reviewers, and the editor of the journal (Dr Ciorstan Smark) for their efforts in making the special issue possible.

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The Road Less Travelled: An Overview and Example of Constructivist Research in Accounting

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Abstract

This article provides a discussion of the nature of constructivism as a research paradigm within the context of accounting and presents a detailed example of a research study to demonstrate the application of this paradigm. The commentary features a particular emphasis on how the practicalities involved in designing and conducting the research meshed with the philosophy of the research paradigm. The illustrative research project concerns an investigation of organisational justice in the context of fairness in the workplace in public accounting firms. Semi-structured interviews were used to collect data, and textual transcriptions were interpreted using thematic methods and discourse analysis. The aim of the discussion and exemplar is to render constructivist approaches to research in accounting more accessible and apprehensible for researchers unfamiliar with, or new to, this field of qualitative inquiry.

Keywords

Constructivism, Social constructionism, Qualitative research, Accountants, Organisational justice, Fairness, Interviewing elites, Demographic data



The Road Less Travelled: An Overview and Example of Constructivist Research in Accounting

Charmayne Highfield*¹ & Jayne E. Bisman¹

Abstract

This article provides a discussion of the nature of constructivism as a research paradigm within the context of accounting and presents a detailed example of a research study to demonstrate the application of this paradigm. The commentary features a particular emphasis on how the practicalities involved in designing and conducting the research meshed with the philosophy of the research paradigm. The illustrative research project concerns an investigation of organisational justice in the context of fairness in the workplace in public accounting firms. Semi-structured interviews were used to collect data, and textual transcriptions were interpreted using thematic methods and discourse analysis. The aim of the discussion and exemplar is to render constructivist approaches to research in accounting more accessible and apprehensible for researchers unfamiliar with, or new to, this field of qualitative inquiry.

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JEL Classification: M40.

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Introduction

During the 1980s and early 1990s, accounting researchers in a range of sub-fields within the discipline questioned, debated, and proposed alternative world views, methodologies, and ideas for exploring and understanding accounting information and those who prepare it (see Tomkins & Groves 1983). Hopwood (1983), for example, called for studies to examine accounting in the contexts in which it operates, promoting case and field studies in organisations (also see Chapman, Cooper & Miller 2009). Chua (1986) put forward ideas about more radical and critical means and theoretical frames by which to study accounting, and discussion of “new” accounting histories based on sociological and interpretive approaches also began to emerge (see Miller, Hopper & Laughlin 1991).

As one component of this movement in world views and suggested pathways for improving and enlightening understandings of accounting and accountants, constructivism (or social constructionism)² also began to find traction (see, for example, Hayes 1983; Hines 1988, 1991, 1992; Neu 1992; Parker, Guthrie & Gray 1998; see also Burr 2003). Ritson (2002, p1) examined this approach by reviewing the content of three significant accounting journals³ from the late 1970s through to the late 1990s, and suggested that:

The social constructionist movement was responsible for introducing to an accounting audience an understanding of the importance of meaning and hermeneutical processes in organisational life ... [however] ... notwithstanding their early success, by the late 1990's the social constructionist movement in accounting felt itself under threat from critical accounting research.

Although the current situation with respect to constructivist research in accounting is not as bleak as was the case when Ritson (2002) made his comments – particularly given the current use of this paradigm in historical accounting research and in concert with particular critical constructivist perspectives – nevertheless constructivist approaches in examining contemporary accounting research issues are still quite relatively underutilised. Hence, we characterise constructivist research in accounting as “the road less travelled”, and exemplify the use and value of applying this paradigm in a contemporary research setting.

The current paper examines the philosophical basis of constructivism and illustrates the application of this paradigm to an accounting research project in which the first author, a PhD candidate, is the chief investigator. The purposes in doing so are not merely to describe, but to also enrich and inform. What is often lacking for accounting researchers, and especially for doctoral students, neophyte researchers, or those looking to branch out by employing alternative methodologies, are works which describe relevant research philosophies and provide guidance on how to apply them (for an unusual and apropos commentary on this point, see Hong 2007). While a published research study can offer some measure of understanding an approach to research, the discussion of the underlying philosophy is often limited or even unstated (Ryan, Scapens & Theobald 1992). Further, the description of the research methods is often brief given the confines of a book chapter or

² Note that while the two terms have come to be used interchangeably and “subsumed under an apparently generic or undifferentiated “constructivism”” (Young & Collin, 2004, p374) strictly speaking social constructionism is focused on the social (social practices, social institutions, and groups of people), whereas constructivism “proposes that each individual mentally constructs the world of experience through cognitive processes” (Young & Collin 2004, p375).

³, *Accounting, Organizations and Society*; *Accounting, Auditing & Accountability Journal*; and *Critical Perspectives on Accounting*.

journal article and the need to overview the prior relevant literature, present the results, and discuss the findings of the investigation. For example, as Irvine and Gaffikin (2006, p115) note: “while much qualitative research has been undertaken within the discipline of accounting, little or no attention has been paid to the way in which that research has been conducted”, and so some researchers have sought to remedy this by specifically explicating how particular paradigms and/or methods can be deployed to study accounting issues (for examples see Haynes 2006; Irvine & Gaffikin 2006; Rudkin 2007; Gomes 2008; Bisman 2010; De Loo & Lowe 2011).

However, in reference to constructivist research in accounting, this void is perhaps all the more noticeable since most business and other research methods textbooks gloss over constructivist research (if it is mentioned at all). Somewhat mitigating this lacuna is a range of works that discuss aspects of, and particular views on, constructivism in accounting (for example, Quattrone 2000; Llewellyn 2007; Nørreklit, Nørreklit & Mitchell 2010), and yet many such treatments presume the reader already has more than a passing acquaintance with the central tenets of the paradigm.

The above introduction possibly suggests that research can be neatly labelled as either constructivist or non-constructivist; however, in reality this division is not so clear-cut. While each research paradigm is characterised by a basic set of assumptions within a specific world view, and points the researcher towards a suitable method or methods, aspects of various research paradigms can and often do overlap (see Guba & Lincoln 1994, 1998).

The Construction of Constructivism

Of course it is happening inside your head, Harry, but why on earth should that mean it is not real?

J.K. Rowling, *Harry Potter and the Deathly Hallows*

The social nature of accounting has been recognised for many years (Gaffikin 2006) and, from an ontological perspective⁴, constructivism maintains that what is real is intangible and mentally constructed and is, therefore, “socially and experientially based” (Guba & Lincoln 1994, p110; see also Burr 2003). Reality is thus created by the mind, and different social realms, organisations, cultures and experiences can, therefore, create multiple social realities. Although what is real is specific to an individual, similarities may exist between individuals and groups of individuals. As such, within constructivism there is no predefinition of dependent or independent variables (as would usually be the case in quantitative, positivist research), but rather a concentration on exploring and giving an account of how people make sense of a situation at a particular point in time (Blaxter, Hughes & Tight 2006). Consequently, reality is not fixed, objective or immutable. Instead, in contrast to notions of scientific research, reality is deemed to be subjective, pluralistic, and elastic – apt to differentiation and change across and within societies, groups and individuals. Epistemologically⁵ for the constructivist there is also acknowledgement that research is value-laden, not value-neutral, and that both those being researched and the researcher make value judgements.

⁴ Ontology concerns what exists and what is considered to be real.

⁵ Epistemology concerns the theory of knowledge and its nature and limits (Blackburn 1996; Marshall 1998), how people develop and accept knowledge (Guba 1990), and the relationship between what is researched and those who research it.

Constructivism is not embedded within a materialist or physical meta-view (ontology) of the world. The belief in, and acceptance of, multiple social realities leads to the conclusions that knowledge is relativistic (that is, knowledge and realities are time, space and context dependent), inquiry should be naturalistic, and that interpretivism (rather than scientific methods and empiricism) is the appropriate frame through which to bring to light and explore these realities. Because of the interactive linkage of the research and the object/s of the research “ ‘findings’ are *literally created* as the investigation proceeds” and, as a result of this relationship, the methodology is hermeneutical and dialectical (Guba & Lincoln 1998, p207). To further elucidate this explanation, hermeneutics “is an approach to the analysis of texts⁶ that stresses how prior understandings and prejudices shape the interpretive process” (Denzin & Lincoln 2005, p27), while the dialectic (within the realm of constructivist philosophy)⁷ involves comparison and contrast of various constructions through “iteration, analysis, critique, reiteration, reanalysis, and so on that leads eventually to a joint (among inquirer and respondents) construction of a case (i.e. findings or outcomes)” (Schwandt 1998, p243).

However, the constructivist paradigm is, as Schwandt (1998, p242; see also Guba & Lincoln 1989) describes it, “a wide-ranging eclectic framework”. As such, while not totally erroneous to do so, narrowly defining constructivism would be oxymoronic as this necessitates an objective and unbiased description and goes against the assumptions and values that constructivism embodies – an alternative way of seeing is to be conscious of how constructivism is synthesised by oneself and by others (Potter 1996). The way in which different social realities are translated into forms accessible to others is through the medium of language or, as persistently described throughout Parker’s (1998) edited volume on social constructionism, through discursive events and practices. Hines (1988, p251) saw this as “in communicating reality, we construct reality”. Hence, constructivist research focuses on the meanings embedded in textual and verbal accounts and generally involves the analysis of archival materials, documentary sources and/or oral and personal histories and narratives garnered through data collection strategies such as interviews. Analysis, as used in this context, is an interpretive act rather than a scientific one. It involves sense making of everyday life and experiences through hermeneutics, whereby generating “rich and compelling interpretations is a key to producing more rigorous forms of knowledge” (Kincheloe 2008, p21).

Adopting a constructivist approach allows the researcher to give meaning to the way things are, and to identify factors that otherwise could not be easily exposed or described through metrics and statistics, nor generalised across entire populations. The researcher is also not constrained by, or wedded to, prior theory, but seeks to produce grounded theory (Glaser & Strauss 1967; Glaser 2012) that emphasises the issues that are of the most importance to the research subjects. In this way, the researcher can provide valuable insights into social structures and human behaviours by adopting a flexible and open-minded approach to the capture of the social constructs central to particular accounting research topics, as understood by individuals. While not necessarily setting out to be a critical catalyst for change, illuminating these manifold realities may provide multiple solutions rather than singular, one-size-fits-all answers to issues in accounting.

⁶ The terms “text” or “texts” can embrace more than simply the written word. For guidance on this point see Schwandt (2007).

⁷ Given that there are different interpretations of dialectics. For brief outlines of various views on the meaning of dialectic and the dialectic method, see Blackburn (1996, pp104-105) and Law (2007, pp302-303).

Constructions of Fairness in the Workplace

This section of the paper chronicles part of the journey undertaken to capture “how [do] accountants perceive fairness in the workplace”⁸. This topic is thus the focus for providing a detailed example of how a constructivist research approach and associated qualitative methodology is being used in an actual research study. Thus the emphasis of the following discussion is on the research design and research process, rather than on the research results or findings.

What became clear from the literature review undertaken prior to embarking on the project was the dearth of research related to fairness in the workplace (traditionally labelled in academic circles as “organisational justice”) concerning public accountants and public accounting firms that used qualitative methodologies (for exceptions, see Lightbody 2007; Haynes 2010). Similarly, there is a profound paucity of scholarly studies that investigate organisational justice (or other) issues in the smaller firm setting (for an exception, see Strachan & Barrett 2010) or in rural or regional Australia (see Alam & Nandan 2010; Carter, Burritt & Pisaniello 2011). The studies that have been conducted, while providing valuable insights into fairness issues, focus almost exclusively on major accounting firms, predominantly using quantitative methodologies and large-scale survey questionnaires (for example, Bernardi & Arnold 1997; Covaeski et al. 1998; Parker & Kohlmeyer 2005; Herda & Lavelle 2011).

Bauman (1978) contends that knowledge and understanding is confined and fits only within a particular context. Building on this, he asserts that notions of right and wrong understanding are therefore context-dependent. Studying fairness in the workplace in accounting firms is one such area in which Bauman’s insights ring true. What appears to be, or is perceived to be, fair in the workplace in one context (for example, locale, organisation or scenario), or to one group or individual (for example employers, partners, employees or trainees), may not be fair in or to another. Hence, the nature of the research and the sensitivity of the topic, as well as the dearth of qualitative research in this particular setting, pointed towards the appropriateness of a constructivist world view for enriching and adding depth to the understanding of organisational justice concerns in public accounting practice.

Further important considerations in designing the research were to enable people to activate their voice, express their realities, and know that their voice was being noticed (see Hammond & Sikka 1996; Napier 2006; Manwaring 2010). When dealing with organisational justice issues, the role of voice is crucial since those who have been treated unfairly often go unheard or feel marginalised and excluded. Thus, the positivist alternative of reducing people to research “objects”, and their feelings to numerical descriptions and statistical generalisations, was inconsonant with the aims of the research and may have alienated participants, discouraged trust, and resulted in superficial and/or inaccurate data (see Weiss & Rupp 2011).

Attracting and Choosing Participants – Keeping it Personal

In positivist research the process of selecting research subjects involves determining the relevant population of interest and choosing a sample that possesses the characteristics necessary for it to be “representative” of that target population, thereby enabling later generalisation of the research results. Yet for the constructivist, ideas of random sampling, representativeness, and generalisation are largely meaningless and are eschewed.

⁸ This is the working title of the research project described in this article.

Attracting participants for the study of fairness in the workplace was a very labour-intensive and time-consuming process. However, painstakingly sourcing and individually inviting people to contribute to the study ultimately achieved the support of 43 participants. This personalisation of the research process also helped the researcher to feel a greater connection to each participant and facilitated the collection of an abundance of content-rich and context-specific data⁹.

As a first step, colleagues and friends were contacted, representing a simple, yet effective way of conveniently recruiting participants. While this avenue for making contact generated interest and encouragement, it was unsuccessful in securing any further participants for the project beyond the pilot study. Drawing upon such contacts is an opportunistic approach (Buchanan, Boddy & McCalman 1988), but can create problems that may affect the credibility and transferability of the research. Dependent relationships may also result in people participating because they feel obliged to do so, rather than volunteering because they want to do so. However, trust and rapport are essential in producing rich data and information may be withheld if the relationship is not strong (Buchanan, Boddy & McCalman 1988).

Potential participants were also identified through extensive use of the Internet. In particular, public practice websites, the *Yellow Pages*, the *White Pages*, and the “*Find an Accountant*” function on the professional accounting bodies’ websites provided useful leads. Where a firm’s website provided the names of its accounting staff and their work email addresses, a personalised email invitation was sent to each listed accountant, together with a copy of the participant information pack. Where a personalised email address was not available, an invitation to participate together with a copy of the information pack and a postage paid self-addressed envelope for the return of the letter of consent was sent to potential participants via Australia Post.

Another opportunity for reaching out to potential participants included the researcher participating in online fora (such as those sponsored by professional accounting bodies), blogs, social media and meetings, and contacting people who had posted articles or relevant information on the Internet. Using this purposive approach, posts to fora, for example, were reviewed and likely participants identified in light of the discussions they had initiated or to which they had contributed and that pointed towards (un)fairness in the workplace. While the researcher was mindful of representing the views of a broad cross-section of the profession, deliberate sampling techniques, such as stratification according to age, gender or professional body affiliation, were not used in, nor appropriate for, this interpretivist study. However, some general criteria reflecting the tenor of the research question were applied to facilitate identification of potential participants, with the key criteria being participants should have experienced one (or more) of the conditions of having: (1) worked in a rural or regional locale; (2) worked in or applied to work in a public accounting firm; or (3) felt unfairly treated during their professional accounting career.

This proactive networking route was particularly fruitful, generating 11 participants with an additional 30 referrals, of which 13 people agreed to participate. In this way, the number of participants grew or snowballed. As part of this strategy of pursuing multiple avenues for identifying potential participants, individual personal letters and emails were the primary method for achieving contact. At the same time, requests were made to the three major professional accounting bodies in Australia to include details of the study in their electronic newsletters. In soliciting assistance from these bodies, preserving the credibility of the lived experiences shared by the research participants was paramount and so it was

⁹ Such alternative approaches to traditional participant selection are also described by Mackay (2011) and are currently being investigated by Prof H Mackay and Dr M Randle from the Institute for Innovation in Business and Social Research at the University of Wollongong.

essential that the researcher not be governed or constrained by priorities imposed on the study in exchange for any support offered by these professional organisations.

Emails of introduction were also sent to the convenors of various rural and regional accounting discussion groups, garnering some interest and securing one interviewee. Business name cards, with the research question printed on the reverse side, were also freely distributed at every opportunity (such as at research workshops, conferences, and meetings) and this is known to have secured at least one participant.

In addition to establishing a dedicated website¹⁰, and the various free electronic methods of promotion outlined above, a paid advertisement was placed in CPA Australia's professional magazine, *InTheBlack*, although this costly approach failed to directly solicit any participants.

As a qualitative study crafted within a constructivist paradigm, the predetermination of the size of the data set was inappropriate. Rather, the apposite number of participants emerged *during* the research by subscribing to the notion of theoretical saturation (Strauss 1987), such that data gathering (interviewing) continued "to the point of redundancy" (Lincoln & Guba 1985, p202) where (and when) new or distinctive information ceased to emerge. In consequence, interviewing and concurrent data analysis continued until the spirit of the experiences related by participants began to recur, and when interpretation of additional interviews failed to identify new themes, incidents or experiences.

At the point of saturation, 43 interviews had been conducted. Guest, Bunce and Johnson (2006), after reviewing prior studies and investigating data sets for qualitative research, found that data from 12 interviews would probably be sufficient to reach theoretical saturation. However, such quantitative heuristics are not ideal, and so each researcher should determine the point of saturation based upon their own data.

Delving into Realities – Semi-structured Interviews

Where the objectives of a research study are primarily exploratory, and particularly when perceptions and feelings are important, semi-structured interviews are a useful approach because of the ability to explore multiple leads and to probe for more information or request clarification, matching with the constructivist nature of the research. The flexibility afforded by using loosely semi-structured interviews in the project provided an advantage over other methods, such as self-report questionnaires, because the researcher was able to address misunderstandings and introduce sensitive topics in real-time to ensure thorough data collection, while still asking each participant a similar (although not identical) set of questions.

Furthermore, researchers such as Aberbach and Rockman (2002) suggest that the use of unstructured or semi-structured formats is preferable when interviewing highly educated professionals because of the degree of respect these individuals expect. In contrast to traditional research instruments (such as questionnaires), such interviews allow the researcher to become the research instrument; a hallmark of interpretivism. Caulley (1994, p5), building on the work of Guba and Lincoln (1981; Lincoln & Guba 1985), cites seven benefits of using the researcher as the instrument which, within the parameters of the research study of fairness in the accounting workplace, included *responsiveness*, *adaptability* and *processual immediacy*, such that the researcher was able to act upon cues from, and the needs of, the participant and the situation, and to incorporate this information into the body of the

¹⁰ www.fairnesszone.com – providing background information about the research project and the researcher, as well as acting as an open invitation to accountants to participate in the study.

conversation. A *holistic emphasis*, the idea of *knowledge beyond the stated*, and *opportunities for clarification and summarisation*, enabled the researcher to draw out specific items without sacrificing the bigger picture. By virtue of the unique connection between the researcher and participant within the constructivist perspective, the researcher was able to access and appreciate implicit information imparted through body language, tone and pace of voice or silence, as well as seek verbal elucidation and augmentation of points made by the participant. Finally, there was the *opportunity to explore atypical or idiosyncratic responses*, which, for the interpretivist researcher, were as potent and worthy of inclusion and further investigation as more expected or orthodox experiences.

Creating the optimal interview setting (Aldridge 1993) required the researcher to be acutely aware of the commonalities and divergences that exist in the interview relationship. For example, a young researcher may have difficulty in establishing their credibility, particularly when the age difference between the researcher and the participant is substantial (Odendahl & Shaw 2002). However, when interviewing elites from the field of economics, Stephens (2007) noted that he was able to use this age difference to his advantage as his relationship mimicked that of supervisor/PhD student. Similarly, the professional qualifications and previous public accounting experience of the researcher, as well as her knowledge of rural and regional communities within Australia, were constructive in establishing trust and rapport with each participant.

Although interviews were a powerful way to help participants express their feelings in a non-threatening environment, the quality of the interview and the usefulness of the data were a simultaneous and synergistic function of the researcher's interview technique and her capacity to engage participants, actively listen, discretely record and think clearly. Practical limitations, such as time constraints, participant availability and participant/researcher needs, were also key considerations when finalising the research design, as well as in the assessment of overall research quality.

The prior review of the literature revealed an array of potential focal points relevant to the research question. The themes ultimately incorporated into the interview guide were selected for their topical nature and everyday familiarity, and included: gender comparisons, level of tolerance, cultural identity, and the rural versus city divide. While a basic set of questions was developed to support the initial stage of the research, the interview guide continued to evolve over the course of the data collection.

The first distinct phase of the project was the preliminary (pilot) study, after which individualised interview guides were devised for each participant, ensuring that core research questions were included. Interview guides were influenced by the researcher's knowledge of each participant, such as the participant's work roles and career lifecycle position. While the initial intent was to interview only accountants, the range of participant job functions was broadened as five human resource professionals from public accounting firms also volunteered to participate. Personalised interview guides also allowed the researcher to develop probing questions specific to a participant, with the ancillary benefit of demonstrating the researcher's genuine interest in the participant as an individual rather than just as a "research object".

The evolving and customised nature of the interview guides also reflected the researcher's recognition of the differing social and professional realities inhabited by participants. Having a well-designed interview guide, even for semi-structured interviews, was an important tool and supported the research (and the researcher) at three levels (as identified by Cavana, Delahaye & Sekaran 2001, p150): *content*; as well as *process* – as a visual cue to probe for additional information, and in reminding the researcher to encourage the participant to reflect on their own experiences and observations; and at the *executive level*

to assist in time-keeping and to provide the researcher with a range of options to keep the discussion energised.

“Evolution” of the Research

As alluded to in the previous section, one dimension of constructivism, especially notable in the sample research study described here, is that the nature of the research process can change or “evolve” during the course of the research (for examples, see Burden 2000; Keso, Lehtimäki & Pietiläinen 2001, 2009; Phillimore & Goodson 2004). Modifications to the research can be based upon developments that occur as a result of the researcher’s interactions with participants and the reflections of the researcher upon the effectiveness of the architecture and progress of the research.

The purpose of undertaking a preliminary study was to refine the design and to check for problems or omissions in the draft interview guide. In this stage, five interviews were conducted (three face-to-face and two via telephone), and the researcher’s autobiographical reflections were also documented. Even though these participants were personally known and connected to the researcher, demographic information, such as career lifecycle position and current employment status, was collected during the first part of each interview. While gathering this information at the beginning of the interview was intended to build rapport by engaging in non-threatening communication of a more general nature (Babbie 1990), it had the unintended result of making the interviews feel too formal and stilted, detracting from the intended conversational nature of the discussion. Moreover, it was often not necessary to ask specific demographic questions as the information was shared as part of the discussion or as background to the answers given.

Alternative means of sourcing demographic information were mobilised (see Table 1) for subsequent interviews, and this range of private and public sources not only assisted in data gathering, but also in making meaning of, and giving context to, the data. For example, some demographic information, as well as career and organisational highlights, was publicly available from archival sources. These sources included company websites, print media articles, social media and professional networking sites, along with publicly accessible industry and community records. Many secondary data sources were quite extensive, yielding details of the participant’s work history, qualifications and social interests. This preparation furnished valuable data and helped build rapport during the interview because of the researcher’s familiarity with and cognisance of the participant’s background and work environment. Even simple facts such as the size and location of the town and the local news for the region were valuable conversation connectors.

A showcard providing a definition of organisational justice was given to participants in the first three pilot interviews for the purpose of contextualising the research topic. However, this practice was discontinued because it may have had the effect of seeding participants with one particular point of view. This action raises a critical point for reflection. At the beginning of this article, it was acknowledged that constructivist research is value-laden, not value-neutral, with both those being researched and the researcher making value judgements. While the researcher is an integral part of the research dynamic, during data collection it is imperative that the researcher conveys genuine empathy, actively listens, and encourages the research subjects to share *their* views and experiences. While the researcher can never be neutral, in constructivist research the researcher’s views must never predominate (unless, of course, they are the research subject).

Table 1
Sources of Qualitative Data Based on Form and Accessibility

	Private	Public
Audio	Personal interview recordings	Conferences, workshops, webinars
Images	Mental images formed by the researcher	Photographs
Print media	Transcribed interview records, emails, documents provided by the participants, the researcher's notes, secondary print media sources	Professional journals, magazines, newspapers, websites, blogs, industry and community records
Contextual	Language, vernacular "Australianisms", cultural differences, corporate persona	Education, professional codes of conduct, cultural norms

Source: Modelled on Bernard and Ryan (2010, p12).

Further, while individuals think about events that generate negative emotions five times longer than events resulting in positive emotions (Ben-Ze've 2000), the pilot suggested that both positive and negative fairness experiences may not be easily recalled. Four of the pilot participants could not think of anything specific from their career that was unjust or overtly fair, even though one participant had an unfair experience in the preceding 12 months that was still not fully resolved at the time of the interview. It was not that this participant was unwilling to share this experience, but that they just did not *initially* connect the event with the notion, concept, and construct of "organisational justice". This outcome reinforced the researcher's conclusion that organisational justice, outside the academic sphere, is not a commonly understood term and may, therefore, be open to misinterpretation. To overcome potential misunderstandings, documentation for the research project was revised to clearly communicate justice and fairness as interchangeable terms (Leventhal 1980). Asking each participant for their understanding of fairness in the workplace, and to relate this to examples from their career, was a more effective way to encourage sharing of both positive and negative experiences, and better aligned with the intended free-flowing nature of the interview.

The preliminary stage of the study also indicated that restricting the research to small accounting firms was challenging. For some participants, events occurred many years earlier and they had difficulty remembering the number of employees in the firm at the time of the event. This recall issue could cause potential participants to self-exclude. By the very nature of the target geography (that is, rural and regional areas), small (and medium) sized firms were expected to be the majority represented. Therefore, "small" was removed from the research agenda. This change, while not significant, did result in additional participants responding that might not otherwise have done so because of their firm's size. For instance, one participant worked for a firm with over 140 employees, with offices throughout regional NSW. While each individual office may be regarded as small, overall the firm was a significant regional employer and did not fit the definition of a small organisation based on employee numbers (Australian Bureau of Statistics 2004).

Another complicating factor proved to be the initial decision to interview only people with experience in rural and regional accounting practice. The pragmatic implications were that weeks or even months could elapse between interviews. By broadening the research boundaries to include city accountants, this not only ensured a steadier stream of interviewees (with the added benefit of keeping the researcher's interviewing skills honed), but was ultimately extremely advantageous by making clearer how certain aspects of the social

realities experienced by the practitioners were differentiated as a result of alternate locales (on this point, see Bisman, forthcoming).

As the study required participants to volunteer their time, a conscious decision was made to stagger interview requests. This approach ensured that each participant’s preferred interview time was available (a key consideration suggested by Morrissey 1970), unanticipated delays could be accommodated, the researcher was not overwhelmed with interview acceptances, that transcription was timely, and there was adequate “thinking space” to allow for researcher reflection and data interpretation to be undertaken between each interview. This staggered approach was also constructive as germane issues previously unidentified often arose and this allowed the data analysis process to inform subsequent data collection – best practice advocated by Gibson and Brown (2009).

Although used in the initial interviews, formal pre-tasking (Cooper & Schindler 2006) of participants was not routinely undertaken as it may have had the effect of implanting interviewees with preconceptions. Further, the researcher was mindful that as busy professionals who were volunteering their time, pre-tasking could give the misleading impression that considerable preparation may be required on the part of the participants. However, two accountants asked if any preparation was required and were simply advised that the interview would begin by the researcher asking: (1) When you look back on your career, have you ever felt unfairly treated or witnessed any instances of unfairness?; and (2) Looking back on your career, can you think of an instance where someone might have been treated too fairly? Two of the five human resource professionals interviewed were also formally pre-tasked at their request.

While the research design allowed for multiple interview modes, telephone interviewing was the principal technique. Table 2 outlines some of the advantages and disadvantages of telephone interviewing specific to this study.

Table 2
Advantages and Disadvantages of Telephone Interviewing in the Research Project

Advantages	Disadvantages
Logistically less challenging than face-to-face interviewing, providing savings in travelling cost and time, as well as allowing the researcher to include participants in geographically remote locations.	More opportunity for participants to be “unavailable”, but researcher flexibility and perseverance assisted in mitigating this problem.
Absence of unintended and/or potentially leading visual cues from the researcher. The researcher’s actions, such as writing notes, did not distract the participant.	Unable to gather non-verbal cues such as body language, and to experience first-hand the physical environment of the locale.
The researcher was able to concentrate on active listening and controlling vocal emotions without the need to control visual cues.	Quality of the telephone connection needs to be considered, although no particular problems were encountered in this study.
The researcher was in familiar surroundings, which helped minimise nervousness and gave access to additional materials and aids that would not have been practical to use during face-to-face interviews.	The use of showcards was impractical.
The lack of visual identification provided some degree of anonymity to the participant.	Potential for participants to lose focus and undertake other tasks or respond to interruptions.

Although there are shortcomings attached to all forms of data collection, those associated with telephone interviewing in this study were relatively easy to alleviate and this interview mode proved to be very productive. The majority of the interviews took place during normal business hours, although some participants requested the interview be conducted during their lunch break or after work. As participants chose the time and location for the interview, it was less likely that any participant moderated the conversation because of unfavourable situational conditions, threats to confidentiality or extraneous influences.

Even though the issues described above are peculiar to this particular research project, they are nevertheless important for future researchers in signalling potential pitfalls that may lead to the collection of compromised or incomplete data. The exposure of these issues also provides an example of how constructivist research adapts and evolves, as well as practical ideas for surmounting possible challenges encountered during the research process.

Meaning-Making – Organising and Interpreting Data

All participants agreed to the interview being audio-recorded and data analysis began by transcribing, organising and editing the raw data into a suitable form so that patterns, themes, similarities and differences could be identified (Basit 2003). Each oral interview recording was personally transcribed by the researcher and returned via email as an electronic password-protected file to the participant for emendation and verification within 15 days of the interview date. While many researchers would balk at the notion of transcribing every interview themselves, given how time-consuming and onerous this task can be, in this study it provided an opportunity for the researcher to immerse herself in the experiences and opinions shared and helped her to better identify with each participant's vantage point.

It was important to present the interview transcript in a polished and logical manner as a professional courtesy and as a mark of respect for the intellect of the participant, while still retaining the rich data of the opinions and experiences shared. This "re-presentation" (Gibson & Brown 2009, p110) of the raw interview data was a crucial first step in the analysis as it demonstrated to the participant that the researcher understood the context of what the participant had said, and was in keeping with interviewing professional people who are well-educated but time-poor (Stephens 2007). It was also important for the researcher to be perceived as knowledgeable and competent, and that participants did not feel the need to correct her work. As part of the transcription process, care was also taken to exclude any personal information shared, such as organisational and town names, that could potentially compromise a participant's anonymity in the write-up of the project.

After verification of the transcript by participants, the interview guide was pressed into service as a template to break down each transcript into themes. Initially, applying a pattern-matching technique, repetitions of opinion within each transcript, as well as replication of experiences and opinions across transcripts were highlighted and loosely clustered by import. As noted by Bernard and Ryan (2010), what points towards a theme's significance is how often it is repeated, if it is culturally pervasive or culturally bound, the reactions to violations of the theme, and how expressions of opinions are contextually constrained. Although van Manen (1998) suggests that themes are a weak proxy for lived experience because of the denatured way in which they represent those events, thematic analysis was a practical starting point in the discovery of both archetypal and unique experiences, and in unearthing points of commonality and contrast in realities, as well as in the identification of relationships between themes.

Drawing on a socially constructed perspective of fairness in the workplace, the traditional organisational justice concepts of distributive justice, procedural justice and interactional justice (for an overview see Colquitt, Greenberg & Zapata-Phelan 2005) were also used to bring together similar opinions and experiences. From these groupings, the first-hand accounts of participants and how they described reactions to fairness issues, as well as the level of tolerance displayed, were re-examined with specific reference to exchange ideology (Eisenberger et al. 1986), equity sensitivity (Huseman, Hatfield & Miles 1987), and zone of tolerance (Gilliland 2008). Constructivist research generally does not rely on existing theory, seeking instead to produce grounded theory, that is, theory that is grounded in and emerges from the data (see Lye, Perera & Rahman 2006 for a review pertinent to accounting). As such, the range of existing theories examined in this study were not used to determine an *a priori* classification scheme for the data and, nor was the theory “tested” in any conventional sense – in any event, these theories were often inadequate descriptors of the actions and incidences relayed by the research participants. The role of these theories in respect to the current qualitative research project was thus to further enable “the expression of a subjective reality more than [the] clarification of an objective one” (Ahrens & Chapman 2006, p819).

Beyond the identification of themes in the manners described above, analysis of the discourse of each transcript was deconstructed to uncover the intrinsic and less overt meanings and understandings embedded in the conversations and to expose opaque relationships within public accounting firms. The transcripts were then searched for links between the different ways of seeing (Berger & Luckmann 1966) and how language in the everyday sense was used to create these conversations, thus revealing connections suggestive of interdependence rather than just of discrete issues. By focusing on the richness and contextual nature of the data collected, and by drilling deeper into the narrative, two central themes began to emerge and which individually or in concert encompassed the array of fairness issues related by participants. Power and bias constituted these main, underlying themes. While the initial review of the prior literature had revealed numerous research foci relevant to the research question, the dominance of power and bias in perceptions of fairness in the workplace for accountants was not anticipated. While not a unique finding in organisational justice research, power and bias were made more visible in this research setting in light of the constructivist approach taken, and the complex interrelationships of the two themes were unveiled. For example, some comments made about female career/life choices were understood by the researcher to be heavily influenced by stereotypical and biased gender role expectations. However, further probing of the emerging discourse uncovered power plays and internecine conflicts that illuminated how power (legitimate and illegitimate) is “perpetuated, reinforced, and resisted” (Bernard & Ryan 2010, p240) within public accounting firms.

Reverting back to the earlier discussion of existing theories in the topic area of the research, these emergent dimensions of the analysis of the discourse reflect what Richardson (2012, p83) foregrounds as an imperative in qualitative accounting research in that “we need to contribute to the literatures from which we draw theory and not just be consumers of theory from other literatures”.

A common tenet linking discourse analysis techniques and constructivism is the rejection of researcher neutrality. As such, it is acknowledged that the analysis of the discourse has been shaped by the researcher’s own background, culture and lived experience. Although there are similarities across the interviews, each individual account is unique, and by taking a constructivist position this uniqueness has become a central element of the analysis as the researcher is not burdened by normative assumptions.

Unlike quantitative research that is judged in terms of validity, generalisability, reliability and objectivity, the quality of qualitative research is described in terms of credibility, transferability, dependability and confirmability (Lincoln & Guba 1985). Credibility requires the researcher to establish the truthfulness and believability of the findings from the participant's perspective. To address this quality criterion, participants were given the opportunity to verify the interview transcript while the research was in draft format, and to request changes and/or amendments. The use of secondary documents, where available, to corroborate the experiences shared, provides further support for the credibility of the findings.

While transferability is a decision for subsequent users, the researcher must provide sufficient detail and explanation so that users can make an informed assessment. As such, it is imperative that the researcher extensively sets out the research setting, key characteristics of the participants and the research processes, so that the limitations and boundaries of the study are clearly identifiable. The use of multiple data sources, between theory comparisons, within method triangulation, and reconstruction of the raw interview narrative, may assist subsequent users to make an appraisal of the applicability of the findings to alternative research settings.

Dependability emphasises the need to account for change. The traditional (positivist) research criterion of reliability measures the level of replicability or repeatability of the research; however in socially constructed research it is not possible to "measure" the same thing twice. Therefore, the researcher must comprehensively describe changes observed in any aspect of the research and document if and how these changes influenced the research. Apart from amendments made to the general research design, as previously discussed, no additional, material changes have been observed.

Confirmability reflects the degree to which the findings of this research are confirmable by others. In this project, an extensive "audit trail" of design information and modification, data and researcher notes and reflections is being kept to recount all steps in the research process from inception to conclusion.

Concluding Remarks

This paper has provided an outline, discussion, and example of the use of constructivist research in accounting and of some of the procedures and merits of the paradigm in enlightening a selected accounting issue. While not presuming to provide a complete step-by-step guide to adopting or applying the constructivist paradigm, by illuminating key aspects of the nature and usefulness of the paradigm, this paper has sought to inform and make manifest and understandable to researchers unfamiliar or less aware of constructivism, how this paradigm can be used to address complex, subjective realities in the discipline.

Although not yet complete, this insightful journey into how accountants perceive fairness in the workplace has opened the researcher's eyes to the myriad of perceptions, expectations, evaluations and opinions held by professional accountants. Employing a qualitative methodology, underpinned by a constructivist world view, has provided the means to generate rich, deep and contextualised understandings of the research issue, and an appreciation of the socially constructed and experienced realities of the participants. The results and findings should also yield practical insights into the importance of organisational justice for the management of professional staff in public accounting firms and, in particular, highlight the pressing (and differentiated) issues faced by rural and regional practitioners. The goal is to give voice to these accounting professionals by telling important and compelling stories that often go unheard and are behind and beyond the "numbers" of

accounting practice. This example also has a hortative purpose in inspiring accounting researchers to engage in constructivist research, and thereby embark on a journey on the road less travelled.

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The Impact of Market Maker Competition on Market Quality: Evidence from an Options Exchange

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Keywords

Options, Market Makers, Liquidity, Market Quality

Cover Page Footnote

This research was funded by the Sydney Futures Exchange under Corporations Regulation 7.5.88(2). The authors thank the Securities Industry Research Centre of Asia-Pacific (SIRCA) for providing data



The Impact of Market Maker Competition on Market Quality: Evidence from an Options Exchange

Angelo Aspris^{*1}, Alex Frino¹ and Andrew Lepone¹

Abstract

This paper examines the dynamic relationship between competition, liquidity provision, and market structure. By examining the entry and exit of market makers in the Australian Options market, this study empirically analyses the issue of market maker competition. Results indicate that market maker entry depends on a broad range of profit, risk and market concentration characteristics, but *free* market maker movement does not explicitly result in a competitive market structure. This study also finds that the degree of market concentration additionally affects the marginal impact of market maker entry (exit), but the effect is significantly more pronounced for the most liquid classes of options. The implication of this finding is pertinent to market regulators since market maker competition may not necessarily contribute to enhancing market quality for less liquid securities.

Keywords: Options, Market Makers, Liquidity, Market Quality

JEL Classification: G12

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Introduction

This paper examines the dynamic relationship between competition, liquidity provision, and market structure. A common perception, widely entrenched in the economics literature, is that the price setting structure of a dealer market approximately reflects the ideals engulfed in standard competitive economic analysis. In principle, the pervasive and (quasi) free movement of registered market makers, who underscore the liquidity provision and price discovery process, are necessary conditions that form the primary basis of this association.² The advent of recent high frequency data from dealer market equity structures, however, has provided market practitioners with a rare opportunity to further understand the dynamics of dealer market structures.

Recent literature on the dynamics of dealer market structures reveals that the attainment of a competitive outcome is both infeasible and potentially less than optimal in terms of its overall effect on market welfare (Schultz (2000), Ellis, Michaely and O'Hara (2002)). The inability to reconcile differences between the theoretical literature and these recent findings provides the motivation for this research. This study examines the mechanics of competition in a dealer market setting as a means of addressing whether competitive price formation is achievable in modern financial markets.

The widely publicised and cited findings of Christie, Harris and Schultz (1994) and Christie and Schultz (1994) provide formative evidence of an apparent deviation from the underlying principles of competitive economic theory. In an examination of the NASDAQ market structure, these studies introduce evidence of non-competitive pricing among market makers contrary to previous suggestions that the NASDAQ market operates as a competitive market. The authors conclude that the divergence from competitive pricing is most likely the result of tacit collusion among dealers. These findings are additionally attested to by Barclay (1997) and Bessembinder (1998), who suggest that the larger than average spreads observed on NASDAQ cannot be explained by stock-specific characteristics, but rather by the more plausible argument of collusive behaviour.

Despite evidence of a pronounced deviation from competitive dealer pricing, a number of authors have vehemently disputed these claims. Both Wahal (1997) and Klock and McCormick (1999), examine the contention that the NASDAQ market operates as a competitive structure and present resolute evidence to contradict previously asserted claims. The authors document a pervasive movement in market makers and show that the net incremental effect of market maker entry is positively associated with improvements in market quality. This evidence is therefore, consistent with the competitive model of dealer pricing.

While there is confusion in the literature as to whether the NASDAQ market represents a competitive dealership, previous literature is also at odds to explain the possible sources of deviation from competitive pricing. For example, Huang and Stoll (1996) conclude that structural impediments – such as internalisation, preferencing of orders, and the presence of inter-dealer trading systems (which reduce incentives for brokers and dealers to act as advocates for investors seeking price improvement) – are

² Stigler (1957) outlines a number of additional conditions relating to the pursuit of a competitive outcome, including: that participants must operate independently of each other (not collusively); that the economics units must possess tolerable knowledge of market opportunities; and that they must be free to act on this knowledge.

primary contributors.³ Shultz (2000) further argues that since dealers are not equal in terms of size, industry and geographical specialisation, potential deviations from atomistic pricing are more than likely in dealership structures. This point is echoed by Ellis, Michaely and O'Hara (2002), who show that despite minimal restrictions to the entry and exit of market makers, certain market makers are able to yield greater market power which is likely to result in a divergence from competitive price setting.

The conflicting findings in the literature, narrowly based on the NASDAQ market structure, shape the direction of this study. We also address issues including whether or not free market maker entry is conducive to competitive price formation, and if dealership structures more closely reflect specialist-like structures than models of standard competitive economic analysis.

In particular, this study empirically analyses the issue of market maker competition, specifically addressing three main issues in order to promote a better understanding of the effect of market maker dynamics. The issues initially centre on determining which factors are associated with maker entry and exit. Following this initial examination, the impact of dealer competition and marginal market maker entry (exit) impact is analysed with respect to quoted bid-ask spreads. Lastly, the types of affirmative market obligations, which are nestled with market maker entry (exit), are examined with respect to their effect on trading costs. The ASX options market is the subject of this examination.

The remainder of this paper is organised as follows. The second section discusses the institutional framework of the ASX options market. The third section describes the dataset and provides summary statistics of the sampled data. The fourth section outlines the research design, the fifth section presents the empirical results and discusses the primary findings. The sixth section presents several additional robustness tests and the final section provides a concluding summary.

Institutional Detail

The Australian Options Market (AOM) is a contemporary mixed market dealer structure. Like many international option exchanges, the AOM has undergone a significant transformation over time evolving from a floor-traded dealer market structure to a dealer structure superimposed on an electronic limit order book. The market is characterised by a competitive dealer price structure that operates with an open electronic limit order book. ASX options are traded on a screen-based system over a range of leading shares that are viewable to all market participants. These options are characterised by a standardised set of strike prices and expiry dates that occur on the Thursday before the last Friday of the settlement month.⁴ Trades are

³ Additionally, whether deviation from the competitive outcome adversely affects the social welfare of market participants is also a contestable issue. Hansch, Naik and Viswanathan (1998) investigate the effect of preferencing and internalisation on spreads and dealer profits. The authors show that preferenced trades pay higher spreads than unpreferenced order flow. While this finding is indicative of the costs that result from violations to competition the authors do however, suggest that preferencing overall does not impair market quality. Other opinions expressed on this issue are provided by: Kandel and Marx (1997), Chung, Chuwonganant, McCormick (2004).

⁴ The effect of excessive product differentiation through a range of expiries and moneyness levels has the ability to foster market power. Requirements by the AOM for market makers to undertake obligations in identical combinations of moneyness and expiry are designed to prevent possible market failures.

executed on a price then time priority basis, and quotes represent firm orders. In the financial year ending 30 June 2007, nearly 23 million options contracts traded on the ASX market.⁵

Market makers play a pivotal role in the AOM. Market makers are charged with maintaining a regular market presence by quoting maximum bid-ask spreads and a minimum depth on a range of option series and maturities. The obligations for market makers as at 8 February 2006, are tabulated in Table 1. These obligations are ascertained from the liquidity category that a security is designated to.⁶ This process demonstrably contributes to the price discovery process by ensuring that option quotes are informative, binding and continuous throughout the trading day.⁷ Although the exchange compensates market makers for providing liquidity, market makers are not granted any special trading privileges over other market participants.⁸

Table 1
Security Categories and Maximum Spread Obligations for Market Makers

Premium Range	Category 1	Category 2
	Maximum Spread	Maximum Spread
0 to 9.5 cents/pts	5	6
10 to 19.5 cents/pts	6	7
20 to 34.5 cents/pts	8	9
35 to 60 cents/pts	10	12
61 to 120 cents/pts	12	14
121 to 180 cents/pts	14	16
181 to 266 cents/pts	16	18
> 266 cents/pts	18	20

This table documents the maximum spread (the difference between the best bid and offer prices) that a dealer can quote when making a market for an option security. The size of the maximum spread depends on whether a stock belongs to Category 1 or 2. Category 1 securities represent the most actively traded option securities. As at 8 February 2006, there were 25 Category 1 option securities and 60 Category 2 securities.

Market makers in the AOM can operate in one of three capacities: making a market on a continuous basis only; making a market in response to quote requests only; or making a market both on a continuous basis and in response to quote

⁵ This represents the equivalent of AUD 27 billion in turnover.

⁶ The two categories are referred to as Category 1 and Category 2 in order of the most liquid group.

⁷ Demsetz (1968) argues that the lack of ‘predictable immediacy of exchange in financial markets’ is a trading problem that can be mitigated by the regular presence of market makers (pg.30).

⁸ This is distributed as a discount in trading fees. There is no public record of the monetary amounts paid to market makers for maintaining obligations. Additionally, there is no public record specifying which market makers have maintained these affirmative obligations.

requests.⁹ Table 2 reports that there are on average 3 market makers for each of the 134 securities for which options were written on between 18 September 2000 and 29 September 2006. A dissection of these results reveals a heavy skew of market makers towards the more liquid securities group. The average number of daily market makers in Category 1 stocks is 8.5 as compared to an average of 1.8 market makers for Category 2 stocks. Furthermore the results show that market makers most prominently select to provide liquidity on a continuous basis where there is an average of 1.957 daily market makers per security. Additionally, there are an average of 0.749 market makers with quote obligations and 0.304 with both continuous and quote obligations for each security¹⁰.

Table 2
Market Maker Designated Obligations

Obligation Type	Average	Median	Std Dev.	Max	Min
<i>Panel A - Category 1 Stocks</i> (<i>n= 8,075</i>)					
Continuous	5.81709	6	2.87108	15	0
Quote	1.48173	1	0.9602	6	0
Both (Continuous + Quote)	1.25845	1	1.13404	7	0
<i>Panel B - Category 2 Stocks</i> (<i>n= 38,437</i>)					
Continuous	1.14658	1	1.89057	11	0
Quote	0.59542	0	0.97853	5	0
Both (Continuous + Quote)	0.10297	0	0.37205	7	0
<i>Panel B - ALL (n= 46,512)</i>					
Continuous	1.957	1	2.74	15	0
Quote	0.749	0	1.031	6	0
Both (Continuous + Quote)	0.304	0	0.727	7	0
<i>Average</i>	<i>3.01</i>	<i>1</i>	<i>3.834</i>	<i>17</i>	<i>0</i>

The following table presents descriptive characteristics of the average number of market makers over 134 securities between 18 September 2000 and 29 September 2006. Market makers in the Australian Equity Options market operate in one of three capacities: to make a market on a continuous basis only; to make a market in response to quote requests only; or to make a market both on a continuous basis and in response to quote requests. Summary statistics relating to the segmentation of their obligations are detailed below.

However the presence of market makers is not the sole source of competition on the ASX Options market. Market makers may face direct competition for order flow from limit order traders. Despite this direct competition, however, market makers are the

⁹ A detailed outline of market maker obligations in the AOM is available from http://www.asx.com.au/investor/options/trading_information/market_makers.htm

¹⁰ A difference in means test between obligations across the different categories of stocks reveals that these results are statistically significant.

primary providers of liquidity, representing approximately 80-85 per cent of executed volume and a much greater percentage of overall quoting behaviour.¹¹

Data

The Reuters intra-day data used in this study are provided by the Securities Institute Research Centre of Asia Pacific (SIRCA) and are captured in real time from the Australian Securities Exchange Integrated Trading System (ITS).¹² The data extends from 18 September 2000 to 29 September 2006 for equity options contracts listed on corresponding ASX securities. Each record contains a date and time stamp to the nearest second as well as fields outlining the trade price, volume and prevailing quotes. Quoted spreads are calculated using the best bid and offer prices.¹³ Option trades are matched with prevailing and average underlying trade and quote data.

The derivation of option volatilities and hedging parameters are solved numerically via the Black-Sholes model (1973) at each trade price.¹⁴ Estimates of delta are given by $\Delta = N(d_1)$ for call options and $\Delta = N(d_1) - 1$ for put options. Gamma risk is measured in the following way:

$$\Gamma = \frac{\partial^2 p}{\partial S^2} = \frac{n(d_1)}{S\sigma\sqrt{T-t}}$$

where: p is the price of a call (put) option; Γ represents the net change in delta over the dollar change in the underlying price.

A series of market maker assignments from the Australian Clearing House (ACH) is used to determine individual market maker movements from specified classes of options.¹⁵ Table 3 reports a total of 2,845 market maker obligation changes over the sample period. Between Category 1 and Category 2 securities, a similar number of obligation changes are observed. However, while there are 27 securities in Category 1, there are 107 securities in Category 2 over the defined sample period.

The event change category reported in Panel C of Table 3, reflects the number of independent market maker event changes. In this category, multiple market maker increases and decreases, pertaining to a particular security on a particular event date, are classified as a single event. Furthermore, where there is an opposing event – where the entry of a market maker corresponds with the exit of a market maker on the

¹¹ The AOM is primarily made up of institutional investors and therefore direct competition from smaller limit order traders is limited.

¹² The ITS is a modified version of the CLICK system developed by OMX Technology. This data is cross-verified with data provided by ASX CORE in order to mitigate potential errors.

¹³ Most recent studies that examine bid-ask spreads in the microstructure literature focus on the effective rather than the quoted spread (see Christie, Harris and Schultz (1994)). Effective spreads capture the actual cost of executing trades by calculating the deviation of the trade price from the true price. Trading on the ASX is carried out on an electronic platform where the effective spread is equal to the quoted spread since traders cannot trade inside the quotes.

¹⁴ To mitigate potential errors in this approach, implied volatilities are also calculated as the average of option series at-the-money strike, one strike above, and one strike below. This is based on option series with more than 20 days to expiration, and is consistent with the methodology of De Fontnouvelle et al. (2003). This analysis also uses indicative volatility estimates provided by the Australian Clearing House (ACH) and finds quantitatively similar results across all three measures.

¹⁵ The Exchange advises market participants of market maker movements in AOM securities. This treatment is in accordance with ASX Market Procedure 22.3. These reports are available at <http://www.asx.com.au/investor/options/notices/>

same event date – the event is categorised as a *no-change* event. Under these criteria, Table 3 reports 1,631 independent market maker changes and 514 ‘no change’ events.¹⁶

Table 3
Frequency Distribution of Market Maker Changes

Panel A – Category 1 Stock Options (n = 27 securities)

	Change = 1	Change = -1	Change > 1	Change < - 1	No Change
Continuous	390	357	41	16	-
Quote	154	151	20	4	-
Both	96	118	2	12	-

Panel B – Category 2 Stock Options (n = 107 securities)

Continuous	378	304	48	36	-
Quote	266	255	25	20	-
Both	43	98	2	9	-

Panel C – Net Changes

Net Change in Market Makers	748	697	102	84	514
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This table documents the frequency distribution of market maker changes in relation to 134 equity option securities between 18 September 2000 and 29 September 2006. Panels A and B contain descriptive statistics regarding the type of market maker entry and exit. Panel C tabulates the aggregate total of market maker changes across Category 1 and Category 2 securities. The *Net Changes* calculation in Panel C examines the net movement in market makers in particular securities. For a particular security on a particular event date, if a departing market maker is replaced by a new market maker, then it is classified as no change.

A series of standard filters were applied to the data. All records with time stamps outside the range 10:00 to 16:20 (EST), and the opening and closing trades of the day, are excluded.¹⁷ Low Exercise Price Options (LEPOs), which are deep-in-the-money options and more accurately depict futures style contracts, are also deleted from the sample. In accordance with Anand (2005), trades and quotes that are more than four standard deviations away from the average trade price, or bid or ask quotes, for the particular option series per trading day are also excluded. The selection criteria results in a sample size of 4,693,469 observations.

Table 4 reports cross-sectional summary statistics of 134 option classes over a seven year window. Consistent with the findings of Benston and Hagerman (1974) and Stoll (1978), among others, Table 4 documents that the number of market makers per security is positively related to trade volume, volatility and market capitalisation. It is additionally negatively related to the bid-ask spread.

¹⁶ Instances where market makers simply change obligations (without leaving a security) are very rare. They are not factored into the main analysis which only considers actual market maker movements.

¹⁷ Market makers are required to maintain their obligations between 10:20-13:00 and 14:00-16:00 per trading day.

Table 4
Cross Sectional Summary Statistics

Market Maker Quintile	N	Bid-Ask Spread	PBAS	Depth	Daily Series Volume	Volatility	Market Capitalisation	No. Market Makers	MM-Both	MM-Continuous	MM-Quote
1	938,694	0.046	15.98%	46.84	100.00	26.65%	\$3,404,021,172	5.31	0.57	2.98	1.75
2	938,694	0.036	12.58%	39.00	196.81	27.22%	\$8,873,482,919	8.99	1.21	6.33	1.45
3	938,693	0.033	12.04%	46.46	254.73	25.73%	\$12,066,900,540	10.78	1.37	7.81	1.59
4	938,694	0.031	10.44%	51.32	296.64	23.70%	\$14,214,111,733	12.34	1.87	8.78	1.68
5	938,694	0.026	10.35%	42.33	407.74	24.18%	\$18,710,873,124	14.43	2.32	9.80	2.30
<i>Full Sample</i>	<i>4,693,469</i>	<i>0.034</i>	<i>12.28%</i>	<i>55.09</i>	<i>251.19</i>	<i>25.50%</i>	<i>\$11,453,877,767</i>	<i>10.37</i>	<i>1.47</i>	<i>7.14</i>	<i>1.76</i>

Summary statistics are reported for 134 securities between 18 September 2000 and 20 December 2006. The statistics are segmented in quintiles, where quintile 1 represents securities, on average, with the lowest number of market makers, and quintile 5, the highest. *Bid-Ask Spread* is the average prevailing bid-ask spread measured in cents. *PBAS* is the average prevailing percentage bid-ask spread. *Depth* is the average cumulative volume posted on the buy and sell sides of the limit order book prior to the execution of a trade. *Daily Series Volume* is measured in contracts (one contract equals 100 shares of the underlying stock). *Volatility* is the implied volatility and is computed using the Black Scholes formula at each trade price. *Market Capitalisation* is the average market capitalisation of the securities in the respective market maker quintiles. *No. Market Makers* is the average number of designated market makers per security. The former category is made up of *MM-Both*, *MM-Continuous*, *MM-Quote* which are categories denoting the number of market makers as per their obligations.

Research Design

The design of appropriately structured methodologies relies exclusively on hypotheses that predict that the pervasive movement of market makers to and from securities is related to a range of profit, risk and market concentration considerations. The selection of variables for this analysis is guided by a number of standard competitive economic tenets, theoretical models of microstructure and extant empirical findings. The former two categories are largely bounded by modelling restrictions, whilst to date empirical findings are largely confounded by a range of contravening market frictions symptomatic of anti-competitive behaviour.

The contravening market frictions documented in previous empirical studies are largely averted in this study since the ASX forbids payment for order flow activity and trade internalisation procedures. Furthermore, strict compliance guidelines regarding market makers quote provision are enforced by the ASX. This study additionally differs from previous empirical studies since it considers not only the characteristics of the main market on which the security is traded, but also associated markets for which hedging characteristics are relevant.

The selection of relevant variables is both guided by perceived and actual profit, risk and market concentration considerations. Specifically, this analysis considers stock-specific characteristics that are likely to have formed part of a dealer's information set at the time of entry (exit). As a consequence, lagged variables that measure the spread, volume, volatility and the number of market makers of individual securities are included. Furthermore, assuming that a market maker's profit and risk considerations largely depend on the liquidity of the underlying market, (consistent with the hypothesis of Cho and Engle (1999)), hedging variables are included in the analysis.

Both the dependent and independent variables are computed as fixed time-series means over two-week intervals.¹⁸ This leads to the following general specification:

$$E_{i,t} = f(X_{i,t-1})$$

where:

$$X_{i,t} = (\text{Spread}_{i,t}, \text{USpread}_{i,t}, \text{IVOL}_{i,t}, \text{Delta}_{i,t}, \text{Gamma}_{i,t}, \text{Volume}_{i,t}, \text{MMakers}_{i,t}),$$

$$i = 1, 2, \dots, n.$$

$E_{i,t}$ denotes the probability of dealer entry (exit) in stock i in period t ; $\text{Spread}_{i,t}$ is the percentage quoted bid-ask spread¹⁹; $\text{USpread}_{i,t}$ is the underlying bid-ask spread; $\text{IVOL}_{i,t}$ is the implied volatility of an asset; $\text{Delta}_{i,t}$ is the option delta; $\text{Gamma}_{i,t}$ is

¹⁸ The two-week timeframe is selected to ensure that the necessary parameters influencing a market maker's decision to enter and exit are captured. For robustness purposes, monthly fixed intervals are considered and the results are qualitatively similar. These results are available upon request.

¹⁹ Percentage quoted bid-ask spreads are used in this analysis rather than absolute quoted bid-ask spreads since percentage spreads are better able to deal with price discreteness. Additionally, percentage spreads provide a more equivalent method of comparing trading costs across different series.

the option gamma; $Volume_{i,t}$ is the log of the average daily trading volume; $MMakers_{i,t}$ is the number of market makers, and is used to measure market concentration.

The model is estimated using both Poisson and logistic regressions. For these specifications, the dependent variable is set to equal one when entry (exit) is positive and zero otherwise. In both specifications, independent variables are lagged by a single period. To examine the possibility that market makers respond to different trade characteristics for particular classes of securities, separate regressions are estimated for Category 1 and 2 securities.

To examine if a dealer market which allows pervasive market maker movement and price competition will approximately reflect a competitive equilibrium, the concentration ratio of the market is examined on a discrete yearly basis.²⁰ A Herfindahl Index proxy measure is employed which examines the proportion of volume executed by active market makers. This measure is calculated as the sum of squares of the market share of each market making participant as indicated below:

$$Herfindahl_{i,t} = \sum_{n=1}^N S_{n,i,t}^2$$

where $S_{n,i,t}^2$ is the percentage of daily traded volume in security i traded by market maker n . A Herfindahl index score will range from $\frac{1}{\text{number of market makers}}$ to 1.

This is the range between a perfectly competitive market and a single monopolistic market.

To examine the association between market maker entry (exit) and the impact on quoted bid-ask spreads, both 30-day and 60-day event windows are constructed around the entry (exit) of single market maker event changes. All overlapping event windows which result from multiple dealer entry (exit), from the time of the originating event, are excluded so as not to confound empirical findings. Finally, to control for other determinants of the bid-ask spread, a pooled regression analysis is undertaken with the following specification:

$$Spread = a_0 + a_1 Option Price + a_2 \sum_{i=1}^{i=7} Tick + a_3 Daily Series Volume + a_4 Underlying Spread + a_5 Market Concentration + a_6 Moneyness + a_7 Time To Expiry + a_8 Volatility + a_9 Delta + a_{10} Event Dummy$$

where:

Spread is the bid-ask spread prevailing at each trade; *Option Price* is the option price; *Tick* are a set of dummy variables that indicate the maximum spread per price step, as specified in Table 1. For example, where the option price is less than 9.5 cents, the maximum allowable bid-ask spread is 5 basis points which rises to 6 basis points, where the option price increases to 19.5 cents.

Daily Series Volume is the daily trade volume summed across option series; *Underlying Spread* is the mean daily quoted underlying spread; *Market Concentration*

²⁰ The inclusion of a concentration index as an independent variable was first purported in the market microstructure literature by Tinic and West (1972).

is an index of the sum of the squares of the percentage market share of each market maker; *Moneyness* describes the intrinsic value of the option; *Time To Expiry* is the time to maturity of each trade; *Volatility* is the average implied standard deviation of trades across daily option series; *Delta* is the average hedge ratio of trades across daily option series; *Event Dummy* is a dummy variable assigned the value of one if the observation occurs after the entry (exit) of a market maker and zero otherwise. If an observed change in the bid-ask spread of an option security is related to the entry (exit) of a market maker, it is expected that the coefficient of the event dummy will be negative (positive) and significant.²¹

The previous specification implicitly assumes that the type of market maker obligations associated with market maker entry (exit) is irrelevant. Recent literature on the examination of affirmation obligations, however, suggests that the nature of market maker obligations may in fact affect market welfare (see Bessembinder, Hao and Lemmon 2007). In their survey, Charitou and Panayides (2009) document a plethora of obligations that are adopted by international security exchanges for assigned market makers.

Thus, to examine the effect of differing affirmative obligations associated with market maker entry (exit), separate regressions based on the type of obligation associated with market maker entry (exit) are performed. The following specification is described below:

$$\begin{aligned} \text{Obligation Type} = & a_0 + a_1 \text{Option Price} + a_2 \sum_{i=1}^{i=7} \text{Tick} + a_3 \text{Daily Series Volume} + a_4 \text{Underlying Spread} + \\ & a_5 \text{Market Concentration} + a_6 \text{Moneyness} + a_7 \text{Time To Expiry} + a_8 \text{Volatility} + a_9 \text{Delta} + a_{10} \text{Event Dummy} \end{aligned}$$

where:

Obligation Type represents one of three types of affirmative obligations: continuous, quote or mixed quote-continuous. The regressions are performed across security categories to examine whether particular obligations associated with market maker entry (exit) are affected by different trade characteristics. Excluded from this sample are events where multiple market maker movements are associated with differing market maker obligations. Results of the following specifications are discussed in the following section.

Empirical Results

Table 5 presents the results of the analysis described in the previous section. The results are based on both logistic and Poisson regression frameworks for which there are 6,600 entry and 6,501 exit combinations over a seven year sample period. The findings in Table 5 indicate that stock characteristics, based on executed trades,

²¹ An issue with empirical analyses characterised by large samples is a tendency to reject the null hypothesis at conventional significance levels, even when posterior odds favour the null hypothesis. This propensity is commonly referred to as Lindley's paradox. In order to avoid Lindley's paradox, the critical *t* values are adjusted for the large sample size according to the following formula:

$$t^* = \sqrt{\frac{2}{c^T T T^T - 1}}(T - k)$$

where *t** is the new critical *t* value; *T* and *k* denote the sample size and the number of regressors, respectively, in the model. According to Bayesian inference, a parameter is significantly different from zero when *t* > *t**. See Johnstone (2005) for the derivation and further discussion of this method.

significantly influence the market maker entry and exit decision. However, the direction and significance of these variables seemingly deviates, not only from the expectations outlined in the previous section, but also from prior theoretical and empirical analyses.

Table 5
Determinants of Market Maker Entry and Exit

	Market Maker Entry		Market Maker Exit	
	Logistic Regression	Poisson Regression	Logistic Regression	Poisson Regression
Intercept	-6.167* (0.602)	-5.916* (0.572)	-3.811* (0.685)	-3.789* (0.646)
Spread	3.468* (1.273)	3.150* (1.200)	5.174* (1.435)	4.642* (1.336)
USpread	6.00 (7.428)	5.611 (7.079)	12.808 (8.154)	11.373 (7.644)
IVOL	1.158** (0.505)	1.021** (0.471)	0.817 (0.619)	0.685 (0.577)
Delta	2.387* (0.931)	2.181* (0.885)	-0.414 (1.103)	-0.353 (1.044)
Gamma	0.242*** (0.133)	0.217*** (0.125)	-0.1745 (0.151)	-0.152 (0.141)
Volume	0.400* (0.056)	0.363* (0.053)	-0.330* (0.063)	-0.286* (0.058)
MMakers	-0.057* (0.021)	-0.051* (0.020)	0.340* (0.025)	0.299* (0.023)

This table presents the results of the logistic and Poisson regressions used to model the determinants of market maker entry and exit. The logistic and Poisson regression models are based on fixed two-week time-series intervals. Independent variables are lagged by a single period. *Spread* is the percentage quoted bid-ask spread; *USpread* is the underlying bid-ask spread; *IVOL* is the implied volatility of the asset; *Delta* is the option delta; *Gamma* is the option gamma; *Volume* is the log of the average daily trading volume; *MMakers* is the number of market makers. Standard errors are reported in parentheses. A single (double, triple) asterisk implies a 99% (95%, 90%) level of significance based on adjusted critical t-values.

Firstly, the results show that higher quoted bid-ask spreads are positively associated with both market maker entry and exit. While this finding appears counter-intuitive (since wider spreads are traditionally connoted with greater market maker income, which should lead to increased (decreased) market maker entry (exit)), it cannot be simply discounted as statistically erroneous. While market makers are attracted to the possibility of higher spreads, if higher spreads reflect higher market maker costs, then market makers may leave the market if they are bounded by exchange-mandated maximum spread rules.²² This is particularly pertinent for

²² The continuous spread rules may lead to an overall social welfare loss (transfer to informed traders) if market makers are forced to maintain two-sided quotes in an environment characterised by large information asymmetries.

Category 2 securities, which are characterised, on average, by higher levels of information asymmetry (Easley, Kiefer and O'Hara (1996) and Weston (2000)).²³

To examine the rigidity of the conjecture from the previous paragraph, a comparison of determinants between Category 1 and 2 securities is required. If the reason that higher quoted spreads are correlated with market maker exit is due to higher adverse selection costs, which are exacerbated by exchange-mandated quoting obligations, then it is expected that this association will be significantly greater for Category 2 securities. According to the results in Table 6, quoted bid-ask spreads, for Category 2 securities, are on average, strongly associated with market maker exit. This relationship, for Category 1 securities, is only statistically significant at the 10 percent level. The nature of these findings lends support to the conjecture that if market makers are forced to maintain two-sided markets in environments characterised by higher levels of information asymmetry, then this may lead to market maker exit which may affect overall competition.

In relation to market maker entry, the results in Table 5 emphasise that higher levels of volatility, option delta costs and levels of trading activity are positively associated with market maker entry. The positive coefficient pertaining to the level of trading activity is largely intuitive and consistent with competitive expectations. Similarly, with implied volatility and option delta variables, the positive and significant coefficients associated suggest that they are important determinants of market maker entry. This latter result, however, contradicts competitive expectations as well as extant empirical evidence (Wahal 1997).

This previous evidence argues that an increase in volatility will increase the risk of carrying inventory and as such deter market maker entry. While this finding is suited to equities-based research, the nature of this finding may be of limited applicability to the options market, since in a more volatile pricing environment, hedging and other risk management techniques become more relevant and profitable for market makers.²⁴ Thus the nature of this finding is likely to vary from previous microstructure results. Results in Table 6 suggest only limited support for this hypothesis. On average, the coefficient associated with volatility is positive and significant for Category 2 securities, yet insignificant for Category 1 securities. Finally, the results in Tables 5 and 6 also indicate that for both Category 1 and 2 securities, stocks with fewer dealers have a higher probability of market maker entry.

The decision of a market maker to leave a particular security is also analysed with respect to a range of stock and option characteristics. Table 5 indicates that the decision of a market maker to exit a security is significantly associated with the bid-ask spread, trading volume, and number of existing market makers. Table 6 provides corroborative evidence of this pattern across Category 1 and 2 securities.²⁵ Overall, the decision of a market maker to enter (exit) from the quote provision process is guided by rational and competitive, profit, risk and market concentration characteristics as predicted in the previous section.

²³ This argument supposes that market makers may not always be able to hedge the risk associated with increased levels of information asymmetry. This type of risk is inherently greater for smaller and less liquid securities that dominate the sample of securities examined.

²⁴ In an environment characterised by higher volatility, hedging and other risk management techniques become more relevant and importantly can be profitable if strategies have been designed with a long gamma and kappa or vega risk stance.

²⁵ Table 6 additionally finds weak evidence of a relationship between higher levels of implied volatility and market maker withdrawal from Category 2 securities.

Table 6
Determinants of Market Maker Entry and Exit for Category 1 and 2 Securities

	Market Maker Entry		Market Maker Exit	
	Category 1	Category 2	Category 1	Category 2
Intercept	-4.409* (1.003)	-6.440* (0.779)	-3.359* (1.109)	-4.277* (0.896)
Spread	2.227 (2.465)	3.351* (1.556)	5.444*** (2.979)	5.447* (1.786)
USpread	5.615 (12.16)	8.882 (9.266)	24.000*** (13.452)	6.342 (10.600)
IVOL	-0.186 (0.744)	2.333* (0.692)	-0171 (0.854)	1.703*** (0.906)
Delta	1.597 (1.547)	2.630** (1.191)	-1.511 (1.764)	0.022 (1.442)
Gamma	0.231 (0.206)	0.059 (0.181)	0.017 (0.221)	-0.518** (0.220)
Volume	0.361* (0.085)	0.335* (0.079)	-0.289* (0.096)	-0.347* (0.088)
MMakers	-0.114* (0.030)	-0.077** (0.035)	0.313* (0.036)	0.415* (0.043)

This table presents results of a logistic regression analysis used to examine the determinants of market maker entry and exit for Category 1 and 2 securities. The logistic regression model is based on fixed two-week time-series intervals. Independent variables are lagged by a single period. *Spread* is the percentage quoted bid-ask spread; *USpread* is the underlying bid-ask spread; *IVOL* is the implied volatility of an asset; *Delta* is the option delta; *Gamma* is the option gamma; *Volume* is the log of the average daily trading volume; *MMakers* is the number of market makers. Standard errors are reported in parentheses. A single (double, triple) asterisk implies a 99% (95%, 90%) level of significance based on adjusted critical t-values.

Table 7 presents results of the analysis related to market concentration. According to the examination, which involves analysing the average Herfindahl concentration ratio of securities in Category 1 and 2 security groups, a wide disparity in the nature of competition exists between liquid and less liquid securities. The results show that Category 1 securities are less concentrated than Category 2 securities, with an average Herfindahl index score of 0.172 for Category 1 securities and 0.447 for Category 2 securities.

The average concentration ratio of a perfectly competitive market, in which (in theory), each market maker receives an equally distributed proportion of the order flow, is also reported. The reporting of this statistic provides a direct comparison of the degree of market concentration for ASX option securities. Relative to the average concentration ratio of a perfectly competitive market, the results documented enforce the view that low volume securities (Category 2) are more concentrated than high volume securities (Category 1). This result is consistent with Ellis, Michaely and O'Hara's (2002) analysis of the NASDAQ market.

Table 7
Herfindahl Index Ratios

Year	Category 1		Category 2	
	Herfindahl Index	1 / number of market makers	Herfindahl Index	1 / number of market makers
2000	0.16203	0.1275	0.36871	0.18574
2001	0.14208	0.11575	0.41902	0.17947
2002	0.15752	0.10692	0.42859	0.22663
2003	0.17334	0.09804	0.45854	0.22407
2004	0.17687	0.09615	0.49909	0.22341
2005	0.18255	0.10132	0.48586	0.22248
2006	0.21401	0.12018	0.47168	0.23811

This table documents Herfindahl index scores for Category 1 and Category 2 securities across discrete time intervals. The Herfindahl index measure is calculated as the sum of squares of the market share of each dealer as indicated below:

$$Herfindahl_{i,t} = \sum_{n=1}^N S_{n,i,t}^2$$

where $S_{n,i,t}^2$ is the percentage of daily traded volume in security i traded by market maker n .

$1/(\text{number of market makers})$ is a comparative ratio of a situation where market makers equally share trade volume and thus is the benchmark for a competitive market.

The results in this study, however, show that low liquidity securities yield a greater degree of market power despite relatively free market maker entry and the emphasis of price competition between market makers. Therefore, while free market maker entry is viewed as a central requisite of competitive price formation, a positive association in this analysis also encompasses the level of overall liquidity.

Table 7 additionally highlights that the average Herfindahl index ratio is up-trending for both Category 1 and Category 2 securities. This result indicates that the proportion of business taken by leading market makers has increased over time. Although this may stem from a range of factors, the most likely reason for this up-trend is that incumbent market makers accrue a greater degree of market power and are therefore able to offer superior quotes. This market power may be the result of incumbent market maker experience which is exhibited in terms of superior market timing or greater industry specialisation.²⁶ As such, new competitors may be limited in their ability to attract a similar degree of order flow.²⁷ The veracity of this statement, however, warrants further research.

²⁶ Schultz (2000) argues that the fact that not all dealers are created equal in terms of capitalisation and industry specialisation may lead to divergences from a competitive outcome. The ASX strictly forbids order preferencing or trade internalisation so that this disparity in market power is most likely due to the factors outlined above.

²⁷ The average Herfindahl index ratio may also increase if there is a decrease in the number of market makers. This reasoning, however, is seemingly implausible given the steady increase in market makers over time.

The previous set of results indicates that the market structure of AOM securities diverges between a competitive (Category 1) and less than competitive (Category 2) state. To examine whether the nature of this state has implications for the entry (exit) of market makers, an event-study regression analysis focusing on the impact on quoted bid-ask spreads, is performed on Category 1 and 2 securities. Pooled 30-day and 60-day event estimates are presented in Table 8. The explanatory power of the regression models ranges between 25.95 percent and 36.76 percent. The F-statistics indicate that the hypothesis that the estimated coefficients are jointly equal to zero can be rejected at the 0.01 level.²⁸ The standard errors of the estimated coefficients are corrected for heteroskedasticity using White's (1980) method.

The results show that market maker entry (exit), pertaining specifically to Category 1 securities, is on average associated with a significant decline (increase) in quoted bid-ask spreads. This result is robust for 30-day and 60-day event windows. The marginal economic impact associated with market entry (exit), is an average decline (increase) in quoted spreads of 3.02 percent (4.42 percent). In relation to Category 2 securities, results show that market maker entry (exit) has a statistically insignificant impact on quoted bid-ask spreads. While these results contradict findings pertaining to Category 1 securities, they are nevertheless consistent with expectations that greater market power in less-liquid securities adversely affects the competitive price formation process.

The results in Table 7 regarding Category 2 securities suggests that if market makers enjoy disparate market power, then the ability of new market makers to compete for order flow may be significantly compromised. On no condition, however, does this finding suggest that by improving the degree of competitiveness then trading costs will decrease. The results of this conjecture are tested and additionally presented in Table 8. According to these results, a significant (insignificant) association between the degree of market concentration and quoted bid-ask spreads is documented for Category 1 (2) securities. The implication of this finding for Category 1 securities is that bid-ask spreads are wider (narrower) under more (less) concentrated market structures. However, for Category 2 securities, irrespective of the level of market concentration, the impact on bid-ask spreads is insignificant.

The findings in Table 8 *inter alia*, assume that obligations attached with market maker entry (exit) have a negligible impact on the price formation process. To examine this proposition further, three separate regressions are performed, based on a selection of obligations associated with market maker entry (exit). Table 9 presents the results of these regressions based on a 30-day event sample for Category 1 and 2 securities.

Focusing on affirmative market maker obligations that are dually associated with market maker entry and exit, the results in Table 9 indicate that in Category 1

²⁸ Conditional Index (CI) values furthermore indicate that multicollinearity is not a major issue in the regression model framework.

Table 8
Market Maker Entry (Exit) and the Bid-Ask Spread

	Market Maker Entry				Market Maker Exit			
	30 Day		60 Day		30 Day		60 Day	
	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2	Category 1	Category 2
Intercept	0.138*	0.299*	0.142*	0.287*	0.092*	0.128*	0.097*	0.145*
Option Price	0.018*	0.005*	0.019*	0.006*	0.015*	0.020*	0.011*	0.023*
Tick Dummy (1)	-0.044*	-0.172*	-0.040*	-0.163*	-0.038*	-0.058*	-0.052*	-0.070*
Tick Dummy (2)	-0.040*	-0.163*	-0.035*	-0.152*	-0.034*	-0.051*	-0.047*	-0.061*
Tick Dummy (3)	-0.036*	-0.154*	-0.032*	-0.143*	-0.032*	-0.045*	-0.042*	-0.057*
Tick Dummy (4)	-0.032*	-0.139*	-0.027*	-0.128*	-0.028*	0.039*	-0.039*	-0.051*
Tick Dummy (5)	-0.024*	-0.114*	-0.018*	-0.106*	-0.021*	-0.026*	-0.030*	-0.039*
Tick Dummy (6)	-0.011*	-0.078*	-0.006*	-0.068*	-0.009*	-0.009*	-0.017*	-0.021*
Tick Dummy (7)	-0.003*	-0.046*	0.003*	-0.026*	-0.002*	-0.002*	-0.008*	-0.009
Daily Series Volume ('000)	-0.003*	2.06*	-0.005*	0.003**	-0.003*	1.04*	-0.003*	0.001
Underlying Spread	0.268*	0.423*	0.283*	0.414*	0.311*	0.470*	0.294*	0.537*
Market Concentration	0.004*	0.001	0.008*	0.003	0.015*	0.001	0.007*	-0.002
Moneyness	-0.106*	-0.127*	-0.122*	-0.140*	-0.064*	-0.072*	-0.055*	-0.080*
Time to Expiry	0.022*	0.005*	0.024*	-0.002	0.019*	0.012*	0.021*	0.009*
Volatility	0.014*	0.042*	0.017*	0.050*	0.012*	0.018*	0.015*	0.12*
Delta	0.022*	-0.020*	0.037*	0.006	0.016*	9.35*	0.020*	0.007
Event Dummy	-0.001*	-0.001	-0.001*	3.27*	0.001*	3.72*	0.001*	0.001
F-Value	12292.6	2166.82	11245.5	2783.03	8471.44	1165.99	10229.9	1664.36
Adj. R-squared	0.3378	0.3676	0.3116	0.3289	0.2595	0.2855	0.2605	0.2832
Critical t-value								
-1%	4.695	4.492	4.699	4.539	4.696	4.465	4.715	4.506
-5%	4.330	4.108	4.334	4.160	4.331	4.078	4.351	4.123
-10%	4.179	3.949	4.183	4.002	4.180	3.918	4.201	3.965

This table presents estimates from regressing quoted bid-ask spreads, of Category 1 and 2 option securities, on independent market maker entry (exit) event changes between 18 September 2000 and 20 December 2006. The estimates are based on 30 and 60-day event windows and are corrected for heteroskedasticity using White's (1980) method. Independent control variables include *Option Price*, *Daily Series Volume*, *Underlying Spread*, *Market Concentration*, *Moneyness*, *Time to Expiry*, *Volatility* and *Delta*. *Underlying Spread* is the mean daily quoted underlying spread; *Market Concentration* is the sum of squares of the percentage market share of each market maker; *Moneyness* describes the intrinsic value of the option; *Time to Expiry* is the time to maturity of each trade; *Volatility* is the average implied standard deviation of trades across daily option series; *Delta* is the average hedge ratio of trades across daily option series. Event Dummy is a dummy variable assigned the value of one if the observation occurs after the entry (exit) of a market maker and zero otherwise. A single (double, triple) asterisk implies a 99% (95%, 90%) level of significance based on adjusted critical t-values.

Table 9
Affirmative Obligations associated with Market Maker Entry (Exit) and the Bid-Ask Spread

	Market Maker Entry						Market Maker Exit					
	Category 1			Category 2			Category 1			Category 2		
	Both	Quote	Continuous	Both	Quote	Continuous	Both	Quote	Continuous	Both	Quote	Continuous
Intercept	0.091*	0.167*	0.142*	0.010	0.368*	0.248*	0.070*	0.095*	0.190*	-0.066*	0.203*	0.082*
Option Price	0.013*	0.021*	0.016*	0.016*	0.023*	0.012*	0.026*	0.014*	0.017*	0.023*	0.006*	0.034*
Tick Dummy (1)	-0.019*	-0.040*	-0.055*	-0.015	-0.195*	-0.147*	-0.006*	-0.038*	-0.072*	-0.069*	-0.116*	-0.025*
Tick Dummy (2)	-0.018*	-0.035*	-0.050*	-0.015	-0.182*	-0.137*	-0.004*	-0.034*	-0.066*	-0.074*	-0.104*	-0.021*
Tick Dummy (3)	-0.016*	-0.032*	-0.046*	-0.013	-0.170*	-0.130*	-0.003*	-0.031*	-0.060*	-0.077*	-0.096*	-0.017*
Tick Dummy (4)	-0.013*	-0.028*	-0.040*	-0.016	-0.151*	-0.119*	-0.003*	-0.028*	-0.053*	-0.084*	-0.085*	-0.014**
Tick Dummy (5)	-0.005*	-0.020*	-0.031*	-0.026	-0.124*	-0.100*	0.004	-0.022*	-0.039*	-0.096*	-0.061*	-0.009***
Tick Dummy (6)	0.009*	-0.003**	-0.021*	0.004	-0.090*	-0.067*	0.013	-0.011*	-0.022*	-0.085*	-0.041*	0.002
Tick Dummy (7)	0.019*	0.001	-0.009*	-0.004	-0.055*	-0.039*	0.017	-0.005*	-0.003*	-0.054*	-0.028*	0.010
Daily Series Volume ('000)	-0.002*	-0.006*	-0.002*	-0.005*	-0.005*	4.62*	-0.001*	-0.003*	0.003*	0.001	-0.002	0.000
Underlying Spread	0.233*	0.240*	0.237*	0.125*	0.397*	0.395*	0.198*	0.307*	0.229*	0.134	0.426*	0.473*
Market Concentration	0.007*	0.009*	0.003**	0.003	-0.009*	-0.002	0.008*	0.012*	0.006*	-0.002	0.002	-0.003**
Moneyness	-0.063*	-0.152*	-0.094*	-0.012	-0.163*	-0.106*	-0.064*	-0.063*	-0.132*	-0.015	-0.078*	-0.065*
Time to Expiry	0.030*	0.014*	0.023*	0.014*	0.012*	4.65*	0.033*	0.016*	0.014*	0.029*	0.007*	0.014*
Volatility	0.020*	0.028*	0.010*	0.012*	0.051*	0.038*	0.023*	0.013*	0.050*	0.024*	0.038*	0.020*
Delta	0.002	0.040*	0.017*	2.87*	0.045*	-0.002	0.022*	0.008*	0.003	0.027*	-0.038	0.014*
Event Dummy	-0.001*	-0.002*	1.49*	4.58*	4.45*	-0.001	8.05***	0.002*	3.20*	0.001	-7.34*	0.001

This table shows estimates from regressing quoted bid-ask spreads, of Category 1 and 2 option securities on independent market maker entry (exit) event changes associated with three types of affirmative obligations. These obligations include *Continuous*, *Quote* and *Both* (mixed continuous/quoted) based on rules between 18 September 2000 and 20 December 2006. The estimates are based on a 30-day event window and are corrected for heteroskedasticity using White's (1980) method. Independent control variables include *Option Price*, *Daily Series Volume*, *Underlying Spread*, *Market Concentration*, *Moneyness*, *Time to Expiry*, *Volatility* and *Delta*. Event Dummy is a dummy variable assigned the value of one if the observation occurs after the entry (exit) of a market maker and zero otherwise. A single (double, triple) asterisk implies a 99% (95%, 90%) level of significance based on adjusted critical t-values.

securities, both quote and mixed quote-continuous based obligations are significantly associated with narrower bid-ask spreads. This finding, however, does not extend to continuous-based obligations attached to market maker entry and exit. Regarding Category 2 securities, results indicate that the extent of obligations associated with market maker entry and exit are insignificant.

The implications of these findings are significant since they suggest that the type of obligation associated with market maker entry (exit) affects quoted spreads. While these findings do not necessarily suggest that quoted and mixed-based obligations dominate continuous-based obligations, they indicate that the marginal benefit of quote and mixed-based obligations is significant for quoted bid-ask spreads of Category 1 securities.²⁹

The results documented in Tables 8 and 9 additionally provide pertinent evidence regarding the determinants of spreads in options markets. Consistent with previous empirical findings (including Neal (1987) and Mayhew (2002)), price, volatility and time-to-expiry are significant determinants of option bid-ask spreads. Interestingly however, while volume is expected to vary inversely with quoted spreads, the significance of this relationship is attributable to securities in Category 1. A similar finding is also reported in terms of market concentration. In relation to the underlying spread and the option delta variables, which are designed to capture the costs of hedging on quoted spreads, the reported results are additionally inconclusive. Specifically, the results related to Category 1 securities provide evidence that higher hedging costs increase option spreads concurring with the “derivative hedge theory” proposed by Cho and Engle (1999). There is however, only limited evidence to support this theory for Category 2 securities.

Robustness Tests

A number of additional robustness tests are performed in this section to validate findings documented in the previous section. For space considerations, these results are not reported but are available upon request from the authors. Firstly, to examine the robustness of trade characteristics, used to explain the market maker entry and exit decision, the sampling procedure is altered so that trade characteristics are defined over a monthly rather than fortnightly period. In addition to the sampling changes, a specification change is also imposed so that the decision between entry, exit and no change (neither entry nor exit) is analysed on an ordinal rather than binomial scale. This is consistent with the methodology of Wahal (1997). As such, an ordered regression analysis is used. This model encompasses a random utility framework

²⁹ It cannot be said that quote and mixed-based obligations dominate continuous obligations since the type of entry (exit) may be dependent on the overall mix of prevailing obligations. Since continuous market makers dominate the existing pool of dealers, as documented in Table 2, the addition of an extra market maker with continuous obligations may be less relevant than a market maker with quote-based obligations.

which assumes that the utility of an alternative decision is a function of a set of attributes plus a random variable. The structural model is described as follows:

$$y_i = x_i' \beta + u_i \quad \text{where } i = 1, \dots, n;$$

where a latent variable y_i^* , ranging from $-\infty$ to ∞ , is defined by an observed y according to the following underlying latent model:

$$y_i = m \text{ if } \tau_{m-1} \leq y_i^* < \tau_m \text{ for } m = 1 \text{ to } J$$

where τ_m represents a range of cut-points. Accordingly, the ordered response model is categorised as follows: $y_i = -1$ for a decrease in market makers relative to the previous period, $y_i = 0$ for no change in market makers relative to the previous period, and $y_i = 1$ for an increase in market makers relative to the previous period. Estimation is performed via maximum-likelihood procedures. On average, the results reveal that, based on stock characteristics from the previous month, increases in delta hedging costs and volume are associated with an increase in market maker entry across all option securities. Furthermore, securities with a lower number of market makers also have a higher probability of market entry.

It is furthermore documented in the previous section that market maker entry (exit), for Category 1 securities leads to a significant marginal decline (increase) in quoted bid-ask spreads. To reduce the effects of intra-day patterns, an examination of this issue is undertaken by averaging all trades for a given security and trade series on a given day. Results indicate that consistent with findings in the previous section, market maker entry (exit) is on average negatively (positively) associated with quoted bid-ask spreads for Category 1 securities. The relationship is however, insignificant for Category 2 securities. This result is additionally robust in both 30-day and 60-day event samples.

To address a methodological issue related to the exiguously non-normal (rightly skewed) distribution of quoted bid-ask spreads, a non-parametric generalised linear regression model (GLM) with a Poisson distribution is used to affirm the quantitative trends presented in the fifth section. To additionally ensure that the results are not driven by any market anomalies (and so that only the most active option series are considered), the sampling procedure is also altered so that both longer term and near-expiration options are excluded. Options that expire within the next 90 days, but not within the next 7 calendar days are included which is consistent with the procedure of De Fontnouvelle, Fische & Harris (2003) who argue that trades in the near term are likely to be motivated to avoid delivering stock on in-the-money options. The GLM regression uses a Poisson distributional assumption which more robustly approximates the marginally right skewed distribution of the quoted spreads dependent variable. The direction and significance of the coefficient estimates from this regression procedure are qualitatively consistent with the primary findings in the previous section.

Conclusion

Standard economic theory proposes a direct association between market maker competition and financial market quality. The extent of the association between competition for order-flow and market quality is additionally recognised by market

regulators who seek to mitigate market frictions and impediments to competition as well as market participants who are concerned with the level of trading costs and price discovery. In light of scant empirical evidence regarding the dynamics of market making in financial dealer markets, this study is based on the ASX options dealer market and provides evidence of a positive link between endogenous market maker movement and the level of trading costs. Significant insight is also shed with respect to the vexed issue of what impact affirmative market maker obligations have on market welfare.

The results derived in this paper argue that market maker entry (exit) in financial dealer markets depends on a broad range of profit, risk and market concentration characteristics. Specifically, these factors relate to trading characteristics of the main and underlying market. However, while pervasive market maker movement is commonly observed in financial dealer markets, recent empirical evidence suggests that this factor alone does not necessarily lead to competitive price formation. This paper examines a trading structure absent of market frictions and provides evidence that *free* market maker movement does not explicitly result in a competitive market structure.

This study finds that the degree of market concentration additionally affects the marginal impact of market maker entry (exit). Results pertaining to the transaction cost analysis indicate that market maker entry (exit) leads to a significant reduction (increase) in quoted bid-ask spreads for Category 1 securities, but not Category 2 securities. In addition to this evidence, results in this study also highlight that the degree of market concentration is not significantly associated with the level of trading costs for illiquid securities. The implication of this finding is pertinent to market regulators since market maker competition may not necessarily contribute to enhancing market quality for less liquid securities.

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Empirical Evidence on the Link Between Compliance with Governance of Best Practice and Firms' Operating Results

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Keywords

Corporate governance, Agency theory, Mid-cap, Best practice, Horwath report



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Tek Lama*¹

Abstract

This study provides robust evidence in support of the agency theory argument that corporate governance matters for a firm's operating performance. Using the corporate governance ratings as the governance proxy from *Horwath 2006 Corporate Governance Report (mid-sized Australian ASX companies)* and *Mid-Cap Corporate Governance Report 2007* (The University of Newcastle 2006; 2007), I examine 60 sample firms to reveal that a firm's governance is positively and significantly related to firm performance as measured by return on equity, earning yield and return on assets. This study extends the findings of these two reports which found a disturbing trend in the corporate governance practice of Australian mid-cap companies – both a decrease in companies with excellent corporate governance, and an increase in companies with significant corporate governance deficiencies. The findings of this study suggest that those mid-size companies who have allowed corporate governance to deteriorate have adversely affected their shareholder returns.

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JEL Classification: G34, G38, K22

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Introduction

The corporate governance of Australia's mid-cap companies attracted attention after the *Horwath 2006 Corporate Governance Report (mid-sized Australian ASX companies)* and the *Mid-Cap² Corporate Governance Report 2007* revealed that the corporate governance standards of mid-cap companies were deteriorating (The University of Newcastle 2006; 2007). In fact, the reports found a disturbing trend – both a decrease in companies with excellent corporate governance, and an increase in companies with significant corporate governance deficiencies³. The findings are as much of a concern for investors as they are for regulators, in particular for the Australian Stock Exchange (ASX), as this raises a serious question about the efficacy of its disclosure and market-based corporate governance guidelines.

The ASX released its *Principles of Good Corporate Governance and Best Practice Recommendations* (ASX guidelines) in March 2003 (ASX 2003) following a number of corporate disasters both in Australia (e.g. HIH Insurance) and in offshore jurisdictions (e.g. Enron in the U.S.). The key objective of the guidelines was to address concerns about unacceptable corporate governance behaviour and restore investor confidence (Gold 2006).

However, some commentators have perceived the poor and deteriorating corporate governance practices by Australia's mid-cap companies two years after these guidelines came into effect to be a matter for concern. For example, Newcastle University Associate Professor Jim Psaros, the co-author of both reports, described the results as a concern while BDO Kendalls director of risk advisory services Andrew Pearce, as cited by Gettler (2007, p.10), said “the increase in companies with serious corporate governance holes was a worry”. The findings may undermine the efficacy of the ASX's disclosure and market-based governance regime and could even ignite a debate for a more prescriptive measure similar to the *Sarbanes Oxley Act 2002* introduced in the U.S. in 2002 (*Sarbanes Oxley Act 2002*).

This study investigates the potential impact of the deteriorating state of corporate governance practices among Australian mid-cap companies on their operating effectiveness. The results suggest that shareholders of companies with a good corporate governance system in place, as measured by the level of compliance with the governance of best practice (e.g. ASX guidelines), enjoy better economic returns, compared to shareholders of companies that have relatively inferior sets of governance mechanisms.

Research Motivation

This study is motivated by two factors. The first is the lack of research on the effect of corporate governance on organisational performance outside the large-cap companies in Australia. For example, virtually all of the literature in the Australian context investigates large-cap companies (Lawrence & Stapledon 1999; Keil & Nicholson 2003; Pham, Suchard & Zein 2007). That effectively means that little is known about the status of the corporate governance practices of Australian mid-cap listed companies and whether these practices have any bearing on their economic performance. The resource constraints and the degree of variation in regulatory requirements means the results observed in the large-cap companies cannot be meaningfully

² The term ‘mid-cap’ in these reports refers to the companies ranked 251 – 400 by market capitalisation at the time of research, whereas the term ‘ASX mid-caps’ refers to the S&P/ASX index comprised of all of the members of S&P/ASX 100 excluding those in the S&P/ASX 50 index.

³ See figures 1 and 2 in Appendix.

generalised to their small-cap counterparts. Furthermore, a deteriorating trend in the governance practices of mid-cap listed companies as shown by their reports means that the constituency of mid-cap companies provides a fitting context to examine the governance-performance relation.

In addition, virtually all studies that examined the governance-performance relation seem to use level data. In other words, these studies attempted to establish causality between governance and performance using a firm's basic data of a given year or years. It can be argued that studying causality is more appropriately achieved by using differential data (i.e. a change in a variable from one period to another) as it is more likely to capture the effect of changes in a predictor variable on the dependent variable/s. Therefore, this study uses the differential data approach in order to capture the changes on the dependent variable as a result of the actual changes in the independent variables.

Underlying Argument for the Governance-Performance Relationship

The relationship between management and shareholders, in terms of agency theory, is based on the separation of ownership and control, and the key assumption that is associated with this is the presumption of fundamental tension between the shareholders and corporate managers (Jensen & Meckling 1976). Furthermore, the managers' superior access to inside information and the relatively powerless position of numerous and diffuse shareholders means that a reasonable prospect exists for managers to benefit personally at the expenses of shareholders.

The 'model of man' underlying the agency theory and organisational economics is that of the self-interested actor rationally maximising his own personal economic gain (Donaldson & Davis 1991). In that sense, managers' decisions could be influenced by their personal preferences that are likely to be inconsistent with organisational goals. Given the unique position that managers occupy, they can benefit substantially without actually bearing the costs. As a result, managers have not only the ability but also the incentive to engage in activities that enhance their personal benefit at the expense of shareholders' residual claims.

Therefore, the rationale for corporate governance stems from a concern to protect shareholders from managerial opportunism arising from goal divergence and the information asymmetry that is inherent in the agency relationship characterising modern corporations. The term 'corporate governance' generally refers to a protective mechanism stemming from agency theory. It is generally understood as a multi-dimensional construct consisting of many systems and processes covering a wide range of components. More specifically, it is the process of supervision and control that ensures that the company's management acts in the interest of shareholders (Parkinson 1994).

Corporate governance codes recommend a range of structural attributes of good corporate governance. These structural attributes are primarily centred on the board of directors. The principal duty of the board of directors is to monitor management's decision-making on behalf of shareholders. The board is more likely to be an effective monitor if it is not associated with executive management, the Chief Executive Officer (CEO) in particular. Boards with a majority of independent directors and a separate Board Chair and CEO are viewed as a necessary governance structure and have been extensively debated and analysed in the academic literature (Cadbury 1992; ASX 2003). According to Fama and Jensen (1983), an independent and engaged board of directors ensures that managers behave in the best interest of shareholders as it counterbalances the power of the management in decision-making. The key role of the board is to ensure that the CEO carries out their duties in a way that serves the best interest of shareholders. Conversely, the board's role can be seriously compromised if the CEO assumes the roles of both CEO and Board Chair. Edwards and Clough (2005) argue that an independent chair enhances the board's capacity to keep the

CEO's activities in check. In addition, the board should also be of an appropriate size so as to encourage efficient decision-making (ASX 2003).

There are two aspects of corporate governance — conformance and performance (Edwards & Clough 2005). The conformance aspect entails the board's responsibility to ensure compliance with relevant governance regulations and the timely discharging of various contractual obligations. The objectives of governance regulations are to provide frameworks for governance systems that reduce managers' improper and unlawful behaviour through enhanced transparency and a greater level of managerial accountability. On the other hand, the performance aspect of corporate governance involves monitoring the performance of the organisation, although monitoring is only one of the board's roles. It also has a strategic role involving setting organisational goals, developing strategic plans for achieving these goals, and being responsive to changing environmental demand. This responsiveness includes the prediction and management of risk. In addition to involvement in strategic planning, boards also contribute to a firm's success by advising management, channelling outside resources to the firm and relating to stakeholders such as communities and employees (Young 2003).

However, the question of whether governance is associated with organisational performance is an empirical one. A significant body of literature has attempted to provide empirical justification for this agency theory argument. The branches of the literature relevant to the current study are reviewed in the next section.

Governance and Organisational Performance: The Empirical Evidence

Early studies on governance and organisational performance, particularly prior to the start of this century, sought to establish the link between various individual governance elements and financial performance measured by various performance indicators with particular focus on the Anglo-Saxon economies⁴, especially the U.S. Although there are almost an infinite number of governance elements, the most examined issues in the governance-performance literature appear to be board independence, separation of the roles of CEO and Chair and board size.

Studies by Hermalin and Weisbach (1991), Klein (1998) and Bhagat and Black (2002) did not find any robust relationship between board independence and firm performance. Lawrence and Stapledon (1999) investigated the Top-100 Australian listed firms in 1995 and found no consistent association between independent directors and firm value. Westphal (2002, p.2) concluded "after nearly two decades of academic research in multiple disciplines (finance, accounting and management) on the consequence of board composition, there is little evidence that board independence enhances the board effectiveness".

Another board structure measure that is highly recommended by the codes of best practice is the separation of the roles of CEO and Chair. However, past studies did not find robust evidence to suggest that having such a measure enhances firm performance (Baliga, Moyer & Rao 1996; Brickly, Coles & Jarrell 1997; Dalton et al. 1998; Kiel & Nicholson 2003).

The general consensus in terms of board size appears to be that a smaller board is desirable (ASX 2003). In theory however, both larger and smaller boards can be justified. For example, larger boards have a better ability to establish external links with the environment, secure more critical resources and bring more highly-qualified directors with an abundance of knowledge and experience vital for the firm's overall strategy formulation (Pfeffer & Salancik 1978; Dalton et al.

⁴ The Anglo-Saxon economy refers to the economy practised in major English-speaking countries such as the United Kingdom, Republic of Ireland, United States, Canada, Australia and New Zealand.

1999). On the other hand, larger boards limit their directors' ability to satisfy its main functions, making coordination, communication and decision-making processes more cumbersome than they are for smaller boards.

The literature has found no conclusive evidence of a link between board size and performance. For example, Yarmack (1996) found that smaller boards are related to a higher firm value, while Kiel and Nicholson (2003) found a positive association between board size and market-based performance (i.e. Tobin's Q). However, Holthausen and Larcker (1993) and Dalton et al. (1999) found no association between board size and firm performance suggesting that board size on its own does not explain the firm performance.

The literature also provides mixed evidence in relation to the association between non-board-related governance variables and firm performance. Managerial ownership and CEO remuneration are two non-board-related variables often examined in the literature. Empirical evidence on their potential impact on firm performance appears similar to those of board-structured governance variables and organisational performance — that is, inconclusive. The literature provides evidence that the relationship between managerial ownership and firm performance is non-linear (Morck, Shleifer & Vishny 1988; Welch 2003; Li et al. 2007). With respect to the link between CEO remuneration and firm performance, most of these studies concluded that these variables are not related.

One possible argument for this lack of relationship is that a firm's corporate governance is a composite function of many governance factors. Therefore, assessing the extent of the firm's corporate governance requires taking into account all of the variables that make up the firm's overall corporate governance system.

Since the start of this century, researchers have started using a number of governance attributes in combination (e.g. broad-based index) to proxy the firm's governance (Love 2012). Theoretically, the broad-based index approach can be considered superior as it better represents the firm's overall corporate governance. Love (2012) argues that the aggregate approach of measuring governance is useful as it focuses on the concept of corporate governance and abstracts from individual governance components that are so numerous that they make such research difficult. This means that a broad-based index, which reflects the firm's overall corporate governance quality, is able to serve as a better proxy for the quality of corporate governance.

Black (2001) is one of the earliest studies to examine the governance-performance relationship using an index as a governance proxy. His examination of 21 Russian firms revealed a strong correlation between the firm's corporate governance ranking (index)⁵ and firm value. However, he described the result as only tentative, given the small sample size.

Gompers, Ishii and Metrick (2003) investigated 1,500 large U.S. firms from 1990 through 1998 and reported on compelling evidence of association between governance and performance. In particular, they demonstrated that an investment strategy that bought firms in the lowest deciles (i.e. good governance) and sold in the highest deciles (i.e. poor governance) on the index would have earned an abnormal return of 8.5% per year during the sample period. Although the findings caused a sensation in academic circles at the time, subsequent analysis questioned their robustness. For example, Yen (2005) found that a reported abnormally high return for well-governed firms in Gompers, Ishii and Metrick (2003) was driven by outliers and by the inclusion of penny stocks. Ferreira and Laux (2007) provided evidence that the higher risk inherent in well-governed firms provides a better explanation for the abnormal return observed by Gompers, Ishii and Metrick.

⁵ The author used the ranking system developed by the Brunswick Warburg investment bank that rated Russian firms on a 0 to 60 scale, with higher numbers indicating poorer governance.

James and Cotter (2007) noted that Australian annual report disclosures about corporate governance practices are not useful to assess default risk. In a complete contrast to general belief, Gold (2006) reported that the portfolio of poorly governed firms significantly outperformed the broad equity market throughout the study period. Furthermore, the poorly governed firms also exhibited operational and financial efficiency superior to the market (Gold 2006). Hiroyuki and Pascal (2007) report similar results in the Japanese context. They found that well-governed Japanese firms performed poorly compared to their poorly governed counterparts between 2000 and 2005.

The review of literature seems to suggest that the quality of a firm's corporate governance, as defined by governance regulations and codes, has little bearing (if any) on its performance in Australia, and for that matter, around the world. This certainly appears to be the case especially in large-cap companies. What is not clear from the literature review, however, is the relationship between governance and performance outside the large-cap companies, particularly Australian mid-cap companies (i.e. the 250 – 400 largest listed companies). Furthermore, as stated in the motivation section, all of the studies reviewed have used level data, which is probably not the most appropriate approach to measure the effect of the changes in one variable/s on the other.

Research Methodology

Data, Sample and Corporate Governance Proxy

The initial sample for this study contained the 150 mid-cap Australian companies included in the *Mid-Cap Corporate Governance Report 2007* (The University of Newcastle 2007). The report states that the research contents were derived from the 2006 Annual Reports disclosures of 150 'mid-sized' Australian listed companies (i.e. the 251 – 400 largest based on market capitalisation as at 31 December 2006). This report follows the *Horwath 2006 Corporate Governance Report (mid-sized Australian ASX companies)* (The University of Newcastle 2006) which also examines the corporate governance practices of 'mid-cap' Australian listed companies.

Samples for this study were selected using three basic selection criteria. The first was that firms must have corporate governance ratings available for both the 2005 and 2006 financial years. Essentially this means that the firm must be included in the both *Horwath 2006 Corporate Governance Report (mid-sized Australian ASX listed companies)* and the *Mid-Cap Corporate Governance Report 2007*. Because of changes in market capitalisation (the basis for determining 'mid-cap' companies), 88 companies were dropped from the mid-cap constituent in the *Mid-Cap Corporate Governance Report 2007*. This means that only 62 companies have corporate governance ratings available for both years.

The second criterion related to the availability of necessary financial data. Data for all 62 companies were hand-collected using the Aspect Huntley Annual Reports and Aspect Huntley FinAnalysis databases. The third and final criterion was that data did not demonstrate unusual attributes⁶ (i.e. they must not be outliers). Two companies – the Life Therapeutics and ST Energy – were identified as outliers and therefore removed from the sample, leaving a net sample of 60 companies. The two companies respectively reported a Return on Assets (ROE) of 8,129.73% and a Return on Invested Capital (ROIC) of -3,224.87%.

⁶ An outlier in this study was defined as a Z-score with an absolute value greater than 4.

Corporate Governance Proxy – BDO Kendalls Star Ratings

This study uses the *Horwath 2006 Corporate Governance Report (mid-sized Australian ASX companies)* and *Mid-Cap Corporate Governance Report 2007* star ratings to proxy the sample firms' corporate governance quality. The star ratings in these reports were prepared using the model that carefully considered objective factors based on publicly-disclosed information pertaining to: the existence and structure of a company's Board of Directors; the level of perceived independence of external auditors from the company; and disclosures relating to the existence of a code of conduct, risk management and share trading policy (The University of Newcastle 2006; 2007). This meant that the governance rating not only captured the structural aspect but also the behavioural and disclosure aspects of a firm's corporate governance. Furthermore, the reports state that the corporate governance assessment model developed in the research is based upon a combination of factors identified in national (e.g. ASX guidelines) and international (e.g. OECD reports) best practice guidelines and research studies. In that sense, it is fair to assume that the ratings represent the firm's overall corporate governance practice and therefore serve as a good, and to an extent, reliable proxy.

The reports have assigned each company stars (*) ranging from 1 to 5. Five stars denotes the highest level of corporate governance while one star denotes the lowest. Table 1 summarily describes the star ratings.

Table 1
Star Ratings Explanations

* Ratings	Descriptions
***** (5)	Corporate governance structures were outstanding. The structures met all best practice standards and could not be faulted.
***** (4.5)	Corporate governance structures were excellent and met all best practice standards other than in relatively minor circumstances.
**** (4)	Corporate governance structures were very good and met the vast majority of best practice standards.
**** (3.5)	Corporate governance structures were generally good and met most of the best practice standards.
*** (3)	Corporate governance structures were adequate and met some of the best practice standards.
** (2)	Corporate governance structures were lacking in some key areas.
* (1)	Corporate governance structures were lacking in most key areas.

Note: The star ratings summary is directly quoted from the Horwath 2006 Corporate Governance Report (mid-sized Australian ASX companies). Please refer to the reports for the detailed description of each star rating.

Corporate Governance Trends of Australian Mid-caps

This section analyses the change in quality of corporate governance practices (in terms of star ratings) of the sample companies over the two-year period. Table 2 shows their corporate governance trends.

Table 2
Trends in Corporate Governance Ratings (2005 and 2006)

Trend	Sample size	% of the Total
Increasing	19	32
Constant	27	45
Decreasing	14	23
Total	60	100

While 19 (32%) companies have improved their corporate governance system by better complying with codes of best practice, 14 (23%) companies have actually taken a backward step. However, the majority of companies, 27 (45%) have kept their corporate governance structure unchanged during the sample period. Table 3 presents the scale of changes made by the remaining 33 sample companies in their corporate governance structure over the two-year period.

Table 3
The Scale of Changes in Corporate Governance for Different Firms

Changes: increase/decrease	Frequency	Cum. frequency	% of the Total	Cum.% of the Total
Increase by 0.5 star	6	6	18	18
Decrease by 0.5 star	5	11	15	33
Increase by 1 star	6	17	18	51
Decrease by 1 star	6	23	18	69
Increase by 1.5 stars	5	28	15	84
Decrease by 1.5 stars	2	30	6	90
Increase by 2 stars	1	31	3	93
Decrease by 2 stars	1	32	3	93
Increase by 2.5 stars	1	33	3	99

As can be seen from Table 2, most of the changes (increase/decrease) in the sample firms' governance ratings occurred in the small scale. For example, 23 (69%) of 33 companies changed their governance star ratings by 1 star rating or less (e.g. 0.5 star). Two possible explanations can be suggested for this trend. First, the change occurs gradually. Second, firms may deliberately avoid drastic changes for the fear of a negative market reaction even if such a drastic change is operationally desirable.

Corporate Governance and Performance: Descriptive Analysis

In order to examine the effect of corporate governance on a firm's operating outcomes, this study first analyses the relationship between a firm's corporate governance structure and their operating performance as measured by various performance indicators. The basic assumption underpinning agency theory is that the firm's corporate governance matters for its operating performance. That essentially means that there is a positive relationship between governance and operating performance – good governance structure means a higher operating performance and vice versa. This study employs three different performance indicators to proxy firm performance. The purpose of using different performance measures is to examine if the impact of governance is more pronounced on certain performance measures as reported by some previous studies (Padget & Shabbir 2005; Love 2012).

- *Return on Equity (ROE)* – Return on equity is a measure of profit earned in relation to equity resources invested. It is a key indicator of how well managers are employing shareholders' funds to generate returns. It is calculated by dividing net profits before abnormal by shareholders' equity.
- *Earnings Yield (EY)* – Earnings yield is the market return on stocks. This study uses the so-called 'magic formula' developed by Greenblatt (2005), which divides *EBIT* (i.e. earning before interest and taxes) by the enterprise's value (i.e. market capitalisation + debt – excess cash) to calculate the earning yield.
- *Return on Assets (ROA)* – Return on assets shows how much profit a company is making on the assets used in the business. Therefore it is a key measure of a company's profitability. It is calculated as follows: $[\text{Net Income} + \text{Interest Expenses} (1 - \text{Corporate tax rate}) / (\text{Total Assets} - \text{Outside Equity Interest})]$.

The means of corporate governance ranking (i.e. *Gov(Rnk)*) and various performance variables for 2005 and 2006 along with percentage changes for the sample companies under three different corporate governance situations are presented in Table 4.

Table 4
Mean Changes of Firms with Various Corporate Governance Situations

Trends	Decreasing			Stable			Increasing		
	2005	2006	Change	2005	2006	Change	2005	2006	Change
Gov(Rnk)	3.71	2.75	-0.96	3.24	3.24	0.00	2.39	3.50	1.11
ROE	0.08	-0.03	-0.11	0.11	0.12	0.01	0.08	0.11	0.03
EY	0.07	0.01	-0.06	0.05	0.07	0.02	0.04	0.08	0.04
ROA	0.05	0.03	-0.02	0.04	0.07	0.03	0.04	0.06	0.02
Observations	14			27			19		

It is apparent from Table 4 that the means of various performance indicators are moving together with the mean of corporate governance rankings (i.e. *Gov(Rnk)*). For example, decreases in the mean *Gov(Rnk)* are associated with decreases in the means of all performance indicators and vice versa. While this does not necessarily indicate the causality between the quality of firm's governance and associated performance, it does provide valid justification for further analysis.

This study uses the Pearson correlation to test the association between firms' corporate governance structure and various measures of firm performance statistically. Table 5 shows the results.

Table 5
Pearson Correlation Matrix

Variables	$\Delta Gov(Rnk)$	ΔROE	ΔEY	ΔROA	$\Delta Firm\ size$	$\Delta Leverage$	$\Delta Growth$
ΔROE	0.24*						
ΔEY	0.21	0.47***					
ΔROA	0.14	0.51***	0.70***				
$\Delta Firm\ size$	-0.31**	0.29**	0.23*	0.38***			
$\Delta Leverage$	-0.30**	-0.13	-0.02	-0.03	0.07		
$\Delta Growth$	0.01	-0.32**	0.27**	0.12	-0.23*	0.03	
$\Delta Profitability$	0.12	-0.05	-0.04	0.03	-0.17	0.12	0.14

*, ** and *** denote significance levels at 0.01, 0.05 and 0.10 respectively (two-tailed test).

As can be seen from Table 5, changes in the firm's corporate governance are positively correlated with all three measures of firm performance. The correlation between the change in *ROE* and change in *Gov(Rnk)* is statistically significant at the 10% level. Although the correlation between change in *Gov(Rnk)* and other two performance measures (*EY* and *ROA*) are insignificant, they appear materially to be important given the size of the correlation values of 0.21 and 0.14 respectively.

As expected, all dependent variables (i.e. *ROE*, *EY* and *ROA*) are positively and significantly correlated to each other. However, in exception to the correlation between size and growth, which is significant at the 10% level, there is no significant correlation between the predictor variables.

Corporate Governance and Performance: Empirical Analysis

This section investigates the link between the firm's corporate governance practices and the measures of firm performance. Prior evidence in Australia does not conclusively support the assumed relationship.

Some earlier studies have used either individual governance elements (e.g. board independence) or a broad-based index to proxy the firms' corporate governance. However, both methods involve examining the relationship between the firm's levels of compliance, individually or in aggregate, and various performance measures using the level data.

This study uses a different approach to examine the governance and performance relationship: the changes in the firm's governance practices and changes in its performance. This approach can be argued to be theoretically sound as it is expected to better capture the effect of changes in the independent variable (i.e. $Gov(Rnk)$) on the changes on the dependent variables (i.e. ROE , EY and ROA). The relationship will be tested using the following multiple ordinary least square regression model:

$$\Delta Performance = \alpha + \beta_1 \Delta Gov(Rnk) + \beta_2 \Delta FirmSize + \beta_3 \Delta Leverage + \beta_4 \Delta Growth + \beta_5 \Delta Profitability + \varepsilon$$

The term 'performance' in the model collectively denotes three performance measures: ROE ; EY ; and ROA . These variables represent the changes in the performance measures of sample firms between 2005 and 2006. The independent variable, the change in $Gov(Rnk)$, represents the actual change in the sample firms' corporate governance structure over the two-year period as measured by the star ratings. α in the model is the intercept term. β represents the coefficients pertinent to the independent variable and control variables. ε is the error term which is assumed to be normally distributed.

The purpose of including the control variable in the regression model is to reduce, if not eliminate, the possibility that the observed relationships are not spurious. These variables are defined and approximated as follows:

- *Firm Size* – The firm's total assets measured in dollar value. It is argued that bigger companies generally have a greater level of access to the resources needed to develop and maintain a higher level of corporate governance structure. Furthermore, additional compliance requirements fall disproportionately on smaller companies that can significantly affect their compliance as well as their performance level. The firm size is used to capture this effect. The variable is transformed using a logarithm to reduce skewness and outliers and increase normality.
- *Leverage* – It is widely accepted that credit providers more closely monitor firms with a higher leverage. Furthermore, the need to service their debt obligations (interest and compliance with debt covenants) places managers of highly-levered firms under a greater pressure to perform than is the case for their lowly-levered counterparts. Leverage, which is defined in this study as the ratio of non-current liabilities to total assets, is used to capture the effect.
- *Growth Prospect* – Logically, the firm's growth prospect may affect its performance or governance decisions. For example, the higher profit observed in growth firms may be driven by their growth rather than by any improvement in corporate governance. It is also possible that growing firms may decide to have better governance systems to attract the capital needed to fund their growth. The logarithm of market-to-book ratio is used to proxy the growth dimension.

- *Profitability* – The firm’s current profitability is also expected to affect its current performance. This variable is approximated by dividing *NOPLAT* (i.e. Net Operating Profit Less Adjusted Taxes) by operating revenue. It represents a key measure of the profitability of sales from an operating perspective while eliminating the effects of capital structure.

The assumption underpinning this research model is that changes in the firm’s governance practices are likely to affect various operating decisions and therefore ultimately its performance. Therefore, we expect to better capture this relationship if it is examined using the differential rather than the level data.

Results

Table 6 presents the results of the regression analysis. Adjusted R^2 values ranges from 18 to 21 under different performance measures indicating that at least 18% of observed variation in the performance was explained by the independent variables. Statistically significant ($p < 0.01$) F-tests indicate that the model is robust.

Table 6
Regression Results

Variables	Exp. \pm	Δ ROE		Δ EY		Δ ROA	
		Coefficient	VIF	Coefficient	VIF	Coefficient	VIF
Intercept		-0.07**		-0.04*		-0.03*	
Δ Gov(Rnk)	+	0.07**	1.23	0.06***	1.23	0.03**	1.22
Δ Firm size	+	0.48**	1.19	0.40***	1.19	0.35***	1.19
Δ Leverage	+	-0.09	1.13	0.07	1.13	0.01	1.10
Δ Growth	+	-0.22**	1.07	0.23***	1.07	0.10**	0.07
Δ Profitability	+	0.00	1.08	-0.02	1.08	0.01	1.02
Sample size		60		60		60	
F-Statistics		3.64***		4.05***		3.93***	
Adjusted R^2		0.18		0.21		0.20	

*, ** and *** denote significance levels at 0.01, 0.05 and 0.10 respectively (two-tailed test)

It is apparent from Table 6 that the difference in *Gov(Rnk)* is positively associated with the differences in all three performance measures. The relationships are robust as indicated by statistically significant coefficients ($p < 0.05$), and in case of *EY*, the relationship is significant at 1% level. These results provide a robust support for the agency theory argument that governance matters for performance. The fact that *Gov(Rnk)* is robustly associated across different performances measures suggests that the impact of the corporate governance is not performance-measure-specific as reported by earlier studies (Padget & Shabbir 2005; Love 2012).

With respect to control variables in the regression results presented in Table 6, the results are broadly as expected. *Firm size* as measured by total assets is significantly positively associated with all of the performance proxies. This result is consistent with the evidence reported by a number of previous studies (Baumol 1959; Majumdar 1997).

Leverage is positively associated with *EY* and *ROA*. This is consistent with the argument that managers of highly-levered firms face greater levels of accountability and need to increase operating efficiency in order to be able to timely discharge the debt obligation. However, the relationship is not robust as indicated by the statistically insignificant coefficients ($p > 0.10$). Although leverage is negatively related to *ROE*, the finding is not unusual. A number of prior studies have provided evidence of negative relationships between leverage and performance

(Agrawal & Knoeber 1996; Weir, Laing & McKnight 2002). Again, a statistically insignificant coefficient ($p > 0.10$) means the relationship is not considered robust.

The coefficient of *Growth* is expected to be positive because firms with greater growth prospects are expected to perform better. This is certainly the case in respect of *ROA* ($p < 0.10$) and *EY* ($p < 0.01$) as demonstrated by significantly positive coefficients. However, the negative and statistically significant coefficient of *ROE* ($p < 0.05$) seems a little puzzling and logically unexplainable. While the relationship between profitability and performance measures is as anticipated except in the case of *EY*, it is not statistically significant ($p > 0.10$). The highest variation inflation factor (*VIF*) is 1.23 which is not significantly greater than 1 for the regression model to be biased (Bowerman, O'Connell & Dickey 1986). Furthermore, the average tolerance⁷ is not below 0.20. This suggests that multicollinearity is not the issue in the dataset.

Conclusion, Contribution, Limitations and Future Research

Corporate governance guidelines (codes) have become much more important in corporate decision-making since the issuance of the U.K. *Cadbury Report* in 1992 (Cadbury 1992) and particularly since the early 2000s. This has also resulted in the considerable expansion in the literature on corporate governance, particularly on codes of good governance. The major impetus for this drive appears to be countries' desires to make their corporate governance practice more effective, in part as a consequence of corporate governance scandals but also to attract investors (Aguilera & Cuervo-Cazurra 2009). In particular, it is argued that good governance is linked to a firm's superior performance. This study provides robust evidence in support of this theoretical argument.

However, the results of this study are subject to some limitations. One key issue that affects the validity of the research of this nature is the direction of causality. This study therefore does not rule out the possibility that the observed relationships may have been a result of profitable companies having good corporate governance systems rather than the other way round. The relatively small sample size is another cause of concern in respect of the findings of this study.

The study contributes to the current corporate governance literature by providing evidence of a robust relationship between governance and performance using differential data instead of level data. Furthermore, this study reduces the apparent knowledge void with respect to corporate governance practices and associated economic consequences outside the large caps band by focussing on mid-cap listed companies. The findings of this study reinforce the importance of having good corporate governance by providing empirical evidence that a firm can benefit economically by having a high standard of corporate governance. It is expected that these findings will provide a valuable reference point for existing policy assessment and/or future policy direction.

One possible extension of this research in the future is to extend the study period from the two-year period used. This approach would enable the researcher to examine the consistency of the relationship over a longer period. Another, possibly more important extension, is to adopt an alternative method that is consistent with the spirit of the principle of the comply-or-explain approach to governance in measuring the firm's corporate governance practice. The generally accepted view is that corporate governance is not a one-size-fits-all concept. Even with companies within a defined category, it is possible that they differ considerably in terms of capital base, risk profile, corporate history, business activity and management and personnel arrangements (Brown &

⁷ The average tolerance, which was not reported in Table 6, is 0.88 which is significantly greater than 0.20; the cut-off point for an indication of the presence of multicollinearity as suggested by Bowerman and O'Connell (1990).

Gorgens 2009). This means no particular governance structure is likely to exist that equally suits all types of corporations.

The 'if not, why not' clause which underpins the ASX guidelines clearly acknowledged this very fact by allowing legitimate departure so long as any such departure is clearly and adequately justified to the potential users of the information – capital markets. Essentially this means it is not the degree of compliance alone but the extent of information offered to justify non-compliance that should form the basis for assessing the firm's overall corporate governance practice. An assessment of a firm's corporate governance system based on compliance rates alone is unlikely to represent the true extent of its corporate governance systems. Therefore, both rates of compliance and the explanations offered for non-compliance must be considered when assessing the firm's corporate governance quality.

The underlying objective of corporate governance is to reduce information asymmetry and enhance managerial accountability. This can only be achieved if the company provides as much information about its corporate governance practices as deemed necessary for the market to make sound economic decisions. The underlying assumption here is that well-governed firms provide detailed information about their corporate governance practice to the market, not just basic conformity to the guidelines.

Therefore, the methodological approach that involves critically analysing both of the pillars of the comply-or-explain model in assessing the firm's corporate governance measure is likely to eliminate some of the problems associated with the traditional method that uses the simple dichotomy of compliance and non-compliance within best practice. It is expected that governance ratings developed using such an approach are likely to capture the true extent of a firm's intentions and behaviour relating to its corporate governance commitment and therefore are likely to provide a better corporate governance proxy. After all, as Heracleous (2008) argued, governance structure is possibly a necessary condition but certainly not a sufficient condition for good performance, and therefore a precise assessment of a governance system requires consideration of other elements that affect the behaviour of decision-makers.

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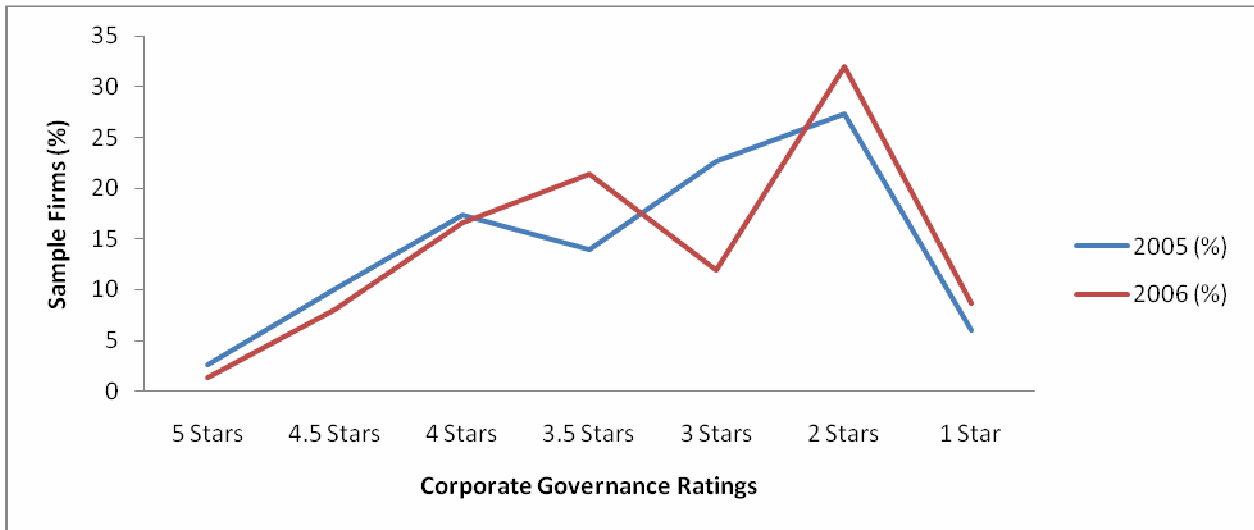
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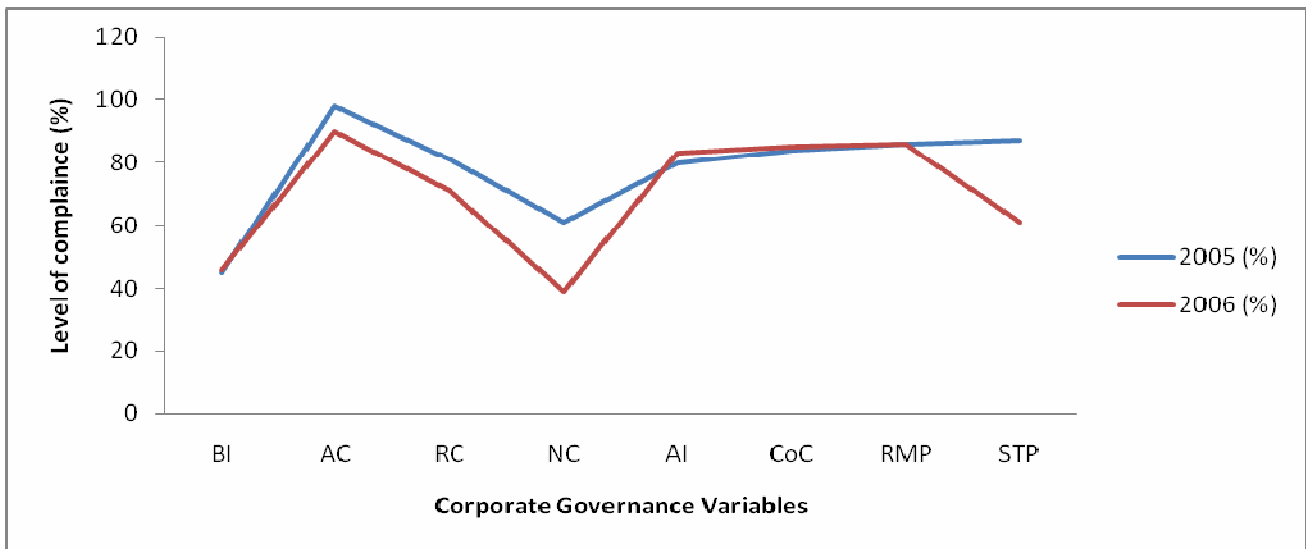
Appendix

Figure 1
Comparative Display of Governance Ratings between the 2005 and 2006 Financial Years



Note: The decrease in the number of companies with 4-5 stars and the increase in the number of companies with 1-2 stars in 2006 suggests that the corporate governance practices of mid-size companies have markedly deteriorated in 2006 relative to the 2005 reporting period.

Figure 2
Comparative Level of Compliance of Various Corporate Governance Elements between the 2005 and 2006 Financial Years



Note: The terms displayed horizontally in the graphs stand for the following: BI 'board independence'; AC 'audit committee'; RC 'nomination committee'; NC 'nomination committee'; AI 'auditor independence'; CoC 'code of conduct'; RMP 'risk management policy' and STP 'share trading policy'. Except for board independence, auditor independence, code of conduct and risk management policy, the compliance level of all of the other governance elements has markedly deteriorated in 2006 compared to the 2005 reporting period.

2012

Stereotypes, Students' Perceptions and Inherent Creativity: Further Australian Evidence

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Keywords

Perceptions, Personality, Accounting, Students

Cover Page Footnote

An earlier version of this paper has benefited from participants' comments at the 2008 Accounting and Finance Association of Australia and New Zealand (AFAANZ) Conference. Dr Baxter acknowledges the financial support of an Internal Seed Research Grant from the University of the Sunshine Coast. The authors also appreciate the comments from Monte Wynder and David Gadenne, as well as the two anonymous reviewers.



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Peter Baxter^{1*} and Marie Kavanagh²

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JEL Code: M40.

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Introduction

Research suggests that young adults tend to develop career aspirations based on pre-conceived ideas, insufficient information and inaccurate perceptions about occupations and their work environment (Greenhaus 2000; Hildebeitel 2000). A substantial body of research has examined how students' perceptions of accounting influences their choice of academic major and their career decision. Studies such as Cohen and Hanno (1993), Hermanson and Hermanson (1995), Saemann and Crooker (1999), Mladenovic (2000), and Jackling (2001) report that many university students have a negative perception of accounting as being too number-oriented and boring which impacts on their decision not to major in accounting. In the US, Saemann and Crooker (1999) and Geiger and Ogilby (2000) report that traditional perceptions of precision and order in the profession discouraged more creative individuals from specialising in accounting.

Creativity in solving accounting problems has been widely recognised as being an important skill that accounting graduates should possess. For example, the use of creativity in problem solving is an implicit component of several of the *Threshold Learning Outcomes for Accounting* identified by the Australian Learning and Teaching Council (ALTC) in the Academic Standards Statement for Accounting (ALTC 2010). More specifically, being creative in the determination of solutions to accounting problems is an important aspect of those *Outcomes* relating to judgement and application skills. These threshold learning outcomes are also acknowledged in the *Professional Accreditation Guidelines for Australian Accounting Degrees* jointly issued by CPA Australia and the Institute of Chartered Accountants in Australia (ICAA) (CPA Australia & ICAA 2012). More broadly, the *Australian Qualifications Framework (AQF)* (AQF Council 2010, p46) specifies that graduates of a Bachelor Degree will have 'cognitive and creative skills to exercise critical thinking and judgement in identifying and solving problems with intellectual independence'.

On the other hand, high-profile corporate collapses and scandals in countries such as the US, Australia, Italy, the UK and the Netherlands have sharply undermined public confidence in corporate financial reporting, auditing and regulation (Carnegie & Napier 2010). In response, professional accounting bodies continue to endeavour to send positive messages about the post-Enron state of the profession (Parker 2005). Despite the widespread efforts to change the public image of accountants, little attention has been given in the post-Enron period to empirically studying the image (Carnegie & Napier 2010). A notable exception is a US study by Theuri and Weickgenannt (2008) that examines the impact of recent ethical scandals on students' perceptions of the accounting profession. This study finds that student maturity is a significant determinant of differentiation in these perceptions. Australia has also experienced major corporate collapses, however their impact on students' perceptions of accounting has not been tested.

The traditional stereotypical image of accounting is one factor that may have contributed to a decline in the number of students undertaking accounting in Australian high schools (Kavanagh 2004; Richardson and Alcock 2010) and those overseas (Albrecht & Sack 2000; Byrne & Willis 2003; Fedoryshyn & Tyson 2003). Accounting firms and the professional bodies have sought to counteract the conservative image of the accounting stereotype through their recruitment brochures and websites (Jeacle 2008). However, it is not clear whether these efforts to change the stereotype have been effective. Indeed, evidence suggests that the proportion of university students studying accounting as a major study is continuing to decline, and this has impacted on the supply of accounting graduates to the profession (Jackling & Calero 2006; McDowall & Jackling 2010).

In summary, decreasing interest in accounting as a profession has been attributed to stereotypes of accounting as dull and boring. The professional bodies and accounting firms

have attempted to counter this stereotype by focusing on the creative and entrepreneurial dimension of the accounting profession, as evidenced in their television and print advertisements in recent years. However, accountants have been accused of excessive entrepreneurship and creativity in the scandals surrounding numerous corporate failures, such as Enron (Jackling & Calero 2006). The purpose of this research, therefore, is to determine whether creative individuals are attracted to accounting, and how accounting is perceived by those studying an introductory accounting course. The study focuses on first year university students since it is often in this stage that students make choices that will influence their future career directions (Jackling & Calero 2006).

Data from this study will assist the accounting professional bodies and firms to assess whether their promotional efforts in recent years have been successful in improving the image of accounting amongst students. While studies of this nature have been conducted overseas (e.g. Saemann & Crooker 1999), their results are now dated and there are no known Australian studies which specifically examine university students' perceptions of accounting in the context of their inherent creativity. Recent Australian research by McDowall and Jackling (2010) examines undergraduate students' attitudes towards accounting, however this study uses only a small sample and the students' inherent creativity is not considered.

The paper proceeds as follows. In the next section the prior literature is reviewed and the research questions are developed. Next, the research method is explained. This is followed by a discussion of the results. Finally, the conclusions, implications for practice, limitations of the paper and future research opportunities are discussed.

Literature Review

Stereotyping and Accounting

A stereotype can be defined as "...a collection of attributes believed to describe the members of a social group" (Dimnik & Felton 2006, p131). Hinton (2000) suggests that stereotyping involves three elements. First, groups are distinguished from the rest of society by reference to a particular identifying characteristic such as nationality, gender or occupation. Second, other stereotypical characteristics are associated with members of the groups. Finally, whenever a person is identified as belonging to a particular group, society will attribute the stereotypical characteristics to that person.

Despite the widespread efforts of the professional bodies and accounting firms to change the public perception of accounting, there is substantial evidence that it is difficult to change stereotypes (Johnston 1996; Wells 2010). Johnston (1996) suggests that an important reason for this is that those holding stereotypical perceptions tend to give greater weight to people who confirm the stereotype than to people who appear to challenge the stereotype.

Social Identity Theory, as developed by Tajfel and Turner (1986), can be used to explain how people categorise themselves as members of various social groups. According to this theory, stereotypes sum up society's attitude to different groups. Individuals generally prefer to be members of groups with positive rather than negative stereotypes. Members of groups subject to negative stereotypes are more likely to work to change the stereotype if they wish to enhance their standing in society (Carnegie & Napier 2010).

The literature on the popular perceptions of accounting identifies two major accounting stereotypes (Carnegie & Napier 2010). The first of these is the 'traditional accountant' or 'beancounter' stereotype. The positive aspects of this stereotype are that they are "...honest and trustworthy, careful with money, painstaking, reliable, polite and well-spoken" (Carnegie & Napier 2010, p364). However, on the negative side, 'traditional

accountants' are dull, boring, excessively fixated with money, pedantic and shabby. Since the late 1960s, the professional accounting bodies and Big 4 accounting firms have attempted to deter the 'traditional accountant' stereotype, so as to "...recruit the best and brightest of students" (Smith & Briggs 1999, p28) and to overcome the shortage of accounting graduates wishing to enter the profession (Albrecht & Sack 2000; Dimnik & Felton 2006).

The second major accounting stereotype has been referred to as the 'business professional' (Carnegie & Napier 2010) and the 'colourful accountant' (Jeacle 2008). This stereotype has been used by the accounting profession to counteract the negative aspects of the 'traditional accountant'. In this regard, the 'business professional' has the "...characteristics of the executive, the manager and even the entrepreneur...a thrusting, proactive and much more creative being" (Hopwood 1994, p229). However, the modern stereotype of accountants as 'business professionals' carries its own stigma of dishonesty and lack of respectability (Jeacle 2008, p1318). Accountants being implicated in major corporate collapses such as Enron have exposed the fragility of the accounting profession's attempts to project the 'business professional' stereotype in a positive light (Carnegie & Napier 2010).

Students' Perceptions of Accounting

A considerable body of research provides evidence that accounting has an unfavourable image among students and others. Boughen (1994) suggests that the mention of 'accountant' conjures up an image of 'a chinless, bespectacled, nervous pencil pusher' as the typical stereotype. Zeff (1989) discovers that students view accounting as characterised by courses consisting of collections of rules to be memorised which results in a rule-based type of educational experience. Albrecht and Sack (2000) suggest that the decline in student numbers electing to major in accounting is due to the unfavourable stereotype of accountants and their work.

Jackling (2002) finds that the majority of business students studying first year core units in accounting have negative perceptions of the accounting profession. Negative views of the accounting profession are also associated with the view that accounting requires ability or skill with numbers (Mladenovic 2000; Parker 2001) and is steeped in rituals that have existed for centuries (Christensen 2004). Given that little research has focused on studying business students' perceptions of accounting in the post-Enron period, the present study seeks to determine first-year university business students' perceptions in a time period after the high profile corporate collapses of the early 21st century. Thus this leads to the following research question:

Research Question 1: How do first year university business students perceive accounting?

Jackling and Kenely (2009) use the Theory of Reasoned Action (TRA) to examine personal and social influences on students' decisions to major in accounting. TRA suggests that "...the intentions to pursue a particular career path are determined by personal and social influences" (Jackling & Kenely 2009, p143). This theory has been widely used in several other studies on students' choice of an accounting major (e.g. Cohen & Hanno 1993; Felton et al. 1995; Allen 2004; Tan & Laswad 2006). Jackling and Kenely (2009) find that 'Reference Groups' were an important social influence on deciding on a particular course of study, particularly for international students. In making decisions about a major at university and subsequent career choices, students are often influenced by their parents, relatives, peers, teachers, counsellors and other authorities such as governments. The present study attempts to understand whether these reference groups as well as other factors also influence the

perceptions of accounting held by first year university students. Thus the following research question is proposed:

Research Question 2: What factors influence first year university students' perceptions of accounting?

Inherent Creativity and Students' Perceptions

The employment choice of accounting graduates and their commitment to the organisation where they work can be influenced by their personality (Hunt, Falgiani & Intrieri 2004). Kovar, Ott & Fisher (2003) used the Myers-Briggs Type Indicator (MBTI) to examine the characteristics of graduating accounting students recruited from accounting programs. They suggested that accounting was attracting students who were sensing, thinking and judgemental and that there is a need to attract and/or educate students with a broader range of characteristics particularly those related to perception, feeling and intuition. Thus students' personalities and their perceptions of accounting are important because the individual's choice of career can be influenced by the stereotypes they associate with accounting.

Technical accounting competence is no longer the only skill required by accounting firms of graduates – rather attributes such as critical thinking, communication and clarity of articulation, initiative, self-management and creativity are highly valued (Boughen 1994; Smith & Briggs, 1999; Kavanagh et al. 2009). Creativity in solving accounting problems has been widely recognised as being an important skill for accounting graduates by the Australian Learning and Teaching Council (ALTC) in the Academic Standards Statement for Accounting (ALTC 2010), the Australian accounting professional bodies (CPA Australia & ICAA 2010) and the *Australian Qualifications Framework* (AQF Council 2010). This leads to the following research question:

Research Question 3: Is there an association between students' inherent creativity and their perceptions of accounting?

Research Approach

Research Design and Data Collection

The data used in this paper were collected via a survey instrument completed by students studying the first-year undergraduate introductory accounting course at two Australian universities. The first is a large university situated in a capital city and the second is a smaller regional university. Two universities were included in the study to improve the potential generalisability of the results and to increase the sample size. The course at both universities is one of the common foundation courses studied by all students enrolled in either a Bachelor of Commerce or Bachelor of Business degree. Both courses provide students with an introduction to the fundamental concepts and processes of accounting. At both universities, students studying degrees from other Faculties may also study the course as an elective.

The survey instrument³ was completed by students in lectures towards the start of the semester to limit the impact of the introductory course on the students' perceptions of accounting. The survey instrument comprised 3 main sections. The first section sought a range of demographic information.

The second section of the survey instrument gathered information on the students' inherent creativity, as one dimension of their personality. The 30-item Creative Personality Scale (CPS) developed by Gough (1979) was used for this purpose. The CPS contains a set of 30 adjectives and the students were asked to tick all adjectives that they felt best described their personality. The possible scores on the CPS ranged from -12 to +18⁴ with a higher score indicating a more creative individual. The CPS was used in this study to enable comparisons with several prior studies (Saemann & Crooker 1999; Worthington & Higgs 2003) that use the CPS in their study of accounting and finance majors respectively.

The third section of the survey instrument asked the students about their perceptions of accounting. The instrument used to gather this information was developed by Saemann and Crooker (1999). It comprised 36 pairs of adjectives representing opposing perceptions of accounting. The students were asked to circle the appropriate number on the 5-point scale between the pairs of adjectives to express the strength of their opinion in the particular direction. Worthington and Higgs (2003) use a similar instrument in their study of factors influencing the decision to study a finance major. Byrne and Willis (2005) also use the same instrument to assess the perceptions of accounting held by Irish secondary students. This section of the survey also asked the students to indicate what influences their perceptions of accounting.

Results

Descriptive Statistics

Table 1 provides the descriptive statistics for the categorical and continuous variables. A combined total of 540 students from the 2 universities completed the survey during their regular lectures, out of a total enrolment of 650 students. This represents an 83% response rate. The majority of students in the sample were: female; aged between 16 and 25; of Australian origin; and studying a non-accounting major. For those students with some prior study of accounting, their average level of enjoyment of this prior study was 3.27 on a 5 point scale with a higher score indicating a greater enjoyment level. The vast majority of students did not have any prior work in accounting, meaning they had no exposure to the practical work of accountants. While comparative data on the demographic characteristics of students at other universities is not available, there is nothing to suggest that the characteristics of students in the sample are substantially different to other universities.

³ See Appendix A.

⁴ This range of scores was due to some items on the CPS (such as commonplace, conventional and honest) being given a score of -1 if selected by the students and other items (such as informal, inventive and original) being given a score of +1 if selected by the students.

Table 1
Descriptive Statistics of Students in Sample

Panel A – Categorical variables

Number of students	540		
Age	<16 (0.2%); 16-20 (71.7%); 21-25 (20.2%); >25 (7.9%)		
University	Capital City (55.4%)	Regional (44.6%)	
Gender	Female (58.0%)	Male	(42.0%)
Country of origin	Australia (66.8%)	Other	(33.2%)
	<u>Yes</u>		<u>No</u>
Enrolled in an accounting major	26.7%	73.3%	
Some prior study of accounting	57.1%	42.9%	
Completion of year 12 in 2006	42.6%	57.4%	
Some prior work in accounting	10.1%	89.9%	

Panel B – Continuous variables

	Minimum	Maximum	Mean	Std Dev	Skewness	Kurtosis
Grade point average	2.00	7.00	5.352	0.958	-0.949	1.756
Number of courses	1	5	3.667	0.796	-1.734	2.775
Enjoyment of prior study of accounting	1	5	3.278	1.116	-0.373	-0.583
OP score ⁵ (if year 12 completed in 2006)	1	25	7.374	4.889	0.678	0.119
Years lived in Australia	0.04	34	4.089	6.592	2.887	9.654
Years since completing year 12	0	31	4.727	5.659	2.881	8.628
Years of prior work in accounting	0	20	2.894	4.188	3.255	11.240

Students' Perceptions of Accounting

Consistent with prior studies using the Saemann and Crooker (1999) perception instrument, an exploratory factor analysis was conducted to identify a reduced number of underlying constructs from the 36 pairs of adjectives. A principal components analysis was undertaken to transform these adjective pairs into a smaller, more conceptually coherent set of pairs. This process reduced the number to 26 pairs suggesting three distinctive factors. These factors

⁵ Overall Position (OP) scores are awarded to year 12 students based on their performance in Queensland Studies Authority approved subjects and the Queensland Core Skills (QCS) Test. The scores are used to determine students' eligibility for entrance to universities.

capture students' perceptions of accounting as boring, definite and precise. The internal reliabilities (Cronbach's Alphas) of the three factors are 0.632 (boring), 0.808 (precise) and 0.827 (definite). These compare favourably with those reported by Saemann and Crooker (1999), Worthington and Higgs (2003) and Byrne and Willis (2005). Table 2 shows the paired adjectives that are included in each of the factors.

Table 2
Paired Adjectives Loading on Perception Factors

Factor 1	Boring		Alpha 0.632
Interesting	1	5	Boring
Exciting	1	5	Dull
Fascinating	1	5	Monotonous
Absorbing	1	5	Tedious
Interaction	1	5	Absorbing
Adaptable	1	5	Inflexible
Variety	1	5	Repetition
Factor 2	Definite		Alpha 0.827
Intuition	1	5	Facts
Flexible	1	5	Structured
Dynamic	1	5	Stable
Ambiguity	1	5	Certainty
Abstract	1	5	Concrete
Conceptual	1	5	Analytical
Imagination	1	5	Logic
New ideas	1	5	Established rules
Alternative views	1	5	Uniform standards
Extrovert	1	5	Introvert
Changing	1	5	Fixed
Factor 3	Precise		Alpha 0.808
Imprecise	1	5	Accurate
Overview	1	5	Details
Superficial	1	5	Thorough
Novelty	1	5	Methodical
New solutions	1	5	Standard operating procedures
Verbal	1	5	Mathematical
Originality	1	5	Conformity
Unpredictable	1	5	Routine

Separate variables were then created for each of the factors using the combined average scores of the individual variables comprising each of the factors. A higher score on the boring factor demonstrates that the students perceive accounting to be more boring, dull and monotonous. A higher score on the definite factor indicates that the students view accounting as more factual, structured and stable. A higher score on the precise factor

suggests that the students believe accounting is more accurate, based on details and thoroughness. Table 3 provides the mean scores for the perception factors. Overall, the mean scores for the sample are: 3.455 (boring); 3.721 (definite) and 3.802 (precise). One sample t-tests revealed that these means are all significantly greater than 3 ($p < .001$) which is the mid-point on the perception variable scale of 1 to 5. In response to research question 1, these results suggest that the students in the sample overall held a traditional stereotypical perception of accounting.

Further tests were conducted to determine whether there were differences in perceptions of accounting between: accounting and non-accounting majors; and males and females. Table 3 provides the mean scores for the three perception factors between these different sub-groups. There is no significant difference in the means of the perception factors between males and females, and like the findings of Saemann and Crooker (1999), more females than males are opting to study accounting. However, the mean score for the boring factor is significantly lower for accounting majors (3.173) than for non-accounting majors (3.568). This suggests, perhaps unsurprisingly, that accounting majors perceive accounting to be less boring and more interesting than non-accounting majors. This also concurs with the findings of Saemann and Crooker (1999) who found that students were much more likely to choose an accounting major when they considered accounting to be interesting.

Table 3
Mean Scores for Perception Factors

Factor	Overall	Accounting majors	Non-accounting majors	Females	Males
BORING	3.455	3.173	3.568**	3.432	3.492
DEFINITE	3.721	3.678	3.738	3.737	3.688
PRECISE	3.802	3.768	3.812	3.814	3.785

** $p < .01$

* $p < .05$

Influences on Perceptions

Table 4 shows the percentages of students who indicated the factors that influence their perceptions of accounting. The most common reported influence is teachers (50.4%), followed by subjects studied while at school (40.6%), the internet (36.9%) and accountants they know (35.9%). This is somewhat similar to the findings of the Byrne and Willis (2005) study that revealed studying the subject at school was the most important influence, closely followed by factual media and the influence of teachers.

Table 4
Influences on Perceptions of Accounting

Influences on perceptions:	
Teachers	50.4%
School subjects	40.6%
The internet	36.9%
Accountants they know	35.9%
Books	32.6%

Family	28.1%
Friends	21.1%
Work experience	20.7%
TV shows	19.8%
Movies	16.7%
Careers guidance counsellors	13.5%
Other	8.1%

To further analyse the factors influencing students' perceptions of accounting, separate regressions were run on each of the three perception factors and several independent variables using the following model. The dependent variable (*FACTOR*) represented the mean scores for each of the three perception factors. The independent variables are as defined in Table 5.

$$\begin{aligned}
 \text{FACTOR} = & a + b_1 \text{ GENDER} + b_2 \text{ AGE} + b_3 \text{ COUNTRY} + b_4 \text{ ACCMAJOR} + b_5 \\
 & \text{PRIORSTUDY} + b_6 \text{ ENJOYMENT} + b_7 \text{ YR12} + b_8 \text{ PRIORWORK} + b_9 \\
 & \text{CREATIVITY} + \varepsilon \qquad (1)
 \end{aligned}$$

Table 5
Regression Estimates of the Effects of Independent Variables on Perception Factors

<i>Variable</i>	<i>BORING</i>	<i>DEFINITE</i>	<i>PRECISE</i>
<i>Intercept</i>	4.319 (12.043)**	4.569 (15.187)**	3.659 (10.338)**
<i>GENDER</i>	-0.122 (-1.485)	-0.152 (-2.142)*	-0.104 (-1.292)
<i>AGE</i>	-0.046 (-1.045)	-0.034 (-0.868)	-0.061 (-1.410)
<i>COUNTRY</i>	-0.105 (-1.225)	-0.102 (-1.365)	-0.122 (-1.438)
<i>ACCMAJOR</i>	-0.293 (-3.031)**	-0.025 (-0.301)	-0.050 (-0.521)
<i>PRIORSTUDY</i>	0.238 (0.811)	-0.186 (-0.796)	0.507 (1.742)
<i>ENJOYMENT</i>	-0.209 (-5.404)**	-0.085 (-2.497)*	0.002 (0.052)
<i>YR12</i>	0.108 (1.224)	-0.009 (-0.124)	-0.031 (-0.358)
<i>PRIORWORK</i>	-0.285 (-2.135)*	-0.307 (-2.634)**	-0.314 (-2.340)*
<i>CREATIVITY</i>	0.001 (0.075)	0.021 (1.856)	0.028 (2.145)*
<i>Adjusted R²</i>	0.199	0.068	0.034
<i>F statistic</i>	8.503**	3.172**	2.050*

** p < .01

* p < .05

BORING: Mean scores from the *BORING* factor variables

DEFINITE: Mean scores from the *DEFINITE* factor variables

PRECISE: Mean scores from the *PRECISE* factor variables
GENDER: 1 = Female; 2 = Male
AGE: A series of categorical variables for age range, i.e. 0= <16; 1= 16-25 etc
COUNTRY: 1 = Australia; 2 = Other
ACCMAJOR: 0 = Not enrolled in an accounting major; 1 = Enrolled in an accounting major
PRIORSTUDY: 0 = No prior study of accounting; 1 = Some prior study of accounting
ENJOYMENT: 5 point scale for level of enjoyment of prior study of accounting
YR12: 0 = Year 12 not completed in 2006; 1 = Year 12 completed in 2006
PRIORWORK: 0 = No prior work in accounting; 1 = Some prior work in accounting
CREATIVITY: Scores from the Creative Personality Scale (Gough 1979)

Table 5 shows the results from these regressions. For the boring factor, accounting major, enjoyment of prior study and prior work in accounting are all significantly negative ($p < .01$). Therefore, students studying an accounting major, students who had higher enjoyment of their prior study, and those with prior work in accounting are more likely to have lower scores on this factor, thus suggesting that they find accounting more interesting and less boring. For the definite factor, the following variables were significant: enjoyment of prior study ($p < .05$), prior work in accounting ($p < .01$), and gender ($p < .05$), with females perceiving accounting to be more definite than males. This suggests that those students who enjoyed prior study and with prior work experience in accounting were less likely to view accounting as definite. For the precise factor, the following variables were significant: prior work in accounting ($p < .05$) and inherent creativity score ($p < .05$). This suggests that students with more creative personalities and those with some prior work in accounting perceive accounting to be more precise. Therefore, in response to research question 2, the following factors have been identified as significantly influencing students' perceptions of accounting: teachers; school subjects; accounting major; enjoyment of prior study of accounting; prior work in accounting; gender; and their creativity.

Students' Inherent Creativity and Perceptions of Accounting

In terms of students' inherent creativity, possible scores on the Creative Personality Scale (Gough 1979) ranged from -12 to +18, with higher scores indicating that the students believe that they are more creative. Table 6 shows the mean scores for the personality variable. The mean personality score for all students was 2.714. This is similar to the average score for finance majors (2.590) in Worthington and Higgs (2003), but lower than the average scores (3.621 and 3.766) in Saemann and Crooker (1999). Accounting majors (2.388) have a lower score than the non-accounting majors (2.821), but the difference between these two groups is not significant.

Table 6
 Mean Scores for Personality Variable

	Overall	Accounting majors	Non-accounting majors
PERSONALITY	2.714	2.388	2.821

** $p < .01$
 * $p < .05$

Table 5 shows the results from the regressions of the three perception factors on several independent variables. *CREATIVITY* is a significant explanatory variable for the *PRECISE* perception factor but not for the other two perception factors. This suggests that students who are more creative perceive accounting to be based more on accuracy, details and being thorough. This finding is similar to Saemann and Crocker's (1999, p11) study which found that more creative individuals had less interest in accounting when they perceived it to be precise as defined by "accurate, challenging, conforming, detail oriented, mathematical, planned, practical, repetitive and thorough". This has implications for the accounting profession given that a creative individual is less likely to find the profession attractive or interesting if he or she associates it with preciseness. As indicated by the mean scores for creativity, it would appear that the profession is struggling to attract 'creative' individuals, despite concerted efforts undertaken by the professional bodies over the past decade to address issues of image and identity construction of accountants through programs and advertising campaigns (Warren & Parker 2009).

Conclusions, Implications, Limitations and Future Research

The objectives of this study are to: ascertain how first year university students perceive accounting in a time period following the high profile corporate collapses of the early 21st century; understand the factors that influence these perceptions; and determine if there is an association between students' perceptions of accounting and their inherent creativity. Given the potential influence of students' perceptions of accounting on their future career decisions, this study gathers evidence about perceptions of accounting and inherent creativity from a diverse sample of students enrolled in the introductory accounting course at two Australian universities.

From the findings of this study, it is evident that the majority of first year university students still hold the 'traditional accountant' or 'beancounter' stereotype of accounting, rather than the newer 'business professional' or 'colourful accountant' stereotype more recently promoted by the accounting profession. More specifically, the students in the sample overall still perceive accounting to be boring, definite and precise. However, perhaps unsurprisingly, accounting majors perceive accounting to be less boring and more interesting than non-accounting majors. These results suggest that the accounting professional bodies' efforts to change the image of accounting in the eyes of students towards the 'business professional' stereotype in the post-Enron period have not been particularly successful so far.

School teachers and their school subjects were also reported by the students as being the main influences on their perceptions. However in this sample, prior study at high school was not a significant influence in the boring, precise, definite perceptions. This may be because the number of students who are entering university with no prior knowledge has increased to over 60% in most first year university accounting courses. Regression analysis highlighted that prior work in accounting and the enjoyment of prior study impact on students' perceptions. Students' perceptions of accounting are also linked to their inherent creativity, in that students who are creative perceive accounting to be based more on accuracy and details.

These findings have several implications for the accounting professional bodies and academics in their ongoing attempts to attract students to major in accounting and pursue a career within the profession. First, as first year students still appear to hold a traditional image of accounting, additional initiatives need to be undertaken by the professional bodies to change students' perceptions. Due to the fact that school teachers and subjects are the major influences on first-year students' perceptions, the professional bodies are continuing to

be more actively involved in schools to promote accounting as an exciting and rewarding career path, and in the case of the ICAA to influence curriculum. In the future, this could include using school-based activities to promote the importance of creativity which is a skill not traditionally associated with accounting. This may help to influence the negative perception gained by high school students who study accounting delivered in a very traditional manner particularly in the final years.

The findings also have implications for universities managing the development of critical thinking and creative skills as part of accounting programs. Academics who design and deliver accounting courses for students need to provide an educational environment in their courses that has a positive influence on students' perceptions about accounting. In line with the ALTC's Academic Standards Statement for Accounting (ALTC 2010), the accounting professional bodies' accreditation guidelines (CPA Australia & ICAA 2012) and the *AQF* (AQF Council 2010), academics need to develop professional skills such as creativity, adapting and responding to challenges, critical thinking, problem solving, communication and self-management by embedding activities to engage students in real case studies and designing assessment items in the curriculum to assure learning. This will require time, training and support from universities to enable academics to develop skills to enable them to continue to deliver the knowledge and content required for accreditation, but in a less traditional manner that assists students to understand the essential and diverse nature of accounting and the services that accountants provide in the business world. As Kovar, Ott & Fisher (2003) suggest, changing the curriculum in accounting programs is one of the strategies to attract and retain individuals with a broad range of personality characteristics, and it will assist in reversing students' stereotypical perceptions of accounting as being definite, boring and precise. Furthermore, more integration of generic skills is essential since Chen, Jones and McIntyre (2008) suggest that the importance of the first year accounting course is critical to selling the profession to students.

The data reported in this study are subject to several limitations. First, the sample is drawn from only first year university students. As other studies have found, perceptions change as a result of maturity levels (Theuri & Weickgenannt 2008). Second, the sample was taken at only two universities. While administered in lectures, participation in the study was voluntary and some students chose not to participate, and this may affect the generalisability of results. Another limitation is that all measures were self-reported. It is possible that some students may have knowingly reported inaccurate or embellished information particularly in the case of inherent creativity.

There are several opportunities for further research arising from the results and limitations of this study. Chen, Jones and McIntyre (2008) suggest that the perceptions of the profession by accounting students change by the time they graduate. Therefore, consistent with McDowall and Jackling (2010), future research should examine whether this is true in the Australian context by undertaking a longitudinal study to assess changes in students' perceptions over time. Another likely extension of this study would be to investigate the numbers of students proceeding with, and completing, an accounting major. Future studies could also examine including these variables and others to tease out specifically where perceptions and influences are sourced. Finally, the study should be expanded to include students at other universities.

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Appendix A – Survey Instrument

Section A: Demographic Data (Please tick the appropriate response)

1. What is your gender?

Female; Male

2. What is your age?

16-20; 21-25; 26-30; 31-35; 36-40 ; 41-45; 46-50 ; 51-55 ;
 56-60; 61-65; 66-70; 71-75; 76 or over

3. What is your country of origin? _____

4. If your answer to Question 3 was not Australia, how many years have you lived in Australia? _____

5. In a sentence, describe what you expect to get out of BUS 106 Introductory Accounting.

6. Are you a Headstart Program student?

Yes; No

If Yes, please move to Section B. If No, please continue from Question 7.

7. Are you currently enrolled in the Bachelor of Business (Accounting) program at USC?

Yes; No

8. If No to Question 7, in which degree are you currently enrolled? (Please write the name of the degree (e.g. Bachelor of Business) as well as the major (e.g. Management). If you are studying more than 1 degree or major, please write each of them.

9. What is your current Grade Point Average (GPA) (if known)? _____

10. How many courses are you studying at USC this semester? _____

11. Prior to coming to University, have you previously studied accounting/bookkeeping/business principles at any of the following? (Please tick all that apply)

High school (Years 11 and 12)

High school (Years 9 and 10)

TAFE

Other (please specify) _____

12. If you ticked any of the answers in Question 11, what was your overall level of enjoyment of your prior study of accounting /bookkeeping/ business principles? (Please circle the appropriate number on the following 5-point scale).

Not enjoyed 1 2 3 4 5 Greatly enjoyed

13. Did you complete Year 12 in 2006?

Yes; No

14. If Yes to Question 13, what was your OP (Overall Position) score?

15. If No to Question 13, how many years has it been since you completed Year 12 or left high school? _____

16. Do you currently work or have you previously worked in an accounting type role/s?

Yes; No

17. If Yes to Question 16, what is the total number of years of employment experience you have had in accounting roles? _____

18. If Yes to Question 16, what type/s of organisations have you worked for? (please tick all in which you have worked)

- Public accounting firm
- Commercial business
- Government department
- Non-profit organisation
- Other (please specify)_____

Section B: Personality Data

19. What follows are adjectives that may be used to describe people. Consider each adjective and tick all that you honestly feel best describes you.

<input type="checkbox"/>	Clever	<input type="checkbox"/>	Capable	<input type="checkbox"/>	Cautious
<input type="checkbox"/>	Commonplace	<input type="checkbox"/>	Confident	<input type="checkbox"/>	Conservative
<input type="checkbox"/>	Conventional	<input type="checkbox"/>	Dissatisfied	<input type="checkbox"/>	Egotistical
<input type="checkbox"/>	Honest	<input type="checkbox"/>	Humorous	<input type="checkbox"/>	Individualistic
<input type="checkbox"/>	Informal	<input type="checkbox"/>	Insightful	<input type="checkbox"/>	Intelligent
<input type="checkbox"/>	Inventive	<input type="checkbox"/>	Mannerly	<input type="checkbox"/>	Narrow interests
<input type="checkbox"/>	Original	<input type="checkbox"/>	Pompous	<input type="checkbox"/>	Reflective
<input type="checkbox"/>	Resourceful	<input type="checkbox"/>	Self-confident	<input type="checkbox"/>	Sexy
<input type="checkbox"/>	Sincere	<input type="checkbox"/>	Snobbish	<input type="checkbox"/>	Submissive
<input type="checkbox"/>	Suspicious	<input type="checkbox"/>	Unconventional	<input type="checkbox"/>	Wide interests

Section C: Perception Data

20. Following are several pairs of words. Think of them as opposites. Consider each pair and select the word that you feel best describes the accounting profession and/or the work of an accountant.

Please circle the appropriate number on the 5-point scale between the words to express the strength of your opinion in the particular direction.

Boring	1	2	3	4	5	Interesting
Creative solutions	1	2	3	4	5	Cut and dry (fixed)
Repetition	1	2	3	4	5	Variety
New ideas	1	2	3	4	5	Established rules
Challenging	1	2	3	4	5	Easy
Dull	1	2	3	4	5	Exciting
Flexible	1	2	3	4	5	Structured
Solitary	1	2	3	4	5	Interaction with others
Conformity	1	2	3	4	5	Originality
Dynamic	1	2	3	4	5	Stable
Standard operating procedures	1	2	3	4	5	New solutions
Extrovert	1	2	3	4	5	Introvert
Conceptual	1	2	3	4	5	Analytical
Innovation	1	2	3	4	5	Compliance
Intuition	1	2	3	4	5	Facts
Ambiguity	1	2	3	4	5	Certainty
Planned	1	2	3	4	5	Spontaneous
People-oriented	1	2	3	4	5	Number crunching
Practical	1	2	3	4	5	Theoretical
Tedious	1	2	3	4	5	Absorbing
Fascinating	1	2	3	4	5	Monotonous
Abstract	1	2	3	4	5	Concrete
Effectiveness	1	2	3	4	5	Efficiency
Imagination	1	2	3	4	5	Logic
Thorough	1	2	3	4	5	Superficial
Unpredictable	1	2	3	4	5	Routine
Details	1	2	3	4	5	Overview
Accurate	1	2	3	4	5	Imprecise
Alternative views	1	2	3	4	5	Uniform standards
Changing	1	2	3	4	5	Fixed
Methodical	1	2	3	4	5	Novelty
Record keeping	1	2	3	4	5	Decision making
Benefits society	1	2	3	4	5	Profit driven
Prestigious	1	2	3	4	5	Ordinary
Adaptable	1	2	3	4	5	Inflexible
Mathematical	1	2	3	4	5	Verbal

21. What influences your perceptions of the accounting profession and/or the work of an accountant? (please tick all that are relevant)

- my teacher/s
- a family member who is an accountant
- TV Shows
- careers guidance counsellors
- books
- an accountant I know (other than family)
- internet
- movies
- school subjects studied
- my friends and their family
- personal work experience
- other (please specify)_____

Thank you for taking the time to complete this survey.

2012

Anybody can do Value at Risk: A Teaching Study using Parametric Computation and Monte Carlo Simulation

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Anybody can do Value at Risk: A Teaching Study using Parametric Computation and Monte Carlo Simulation

Abstract

The three main Value at Risk (VaR) methodologies are historical, parametric and Monte Carlo Simulation. Cheung & Powell (2012), using a step-by-step teaching study, showed how a nonparametric historical VaR model could be constructed using Excel, thus benefitting teachers and researchers by providing them with a readily useable teaching study and an inexpensive and flexible VaR modelling option. This article extends that work by demonstrating how parametric and Monte Carlo Simulation VaR models can also be constructed in Excel, thus providing a total Excel modelling package encompassing all three VaR methods.

Keywords

Value at risk, Parametric value at risk, Monte Carlo simulation, Financial modelling, Pseudo-random number generator



Anybody can do Value at Risk: A Teaching Study using Parametric Computation and Monte Carlo Simulation

Yun Hsing Cheung¹, Robert Powell¹

Abstract

The three main Value at Risk (VaR) methodologies are historical, parametric and Monte Carlo Simulation. Cheung & Powell (2012), using a step-by-step teaching study, showed how a nonparametric historical VaR model could be constructed using Excel, thus benefitting teachers and researchers by providing them with a readily useable teaching study and an inexpensive and flexible VaR modelling option. This article extends that work by demonstrating how parametric and Monte Carlo Simulation VaR models can also be constructed in Excel, thus providing a total Excel modelling package encompassing all three VaR methods.

Keywords: Value at risk, Parametric value at risk, Monte Carlo simulation, Financial modelling, Pseudo-random number generator.

JEL Classification: G17.

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Introduction

Cheung and Powell (2012) showed the procedures of doing one-step ahead Value at Risk (VaR) in Microsoft Excel using the non-parametric historical method. This paper extends this prior research by calculating VaR using parametric and Monte Carlo simulation methods. In the parametric method, the asset returns are assumed to follow a known probability distribution whilst the Monte Carlo method assumes that asset returns are driven by a known stochastic process.

The major attraction of using a nonparametric approach, as argued by Cheung and Powell (2012), is avoiding the misspecification of probability density functions of risk factors in an era of frequent financial disturbance. If trading conditions are deemed to be normal then the VaR calculation can be simplified considerably if the distributions of the risk factors can be assumed to belong to certain parametric families, such as normal or gamma distribution. This leads to the use of the parametric method. Some researchers, especially those with a statistical background, may find the use of the parametric method to derive VaR rather restrictive and over-simplified, preferring instead that the probability distributions of the risk factors are derived empirically. This can be done by Monte Carlo simulation if the mechanisms of changes in the risk factors are known. In this paper, we assume that a stochastic process can model the mechanism of changes in asset returns, thus the asset returns are presented as a probability distribution rather than values. Moreover, we incorporate a self-contained pseudo-random number generator into our Monte Carlo simulation method, which as far as we know is a first in financial modelling using an Excel 2007 spreadsheet.

There are several studies which compare the relative merits of historical, parametric and Monte Carlo VaR approaches, for example Lechner & Ovaert (2010), Deepak & Ramanathan (2009), Jorion (2001), Pritsker (1997) and Stambaugh (1996). In general these studies find that there is no particular best method. Parametric methods are simple to implement and very useful when returns follow a normal distribution, but they are not appropriate when there is non-normality such as asymmetry or leptokurtosis. Monte Carlo has the advantage of increasing the number of observations but it can be time-consuming and computer-intensive to implement. The historical method accurately measures past returns but it can be a poor estimator of future returns if the market has shifted. Stambaugh (1996) notes that each method has strengths and weaknesses and that they should not be viewed as competing methods but as alternatives which might be appropriate in certain circumstances. Different approaches may be appropriate for different types of portfolio, different purposes and different levels of resources available to invest in the analysis.

To illustrate the use of the two methods described in this paper, we continue the Cheung and Powell (2012) teaching study. Four listed shares (Coca Cola, Bank of America, Boeing and Verizon Communication) from the New York Stock Exchange are used to demonstrate the calculation of VaR of a single asset and a portfolio. In the case of a single asset, an investor has an exposure of \$1 million (V) worth of Coca Cola shares at time t (any trading day after 3 August 2010, which is the closing share price date in our sample). The risk factor is share price (p), risk horizon is one trading day, historical data series is 10 years of daily adjusted closing prices (from 4 August 2001 to 3 August 2010, a total of 2,513 observations), and the level of confidence (α) is 95%. The question of interest is: in 95 out of a 100 times, what would be the worst daily loss the investor could experience by holding \$1 million Coca Cola shares? In the case of a portfolio (using the same historical period, number of observations, risk horizon and confidence level used

for the single asset above), the investor extends his/her share portfolio exposure (V) to \$5 million, comprising \$1 million Coca Cola (20%), \$1.5 million Bank of America (30%), \$1.5 million Boeing (30%), and \$1 million Verizon (20%). Again, we ask the question: in 95 out of a 100 times, what would be the worst daily loss the investor could experience by holding this \$5 million portfolio?

This paper is organised as follows. The next section discusses the application of the parametric method to a single asset. The third section describes the workings of the Monte Carlo simulation method, again only applied to a single asset. The fourth section expands the two methods to calculate VaR for a portfolio of assets. The fifth section compares and discusses the results from the various methods. The last section is the conclusion.

Parametric Method: Single Asset

Using the parametric method, the researcher specifies a probability distribution that characterises the likely values of a risk factor. Bachelier (1900) used the central limit theorem to derive a normal distribution for share price movements in the Paris Stock Exchange, and discovered that successive changes in share prices are approximately normal. This normality assumption for asset returns has been in place since then. However, in the Black-Scholes (1973) model, share prices are assumed log-normally distributed, consistent with continuous compounding.

The crucial step in the parametric method is to obtain the mean and standard deviation of the normal distribution from the historical data series. Once these values are obtained, we can proceed to calculate the 5% VaR return by entering 5% in the first argument of the Excel function *NORMINV* (probability, mean, standard deviation). The 5% VaR value is then calculated by multiplying the exposure by $(1 - \text{the absolute value of the 5\% VaR return})$. To plot the parametric VaR diagram, we construct a table with 80 bins for the calculation of the relative frequencies of the normal distribution. In Excel, the probability density function of a normal distribution is calculated by *NORMDIST* (x , mean, standard deviation, cumulative) where x is the x -coordinates showing the daily returns, mean and standard deviation are the parameters of the normal distribution, and cumulative = FALSE for the probability density function. The execution of this procedure is presented as a screenshot in Table 1.

Table 1
Individual Asset Parametric VaR

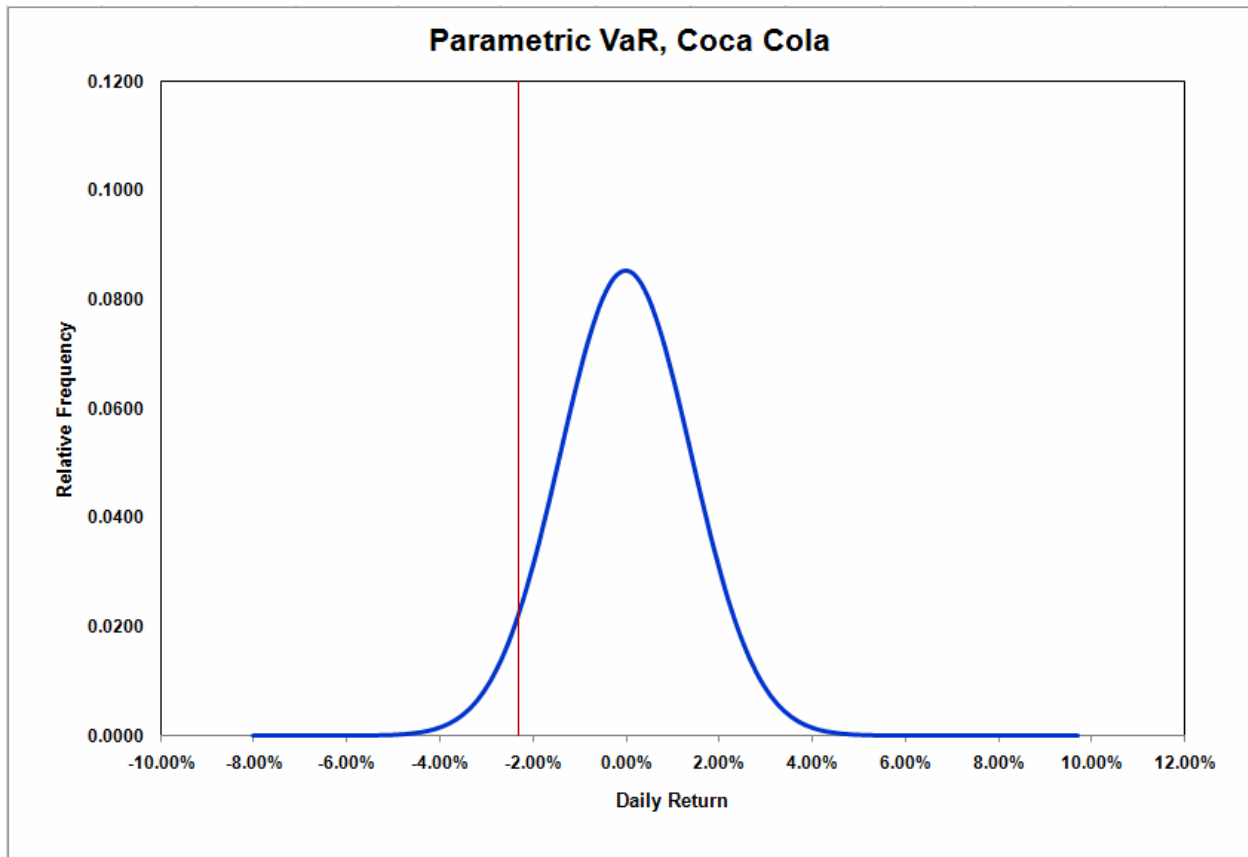
This screenshot shows the historical data series (called “cocadaily1” in Cells C7:C2519). For brevity we only show the first few returns. $V = \$1$ million (as shown in Cell G13), risk horizon is 1 day, n is 2,512, and confidence level (α) is 95% (Cell G8). We find that the daily mean return is -0.004% (Cell G6), standard deviation is 1.40% (Cell G7), 5% VaR return is -2.31% (Cell G10), and the 5% VaR value is -\$23,123.61 (Cell G12). For Excel functions applied to each cell in the spreadsheet, see Column I.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		Coca Cola: 95% VaR by Parametric Method											
3													
4		Data				Calculation of 5% VaR value							
5			Daily										
6		Obs	Returns		Daily mean return		-0.004%		Cell(G6)'s Formula: =AVERAGE(cocadaily1)				
7		1	-1.71%		Daily stn dev		1.40%		Cell(G7)'s Formula: =STDEV(cocadaily1)				
8		2	1.31%		Confidence level		95%		Cell(G8)'s Value = 0.95				
9		3	-3.36%		5% VaR in decimal pt		5.00%		Cell(G9)'s Formula: =1-G8				
10		4	0.10%		5% VaR return		-2.31%		Cell(G10)'s Formula: =NORMINV(G9,G6,G7)				
11		5	1.13%		Amount of investment		\$1,000,000		Cell(G11)'s Value = 1000000				
12		6	1.93%		5% VaR Value		\$23,123.61		Cell(G12)'s Formula: =ABS(G11*G10)				
13		7	0.10%										
14		8	-1.52%		Data for Charting								
15		9	-1.95%		Min daily return		-12.33%						
16		10	-1.15%		Max daily return		8.11%						
17		11	0.42%		Range		20.45%						
18		12	0.10%		No of daily obs		2,512						
19		13	-1.47%										
20		14	-1.07%										
21		15	-1.62%										
22		16	-0.22%										
23		17	-0.88%		0	x	f(x)	Relative frequency					
24		18	-2.23%		1	-8.00%	0.0000	0.0000	Cell(G23)'s Formula: =NORMDIST(F23,\$G\$6,\$G\$7,FALSE)				
25		19	-2.39%		2	-7.70%	0.0000	0.0000	Cell(H23)'s Formula: =G23/\$G\$83				
26		20	-0.35%		3	-7.40%	0.0000	0.0000					
27		21	0.00%		4	-7.10%	0.0001	0.0000					
28		22	1.61%		5	-6.80%	0.0002	0.0000					
29		23	-0.92%		6	-6.50%	0.0006	0.0000					
30		24	-0.23%		7	-6.20%	0.0017	0.0000					
31		25	0.00%		8	-5.90%	0.0042	0.0000					
32		26	-2.80%		9	-5.60%	0.0100	0.0000					
33		27	1.41%		10	-5.30%	0.0230	0.0001					
34		28	-3.21%		11	-5.00%	0.0503	0.0002					
					12	-4.70%	0.1052	0.0003					

Armed with the relative frequencies, we plot the parametric one-day VaR for Coca Cola shares in Figure 1.

Figure 1
Parametric One-day 5% VaR, Coca Cola

This shows the histogram of Coca Cola returns and the corresponding 5% VaR line using the parametric method. Data is contained in Cell F25:H84 of Table 1 where the x-coordinates representing the returns are listed in Cells F23:F83, the absolute frequencies in Cells G23:G83, and the resulting relative frequencies in Cells H23:H83. The insertion of the 5% VaR return line is thoroughly discussed in Cheung and Powell (2012) and will not be repeated here.



Monte Carlo Simulation Method: Single Asset

Monte Carlo simulation relies heavily on probability theory to drive the simulation process. It involves conducting repeated trials of the values of the uncertain input(s) based on some known probability distribution(s) and some known process to produce a probability distribution for the output. That is, each uncertain input or parameter in the problem of interest is assumed to be a random variable with a known probability distribution. The output of the model, after a large number of trials or iterations, is also a probability distribution rather than a numerical value. In the context of VaR, the uncertain input is the one-step-ahead asset returns and the uncertain outputs are the 5% VaR return and value. The process linking the inputs with the output is the geometric Brownian motion process.

Intuitively, the researcher can think of simulation like scenario analysis. Instead of having three or five scenarios, the simulation process generates thousands or tens of thousands of scenarios. From this long list of scenarios, we gain a much better understanding of the nature of the problem, the most likely outcome and the extent of uncertainty surrounding it.

Instead of defining the probability distribution of the risk factor (in this case, the return of a share) as in the parametric method, the Monte Carlo simulation method derives the distribution of the share returns using a stochastic process. In most finance studies, we assume that asset prices, though largely unpredictable, follow a special type of stochastic process known as geometric Brownian motion, described by the following equation:

$$S_{t+\Delta t} = S_t e^{(k\Delta t + \sigma \varepsilon_t \sqrt{\Delta t})} \quad (1)$$

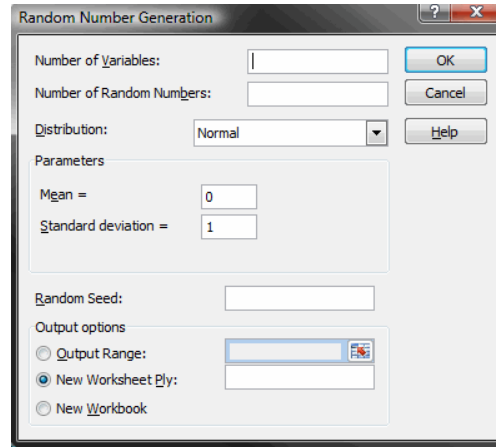
where S_t is the share price at time t , e is the natural log, Δt is the time increment (expressed as portion of a year in terms of trading days, e.g. one trading day will yield $\Delta t = 1/251.4$ of a trading year in our exercise), $k = \mu - (\sigma^2/2)$ is the expected return (which equals annualised mean return μ minus half of the annualised variance of return σ^2), and ε_t is the randomness at time t introduced to randomise the change in share price. The variable ε_t is a random number generated from a standard normal probability distribution, which has a mean of zero mean and a standard deviation of one. Sengupta (2004, pp.285-295) provides a solid discussion of equation (1).

The return of a share price can be obtained by rearranging equation (1) to yield equation (2):

$$R_{t+\Delta t} = \ln \left(\frac{S_{t+\Delta t}}{S_t} \right) = k \Delta t + \sigma \varepsilon_t \sqrt{\Delta t} \quad (2)$$

The key to our exercise is generating the future returns according to equation (2). The main problem in modelling and simulating stochastic processes is generating a stream of random numbers. Excel provides several ways to generate random numbers, some true ones and some pseudo ones. True random numbers between 0 and 1 can be generated by the Excel function *RAND* (). The problem with true random numbers is their volatile nature, which means a new value is returned every time the worksheet is recalculated (e.g. by pressing F9). This can be problematic if the researcher wants to repeat the experiment with the same set of random numbers or to re-examine the simulation results. This is where pseudo-random numbers come into play. Pseudo-random numbers are generated by formulas. As long as the seed number is fixed, the set of random numbers will be fixed, which enable the researcher to have a second chance to re-examine the simulation results. Excel provides a pseudo-random number generator in its Random Number Generation tool in Data Analysis buried deep in the Data Ribbon. Figure 2 is a screenshot of Excel's Random Number Generator. The number of variables box is the number of random number columns desired by the researcher, and the number of random numbers box is the required number of rows. The seed number is any whole number selected by the researcher, which is fixed to a specific set random numbers. For example, every time the number 10 is re-entered, those same random numbers will be generated.

Figure 2
Excel's Random Number Generator Dialog Box



To avoid the tedious task of calling up and filling in the Random Number Generator dialog box every time the researcher wants to change the seed number or simulate another stream of pseudo-random numbers, we recommend that the researcher build their own pseudo-random number generator. This can be easily incorporated into the simulation model.

One of the most popular random number generators is the linear congruential method developed by Lehmer as discussed in Sheskin (2007, pp.402-407). Equation (3) is a multiplicative variant of the linear congruential method which is designed to generate a stream of uniformly distributed random numbers x between 0 and 1:

$$x_{i+1} = [(ax_i) \bmod m] / m \quad (3)$$

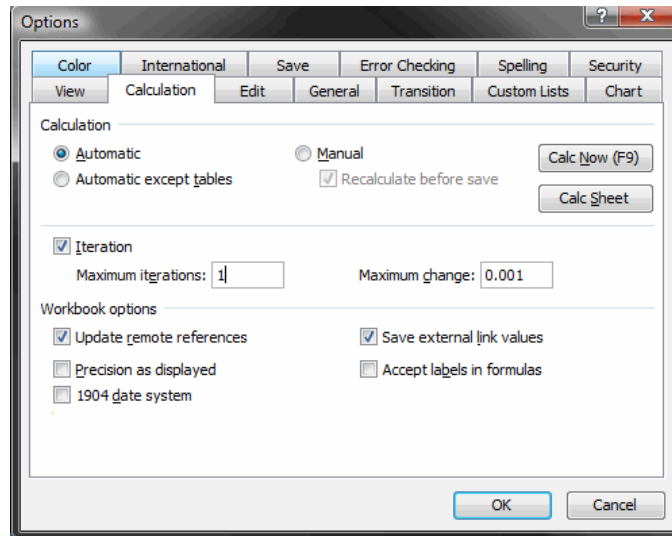
where \bmod is the modulo operation (it is conducted in Excel by the function *MOD* (number, divisor)), $0 \leq a$ is the multiplier (a recommended number for a , as used by most statisticians, is 7^5), m is the modulus and it has to be greater than a (a recommended number for m , as used by most statisticians, is $2^{31}-1$ or 2^{31}), and lastly, $0 < x_0$ is the initial seed number or starting value. The longest possible length of non-degenerated and non-cycled random numbers of this method is the value of the modulus.

The random numbers (x) generated by equation (3) are uniformly distributed random numbers representing probabilities of the events that certain rates of return will occur. They have to be transformed into normally distributed numbers (ε) before incorporating into equation (2). The transformation is carried out the using the Excel function *NORMSINV* (probability) where the random numbers enter the function as the only argument.

If the researcher wishes to use true random numbers, the Excel calculation function needs to be set up before incorporating the *RAND* () function (note that this Excel function does not have an argument). In Excel 2003 or before, go to Tools and then Options. Once the Options dialog box appears, go to the Calculation tab and tick the Iteration box and set Maximum iterations to 1 and Maximum change to 0.001 (see Figure 3). Once iteration is turned on, iterations are generated by pressing the F9 key (instead of the random numbers continually recalculating themselves). Excel then recalculates the worksheet the number of times specified in

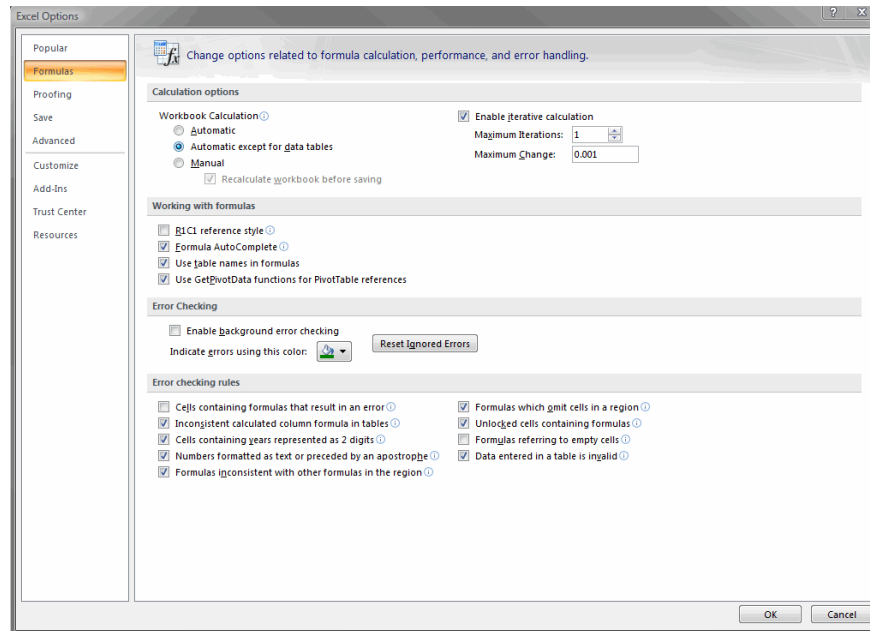
the Maximum iterations box (when you press the F9 key) or until the results between calculations change less than the amount specified in the Maximum change box.

Figure 3
Excel Options Dialog Box in Excel 2003



If using Excel 2007 (with Vista), click the Microsoft Office Button, then Excel Options at the bottom of the dialog box, select Excel Add-Ins, and then select Formulas on the left-hand side panel to display the dialog box below. In the Calculation Options section, tick the Enable Iteration Calculation box and set the Maximum iterations to 1 and Maximum change to 0.001 (see Figure 4).

Figure 4
Excel Options Dialog Box in Excel 2007



The above discussion lays the groundwork for performing Monte Carlo simulations for calculating 5% VaR return and value for an individual asset.

The simulation process for 5% VaR returns and value includes five steps. Step one calculates the parameters in the geometric Brownian motion process. Step two generates uniformly distributed pseudo-random numbers between 0 and 1. Step three converts the uniformly distributed random numbers from step one to normally distributed random numbers between 0 and 1. Step four applies the normally distributed random numbers into the geometric Brownian motion process to yield the simulated asset returns. The final step calculates 5% VaR returns and 5% VaR value in a fashion similar to that discussed in the parametric method. Table 2 succinctly captures the calculation of the Monte Carlo simulation process.

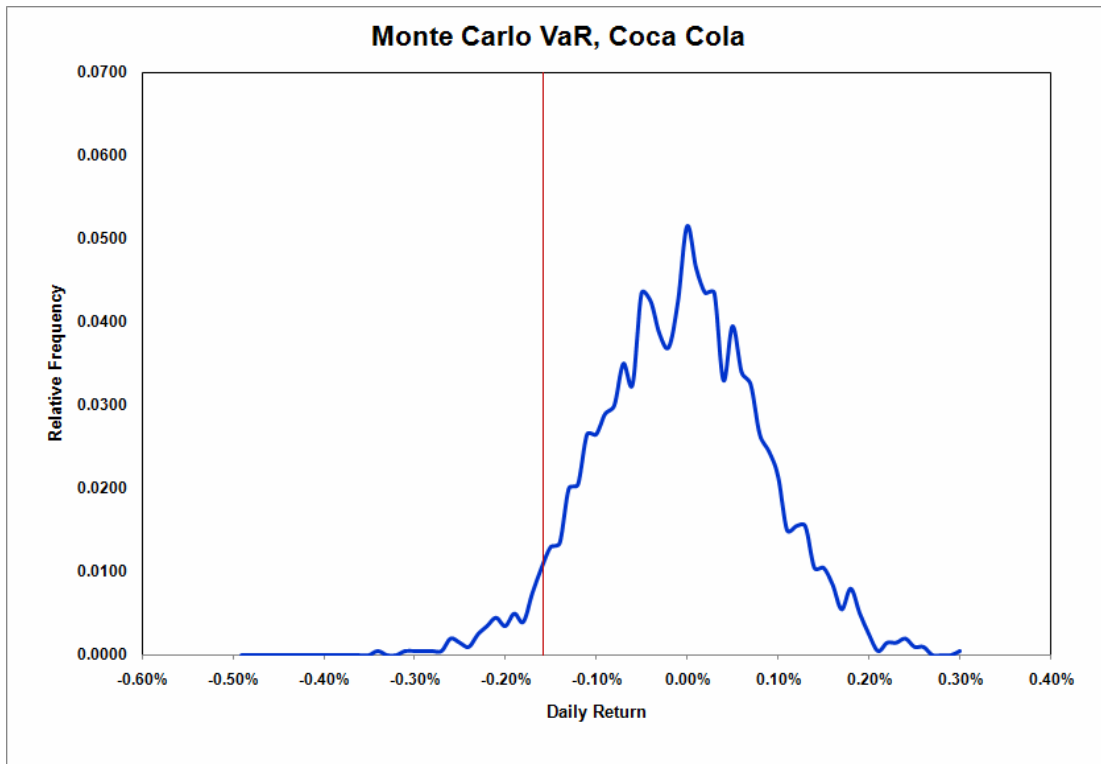
Table 3
Monte Carlo One-day 5% VaR, Coca Cola

The 5% VaR return (Cell N8) is obtained by using the Excel function *SMALL* (array, k-th smallest value in the array). Note that “simreturn” in the formula in Cell N8 is the name given to the 2,000 daily simulated return series (H24:H2023) from Table 2.

	A	L	M	N	O	P	Q
1							
2							
3							
4		Calculation of 95% VaR Value					
5							
6		Confidence level		95%	Cell(N6)'s Value = 0.95		
7		Bottom 5% obs		99	Cell(N7)'s Formula: =(1-N6)*W11-1		
8		5% VaR		-2.318%	Cell(N8)'s Formula: =SMALL(simreturn,N7)		
9		Amount of investment		\$1,000,000	Cell(N9)'s Value = 1000000		
10		5% VaR Value		\$23,177.81	Cell(N10)'s Formula: =ABS(N9*N8)		

Table 3 shows the calculation of VaR return and VaR value. To plot the probability distribution for the simulated returns, we construct an 80-bin table from -8.00% to 8.00% (with bin size of 0.2%) and use the *FREQUENCY* (data array, bins array) function to calculate the number of returns that fall into each bin. We then use the relative frequencies to construct a scatter with a smooth line chart, as shown in Figure 5. Apparently the returns are not normally distributed, with the distribution skewed to the left and showing a jagged curve. As usual, a volatile 5% VaR return line is fitted to the diagram.

Figure 5
 Monte Carlo One-day 5% VaR, Coca Cola



There are two important issues to consider in relation to the Monte Carlo simulation method. The first issue concerns the initial seed number. Since this can be any positive value, what is the appropriate number? The second issue relates to the number of iterations. In our example, we run 2,000 iterations, which is an *ad hoc* decision. Is there a minimum number of ideal iterations? In the following paragraphs, we briefly discuss these two issues.

In Table 2 the initial seed number used in the simulation process was arbitrarily selected as 230. The resultant 5% VaR return and the 5% VaR value are -2.318% and \$23,177.81 respectively (Table 3). Table 4 uses a range of other seed numbers to illustrate that there is no appropriate initial seed number.

Table 4
Impact of Initial Seed Number on 5% VaR Return and Value

In addition to the initial seed number of 230 used in Table 2, we perform the same simulation process with another four initial seed numbers: 5; 1,520; 29,765; and 677,777 as shown in the first column with the resulting VaR returns and values shown in the ensuing columns.

Initial seed number	5% VaR return	5% VaR value
5	-2.40%	\$23,972
230	-2.32%	\$23,178
1,520	-2.28%	\$22,832
29,765	-2.28%	\$22,832
677,777	-2.41%	\$24,099

The 5% VaR return, in this sample of five seed numbers, fluctuates between -2.41% to -2.28%, while the 5% VaR value fluctuates from \$24,099 to \$22,832. The differences in the latter are insignificant with respect to the exposure of \$1 million. The differences will narrow as the number of iterations increases. In view of this, any initial seed number is acceptable as long as a large number of iterations are simulated as discussed in the ensuing paragraphs.

Put into context, the number of iterations n is the number of pseudo-random numbers (ε) we have to generate. The minimum number of trials n depends on how precise you want your simulation to be. Equation (4) gives the minimum number of iterations to achieve the desired accuracy D , defined as $D = y - \mu$ where y is the simulated value of the risk factor and μ is the mean of the probability distribution of the risk factor.

$$n = \left(\frac{z_{\alpha/2} \hat{\sigma}}{D} \right)^2 \quad (4)$$

Most researchers, however, ignore equation (4) and simulate at least 10,000 to 20,000 times, which should give an approximately normal distribution for the risk factor. In our teaching study, we simulate only 2,000 times for illustration purposes.

Parametric Method: Mutiple Asset Portfolio

Assume our investor increases their portfolio holdings by purchasing \$1.5 million shares in Bank of America (BoA). The investor now has a portfolio of \$2.5m with \$1m (40%) Coca Cola and \$1.5 million (60%) BoA. When additional assets are introduced into the portfolio, we need to account for correlation and covariance between the assets before calculating the VaR. We use the variance-covariance matrix, which is the approach used by RiskMetrics (J.P. Morgan & Reuters 1996), who introduced VaR. We start with a two asset portfolio. The steps involved are shown in Table 5, and further reading on this approach can be obtained in Choudhry (2004).

Table 5
Two Asset Parametric VaR

The table shows the calculation of VaR for a 2 asset portfolio (Coca Cola and BoA). Steps 1-4 are calculated individually for each of the 2 assets. Steps 5-9 calculate the portfolio standard deviation by first calculating portfolio mean, correlation coefficient, covariance and portfolio variance. Formulae are shown alongside each step. VaR is calculated based on the standard normal distribution as shown in steps 10-12. This process is based on similar examples by Choudhry (2004).

	A	B	C	D
1				
2		Coca Cola	BoA	
3	1. Obtain relative weightings (w)	40.00%	60.00%	
4	2. Calculate mean (μ) return for each asset	-0.004%	-0.022%	
5	3. Calculate stdev (σ) for each asset	1.403%	3.635%	
6	4. Calculate variance (σ^2) for each asset	0.0002	0.0013	
7	5. Calculate weighted portfolio mean return (μ_p)	-0.015%	Formula: =SUMPRODUCT(\$B\$3:\$C\$3,\$B\$4:\$C\$4)	
8	6. Calculate correlation coefficient (ρ_{xy})	0.2941	Formula: =CORREL(cocadaily1,BoAdaily1)	
9	7. Calculate covariance ($\rho_{xy}\sigma_x\sigma_y$)	0.0002	Formula: =\$B\$8*\$B\$5*\$C\$5	
10	8. Calculate Portfolio variance (σ_p^2) for each asset	0.0006	Formula: =(B3^2*B6)+(C3^2*C6)+(2*B3*C3*B9)	
11	9. Portfolio stdev (σ_p) = square root $\sigma^2\rho$	0.0241	Formula: =SQRT(B10)	
12	10. 5% VaRdaily return	-3.97%	Formula: =NORMINV(0.05,\$B\$7,\$B\$11)	
13	11. Initial portfolio value	\$2,500,000		
14	12. 5% VaRvalue	-\$99,355.32	Formula: = B12* B13	

Matrix multiplication is required to calculate variance-covariance for several assets. Matrices need to be set up with the number of columns in matrix *A* equal to the number of rows in matrix *B*. To calculate the value of a matrix *C* from matrices *A* and *B*, (where *i* is the row index and *j* is the column index for matrix *A*, and *j* is the row index and *k* the column index for matrix *B*), the following formula is used:

$$C_{ik} = \sum_j A_{ij} B_{jk} \tag{5}$$

Let us assume our investor's portfolio consists of \$5 million. In addition to the shares mentioned in the previous section, the investor has \$1.5 million shares in Boeing and \$1 million in Verizon. The portfolio now contains shares in four companies with 20% Coca Cola (\$1 million), 30% BoA (\$1.5 million), 30% Boeing (\$1.5 million) and 20% Verizon (\$1 million).

Variance and correlation matrices need to be created and multiplied together to form a variance-covariance matrix. This in turn multiplies with the variance matrix to create a variance-covariance matrix, which is then multiplied with the weightings to form a weighted variance-covariance matrix, the sum of which gives the portfolio standard deviation from which the VaR can be calculated as shown in Table 6.

Table 6
Multiple Asset Parametric VaR

	A	B	C	D	E	F	G
1		Coca Cola	BoA	Boeing	Verizon		
2							
3							Formulae
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
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29							
30							
31							
32							
33							
34							
35							
36							
37							

The table shows matrix multiplication for the four share portfolio. The historical return series for each of the four assets are named cocadaily1, BoAdaily1, boeingdaily1 and verizondaily1. Further shares can be accommodated by increasing the number of rows and columns equally, limited only by the number of columns in Excel. Matrices in Excel can be multiplied together using the formula *MMULT()* as shown in the formulae in Column G. The variance matrix is multiplied by the correlation matrix to form the variance-covariance matrix, which is then multiplied by the variance matrix and share weightings to form the variance-covariance matrix. The latter is summed to calculate the portfolio variance from which the standard deviation and VaR are calculated as per Rows 32:37. It should be noted that, if preferred, the Excel Data Analysis Add-in can be used an alternative tool to generate individual matrices such as the correlation matrix.

Monte Carlo Simulation Method: Multiple Asset Portfolio

First undertake a Monte Carlo simulation for each asset in the portfolio. Then obtain the daily weighted average returns from which VaR is calculated as per Table 7.

Table 7
Multiple Asset Monte Carlo Simulation VaR

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2	Historical Returns:												
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21	Simulated Returns:												
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													

	Coca Cola	BoA	Boeing	Verizon
1	-1.71%	4.00%	-0.13%	0.40%
2	1.31%	-0.96%	-0.64%	-5.02%
3	-3.36%	-0.24%	0.00%	-6.03%
4	0.10%	2.38%	-2.21%	-4.54%
5	1.13%	0.35%	1.95%	2.45%
6	1.93%	0.23%	2.29%	-0.91%
7	0.10%	2.42%	-2.16%	1.36%
8	-1.52%	-0.80%	-3.54%	0.45%
9	-1.95%	-1.51%	-2.16%	-1.36%
10	-1.15%	-0.47%	0.14%	-2.77%
11	0.42%	0.82%	0.00%	8.23%
12	0.10%	0.23%	3.87%	-1.01%

	Coca Cola	BoA	Boeing	Verizon
1	2,512	2,512	2,512	2,512
2	-12.33%	-37.64%	-23.07%	-14.70%
3	8.11%	31.52%	12.31%	12.32%
4	56.27	14.36	37.60	29.64
5	251.4	251.4	251.4	251.4
6	0.0040	0.0040	0.0040	0.0040
7	0.00%	-0.02%	0.01%	-0.01%
8	1.40%	3.64%	2.10%	1.86%
9	-1.07%	-5.65%	3.47%	-3.52%
10	22.25%	57.65%	33.25%	29.47%
11	-3.55%	-22.27%	-2.06%	-7.86%

	Coca Cola	BoA	Boeing	Verizon
1	2,000	2,000	2,000	2,000
2	230	500	750	1,000
3	2,147,483,647	2,147,483,647	2,147,483,647	2,147,483,647

	Weighted average	Coca Cola	BoA	Boeing	Verizon
1	0.861%	-0.944%	2.584%	0.819%	0.145%
2	1.552%	1.114%	3.006%	1.115%	0.465%
3	1.015%	-0.051%	-1.738%	4.697%	0.685%
4	0.056%	0.114%	-1.165%	0.391%	1.325%
5	-0.034%	-0.515%	-0.275%	-1.631%	3.204%
6	-0.712%	1.272%	0.115%	-1.209%	-3.189%
7	-0.775%	-1.537%	-0.708%	-2.194%	2.016%
8	-0.065%	-1.013%	1.295%	-0.154%	-1.025%
9	-1.005%	2.850%	-1.524%	-4.328%	0.905%
10	0.675%	-1.168%	2.375%	0.668%	-0.022%
11	0.556%	-0.135%	1.904%	0.320%	-0.424%
12	-0.215%	-1.649%	-0.246%	-1.599%	3.344%

	Weighting:	20%	30%	30%	20%
1	0.861%	-0.944%	2.584%	0.819%	0.145%
2	1.552%	1.114%	3.006%	1.115%	0.465%
3	1.015%	-0.051%	-1.738%	4.697%	0.685%
4	0.056%	0.114%	-1.165%	0.391%	1.325%
5	-0.034%	-0.515%	-0.275%	-1.631%	3.204%
6	-0.712%	1.272%	0.115%	-1.209%	-3.189%
7	-0.775%	-1.537%	-0.708%	-2.194%	2.016%
8	-0.065%	-1.013%	1.295%	-0.154%	-1.025%
9	-1.005%	2.850%	-1.524%	-4.328%	0.905%
10	0.675%	-1.168%	2.375%	0.668%	-0.022%
11	0.556%	-0.135%	1.904%	0.320%	-0.424%
12	-0.215%	-1.649%	-0.246%	-1.599%	3.344%

	Confidence level	95%
1	Bottom 5% obs	99
2	5% VaR	-2.71%
3	Amount of investment	\$5,000,000
4	5% VaR Value	\$135,307.57

Cell(I27)'s formula: = SMALL(weightedsimreturn,I25)

An identical simulation process is followed for each of the four shares in our portfolio as was followed for Coca Cola in Table 2, and the daily weighted average returns are then calculated. The summarised results are shown in Cells B24:F35. VaR is then calculated in Cells I25:I29 for the weighted average returns in exactly the same manner as was used for a single asset in Table 3. Formulae are not repeated from Tables 2 and 3. The share prices in Cells I7:L7 are the closing prices of the last day of our data sample (3 August 2010).

A Comparison of the Teaching Studies Results

Table 8
Comparison of Results from Various VaR Methods

The 5% VaR returns and values calculated from the various methods are shown in the table. Historical and Historical bootstrap results are extracted from Cheung and Powell (2012) who use identical data to this study. Parametric and Monte Carlo results are obtained from this study (individual asset results from Tables 1 and 3 with multiple assets results from Tables 6 and 8).

Method	Individual Asset (Coca Cola)		Portfolio of Multiple Assets	
	5% VaR return	5% VaR value	5% VaR return	5% VaR value
Historical	-2.20%	\$21,979	-2.63%	\$131,334
Historical bootstrap	-2.20%	\$21,978	-2.63%	\$131,334
Parametric	-2.31%	\$23,124	-2.93%	\$146,507
Monte Carlo simulation	-2.32%	\$23,178	-2.71%	\$135,308

The smallest and the largest 5% VaR returns in Table 8 differ by 0.12% (Coca Cola) and 0.30% (portfolio), while the smallest and the largest 5% VaR values differ by \$1,200 (Coca Cola) and \$15,163 (multiple asset portfolio). These differences are insignificant given the portfolio sizes of \$1 million (individual asset) and \$5 million (multiple asset). Based on the similar results obtained, it is difficult to argue which method is better. Indeed, the results depend on the method and the historical data series collected. Further back testing, beyond the scope of this paper, needs to be performed to yield further information to ascertain the appropriateness of these methods (Berry 2009).

Conclusion

The study, together with the prior work of Cheung and Powell (2012), shows how a complete range of VaR models, encompassing all three main VaR methods, can be constructed in Excel. The step-by-step teaching study approach allows teachers, students and researchers to build inexpensive VaR models. These range from simplistic parametric methods suitable for normal trading conditions through to more complex historical and (most complex) Monte Carlo models not dependent on a normal distribution assumption and more suited in times of frequent financial disturbance. The Excel models are highly flexible and easy to change as well as offering a range of modelling techniques such as the real or pseudo random number generators.

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2012

The Impact of IFRS on Annual Report Length

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The Impact of IFRS on Annual Report Length

Abstract

The move to the NZ IFRS has been surrounded by complaints of too much information being provided. This is not simply a matter of the cost of providing the information, but the possibility of data overload. Data overload is an important issue as it impacts information search strategies and decision outcomes. This is relevant for assessing whether the NZ IFRS has achieved its goals of reducing the cost of financial analysis. This paper develops a model of information processing capacity and then examines the impact of the move to international financial reporting by New Zealand listed entities on the quantity of data provided in their annual reports. Our analysis shows that the annual report length increased for 92% of our sample firms. The average increase in size was 29% above the prior years' annual report and arose through notes to the accounts and accounting policies. Even after transitional information (e.g. accounting policies and reconciliations) the increase was 15%.

Keywords

IFRS adoption, Disclosures, Information overload

Cover Page Footnote

We thank attendees at the Asian-Pacific Conference on International Accounting Issues 2010 and Massey University, Albany workshop for their helpful comments. We also appreciate the comments of the reviewers



The Impact of IFRS on Annual Report Length

Maria Morunga*¹, Michael E. Bradbury¹

Abstract

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JEL classification: M40, M41

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Introduction

“The other major gripe with IFRS was the sheer volume of disclosures required...” (Hall 2009). This quote is typical of anecdotal claims by practitioners that the move to the International Financial Reporting Standards (IFRS) has substantially increased the size of the annual report. Studies that report on the potential impact of NZ IFRS (e.g. Dunstan 2002; Ernst & Young 2004) have ignored the impact of financial report length and the potential information overload as a cost of moving to the NZ IFRS. Thus the possibility of information overload is an important issue when considering whether the benefits of adopting IFRS have been achieved.

This paper has two objectives. The first is to raise the issue of information overload and its affect on the reporting and understanding of financial statements. This is important because the efficient market hypothesis implies that ‘more disclosure’ is the solution to information asymmetry in capital markets (Beaver 1973). On the other hand, psychology-based literature acknowledges that information overload impacts information processing strategies and decision outcomes (Eppler & Mengis 2004). To meet this objective we develop a theoretical model of information processing capacity. This model distinguishes between information characteristics and the information environment. Standard setters-only have responsibility for information characteristics (i.e. readability and information load). Given the considerable literature on the readability of annual reports, the second objective of this paper addresses information load.

To meet our second objective we provide empirical evidence on the anecdotal claims of increased report length under the NZ IFRS. We measure the change in the length of annual reports in the years surrounding the implementation of IFRS. We classify the major reasons for the change in disclosure and ask if other (non-financial statement) disclosures are reduced as a result of IFRS. Report length is a major element in assessing whether information overload is a potential issue under NZ IFRS. We find that 92% of our sample had annual reports which increased in length. This increase is due solely to an increase in the financials section (i.e. the financial statements and notes) of the annual report. The median increase from the previous year was 24%. Most of the increase arises from the notes to the accounts. We also find that firms beyond the transition phase of the NZ IFRS increase report size by 9%.

In the next section we discuss the literature on information processing capacity and information load. The following section provides an empirical analysis of the change in length of annual reports. The final section is a discussion.

Information Processing and Information Load

The semi-strong form of the *Efficient Market Hypothesis* (EMH) holds that market prices fully reflect all publicly available information (Fama 1970). One of the main implications of market efficiency for financial reporting is simply to provide more disclosure (Beaver 1973).² However, there is increasing dissatisfaction with the EMH due to evidence of pricing anomalies. For example, the post-announcement-drift anomaly arises when prices drift after the market has had the opportunity to react to

² Beaver (1973) was perceptive enough to suggest that future research ought to examine the behavioural impact of accounting data on individual investors, as opposed to the impact on aggregate prices.

information (e.g. Bernard & Thomas 1990). Sloan (1996) provides evidence that prices over-react to the transitory accrual component of earnings. Hand (1990) finds a market reaction to a component of earnings that reflects previously announced information (with regard to a debt-equity swap). Furthermore, the experimental literature that shows that displaying financial information is important. For example, the manner of presenting comprehensive income influences investors' information processing and resulting judgements (Hirst & Hopkins 1998; Maines & McDaniel 2000; Hunton, Libby & Mazza 2006).

Bloomfield (2002) provides a rationale for some of the observed anomalies in the EMH. He develops an *Incomplete Revelation Hypothesis* (IRH). The IRH suggests that "statistics" (i.e. useful facts extracted from financial statements such as earnings and financial ratios) that are more costly to extract result in less trading interest and are therefore less completely revealed by market prices. The market anomalies (i.e. information not being fully absorbed into prices) observed by Sloan (1996), Hand (1990), Bernard and Thomas (1990) and others can be explained by the cost of information extraction. The IRH does not imply that investors are irrational, but that the cost of extracting information not impounded in prices will not generate sufficient profits. Hence information processing capacity is an important factor in the efficient functioning of capital markets.

Figure 1 is a conceptual view of information processing capacity. The underlying demand for information arises from the requirements of the decision task (i.e. whether the task is simple or complex). Figure 1 indicates that information processing capacity is affected by characteristics of the information, such as readability and the information load (Tuttle & Burton 1999), and environmental factors such as the ability (capacity) of the decision maker (Eppler & Mengis 2004) and time constraints. Figure 1 also indicates that analysis can be motivated (by incentives) to adopt processing strategies that limit the impact of cognitive processing limits.

Readability of the information is an important consideration in information processing. Several studies analyse the readability of annual report disclosures using formulas (see the review by Jones & Shoemaker 1994). The consensus is that the readability of annual report disclosures is 'poor' (Schroeder & Gibson 1990) or ranges from 'difficult to very difficult' (Worthington 1978; Curtis 1986).

Information load also has an important impact on processing. Schroder, Driver & Struefert (1967) consider that task performance improves as the amount of information expands. However, as the amount of information exceeds the decision maker's capacity to process it, performance eventually declines. Information overload arises when the supply of information exceeds the individual's capacity to process information within the available time (Snowball 1980; Schick, Gordon & Haka 1990). The Schroder, Driver & Struefert (1967) model is important, because it is the accountants who prepare reports that determine how much information is presented and, therefore, used by decision makers (Tuttle & Burton 1999). Several studies examine decision performance under differing levels of accounting information (Casey 1980; Snowball 1980; Shields 1983; Iselin 1988; Churning & Harrell 1990).³ The information load in these studies is manipulated by varying the level of aggregated data: by not including the notes to the financial statements; and by diversifying the amount of information presented.

³ Casey (1980) summarises the empirical and non-empirical research over the period 1961-1975.

Information overload has consequences for processing strategies and decision outcomes. Research on how individuals cope with information overload is limited. A few studies have focussed on information search and on retrieval strategies. In dealing with the stress of information overload, research suggests an ordered response: (1) acceleration; (2) filtration; and (3) changing the decision model. Without time constraints individuals spend more total time to make decisions relative to those with lower information loads (Casey 1980). Even without time constraints individuals often self-impose time limits on tasks. Accelerating the rate at which information is processed is the simplest form of coping with information overload, but the most difficult to sustain. Research into human processing indicates that individuals can only process about six or seven chunks of information at one time (Chewning & Harrell 1990). Filtration consists of processing the information that is perceived to be most important and filtering out that which is less important. High information loads also lead to the adoption of a less cognitively demanding decision model.

The ordered response to information overload suggests that differences in decision outcomes may occur depending on the chosen coping strategy. In general, research shows that information overload results in lower decision quality (e.g. Chewning & Harrell 1990; Stocks & Harrell 1995; Stocks & Tuttle 1998; Tuttle & Burton 1999).

In the following empirical analysis we focus on the impact of IFRS on information characteristics (rather than on the decision makers' environment) because these factors are more likely to be important to accounting policy makers. We focus on information load rather than readability. There is sufficient literature to show that the readability of annual reports is poor.⁴ Hence, we focus on report length, because, although there are anecdotal claims of increased report length under IFRS, there is no systematic evidence on the source of this increase in report length.

Empirical Analysis of Annual Report Length

Data

The population for sampling was all (170) firms listed on the New Zealand Stock Exchange as at 31 March 2009. An interval sampling method was used, with a randomly chosen starting point. Firms were discarded for several reasons. First, we excluded finance companies, banks, or insurance companies as they have prudential supervision requirements and additional industry standards under the NZ IFRS which are likely to impact the level of disclosures. Second, we excluded firms not reporting under the NZ IFRS (e.g. those reporting under Australian equivalents to IFRS). Third, we excluded trusts as these have a different ownership and governance structure to other listed firms, and this is known to influence financial reporting. When a firm was discarded the next firm on the NZ Stock Exchange list was sampled.

The mandatory date for the NZ IFRS adoption was for periods beginning 1 January 2007.⁵ For sampled firms the annual reports for 2007 and 2008 were either downloaded from the entity's website or from the Companies Office website

⁴ It is difficult to imagine that IFRS has improved the readability of annual reports, when it has introduced standards on accounting topics such as financial instruments and share-based payments.

⁵ Firms were allowed to early adopt the NZ IFRS from 2005. Early adopters were identified against a list of 48 firms obtained from the Investment Research Group website.

(www.companies.govt.nz). However, it was expected that our sample would include early adopters of NZ IFRS. Late adopters provide evidence on the transition to the NZ IFRS (i.e. 2007 is pre-IFRS and 2008 is IFRS), whereas early adopters provide an interesting control group of firms that have passed the transition year and are continuing under the NZ IFRS. The sampling procedures resulted in a total of 38 firms comprising 12 early adopters and 26 late adopters.

Data are collected from the annual reports by counting the number of pages or part-pages to selected topics. We use page size, rather than sentence counts, because the data analysed contains tables as well as text. Furthermore, while measurement in sentences may be carried out with greater accuracy than measurement in proportions of a page, the former is likely to give less relevant results than the latter (Unerman 2000). The authors independently coded one company's annual report and then compared the results. This comparison and discussion formed the basis for the procedures to be followed. Annual report pages were analysed into fractions of pages: halves, thirds, quarters and eighths were used.⁶ One author collected data for the entire sample while the other independently test checked 10% of the sample observations. As a numerical control, all individual sections were added and checked against the total number of pages in the document.

To measure the relative change length of the annual report we estimate the following statistic: $\text{relative change} = (\text{length of section in year } t \text{ less length of section in year } t-1) / \text{total annual report length in year } t-1$.⁷

Results

Annual Report Length

In Table 1, Panel A we report the percentage of firms which increase, decrease or have no change in their annual report length. We also report the distribution of annual report length (page) for each year (2007 and 2008) analysed by late adopters (Panel B) and early adopters (Panel C).

As seen in Panel A, 77% of late adopters increased their annual report size, compared to 75% of early adopters. Recall that late adopters reflect the transition to IFRS, while early adopters reflect continuing IFRS obligations. This explains the higher proportion of no change firms (17%) in the early adopters. Unexpectedly, given anecdotal claims, more late adopters actually decrease the annual report (19%) than early adopters (8%).

In Panel B, the median (mean) annual report for late adopters increased from 53 (60) pages to 71 (76) pages. In Panel C, it can be seen that a large number of early adopters also increased their report length from median 63 pages to 72 pages). The means and medians in Table 1 indicate that the data are right skewed. Hence, non-parametric statistics are appropriate. In Panel D we report the results of a Wilcoxon matched pair test. The results show that the difference in annual report length between 2007 and 2008 is statistically different from zero (at the 0.01 level) for both late and early adopters.

⁶ The fineness of the page fraction recorded is a trade-off between capturing the appropriate level of detail and estimation reliability. The authors were reluctant to use a finer fraction than 1/8th of a page. Non-financial statement report pages only required counting in whole or half pages.

⁷ We considered scaling the section change in t by the length of the section in $t-1$. However, in several cases the length in the section in $t-1$ is zero.

In the untabulated results we compare the difference between early and late adopters of IFRS. The difference in report length between early and late adopters is not significantly different from zero (at conventional levels) in either year. We also examine whether the change in annual report length is related to firm characteristics. The change in report length is not related to firm size, leverage or profitability.

Overall, these results suggest that both the move to the NZ IFRS and the continuing requirements have increased annual report size across a wide range of listed firms. However, unexpectedly, a large number of late adopters (19%) reduced their annual report length.

Table 1
A comparison of annual report length for late adopters (N=26)
and early adopters (N=12)

	<i>Late adopters</i>	<i>Early adopters</i>
<i>Panel A: Summary change in report length (percentage of firms)</i>		
Increase	77%	75%
Decrease	19%	8%
No change	4%	17%
	2007	2008
<i>Panel B: Late adopters (annual report pages)</i>		
Mean	60	76
Std Dev	25	30
Minimum	28	40
Median	53	71
Maximum	122	138
<i>Panel C: Early adopters (annual report pages)</i>		
Mean	69	79
Std Dev	23	31
Minimum	40	44
Median	63	72
Maximum	111	153
<i>Panel D: Is the change significant? (Wilcoxon matched pair test)</i>		
Z statistic	3.775	2.727
p-value (2-tailed)	0.000	0.006

Annual Report Components

We analyse the relative change in the annual report for three major components: (1) financials (the major statements and notes); (2) non-financials (management commentary, audit reports and directory information); and (3) other (non-content items such as title pages, blank pages and pictures). The untabulated results show that the relative change (increase) in the financials component was

statistically significant, while changes in the other two components are not statistically different. Hence, it is only the financial statements that are driving the changes (on average increase) in annual report length observed in Table 1.

Table 2 reports the change in financials section of the annual report analysed by components: (1) the four major statements (balance sheet, income statement, movement in equity, cash flow statement); (2) accounting policies; and (3) notes. In Panel A we report the increase, decrease and no change, and in Panel B we report descriptive statistics of the relative change measure. The results of statistical tests of whether the change in relative report length is significant and whether there is a difference between late and early adopters is reported in Panel C.

As seen in Table 2, Panel A, the financials section of the annual report increases for 92% of firms and decreases for 8%. The median (mean) relative increase on last year's annual report is 24% (22.4%). In Panel B, the change in the length of the financials section ranges from -16% to +67%. That is, for at least one firm the financial section of the annual report increased by two-thirds. Panel C shows that the relative increase is statistically significant at the 0.01 level. All of the components of the financials have increased. Panel B shows that the largest (median) increase is in the notes to the accounts (10.9%), followed by accounting policies (10.3%) and the statements (0.5%). These increases are statistically significant at the 0.01 level. The increase in annual report length is greater for late adopters than early adopters and it is statistically significant at conventional levels.

Table 2
An analysis of the change in the length of the financials section of annual reports for the total sample (N=38) by component

	Components			Notes
	Major Statements	Accounting Policies		
<i>Panel A: Summary of change (percentage of firms)</i>				
Increase	92%	74%	92%	84%
Decrease	8%	16%	8%	16%
No change	0%	11%	0%	0%
<i>Panel B: Relative change</i>				
Mean	0.224	0.008	0.098	0.117
Std Dev	0.196	0.014	0.066	0.133
Minimum	-0.160	-0.023	-0.034	-0.104
Median	0.240	0.005	0.103	0.109
Maximum	0.670	0.047	0.250	0.470
<i>Panel C: Statistical tests</i>				
<i>Is the change significant? (Wilcoxon matched pair test)</i>				
Z statistic	5.040	3.781	5.228	4.576
p-value	0.000	0.000	0.000	0.000
<i>Are late adopters different from early adopters? (Mann Whitney test)</i>				
Z statistic	3.046	2.859	2.292	3.423
p-value	0.002	0.004	0.022	0.001

Financials Components

We provide further analysis of the change in the length of the financials section. Table 3 analyses the impact of the NZ IFRS on each accounting statement and the accounting policies. Panels A and B report the percentage increase, decrease and no change for the late and early adopters respectively. Panel C reports descriptive statistics on relative changes and Panel D reports the results of the statistical tests. Table 4 examines the impact on the notes to the financial statements. Panels A and B report the percentage increase, decrease and no change for the late and early adopters respectively.

For the late adopters (i.e. the IFRS transition effect) the change in the length of the balance sheet and cash flow statement is not statistically significant at conventional levels. There are small (but significant) increases to the income statement and comprehensive income statement (statement of changes in equity or statement of recognised income and expense). The NZ IFRS requires more items to be shown on the face of the balance sheet (*IAS 1.68*) and the income statement (*IAS 1.81*) than under the previous Generally Accepted Accounting Practice (GAAP) (pre-IFRS). The norm under GAAP was to have a simple income statement with more details in the notes.

For the change in accounting policy components, we analysed separately ‘IFRS transition’ and ‘critical estimates’, as these are new reporting requirements under IFRS. It became obvious during the analysis that ‘financial instruments’ was a major item of change. The ‘general’ column represents the residual impact on accounting policies after the changes in transition, critical estimates and financial instruments have been measured.

All components of accounting policy (general, IFRS transition, financial instruments and critical estimates) have significantly increased in length. For late adopters, the financial instrument accounting policy increased for 96% of the sample firms, and even general accounting policies increased for 81% of the sample firms (Table 3, Panel A). The IFRS transition policy note is relatively small. The critical estimates policy is a new feature under NZ IFRS (*IAS 1.116*). Perhaps surprisingly for 46% of firms there is no change for the accounting policy on critical estimates.

As to be expected, the early adopters have a larger percentage of no changes across all items in Table 3, Panel B. For early adopters, the only items to register statistically significant changes are increases in accounting policy notes in the general and financial instrument components. These items suggest the continuing effect of IFRS is both specific (to IFRS) and general.

In Table 4 we report the impact of the NZ IFRS on the notes to the financial statements. For late adopters (Panel A), tax and deferred tax (row 4) is the most common cause of increase (92% of firms). The requirement to report earnings per share (row 12) increased annual report length for 81% of firms. Earnings per share was not required to be reported under GAAP. However “other” balance sheet items (row 5) also increased for 81% of firms, indicating a general increasing trend. For late adopters, the total impact on notes to the accounts (row 1) is a median (mean) increase of 14% (16.1%). The range is from -10.4% to +47%. The median (mean) increase due to the IFRS reconciliation (row 17) is 4.5% (4.6%). Hence, if the IFRS reconciliation is a temporary reporting requirement, the transition to the NZ IFRS has resulted in a median 10% increase in the notes to the financial statements.

Table 3
An analysis of the change in the length of statements and accounting policies

	Statements				Accounting Policies			
	Income statement	Balance sheet	Comprehensive income	Cash flow statement	General	IFRS transition	Financial instruments	Critical estimates
<i>Panel A: Late adopter: Summary change (% of firms)</i>								
Increase	65%	19%	58%	19%	81%	54%	96%	46%
Decrease	4%	8%	8%	15%	19%	19%	0%	8%
No change	31%	73%	35%	65%	0%	27%	4%	46%
<i>Panel B: Early adopter: Summary change (% of firms)</i>								
Increase	25%	0%	33%	8%	75%	17%	100%	25%
Decrease	25%	0%	17%	17%	17%	8%	0%	25%
No change	50%	100%	50%	75%	8%	75%	0%	50%
<i>Panel C: Relative change</i>								
Mean	0.003	0.000	0.005	0.000	0.035	0.007	0.054	0.003
Std Dev	0.005	0.005	0.010	0.005	0.039	0.021	0.035	0.005
Minimum	-0.004	-0.024	-0.004	-0.017	-0.034	-0.018	0.000	-0.005
Median	0.002	0.000	0.000	0.000	0.025	0.000	0.048	0.000
Maximum	0.017	0.012	0.042	0.017	0.156	0.116	0.119	0.017
<i>Panel D: Statistical tests</i>								
<i>Is the change significant? Late adopters (Wilcoxon matched pair test)</i>								
Z statistic	3.835	1.030	3.341	0.241	3.797	2.248	4.445	2.819
p-value	0.000	0.302	0.001	0.810	0.000	0.025	0.000	0.005
<i>Is the change significant? Early adopters (Wilcoxon matched pair test)</i>								
Z statistic	0.127		0.888	-0.576	2.551	0.680		0.211
p-value	0.899		0.374	0.565	0.011	0.496		0.833
<i>Are late adopters different from early adopters? (Mann Whitney test)</i>								
Z statistic	2.674	0.836	0.052	0.594	2.261	0.914	0.47	1.86
p-value	0.008	0.403	0.692	0.545	0.024	0.361	0.574	0.063

Table 4
Panel A: Late adopters
 An analysis of the change in the length of notes to the financial statements

	Relative change					Change (% firms)			Statistical tests	
	Mean	Standard Deviation	Minimum	Median	Maximum	Increase	Decrease	No change	Z statistic	p-value (2-tailed)
1. Total	0.161	0.137	-0.104	0.140	0.470	88%	12%	0%	4.178	0.000
2. Segments	0.005	0.018	-0.071	0.005	0.028	62%	15%	23%	2.712	0.007
3. Revenue and expense	0.006	0.017	-0.030	0.008	0.055	69%	27%	4%	1.867	0.062
4. Tax and deferred tax	0.015	0.012	-0.004	0.015	0.043	92%	8%	0%	4.280	0.000
5. Balance sheet (other)	0.027	0.031	-0.026	0.026	0.096	81%	19%	0%	3.543	0.000
6. Intangibles	0.012	0.012	-0.006	0.012	0.033	73%	8%	19%	3.853	0.000
7. Investments	-0.002	0.021	-0.066	0.000	0.040	38%	42%	19%	0.204	0.838
8. Borrowings	0.009	0.013	-0.003	0.003	0.047	58%	8%	35%	3.380	0.001
9. Equity and dividends	0.013	0.023	-0.019	0.009	0.085	69%	19%	12%	2.950	0.003
10. Cash flow reconciliation	0.000	0.004	-0.008	0.000	0.010	23%	31%	46%	0.604	0.546
11. Share based payments	0.010	0.015	0.000	0.000	0.044	35%	0%	65%	2.980	0.003
12. Earnings per share	0.007	0.006	-0.002	0.006	0.026	81%	8%	12%	4.120	0.000
13. Contingencies, commitments and leases	0.003	0.005	-0.007	0.003	0.015	69%	15%	15%	3.081	0.002
14. Related party	0.009	0.011	-0.012	0.006	0.042	73%	15%	12%	3.445	0.001
15. Events dafter balance date	0.000	0.007	-0.027	0.000	0.015	46%	35%	19%	0.549	0.583
16. Retirement plans	0.002	0.008	0.000	0.000	0.039	4%	0%	96%	1.000	0.317
17. IFRS reconciliation	0.046	0.041	-0.027	0.045	0.151	77%	12%	12%	3.928	0.000

Table 4
Panel B: Early adopters
An analysis of the change in the length of notes to the financial statements

	Relative change					Change (% of firms)			Statistical tests	
	Mean	Standard Deviation	Minimum	Median	Maximum	Increase	Decrease	No change	Z statistic	p-value (2-tailed)
1. Total	0.021	0.040	-0.044	0.014	0.110	75%	25%	0%	1.648	0.099
2. Segments	0.001	0.004	-0.008	0.000	0.008	42%	8%	50%	1.480	0.139
3. Revenue and expense	0.001	0.007	-0.010	0.000	0.016	25%	33%	42%	-0.123	0.902
4. Tax and deferred tax	-0.001	0.006	-0.012	0.000	0.008	33%	50%	17%	-0.669	0.503
5. Balance sheet (other)	0.002	0.014	-0.019	0.001	0.025	58%	42%	0%	0.549	0.583
6. Intangibles	0.002	0.004	-0.003	0.000	0.009	42%	17%	42%	1.435	0.151
7. Investments	0.008	0.020	-0.011	0.003	0.065	58%	33%	8%	1.295	0.195
8. Borrowings	0.003	0.006	-0.005	0.002	0.018	58%	8%	33%	2.088	0.037
9. Equity and dividends	0.004	0.016	-0.038	0.006	0.020	58%	17%	25%	1.586	0.113
10. Cash flow reconciliation	0.001	0.002	-0.002	0.000	0.006	17%	8%	75%	0.680	0.496
11. Share based payments	0.004	0.009	-0.001	0.000	0.030	33%	8%	58%	1.506	0.132
12. Earnings per share	0.001	0.003	-0.005	0.000	0.008	33%	17%	50%	0.804	0.422
13. Contingencies, commitments and leases	0.001	0.004	-0.007	0.001	0.008	50%	25%	25%	1.230	0.219
14. Related party	-0.001	0.009	-0.029	0.001	0.010	50%	25%	25%	0.952	0.341
15. Events after balance date	-0.001	0.002	-0.006	0.000	0.001	17%	50%	33%	-1.767	0.077
16. Retirement plans	0.000	0.000	0.000	0.000	0.000	0%	0%	100%		
17. IFRS reconciliation	-0.004	0.013	-0.046	0.000	0.000	0%	8%	92%		

For early adopters (Panel B, row 1) there is a median increase in report length of 1.4% (mean 2.1%). Overall this increase is weakly significant at the 0.10 level. Only borrowings (row 8) registered a significant increase (at the 0.05 level). This is likely to be due to the requirements of the NZ IFRS 7 *Financial Instrument Disclosures* which became operative on or after 1 January 2007, or which could be adopted earlier if the full NZ IFRS was adopted early.⁸

Discussion

Concerns over the psychological limitations of information processing and data expansion on accounting communication and understanding are not new (e.g. Fertakis 1969; Revsine 1970). Furthermore, some accounting jurisdictions acknowledge the impact of processing costs on disclosure by having a differential reporting regime. For example, *Framework for Differential Reporting* (ICANZ 2001, 3.3 (a)) acknowledges that financial reporting standards create costs (usually for the reporting entity) and benefits (usually for the users of financial reports).⁹

However, the *Conceptual Frameworks* of the IASB and Financial Accounting Standards Board have not developed a conceptual basis for disclosure or analysed the costs of disclosure. Hence, the first objective of this paper is to begin to develop an information processing capacity framework (Figure 1). This model distinguishes between information characteristics and the information environment decision.

Standard-setters are mainly focussed on information characteristics (i.e. readability and load). On the basis that there already exists evidence on the readability of financial statements, the second objective of this paper was to examine the area of information load. This is important because studies that consider the impact of adopting IFRS (e.g. Dunstan 2002), while acknowledging the cost to preparers of financial reports, do not explicitly consider the possible impact of information load. In reviewing whether the benefits to financial analysis under the NZ IFRS have been achieved (i.e. whether the cost of capital is lower), it seems reasonable to consider the negative effects of any potential information overload. Thus the second part of this study examines the annual report length surrounding the introduction of IFRS in New Zealand.

The results show that the increase in annual report size was due to the financials section of the report. The financials section increased for 92% (Table 2, Panel A) of our sample firms and decreased for 8%. (Table 2, Panel A) The median increase in financials section was 24% (Table 2, Panel B), which came mostly from increases in the notes to the accounts and accounting policies. IFRS reconciliations and accounting policies on transition accounted for nearly 5% (Table 4, Panels A and B) of this increase. These items are not required on a continuing basis. If these transitory items are eliminated, the results indicate nearly a 20% continuing increase in the annual report arising mostly from accounting policy and note disclosures under

⁸ Events after balance date significantly decreased for early adopters. Arguably this item could be removed from the analysis as it relates to (possibly random) events that might confound the analysis. Our preference is to report these in our analysis rather than eliminate them from the reader's view. However the impact is unlikely to alter the interpretation.

⁹ The IASB issued *IFRS for Small and Medium-sized Entities* in July 2009. In June 2010, the Australian Accounting Standards Board established a reduced disclosure framework consisting of two tiers of reporting requirements for preparing general purpose financial statements.

IFRS. The annual reports of firms continuing under the NZ IFRS (i.e. the early adopters) have a median relative increase of 9%, mostly related to accounting policies.

When the decision to adopt IFRS was made in 2002, the Financial Reporting Standards Board (FRSB) and the Accounting Standards Review Board (ASRB) discontinued its previous harmonisation policy with Australian and international accounting standards. Had this policy continued, then it is likely that IAS 39, *Financial Instruments: Recognition and Measurement* and IFRS 2 *Share-based Payments* would have been adopted. Hence, it could be argued that these two standards are not strictly part of the adoption to IFRS or at least should be considered separately. These two accounting standards accounted for a median 4.8% increase in annual report for late adopters. Thus, even if IAS 39, IFRS 2 and the transition and reconciliation adjustments are discounted, the NZ IFRS reports have increased by 15% for adopting firms and 3% for firms continuing under the NZ IFRS.

In conclusion, the NZ IFRS has significantly increased information loads for the preparation, communication and understanding of financial statements. However, it should be noted that 19% of the sample reduced their annual report size, although only 8% decreased the financial statement section. This suggests that annual report narrative (e.g. management commentary) and financial disclosures are substitutes. This raises the question of whether increased requirements to report accounting numbers will drive out narrative interpretation.

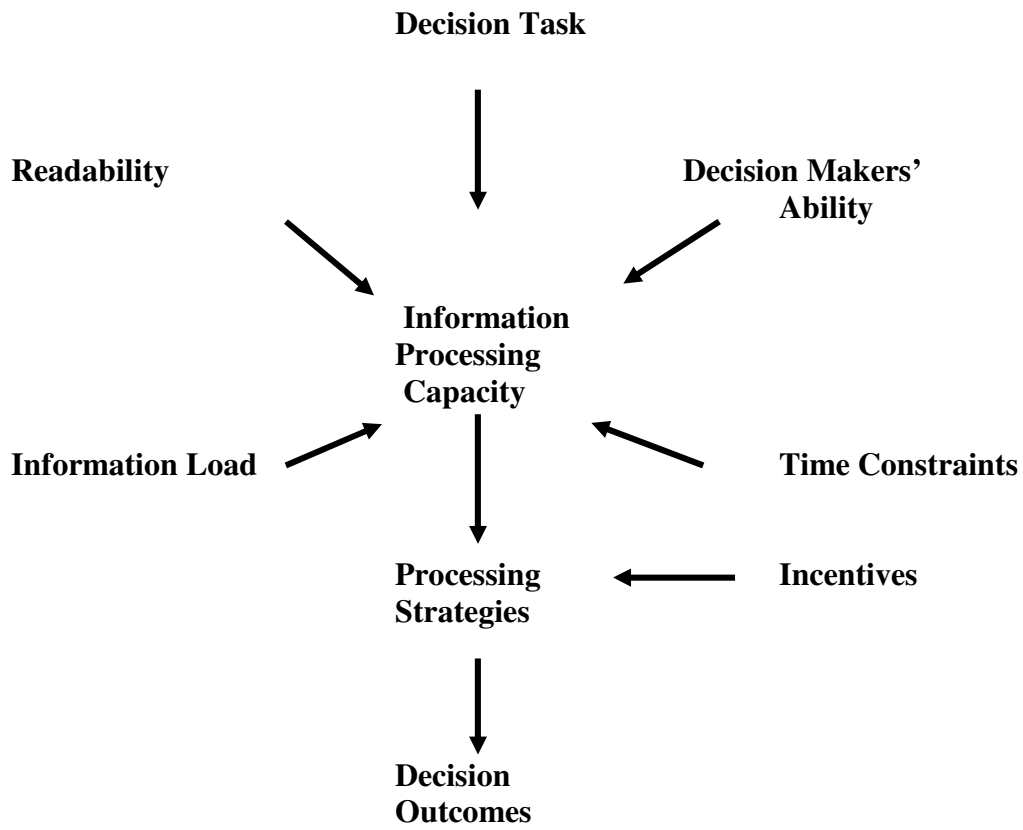
The understandability of accounting information is a joint product of the decision maker's ability, the readability and amount (load) of information. The readability of accounting information is known to be poor (see Curtis 1986; Schroeder & Gibson 1990; Jones & Shoemaker 1994). This paper has provided evidence that the information load has significantly increased under IFRS. Future research needs to establish whether the increased information in IFRS annual reports (and financial instruments in particular) has increased the cost of analysis or resulted in better decisions. Figure 1 indicates that this will require specifying the decision context in which the information is used and holding the environmental factors constant.

Figure 1

Conceptual view of factors associated with information processing capacity

Information Factors

Environment Factors



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