Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 1

2012

Editorial Volume 6 Issue 3

Ciorstan Smark
University of Wollongong, csmark@uow.edu.au

Recommended Citation
Smark, Ciorstan, Editorial Volume 6 Issue 3, *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 1-2.

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Abstract

This issue of AABFJ has several finance articles related to the Australian securities market. Segara, Das and Turner (2012) report results from the use of active extension strategies in the Australian equities market. Lee (2012) examines whether individual hedge funds and funds-of-hedge funds (FOHFs) exhibit risk-return trade-off patterns. Finally, Aldamen, Duncan and Khan (2012) explore the impact of corporate governance on the demand for debt in the Australian market. Pickering (2012) explores the issue of whether public (ASX listed) or partnership ownership of accounting firms is the more efficient form.

Keywords

Editorial

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Ciorstan Smark[1]*

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From other discipline areas, Ahmed and Alam (2012) analyse the changes in Australian local government entities resulting from International Financial Reporting Standards (IFRS) being adopted. Volkov and Laing (2012) test the decision usefulness of graphical representation of information as an alternative to other representations of information in financial statements. Finally, Rashid, De Zoysa, Lodh and Rudkin (2012) provide a response to Chowdhury (2010).

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[a] University of Wollongong, Australia. * csmark@uow.edu.au

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Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 2

2012

Performance of Active Extension Strategies: Evidence from the Australian Equities Market

Reuben Segara
University of Sydney, reuben.segara@sydney.edu.au

Abhishek Das
Capital IQ; University of Sydney

James Turner
The Royal Bank of Scotland; The University of Sydney

Recommended Citation
Segara, Reuben; Das, Abhishek; and Turner, James, Performance of Active Extension Strategies: Evidence from the Australian Equities Market, *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 3-24.

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Abstract

This study examines the performance of several active extension strategies, commonly known as 130/30, in the Australian equities market. A detailed analysis of the factors affecting performance is explored using Monte Carlo simulations based on eight years of historical returns for the constituents of the S&P/ASX 200 index under a variety of realistic cost assumptions. We find evidence of a statistically significant increase in performance of active extension strategies over equivalent long-only portfolios, holding all other factors constant. The observed increase is highest for managers with greater levels of skill, where any tracking error limit is high and total costs are low. This is one of the first studies in the Australian market and is expected to have a high degree of relevance to institutional investors considering active extension strategies.

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Cover Page Footnote

Acknowledgement: We acknowledge the helpful comments and support from The Royal Bank of Scotland, Australian fund managers and a research scholarship from the University of Sydney. This paper has benefited from comments at a University of Sydney research seminar and anonymous referees. We are responsible for any remaining errors.

Performance of Active Extension Strategies: Evidence from the Australian Equities Market

Reuben Segara[1], Abhishek Das[2] & James Turner[3]

Abstract

This study examines the performance of several active extension strategies, commonly known as 130/30, in the Australian equities market. A detailed analysis of the factors affecting performance is explored using Monte Carlo simulations based on eight years of historical returns for the constituents of the S&P/ASX 200 index under a variety of realistic cost assumptions. We find evidence of a statistically significant increase in performance of active extension strategies over equivalent long-only portfolios, holding all other factors constant. The observed increase is highest for managers with greater levels of skill, where any tracking error limit is high and total costs are low. This is one of the first studies in the Australian market and is expected to have a high degree of relevance to institutional investors considering active extension strategies.

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JEL Classification: G11, G17

[1] Email: reuben.segara@sydney.edu.au
[2] Capital IQ
[3] The Royal Bank of Scotland; The University of Sydney
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Introduction

The long-only constraint remains the most common and binding of all portfolio constraints imposed on fund managers. Restricting short sales prevents managers from fully implementing their complete information set when constructing their portfolios. Recently, a portfolio structure known as '130/30' or 'active extension' has come into favour among investment funds, by relaxing the short-selling constraints associated with long-only portfolios. This provides fund managers with exposure to market returns unavailable to market neutral long-short portfolios. In theory, relaxing the short-selling constraint allows investors to construct more efficient portfolios that generate higher performance on a risk-adjusted basis. However, increasing short-selling also increases costs relating to turnover, borrowing stock and financing which act as a drag on portfolio performance. Previous research focused on the US equities market has proposed that the increased performance of active extension portfolios outweigh the costs, leading to higher risk-adjusted performance. This study aims to verify that this proposition holds true for the Australian equities market under several realistic cost assumptions. Furthermore, our research quantifies the sensitivity of performance to a number of endogenous and exogenous factors such as the level of manager skill, risk target, costs and benchmark characteristics.

Active extension funds have considerable appeal in the Australian context due to higher level concentration in the S&P/ASX 200 benchmark, lower regulatory restrictions on the amount of leverage that can be employed by retail funds and a highly liquid market for borrowing stock. Many active extension strategies have only been created in the past five to ten years in the US and Europe and experienced rapid growth rates.[4] Although active extension portfolios are not yet as common in the Australian market as they are in the US or Europe, some Australian superannuation funds have followed the lead of pension funds in these markets in providing active extension strategies to investors. Considering the growing uptake in active extension strategies by superannuation funds and other institutional investors, an analysis of the performance of active extension strategies is also of prime importance to these participants. Given the lack of previous research directed towards the Australian market, there is considerable scope for academic research into quantifying the benefits of active extension strategies within the Australian equities market.

The remainder of this study is organised as follows. The second section provides an overview of active extension strategies. The third section reviews the literature that examines the performance of active extension strategies. This is followed by a description of hypotheses to be tested. The fifth section describes the data and method. The sixth section provides and discusses the results and the seventh section concludes.

An Overview of Active Extension Strategies

Active extension portfolios provide an effective blend of long-only funds and market-neutral hedge funds (see Appendix 1), allowing managers to pursue short-selling opportunities to potentially increase portfolio alpha (i.e., benchmark outperformance) while simultaneously retaining an exposure to overall market returns. In recent years, a portfolio structure known as '130/30' or 'active extension' has become increasingly common. In this type of portfolio, securities to 30% of the value of the fund are short-sold, with the sale proceeds reinvested into

[4] For example, the funds under management for active extension strategies grew by 77% over a twelve month period to September 2007 (Pensions & Investments 2007)

the long side of the portfolio. On a net basis the portfolio has a 100% exposure to the market and often has a target beta of one. This portfolio structure presents a hybrid of the market exposure that traditional long-only portfolios have with the ability of a long-short fund to take short positions. Although the name '130/30' is commonly used to describe this portfolio structure, it is often used as a generic term for active extension portfolios with different amounts of leverage. As the '130/30' label suggests, a short-selling level of 30% is most commonly used for these strategies, although this may not represent the optimal level of short-selling. In practice, the optimal level varies depending on factors such as level of managerial skill, risk targets, total costs and benchmark characteristics.

The prime benefit of relaxing the short-sale constraint is the ability to take full advantage of negative information about a security. With a short-selling constraint imposed, long-only managers are restricted from efficiently implementing their "sell ideas" into the portfolio. In this scenario, a fund manager's minimum position in a security is a zero holding. Relative to the index position, the maximum underweight that can be undertaken by active managers is the negative of the index weight. Relaxing the long-only constraint improves the ability of a manager to implement their negative views on a stock by increasing their potential to take larger underweight positions to benefit from stocks they expect to underperform. The proceeds earned from this underweighting are subsequently directed into a portfolio's buy positions. In the case of a 130/30 portfolio for example, a 30% overweight in long positions of stocks expected to outperform the market allows fund managers to increase exposure in undervalued stocks.

The benefit from relaxing the short-sale constraint is highly related to the level of benchmark concentration. Benchmark concentration refers to the large proportion of an index made up of a small number of stocks with large market capitalisations.[5] For example, the largest 12 stocks in the S&P/ASX 200 index represent 50% of the benchmark by capitalisation, with the remaining 189 stocks comprising the remaining 50%. Only the largest 21 stocks in the index have an index weight above 1%, with the bottom 179 having benchmark weights below 1%.[6] In a long-only context, it is difficult to achieve a meaningful underweight position in these stocks with a restriction on short-selling in place, thereby reducing the manager's ability to construct efficient portfolios. This view is consistent with Foley (2006).

Some argue that active extension portfolios are inherently more risky than long-only portfolios as a result of their higher gross exposure (Patterson 2006). Although increasing gross market exposure of managed funds by incorporating extra short-side and long-side positions to a portfolio intuitively appears to increase risk, this is not necessarily the case. An active extension portfolio can be constructed with the same level of risk as a long-only portfolio using the same set of forecast returns. In Section 6, we show that on average this leads to higher risk-adjusted returns from active extension portfolios before adjusting for costs. Since increasing the level of short positions involves an additional yet equal increase to the long positions, the systematic risk from shorting is offset. The increase in residual risk may be mitigated in portfolio construction

[5] Benchmark concentration in the Australian market is more pronounced than in other developed markets due in part to the large weighting of BHP Billiton, Rio Tinto, Woolworths and the four major banks. Applying the metric of benchmark concentration (i.e. the Gini coefficient used by Grinold & Kahn 2000) to the S&P/ASX 200 gives a value of 0.85, compared to 0.80 for the S&P 500, 0.81 for the FTSE 100 and 0.81 for the Eurostoxx 300. These results suggest that the Australian market has a higher degree of benchmark concentration relative to other major indexes of developed markets.

[6] The information provided was sourced from Bloomberg as of 2 May 2008.

by proportionally reducing the size of other active positions[7]. The ability to incorporate short-side information into active extension portfolios allows for an increase in performance with the same level of risk (as measured by tracking error).[8]

Literature Review

There are a number of studies, which measure the efficiency of portfolio implementation. The seminal piece of work in this area began with Grinold (1989), who introduced the 'fundamental law of active management' equation as:

$$IR = IC.\sqrt{N} \quad (1)$$

where IR is the observed information ratio, a measure of risk-adjusted outperformance[9], IC is the information coefficient given by the correlation of forecast security returns with realised security returns, and N is the number of securities in the investment universe. Although Grinold (1989) acknowledges that the fundamental law is approximate in nature, the important intuition is that returns are a function of information level, breadth of investment universe and portfolio risk.

Clarke, de Silva and Thorley (2002) extend the seminal ideas of Grinold (1989) by introducing the idea of a transfer coefficient (TC) to measure the efficiency of portfolio implementation. The transfer coefficient measures how efficiently forecast returns are implemented in portfolio construction. A simplifying assumption of the Grinold (1989) framework is that managers have no restrictions on how they can construct a portfolio from the information set they possess. Within an adjusted Grinold (1989) framework, IR is equal to:

$$IR = TC.IC.\sqrt{N} \quad (2)$$

From Eq. 2, the transfer coefficient acts as a scaling factor on the level of information. This is an important result, as it infers that portfolio outperformance is driven not only by the ability to forecast security returns but also by the ability to frame those security returns in the form of an efficient portfolio. The implication is that managers who are skilled at forecasting security returns need to be able to construct an efficient portfolio to maximise the benefit from their information set. Assuming the construction of an efficient portfolio in the absence of any constraints the transfer coefficient will be equal to one. Constraints on portfolios lower the transfer coefficient as they place limits on how efficiently managers can construct portfolios that reflect their forecasts.

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7 Active positions (weights) are defined as the portfolio weight in a security less the benchmark weight, and provide a measure of portfolio weighting relative to a benchmark. With the long-only constraint in place, the smallest position it is possible to have in an individual stock is to not hold it, and hence the lowest active weight possible to have in a single stock is the negative of its benchmark index weight.

8 Tracking error refers to the standard deviation of portfolio returns against the benchmark return. In this context, risk refers to the deviation of the portfolio returns from the benchmark returns. The use of tracking error as a measure of portfolio risk is common through industry and in the active management literature (Grinold &Kahn 2000).

9 The main performance measure used to measure portfolio performance is risk-adjusted performance, measured by the information ratio of the portfolio. Information ratios are defined as excess return over the benchmark, divided by tracking error.

Clarke et al. (2002) also extend their analysis with a Monte Carlo simulation of example portfolios constructed from the constituents of the S&P 500, subject to a set of constraints. The effect of size-neutrality, sector neutrality, value-growth neutrality, maximum total number of positions and long-only constraints are analysed. Clarke et al. (2002) find that the long-only constraint is the most significant restriction placed on portfolio managers, but by nature of its ubiquity remains ignored as a constant that affects portfolio construction. In a later study, Clarke, de Silva and Sapra (2004) find that short sale constraints in a long-only portfolio cause the most significant reduction in portfolio efficiency.

In comparing the additional costs and benefits associated with an active extension structure compared to a long only portfolio, Sorensen, Hua and Qian (2007) conclude that the long-only constraint impedes the ability of fund managers to outperform their target benchmarks. The authors specifically examine the optimal level of short selling and show it to be a function of manager skill, the desired risk target, turnover, leverage and trading costs. Most importantly, they find that there is no universal optimal level of short selling in an active extension portfolio. Rather, the required level of short selling varies according to different factors and market conditions.

Clarke et al. (2008) develop a mathematical model that computes the expected level of short positions for the portfolio. The authors empirically show that an increase in benchmark concentration and pair-wise correlation between stocks increases the expected level of short selling, while an increase in market volatility decreases the desirable level of shorting.

Hypothesis Development

In this section, the development of hypotheses relating the performance of active extension portfolios to unique factors ranging from characteristics of the specific fund manager to overall market conditions are presented.

Skill Levels

Theoretically, managers with higher skill levels are able to benefit more from relaxing the long-only constraint (Sorensen et al. 2007). Increasing the short selling level has a net benefit only if the increase in outperformance is greater than the increase in cost burden. Managers with greater skill are able to undertake greater short selling levels until the additional transaction and financing costs outweigh the marginal benefits. Foley (2006) notes that in the case where a manager has no stock picking skill (IC $\approx$ 0) the optimum level of short selling will be zero, since increasing short selling levels will only result in higher costs. In the case where a manager has some predictive skill (IC > 0), the manager will be able to transform larger active weights into greater outperformance, leading to a higher level of performance from active extension strategies as they utilise the manager's informational advantage.

H1: Managers with higher skill levels have a greater increase in performance from relaxing the long-only constraint.

Skew in Predictive Ability

One of the barriers to successful implementation of active extension strategies identified by Gastineau (2008) is the ability of the manager to be able to pick stocks that can potentially underperform in addition to picking stocks that can outperform. Managers who have previous stock-selection experience in managing long-only portfolios are likely to have developed greater skills in identifying potential outperformers than potential underperformers. Intuitively, being able to pick potential underperformers is a key concern when managing a portfolio that involves short selling.

H2: Managers with a higher skew towards picking underperforming stocks can construct active extension portfolios with higher levels of performance

Risk Constraints

Portfolio managers usually have some form of risk constraint placed on them by investors or fund administrators in the form of a limit (target) to tracking error. The size of a tracking error is a function of portfolio active weights and the variance-covariance matrix. In general, the tracking error of a portfolio will be proportional to the gross size of active weights. As Jacobs and Levy (2006) identify, a portfolio with a low tracking error targets such as an enhanced index fund will likely have weights close to the index and is not restricted by the long-only constraint. Funds with higher tracking error targets will have higher active weight positions as managers are able to take larger overweight and underweight positions within the risk target. As the active weight sizes are increased, managers are more likely to run up against the short-sale constraint when implementing their underweight positions. In a long-only portfolio, managers concentrate their portfolios by holding large positions in their favourite stocks, but are restricted on the short side from being unable to negatively gear their least favourite stocks. Funds with higher tracking error targets are more likely to be constrained by a long-only requirement and will gain the greatest increase in transfer coefficient from relaxing the long-only constraint. As Clarke et al. (2004) note, there is a trade-off between the maximum transfer coefficient, target tracking error and level of shorting. If the portfolio has a higher tracking error target, a higher level of short selling is needed to maximise the transfer coefficient.

H3: Portfolios with higher tracking error targets experience greater performance increase from relaxing the long-only constraint.

Costs

Transaction, financing and stock borrowing costs increase proportionally to the gross exposure of the fund, which is driven by the level of short selling in the portfolio. A higher cost base acts as a drag on net of cost portfolio performance, decreasing the benefits from an active extension strategy. Higher costs should decrease the attractiveness of higher levels of gross exposure, leading to a lower optimum shorting level. Whether the decrease in the optimal level of shorting is material depends on the level of costs versus managerial skill.[10]

[10] It should be noted that costs are partly endogenous to the extent that trading is discretionary.

H4: An increase in costs relative to the skill the manager possesses will at some point lower the performance of active extension strategies.

Volatility

One of the consequences of a high risk target in long-only funds is that managers create portfolios with weightings concentrated in their best overweight selections. Montagu, Cahan and Morton (2007) argues that in more volatile markets, greater portfolio concentration may expose a portfolio to higher risk due to lower diversification. An active extension strategy by contrast, allows for a lower risk target for the same return by using short-side information in a portfolio with added diversification, achieving a higher risk-return outcome. In a higher volatility environment the benefits of increased diversification should increase the net benefit of increasing short-selling, leading to higher risk-adjusted returns for active extension portfolios.

H5: Higher market volatility will increase the performance of active extension strategies.

Cross-sectional Spread of Returns

Over the past decade, a decrease in the cross-sectional spread (dispersion) of individual stock returns on the S&P/ASX 200 has been found (Montagu et. al.,2007). This decrease is associated with a sharp increase in pairwise correlations between individual stock returns.[11] An argument put forward by Grinold and Kahn (2000) and Clarke et al. (2008) is that in environments of higher correlation between individual security returns, larger active positions are needed to achieve the same target level of outperformance. If managers are required to increase their active weight sizes in environments of low cross-sectional dispersion, they will be more highly constrained by the long-only requirement. Accordingly, they will benefit more from introducing short positions into their portfolios. A higher level of short selling will allow managers to more efficiently distribute their higher active weights over both long and short positions in the portfolio to target a higher excess return for the same level of risk.

H6: Active extension portfolios perform better in comparison to long-only portfolios in periods where individual stock returns are more highly correlated

Market Conditions

There is no evidence or theoretical basis to suggest that active extension portfolios will perform better or worse in rising or falling markets. By definition, active extension portfolios have a constant 100% net market exposure and will have a beta approximating one if well diversified, and thus on average will perform in line with the broader market. Bear market conditions, defined as periods where market returns are below their long-term average, may be associated with changes in related exogenous factors such as market volatility, cross-sectional spread of returns or higher transaction costs due to lower liquidity. Apart from the effects of these factors, when all other factors are held equal, declines or increases in the broader market should not be

[11] This study finds that the average pair-wise correlation of securities in the S&P/ASX200, calculated using rolling 12-month periods, has increased over the sample period analysed (i.e. May 2000 to July 2008)

expected to have an impact on the ability of active extension strategies to outperform (or underperform) the broader market.

H7: The level of outperformance or underperformance of active extension portfolios is equivalent across periods of positive or negative market returns.

Data and Method

Data on historical stock returns and index weightings is obtained from IRESS. The analysis encompasses all stocks in the S&P/ASX 200 index from May 2000 to July 2008, including stocks added or removed due to index rebalancing by Standard and Poor's (S&P). The sample covariance matrix was constructed from five years of monthly returns prior to May 2000. The S&P/ASX 200 index is chosen due to the liquidity of its constituents and the greater availability and lower cost of borrowing stock relative to less liquid securities outside the index. Total shareholder returns are used for the analysis to include the value of dividends, and accordingly portfolio performance is benchmarked against the S&P/ASX 200 Accumulation index.

Theoretical portfolios are constructed based on historical returns data from the top 200 stocks by market capitalisation listed on the Australian Securities Exchange (ASX). Monte Carlo simulations of multiple portfolios with different levels of short-selling provide a back test of how active extension portfolios performed over the previous eight year period. To test these hypotheses, the effect of changes in factors such as forecasting skill, skew in predictive ability and trading costs are varied, and the subsequent changes in portfolio performance over various levels of short selling are analysed. The following discussion explains the portfolio construction techniques for the Monte Carlo simulation.

The stock selection method is based on a quantitative forecasting procedure proposed by Grinold and Kahn (2000) that is related to the fundamental law of active management. To create each set of forecasted returns for the top 200 stocks, returns are drawn from a normal distribution with a set correlation to realised returns for that period. The correlation of forecasted returns to realised returns is equal to the information coefficient, which allows for the specific ex-ante predictive ability of the stock selection model to be set for each portfolio. In essence, this involves creating forecasts by adding noise to realised returns to mimic an active manager with some forecasting skill.

An approach suggested by Qian, Hua and Sorensen (2007a) is to incorporate the effects of transaction costs into the stock selection model. Portfolio turnover comes from two sources: the need to rebalance portfolios back to target weights due to security price movements, and changes in forecasts necessitating changes in portfolio weights. To implement this, generated forecasts have an autocorrelation of 0.25 with forecasts from the previous period as recommended by Qian et al. (2007a) to simulate stability in forecasts across different time periods. This reflects the intuitive notion that a manager's positive or negative view on a stock will have some consistency over time. Turnover is limited to realistic levels as using a new set of forecasts for each monthly period requires the portfolio to be completely rebalanced, incurring high trading costs.

Costs are factored into the portfolio optimisation algorithm to reflect their impact on portfolio performance.[12] Qian, Hua and Sorensen (2007b) recommend incorporating transaction

[12] The portfolio optimisation algorithm to determine portfolio weights has an objective function that maximises the information ratio after transaction costs and a number of other constraints (e.g., budget, short-selling,

and stock borrowing costs at the portfolio construction stage. The transaction component of the cost function is determined by applying a cost model incorporating commission and spread costs to the change in portfolio weightings.[13] The short position component of the cost function is determined by the proportion of the portfolio short sold, multiplied by the assumed cost of borrowing stock. Including the impact of costs into the portfolio construction model allows the portfolio to be optimised net all costs involved in shorting stocks or portfolio rebalancing. Repeating this process for each generated vector of forecasts is undertaken to provide a set of portfolios for analysis over different assumptions of manager skill, risk tolerance, trading costs and market conditions. The inclusion of a cost model in the portfolio construction is important to provide fair comparison of the performance of active extension funds against long-only portfolios, as they incur a larger implementation cost. The cost function included in the model incorporates transaction costs and costs of borrowing stock. Consistent with Montagu et. al. (2007) and anecdotal evidence from market participants, the base case annual stock borrowing cost is assumed to be 50bps, around 4.2bps on a monthly basis.

This study assumes monthly rebalancing of portfolios, with the transaction cost function applied based on the rebalancing required to meet the new target weights. We begin with an analysis of the performance of active extension portfolios; assuming the base case costs, information coefficient and tracking error target (see Table 1). The assumptions are then varied, with the sensitivity to active extension portfolio performance measured. Sensitivity to variations in skill levels, risk constraints and costs are measured by running a series of optimisations with modifications made to the base-case assumptions. Variation with respect to market conditions, cross-sectional dispersion and volatility are measured by performing a regression analysis on the sensitivity of performance of the active extension portfolios to these factors.

Table 1
A Summary of the Model's Base-case Assumptions

Name	Assumption	Based on
Information coefficient	0.1	Montagu et al. (2007): 0.09 Kroll et al.(2005): 0.05-0.15
Tracking error limit	4%	Montagu et al. (2007): 4% Liodakis (2007): 1-5% Kroll et al. (2005): 4% Martielli (2005): 5%
Commission costs	0.4%	Anecdotal*: 0.4%
Stock borrow costs	0.5%	Montagu et al. (2007): 0.5% White (2007): 0.65% Anecdotal*: 0.5%
Funding spread[11]	0.5%	White (2007): 0.5-0.7%

* Anecdotal evidence was based on discussions with Australian fund managers.

tracking error). The Qian et al. (2007b) algorithm is used, which is based on Kuhn-Tucker conditions for optimisation with inequality constraints.

[13] The cost function is provided by Grinold and Kahn (2000) and incorporates both the explicit cost of commissions and market impact costs. It is noted that this cost function is likely to overstate transaction costs. However, considering the aim of this study is to show that active extension portfolios outperform long-only funds; it is preferable to overstate rather than understate transaction costs.

Results

This section summarises the performance of the simulated active extension portfolios relative to long-only portfolios and benchmark returns. Performance statistics are presented as raw returns, excess returns, information ratios and Jensen's alpha, with tests for statistical significance performed on the active performance metrics. The sensitivity of performance to changes in the endogenous and exogenous factors outlined in the hypotheses is measured, including the effect of different skill levels, net execution costs, volatility, cross-sectional dispersion and market conditions.

Performance Overview

Using the base case assumptions 10,000 simulated sets of forecasts were created, from which portfolios were constructed at 11 different levels of short selling for a total of 110,000 portfolios, rebalanced monthly. Table 2 provides an overview of the performance of the simulated active extension strategies. Over the sample period of May 2000 to July 2008, the active extension portfolios outperformed the equivalent long-only and benchmark index returns by a statistically significant margin. The average compound annual growth rate (CAGR) for 130/30 portfolios was 15.2%, compared with 13.3% for long-only funds utilising the same forecasts. The CAGR for the benchmark S&P/ASX 200 Accumulation index by comparison was 10.1%. The performance of active extension portfolios increased with the level of short selling, with 150/50 funds having the highest CAGR of 16.1% compared to the returns for 110/10 of 14.2%. The portfolios with higher levels of short selling had higher information ratios and transfer coefficients, further evidence that relaxing the long-only constraint leads to the construction of more efficient portfolios.

Table 2
The Average Performance of Long-only and Active Extension Funds, Using Base-case Simulation Assumptions

This table presents the mean annualised performance for the simulated portfolios over different levels of short selling. Mean excess return (ER), tracking error (TE) and information ratio (IR) are presented for each set of portfolios. Alpha and beta figures for the median portfolio in terms of performance are also presented. The results are provided before (gross) and after (net) the involved transaction costs and stock borrow costs. Significance tests for information ratios and Jensen's alphas are run under the null hypothesis that risk-adjusted out performance is not greater than zero by a statistically significant level. The significance test for beta identifies whether beta is greater or lower than one by a statistically significant margin. Statistical significance at the 5% and 1% level is represented by * and ** respectively.

	100/0	105/5	110/10	115/15	120/20	125/25	130/30	135/35	140/40	145/45	150/50
Gross ER	3.63%	4.16%	4.52%	4.74%	4.97%	5.32%	5.61%	6.05%	6.29%	6.42%	6.45%
Gross TE	4.02%	4.04%	4.09%	4.08%	4.14%	4.29%	4.44%	4.60%	4.64%	4.69%	4.72%
Gross IR	**0.90**	**1.03**	**1.10**	**1.16**	**1.20**	**1.24**	**1.26**	**1.32**	**1.36**	**1.37**	**1.37**
Turnover	39%	42%	44%	45%	46%	49%	50%	52%	55%	56%	58%
Trading costs	0.28%	0.29%	0.31%	0.32%	0.33%	0.34%	0.35%	0.37%	0.38%	0.40%	0.41%
Borrow and funding costs	0.00%	0.05%	0.10%	0.15%	0.20%	0.25%	0.30%	0.35%	0.40%	0.45%	0.50%
Total costs	0.28%	0.34%	0.41%	0.47%	0.53%	0.59%	0.65%	0.72%	0.78%	0.85%	0.91%
Net ER	3.35%	3.83%	4.11%	4.27%	4.45%	4.73%	4.96%	5.33%	5.51%	5.57%	5.54%
Net IR	**0.83**	**0.95**	**1.00**	**1.05**	**1.07**	**1.10**	**1.12**	**1.16**	**1.19**	**1.19**	**1.17**
IR t-stat	2.21	2.51*	2.66*	2.77*	2.84*	2.92*	2.96*	3.07*	3.14*	3.14*	3.11*
TC	0.59	0.67	0.71	0.74	0.76	0.78	0.79	0.82	0.84	0.84	0.83
Alpha	**0.0024***	**0.0028****	**0.0077****	**0.0078****	**0.0078****	**0.0082****	**0.0083****	**0.0085****	**0.0088****	**0.0088****	**0.0090****
Beta	1.027	1.014	0.985	0.993	1.023	0.995	1.026	1.032	0.986	1.005	0.967

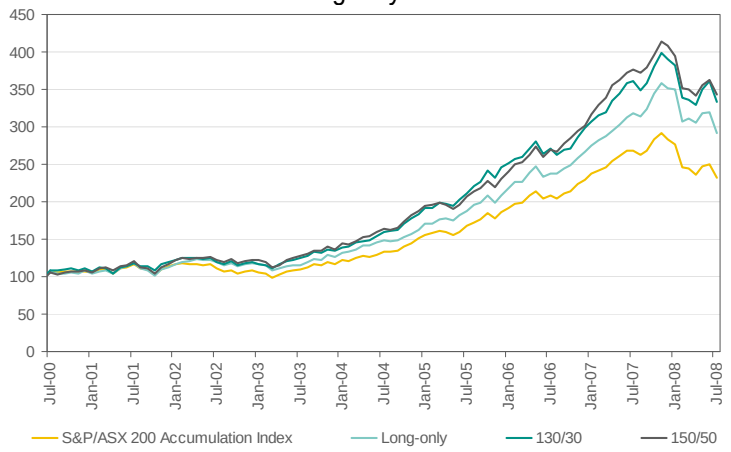
Table 2 shows an increase in the information ratio as the level of short selling is increased, with active extension portfolios utilising higher levels of short selling exhibiting higher risk-adjusted returns. We separately report information ratios net and excluding transaction, borrowing and funding costs. We note that net all costs active extension portfolios continue to outperform equivalent long-only portfolios despite costs reaching as high as an average 0.91% for 150/50 portfolios. Applying a t-test to the realised information ratios shows that the outperformance for the sampled active extension portfolios at 105/5 and above is significant at a 5% level. Using Eq. 2, the transfer coefficients are calculated from the information coefficient, breadth and realised information ratio. The average transfer coefficient for a long-only portfolio is 0.59, implying that 41% of the theoretical unconstrained information ratio is lost to implementation costs and the effects of constraints. Relaxing the long-only constraints leads to an increase in average transfer coefficient, with the 140/40 and 145/45 portfolios returning the highest average transfer coefficients of 0.84.

Although the ex-ante tracking error target was set to 4%, the ex-post tracking error often exceeds this target by an amount that increases at higher levels of short selling. Qian et al. (2007b) identify that a variation in IC over time, representing strategy risk, causes realised tracking error to increase above its target level. Although realised tracking error increases as the level of short selling is increased, on a risk-adjusted basis the information ratio is still higher for larger levels of short positions.

We also compare portfolio performance using Jensen's alpha as a measure of benchmark outperformance after adjusting for systematic risk exposure. The realised alpha and beta for the portfolio with median performance is shown in Table 2. The alphas for all active extension portfolios were greater than zero at a 1% level of significance, while none of the betas were significantly different to one at the 5% level. This indicates that, after adjusting for exposure to systematic risk, the active extension portfolios outperformed the benchmark index, with higher levels of short selling corresponding to higher levels of outperformance. Beta was found to be statistically no different to one, confirming H7 that active extension portfolios have equal performance irrespective of market direction

Figure 1 plots the average performance of the long-only, 130/30 and 150/50 strategies against the benchmark S&P/ASX 200 Accumulation index over the sample period. Each portfolio is rebased to 100 as of the start date. Both long-only and active extension portfolios outperform the benchmark index due to a relatively high assumed information coefficient of 0.1. The active extension portfolios benefit from a relaxation in the long-only constraint and are able to consistently outperform both the long-only portfolios and benchmark index over the sample period.

Figure 1:
Cumulative Performance of Long-only and Active Extension Portfolios



This figure shows that the cumulative performance of active extension portfolios outstrips long-only and benchmark index performance.

Variation in Skill Levels

To model the effect of different skill levels, portfolios are simulated with information coefficients of 0.05, 0.1 and 0.15 to represent managers with low skill, good skill and exceptional levels of skill (as suggested by Grinbold & Kahn 2000).

Table 3
Active Extension Fund Performance Across Different Skill Levels

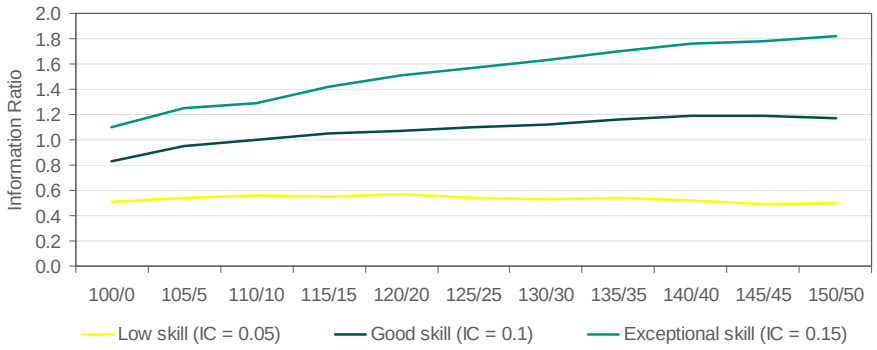
	100/0	105/5	110/10	115/15	120/20	125/25	130/30	135/35	140/40	145/45	150/50
Low skill (IC = 0.05)											
ER	2.03%	2.18%	2.25%	2.23%	2.31%	2.25%	2.24%	2.33%	2.26%	2.17%	2.26%
TE	3.99%	4.01%	4.03%	4.05%	4.09%	4.19%	4.22%	4.28%	4.31%	4.39%	4.51%
IR	**0.51**	**0.54**	**0.56**	**0.55**	**0.57**	**0.54**	**0.53**	**0.54**	**0.52**	**0.49**	**0.50**
TC	0.72	0.77	0.79	0.78	0.80	0.76	0.75	0.77	0.74	0.70	0.71
Alpha	**0.0014**	**0.0018**	**0.0030***	**0.0041****	**0.0050****	**0.0045****	**0.0048****	**0.0050****	**0.0042****	**0.0044****	**0.0047****
Good skill (IC = 0.10)											
ER	3.35%	3.83%	4.11%	4.27%	4.45%	4.73%	4.96%	5.33%	5.51%	5.57%	5.54%
TE	4.02%	4.04%	4.09%	4.08%	4.14%	4.29%	4.44%	4.60%	4.64%	4.69%	4.72%
IR	**0.83**	**0.95***	**1.00***	**1.05***	**1.07***	**1.10***	**1.12***	**1.16***	**1.19***	**1.19***	**1.17***
TC	0.59	0.67	0.71	0.74	0.76	0.78	0.79	0.82	0.84	0.84	0.83
Alpha	**0.0024***	**0.0028****	**0.0077****	**0.0078****	**0.0078****	**0.0082****	**0.0083****	**0.0085****	**0.0088****	**0.0088****	**0.0090****
Exceptional skill (IC = 0.15)											
ER	4.45%	5.11%	5.32%	5.93%	6.34%	6.77%	7.33%	8.01%	8.61%	8.93%	9.40%
TE	4.03%	4.08%	4.11%	4.17%	4.21%	4.31%	4.49%	4.72%	4.89%	5.01%	5.15%
IR	**1.10***	**1.25***	**1.29***	**1.42****	**1.51****	**1.57****	**1.63****	**1.70****	**1.76****	**1.78****	**1.82****
TC	0.52	0.59	0.61	0.67	0.71	0.74	0.77	0.80	0.83	0.84	0.86
Alpha	**0.0032****	**0.0088****	**0.0089****	**0.0090****	**0.0095****	**0.0103****	**0.0123****	**0.0128****	**0.0137****	**0.0141****	**0.0153****

This table presents the mean annualised performance for the simulated portfolios at different levels of short selling and different skill levels. Mean excess returns (ER), tracking errors (TE), information ratios (IR) and transfer coefficients (TC) are presented for each portfolio, along with computed alphas for the median-performing portfolio. The results are provided on an after costs basis. Significance tests for information ratios and Jensen's alphas are run under the null hypothesis that risk-adjusted out performance is not greater than zero by a statistically significant level. Statistical significance at the 5% and 1% levels are represented by * and ** respectively.

Table 3 summarises the performance of these portfolios segregated by skill level. Across all short selling levels, performance is highest for the portfolio with the largest information coefficient, reflecting superior information content in the generated forecasts.

Relaxing the long-only constraint leads to a greater increase in performance for the 'exceptional skill' portfolio compared to the 'low skill' portfolio. Figure 2 shows this difference graphically. The information coefficient of 'exceptional skill' portfolios increases by 65% moving from a 100/0 to 150/50 makeup, while the information coefficient of the 'low skill' portfolio decreases by 2% for the same shift in short selling. This result confirms H1.

Figure 2
Average Information Ratios Across Skill Levels



This figure shows that managers with exceptional skills exhibit higher average information ratios

Three sets of portfolios over the sample period are constructed to examine how the skew in managerial skill affects the information ratios of active extension strategies. The first portfolio represents managers with equal skill and uses the 10,000 simulated forecasts and associated portfolios that assumed a tracking error of 4% and an information coefficient of 0.1. The second (third) portfolio simulates a manager with a bias in skill towards identifying outperforming (underperforming) stocks for long (short) positions by giving the manager a skill of 0.15 (0.05) in selecting stocks that go on to outperform the index, and a skill of 0.05 (0.15) at selecting underperforming stocks. Table 4 shows the results for all three sets of portfolios. When the long-only constraint was imposed, the portfolio based on long-biased skill outperformed the equal skill and short-biased skill portfolios. However, at 130/30 and above, the equal skill portfolio outperformed the portfolios with bias in skill. The portfolios constructed with long-biased and short-biased skill underperformed the equal skill portfolio at levels of short selling above 130/30. Further, all portfolios with long-biased skill and equal skill are able to outperform the portfolios with short-biased skill at all levels of short selling. These results are not consistent with H2.

Table 4
Performance for Active Extension Funds with Bias in Stock-selection ability

	100/0	105/5	110/10	115/15	120/20	125/25	130/30	135/35	140/40	145/45	150/50
Equal skill											
ER	3.35%	3.83%	4.11%	4.27%	4.45%	4.73%	4.96%	5.33%	5.51%	5.57%	5.54%
TE	4.02%	4.04%	4.09%	4.08%	4.14%	4.29%	4.44%	4.60%	4.64%	4.69%	4.72%
IR	**0.83**	**0.95***	**1.00***	**1.05***	**1.07***	**1.10***	**1.12***	**1.16***	**1.19***	**1.19***	**1.17***
TC	0.59	0.67	0.71	0.74	0.76	0.78	0.79	0.82	0.84	0.84	0.83
Alpha	**0.0024***	**0.0028****	**0.0077****	**0.0078****	**0.0078****	**0.0082****	**0.0083****	**0.0085****	**0.0088****	**0.0088****	**0.0090****
Long-biased skill											
ER	3.94%	4.26%	4.60%	4.46%	4.39%	4.91%	4.86%	5.31%	5.41%	5.26%	5.42%
TE	4.04%	4.02%	4.12%	4.15%	4.14%	4.51%	4.41%	4.69%	4.72%	4.71%	4.79%
IR	**0.98***	**1.06***	**1.12***	**1.07***	**1.06***	**1.09***	**1.10***	**1.13***	**1.15***	**1.12***	**1.13***
TC	0.69	0.75	0.79	0.76	0.75	0.77	0.78	0.80	0.81	0.79	0.80
Alpha	**0.0035****	**0.0079****	**0.0088****	**0.0086****	**0.0081****	**0.0073****	**0.0075****	**0.0082****	**0.0079****	**0.0095****	**0.0083****
Short-biased skill											
ER	2.17%	2.94%	3.51%	3.95%	4.40%	4.52%	4.63%	5.06%	5.25%	5.04%	5.45%
TE	4.03%	4.08%	4.07%	4.17%	4.38%	4.44%	4.42%	4.65%	4.70%	4.69%	4.76%
IR	**0.54**	**0.72**	**0.86**	**0.95***	**1.00***	**1.02***	**1.05***	**1.09***	**1.12***	**1.07***	**1.15***
TC	0.38	0.51	0.61	0.67	0.71	0.72	0.74	0.77	0.79	0.76	0.81
Alpha	**0.0019***	**0.0021***	**0.003****	**0.0055****	**0.0070****	**0.0069****	**0.0085****	**0.0087****	**0.0089****	**0.009****	**0.0088****

This table presents the mean annualised performance for the simulated portfolios, where stock selection skill is skewed towards picking potential out performers or potential underperformers. Mean excess returns (ER), tracking errors (TE), information ratios (IR) and transfer coefficients (TC) are presented for each portfolio, along with computed alphas for the median-performing portfolio. The results are provided after costs. Significance tests for information ratios and Jensen's alphas are run under the null hypothesis that risk-adjusted out performance is not greater than zero by a statistically significant level. Statistical significance at the 5% and 1% level is represented by * and ** respectively.

Risk Constraints

Five sets of portfolios over the sample period are constructed to examine whether portfolios with higher risk constraints (as measured by tracking error) are likely to benefit more from introducing short selling than portfolios with lower tracking error. 10,000 sets of forecasts were simulated, with long-only portfolios and active extension portfolios constructed over 11 different levels of short selling at 5% intervals with five different levels of tracking error, creating a total sample of 550,00 portfolios that are rebalanced monthly. Table 5 shows the average information ratios and transfer coefficients for the sampled portfolios across different levels of tracking error. The largest excess returns were for the portfolios with higher tracking error and higher levels of short selling, as these portfolios allowed the largest active positions to be taken to reflect the forecast stock returns. The increase in average information ratio from long-only to 150/50 can be seen to be positively related to the level of tracking error in the portfolio. At a 2% level of tracking error, the average information ratio increases from 0.98 for the long-only portfolio to 1.20 for the 150/50 fund. At the 6% level of tracking error, the average information ratio increases from 0.3 to 1.12. This result confirms H3.

Table 5
Average Performance for Long-only and Active Extension funds with Different Tracking Error Targets

	100/0	105/5	110/10	115/15	120/20	125/25	130/30	135/35	140/40	145/45	150/50
2% target tracking error											
ER	1.96%	2.14%	2.24%	2.30%	2.46%	2.51%	2.65%	2.58%	2.65%	2.61%	2.63%
TE	2.01%	2.02%	2.06%	2.06%	2.10%	2.11%	2.13%	2.15%	2.18%	2.20%	2.19%
IR	0.98**	1.06**	1.09**	1.12**	1.17**	1.19**	1.24**	1.20**	1.22**	1.19**	1.20**
TC	0.69	0.75	0.77	0.79	0.83	0.84	0.88	0.85	0.86	0.84	0.85
3% target tracking error											
ER	2.64%	2.83%	3.22%	3.26%	3.35%	3.58%	3.76%	3.91%	3.95%	4.04%	4.20%
TE	3.02%	3.03%	3.08%	3.07%	3.12%	3.20%	3.29%	3.38%	3.41%	3.45%	3.46%
IR	0.88*	0.93**	1.05**	1.06**	1.07**	1.12**	1.15**	1.16**	1.16**	1.17**	1.22**
TC	0.62	0.66	0.74	0.75	0.76	0.79	0.81	0.82	0.82	0.83	0.86
4% target tracking error											
ER	3.35%	3.83%	4.11%	4.27%	4.45%	4.73%	4.96%	5.33%	5.51%	5.57%	5.54%
TE	4.02%	4.04%	4.09%	4.08%	4.14%	4.29%	4.44%	4.60%	4.64%	4.69%	4.72%
IR	0.83*	0.95**	1.00**	1.05**	1.07**	1.10**	1.12**	1.16**	1.19**	1.19**	1.17**
TC	0.59	0.67	0.71	0.74	0.76	0.78	0.79	0.82	0.84	0.84	0.83
5% target tracking error											
ER	2.41%	3.22%	4.13%	4.39%	4.66%	4.86%	5.21%	5.63%	5.83%	6.06%	6.30%
TE	5.02%	5.06%	5.13%	5.09%	5.15%	5.29%	5.42%	5.60%	5.65%	5.72%	5.71%
IR	0.48	0.64	0.81*	0.86*	0.91**	0.92**	0.96**	1.00**	1.03**	1.06**	1.10**
TC	0.34	0.45	0.57	0.61	0.64	0.65	0.68	0.71	0.73	0.75	0.78
6% target tracking error											
ER	1.79%	3.77%	4.45%	4.96%	5.40%	5.74%	6.28%	6.47%	7.03%	7.30%	7.85%
TE	6.03%	6.07%	6.17%	6.15%	6.26%	6.44%	6.63%	6.83%	6.90%	6.98%	7.03%
IR	0.30	0.62	0.72*	0.81*	0.86*	0.89*	0.95**	0.95**	1.02**	1.05**	1.12**
TC	0.21	0.44	0.51	0.57	0.61	0.63	0.67	0.67	0.72	0.74	0.79

This table shows the mean excess returns (ER), tracking errors (TE), information ratios (IR) and transfer coefficients (TC) for each level of tracking error for a given level of short selling. Risk-adjusted out performance, as measured by the information ratio, is higher for portfolios with lower levels of tracking error and higher levels of short selling. Significance tests are performed on the information ratios, with * and ** denoting significance levels of 10% and 5% respectively.

The highest information ratios and transfer coefficients were exhibited by portfolios with the lowest tracking error. There was also a comparatively smaller increase in performance by introducing short positions, and a negligible performance benefit in increasing the level of short selling past 30%. As the level of short selling is set as a maximum upper bound, for portfolios with short selling levels above 30%, the portfolio optimiser chose a smaller level of short selling than the maximum, to maximise returns within the relatively low tracking error. For example, there would be little utility in constraining all portfolios to an exact 50% shorting level if the tracking error target was 2%. As a result, there is reduced benefit to increasing short selling in these portfolios past the typical 30% level. Imposing a high level of short selling becomes needlessly restrictive.

Costs

Three sets of portfolios over the sample period are constructed to assess the impact of costs relative to managerial skill on the performance of active extension portfolios. Based on the cost assumptions in Table 6, portfolios are simulated at low, medium and high levels of costs. 10,000 simulated portfolios are created for each cost assumption case at each level of short selling, yielding a total 330,000 sample portfolios that are rebalanced monthly over the sample period. The ‘base case’ cost assumptions are identical to those used for testing all other hypotheses.

Table 6
Simulation Cost Assumptions

	Low	Medium (base case)	High
Commission costs	0.20%	0.40%	0.60%
Stock borrow costs	0.25%	0.50%	0.75%
Funding spread	0.25%	0.50%	0.75%

This table presents the mean annualised performance for the simulated portfolios over different levels of short selling. Mean excess return (ER), tracking error (TE) and information ratio (IR) are presented for each set of portfolios. Alpha and beta figures for the median portfolio in terms of performance are also presented. The results are provided before (gross) and after (net) the involved transaction costs and stock borrow costs. Significance tests for information ratios and Jensen's alphas are run under the null hypothesis that risk-adjusted out performance is not greater than zero by a statistically significant level. The significance test for beta identifies whether beta is greater or lower than one by a statistically significant margin. Statistical significance at the 5% and 1% level is represented by * and ** respectively.

Table 7 shows the average realised performance and costs for the sampled portfolios. As the portfolio construction process takes into account the effect of costs during the optimisation process, the portfolios have different weightings and therefore different levels of performance before costs.

Table 7
Sensitivity of Active Extension Performance to Changes in Trading, Borrow and Funding Costs

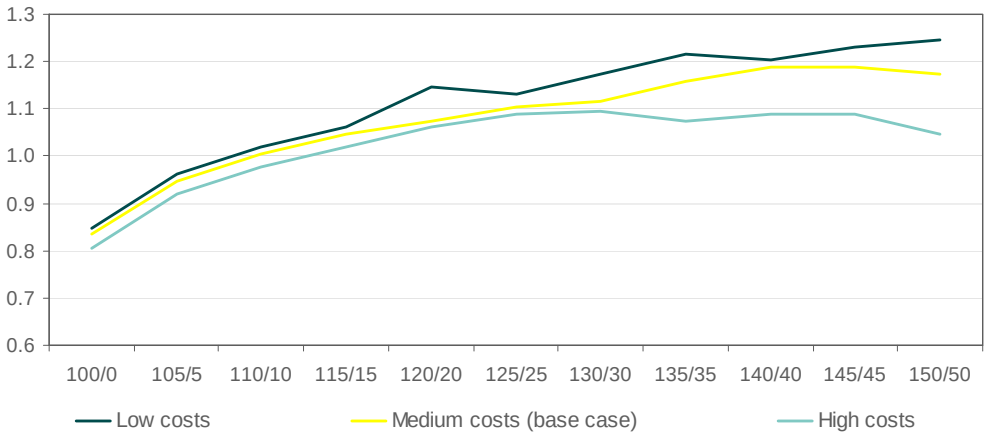
	100/0	105/5	110/10	115/15	120/20	125/25	130/30	135/35	140/40	145/45	150/50
Low costs											
Turnover	47%	51%	53%	54%	56%	59%	61%	63%	66%	68%	74%
Trading costs	0.27%	0.28%	0.30%	0.31%	0.32%	0.33%	0.34%	0.36%	0.36%	0.39%	0.42%
Borrow & funding costs	0.00%	0.03%	0.05%	0.08%	0.10%	0.13%	0.15%	0.18%	0.20%	0.23%	0.25%
Total costs	**0.27%**	**0.31%**	**0.35%**	**0.38%**	**0.42%**	**0.45%**	**0.49%**	**0.53%**	**0.56%**	**0.61%**	**0.67%**
ER	3.40%	3.89%	4.16%	4.34%	4.75%	4.84%	5.22%	5.61%	5.54%	5.82%	5.90%
TE	4.01%	4.05%	4.09%	4.09%	4.15%	4.28%	4.45%	4.61%	4.61%	4.73%	4.74%
IR	**0.85***	**0.96****	**1.02****	**1.06****	**1.15****	**1.13****	**1.17****	**1.22****	**1.20****	**1.23****	**1.24****
TC	0.60	0.68	0.72	0.75	0.81	0.8	0.83	0.86	0.85	0.87	0.88
Medium costs (base case)											
Turnover	39%	42%	44%	45%	46%	49%	50%	52%	55%	56%	58%
Trading costs	0.28%	0.29%	0.31%	0.32%	0.33%	0.34%	0.35%	0.37%	0.38%	0.40%	0.41%
Borrow & funding costs	0.00%	0.05%	0.10%	0.15%	0.20%	0.25%	0.30%	0.35%	0.40%	0.45%	0.50%
Total costs	**0.28%**	**0.34%**	**0.41%**	**0.47%**	**0.53%**	**0.59%**	**0.65%**	**0.72%**	**0.78%**	**0.85%**	**0.91%**
ER	3.35%	3.83%	4.11%	4.27%	4.45%	4.73%	4.96%	5.33%	5.51%	5.57%	5.54%
TE	4.02%	4.04%	4.09%	4.08%	4.14%	4.29%	4.44%	4.60%	4.64%	4.69%	4.72%
IR	**0.83***	**0.95****	**1.00****	**1.05****	**1.07****	**1.10****	**1.12****	**1.16****	**1.19****	**1.19****	**1.17****
TC	0.59	0.67	0.71	0.74	0.76	0.78	0.79	0.82	0.84	0.84	0.83
High costs											
Turnover	35%	37%	39%	40%	43%	42%	46%	49%	51%	53%	57%
Trading costs	0.28%	0.29%	0.31%	0.32%	0.33%	0.34%	0.35%	0.37%	0.38%	0.40%	0.41%
Borrow & funding costs	0.00%	0.08%	0.15%	0.23%	0.30%	0.38%	0.45%	0.53%	0.60%	0.68%	0.75%
Total costs	**0.28%**	**0.36%**	**0.46%**	**0.54%**	**0.63%**	**0.72%**	**0.80%**	**0.89%**	**0.98%**	**1.07%**	**1.16%**
ER	3.24%	3.71%	3.99%	4.16%	4.39%	4.66%	4.86%	4.96%	5.05%	5.12%	4.97%
TE	4.02%	4.04%	4.09%	4.09%	4.14%	4.28%	4.44%	4.62%	4.64%	4.70%	4.75%
IR	**0.81***	**0.92***	**0.98****	**1.02****	**1.06****	**1.09****	**1.10****	**1.07****	**1.09****	**1.09****	**1.05****
TC	0.57	0.65	0.69	0.72	0.75	0.77	0.775	0.76	0.77	0.77	0.74

This table presents the mean annualised performance for the simulated portfolios over different levels of short selling over the three cost cases outlined in Table 6. Mean excess returns (ER), tracking errors (TE), information ratios (IR) and transfer coefficients (TC) are presented for each set of portfolios. Performance results are provided after the involved transaction costs and stock borrow costs. Significance tests for information ratios are run under the null hypothesis that risk-adjusted outperformance is not greater than zero by a statistically significant level. Statistical significance at the 10% and 5% level is represented by * and ** respectively.

After including all costs, portfolios with higher costs had lower levels of performance. The portfolios with the highest costs exhibited the largest drop-off in information coefficient as the level of short selling was increased. The highest information coefficient for the 'high costs' portfolios was 130/30, above which the information coefficient dropped due to the higher trading and borrow costs. The 'low costs' portfolio suffers less of a drop-off in performance at higher levels of short selling as the cost drag from increased turnover and borrowing is lower.

Figure 3 shows the information ratios for each set of cost assumptions over different levels of short selling. The implication is that when faced with increased costs, a lower amount of short selling should be used. Additional short positions beyond a certain level will be inefficient due to the higher costs involved. All other factors being equal, higher costs necessitate targeting a lower level of short selling. These results confirm H4.

Figure 3
Average Information Ratios over Different Cost Assumptions



This figure shows that increasing total costs lead to lower average information ratios across a range of active extension portfolios.

Volatility, Cross-sectional Spread and Market Conditions

The effect of exogenous market factors on the performance of active extension portfolios are tested jointly by adding proxies for volatility and cross-sectional spread into a modified CAPM equation given below.

$$R_p - R_f = \alpha + \beta_1 (R_m - R_f) + \beta_2 \sigma_M + \beta_3 \rho_M + \varepsilon \quad (3)$$

where R_p is the portfolio total returns, R_m is the market returns given by the returns on the S&P/ASX 200 Accumulation index, R_f is the risk-free rate given by the 10-year Australian government bond yield, alpha (α) measures the outperformance on a risk-adjusted basis, beta (β) measure the systematic risk. Eq. 3 is an extension of Jensen's (1968) model to measure the effect on performance of active extension portfolios of market-wide volatility (σ_M) and cross-sectional spread (ρ_M), after adjusting for market excess returns (R_m-R_f). The measure of cross-sectional dispersion used is the mean pair-wise correlation of monthly returns. Volatility for the S&P/ASX

200 Accumulation index was measured on a historical 12-month basis. Monthly returns from 10,000 simulated 130/30 portfolios are used, for a total sample size of 990,000 observed monthly returns. Table 8 shows the results of the above regression.

Table 8
Regression Results

Variable	Coefficients	Standard Error	T Statistic	P-value
Intercept	0.000	0.000	-1.449	0.147
Market returns	1.015	0.002	432.230	0.000
Market volatility	-0.357	0.198	-1.802	0.071
Pairwise correl.	0.000	0.001	0.005	0.996

Regression Statistics	
R Square	0.950
Adj.R Square	0.950
Standard Error	0.008
F-statistic	62665
Observations	990,000

This table presents the regression results which show the explanatory power of market volatility and cross-sectional dispersion on portfolio performance. Monthly excess returns over the risk-free rate (10-year bond yield) are regressed against market excess returns, market volatility and pair-wise correlations.

The coefficient for market volatility is -0.357, suggesting that monthly outperformance decreases by -0.357% for every 1% increase in 12-month rolling market volatility. This contradicts H5, which put forward that higher market volatility would lead to higher risk-adjusted portfolio performance. The coefficient for pair-wise correlation was close to zero with no statistical significance, implying that pair-wise correlation has no effect on the performance of active extension portfolios. This finding neither confirms nor rejects H6. The observed coefficient for market returns is 1.015, which is statistically significant at the 1% level. This suggests that active extension portfolios outperform the index when index returns are positive and underperform the index when index returns are negative. However, the beta coefficient of 1.015 is only marginally greater than one, implying that the exposure to systematic risk is roughly in line with the benchmark index. This result is also confirmed by the regression results in Table 2, which found that the beta for the active extension portfolios was statistically no different to one.

Conclusions

This study uses simulation analysis to examine the performance of active extension strategies in the Australian equities markets from May 2000 to June 2008. We find that active extension portfolios are capable of outperforming equivalent long-only portfolios and the benchmark S&P/ASX 200 index. Our results build on the previous US based literature of Qian et al. (2007a) and Clarke et al. (2008) by extending the analysis to encompass a different market and examining the effects of additional factors on portfolio performance.

The study finds that the degree to which an active extension portfolio outperforms an equivalent long-only portfolio and the benchmark index is positively related to the level of manager skill and negatively related to the level of costs. Active extension strategies do not generate additional information, but provide managers with the ability to more efficiently use their existing information. Costs have a significant effect on portfolio performance as they tend to increase as the level of short selling in the portfolio is increased. Whether active extension portfolios are able to outperform long-only portfolios depends on whether the forecasting ability of the manager is sufficient to outperform the cost drag. Provided that the manager has reasonable forecasting ability, active extension portfolios outperform equivalent portfolios with the long-only constraint in place. If the manager has little to no skill in stock picking, the net effect of using an active extension strategy will be to decrease performance due to the increased cost drag.

The performance of active extension strategies is also closely related to the targeted level of risk. Funds with lower risk targets benefit little from introducing short-selling, while funds with higher risk targets generally present greater risk/return opportunities than funds concentrated in a small number of long positions. External market conditions such as volatility, pair-wise correlation between individual stocks and market direction are found to have a limited impact on active extension performance.

Overall, the results of this study have a high degree of relevance to institutional fund managers who seek guidance on the appropriate level of short-selling for a fund by quantifying the benefits of introducing short-selling to existing long-only Australian equity portfolios. The results are also highly pertinent to investors seeking to identify whether allocating assets to an active extension fund is appropriate and if so, the characteristics to consider when choosing a fund.

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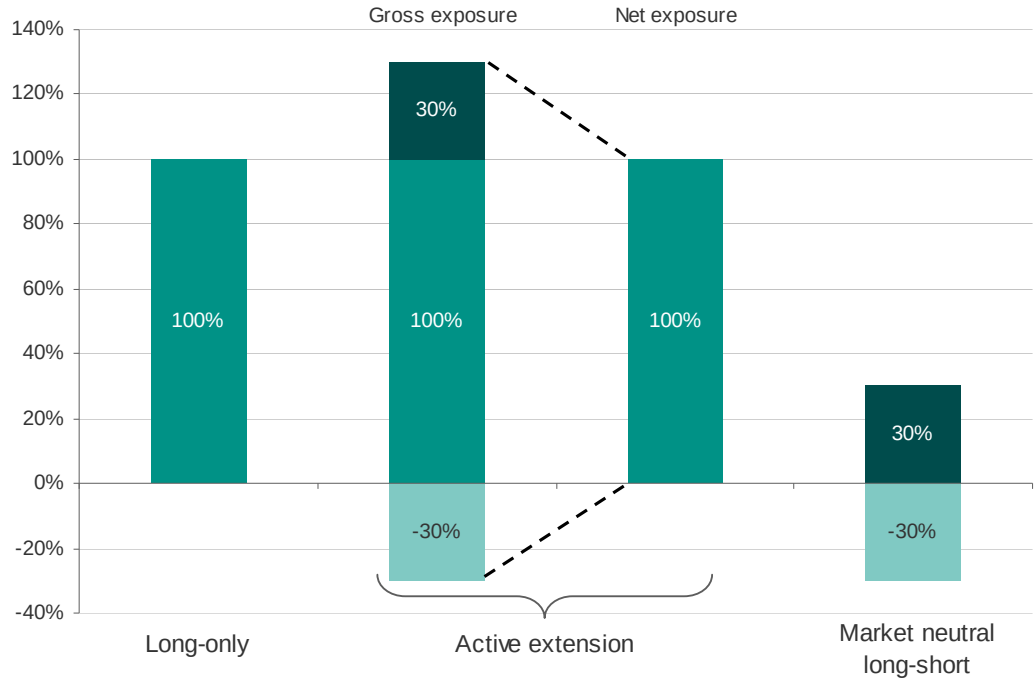
Appendix 1

A Comparison of Active Extension Strategies to Similar Equity Portfolios

The structure of an active extension portfolio relative to similar equity portfolios (i.e., long-only and market neutral long-short portfolios) is shown in Figure A.1. Unlike a long-short portfolio style traditionally adopted by hedge funds, the active extension portfolios are fully invested in the market at all times and do not seek to generate excess returns by market timing. Instead, the benefit of the strategy comes from removing the long-only constraint and introducing the ability to short-sell stocks.

Figure A.1: Comparison of active strategies



This figure compares the structures of long only, 130/30 active extension and market neutral long-short strategies.

Active extension strategies are typically benchmarked to an equity index to reflect their full exposure to the market, unlike traditional market neutral long-short strategies, which are often measured against a total return benchmark such as the cash rate. By relaxing the long-only constraint managers are able to fully utilise their views on stocks they expect to underperform as well as taking additional positions in stocks they expect to outperform.

Although active extension funds are sometimes viewed as a type of hedge fund strategy due to the short-selling employed, in practice they have greater similarities to traditional long-only equity portfolios with the addition of greater flexibility and efficiency. Most active extension funds have mandates to take positions in equities only and do not invest in the wide range of assets in which some hedge funds invest. Active extension strategies have return characteristics that are closer to long-only funds than market-neutral funds, as they have 100% net exposure to equities at all times and are typically benchmarked to a market index. However,

similarities exist between the fee structures seen in active extension funds and hedge funds. Active extension funds, like hedge funds, often charge a performance fee in addition to a base fee that is typically higher than that charged by long-only funds. Table A.1 highlights the key differences between active extension strategies and other similar equity portfolios.

Table A.1
Overview of Similar Equity Active Management Strategies

	Long-only	Active extension	Market Neutral Long-Short
Investment style	Relative return	Relative return	Absolute return
Benchmark	Market index	Market index	Cash rate/hurdle rate
Net exposure	100%	100%	0%
Gross exposure	100%	160%[a]	Variable
Target beta	1	1	0
Short selling	None	30%[a]	Variable
FUM[b]	US$63.7t	US$53.3b	US$2.48t
Typical management fee[b]	30-80bp	60-150bp	>150bp
Performance fee	Usually 0%	0-20%	Typically 20%
Introduced in:	Mid-1800s	Late 1990s	1949

[a] The percentage given assumes a typical 130/30 structure
[b] The Funds Under Management (FUM) and typical management fees are approximate estimates based on industry reports in late 2008.

Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 3

2012

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Husam Aldamen
Qatar University, Doha, Qatar

Keith Duncan
Bond University, kduncan@bond.edu.au

Safdar Khan
Bond University

Recommended Citation
Aldamen, Husam; Duncan, Keith; and Khan, Safdar, Governance-Default Risk Relationship and the Demand for Intermediated and Non-Intermediated Debt, *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 25-42.

Governance-Default Risk Relationship and the Demand for Intermediated and Non-Intermediated Debt

Abstract

This paper explores the impact of corporate governance on the demand for intermediated debt (asset finance, bank debt, non-bank private debt) and non-intermediated debt (public debt) in the Australian debt market. Relative to other countries the Australian debt market is characterised by higher proportions of intermediated or private debt with a lower inherent level of information asymmetry in that private lenders have greater access to financial information (Gray, Koh & Tong 2009). Our firm level, cross-sectional evidence suggests that higher corporate governance impacts demand for debt via the mitigation of default risk. However, this relationship is not uniform across all debt types. Intermediated debt such as bank and asset finance debt are more responsive to changes in governance-default risk relationship than non-bank and non-intermediated debt. The implication is that a firm's demand for different debt types will reflect its governance-default risk profile.

Keywords

Corporate governance, default risk, intermediated debt, non-intermediated debt, endogeneity, 2-stage least squares

Cover Page Footnote

This paper has benefited from comments by seminar participants at University of Southern Queensland, participants at the 22nd Asian-Pacific Conference and Jere Francis, Catherine Whelan, Jan Hollandale and Tony van Zijl who commented on earlier versions of this research. Any remaining errors and omissions remain the authors

Governance-Default Risk Relationship and the Demand for Intermediated and Non-Intermediated Debt

Husam Aldamen[1], Keith Duncan[2], Safdar Khan[2]

Abstract

This paper explores the impact of corporate governance on the demand for intermediated debt (asset finance, bank debt, non-bank private debt) and non-intermediated debt (public debt) in the Australian debt market. Relative to other countries the Australian debt market is characterised by higher proportions of intermediated or private debt with a lower inherent level of information asymmetry in that private lenders have greater access to financial information (Gray, Koh & Tong 2009). Our firm level, cross-sectional evidence suggests that higher corporate governance impacts demand for debt via the mitigation of default risk. However, this relationship is not uniform across all debt types. Intermediated debt such as bank and asset finance debt are more responsive to changes in governance-default risk relationship than non-bank and non-intermediated debt. The implication is that a firm's demand for different debt types will reflect its governance-default risk profile.

Key Words: Corporate governance, default risk, intermediated debt, non-intermediated debt, endogeneity, 2-stage least squares

JEL Codes: M40, M41

[1] Qatar University, Doha, Qatar
[2] Bond University
Email: kduncan@bond.edu.au

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Introduction

We examine the impact of the corporate governance-default risk relationship on the demand for intermediated and non-intermediated debt in Australia. There is a relatively new but growing literature that links corporate governance, accounting information and debt contracting (Armstrong, Guay & Weber 2010). However, most of this research is United States (US) centric and has largely focused on the drivers of non-intermediated (public) debt pricing (Anderson, Mansi & Reeb 2004; Ashbaugh-Skaife, Collins & LaFond 2006; Bhojraj & Sengupta 2003; Mansi, Maxwell & Miller 2004; Sengupta 1998). In contrast, the Australian corporate debt market is dominated by intermediated or private debt, with relatively low levels of non-intermediated debt (Reserve Bank of Australia 2005). More importantly, the Australian debt market arguably has lower inherent information asymmetry, relative to other countries, due to the continuous disclosure regulations which ensure private lenders have greater access to financial information (Gray et al. 2009). Despite this unique market characteristic, recent research finds good accruals quality reduces the cost of debt (Aldamen & Duncan 2011b; Gray et al. 2009) but governance and default risk only impact the cost of non-intermediated (not intermediated) debt (Aldamen & Duncan 2011a). However, as Armstrong et al.'s, (2010) review notes, to date the literature has generally ignored the relationship between other debt contracting parameters, such as the demand for different types of debt, and the firm's corporate governance and accounting information characteristics. We address this gap in the literature and build on the work of Aldamen and Duncan (2011a) to explore the impact of different corporate governance-default risk relationships on the demand for different types of debt.

Wang and Lin (2010) find that default risk reduces significantly as the number of corporate governance provisions adopted increases. Furthermore, Armstrong et al.'s, (2010) review suggests that different segments in the debt market (i.e. debt types and lenders in each category) have different corporate governance-default risk preferences and that this heterogeneity is a function of firms' economic characteristics. Firms will demand more of the debt type that matches their extant governance-default risk characteristics. In our analysis we focus on the relative levels of each debt type across firms, rather than capital structure questions that are dealt with extensively elsewhere, and distinguish between two broad debt types, intermediated and non-intermediated debt (Cantillo &and Wright 2000; Denis & Mihov 2003). The greater monitoring information available to Australian intermediated debt providers potentially reduces the default risk mitigating effect of good corporate governance and differentially impacts the demand for intermediated versus non-intermediated debt relative to debt providers in other countries.

One of the core differences between intermediated and non-intermediated debt is the role of the intermediary versus the market. Intermediated debt requires a third party intermediary to facilitate the debt contracting process between lenders and borrowers (Warner 1989) and the main types of intermediated debt in Australia are asset finance debt, bank debt and non-bank debt (Aldamen & Duncan 2011a). Asset finance debt includes finance leases and hire purchase finance. Bank debt is composed of bank loans, facilities and overdrafts, while non-bank debt includes loans from non-bank financial institutions, directors and related entities. Non-intermediated debt includes publicly traded debt instruments that are issued directly to lenders without intermediation, such as corporate bonds and other placements such as convertible and non-convertible commercial papers and notes.

For intermediated debt the intermediary performs much of the market's role (for non-intermediated debt) and assesses and monitors the borrower's risk and determines the optimum contracting terms (Diamond 1984). Given the supervisory role of the intermediary, intermediated debt is also referred to as highly monitored debt (Majumdar & Sen 2006, 2007;

Rauh & Sufi 2008). Monitoring by the intermediary provides an alternative form of control and thus mitigates the demand for formal corporate governance mechanisms such as those recommended by the Australian Securities Exchange (ASX) (Armstrong et al. 2010; Berger & Udell 2002; Bhattacharya & Chiesa 1995; Diamond 1984; Fama 1985; James 1987; Leland & Pyle 1977). It is, however, an empirical question whether or not lower demand for monitoring translates to lower governance in place for companies with high levels of intermediated debt. In contrast, non-intermediated debt is characterised by a lower monitoring intensity, reflective of the borrower's lower risk position (Cantillo & Wright 2000; Denis & Mihov 2003; Diamond,1991). Lower monitoring, however, could in turn result in increased information asymmetry between the debt contracting parties, adversely impacting demand for non-intermediated debt. We propose that higher levels of corporate governance mitigate this effect and positively impact demand for non-intermediated debt.

The research question we pose is whether in Australia's debt market, a unique monitoring environment dominated by intermediated debt, the nature of the governance-default risk relationship differentially impacts the demand for intermediated and non-intermediated debt. We address this question and extend the predominantly US empirical evidence on the drivers of demand for different debt types in a market dominated by intermediated debt. While there are many debt demand drivers, we draw on the work of Aldamen and Duncan (2011a) and explore the role of corporate governance and default risk as the two primary drivers. We contribute to the literature by modelling a two stage process whereby governance mitigates default risk and this modified risk drives demand for four intermediated and non-intermediated debt types. Our methodology explicitly recognises potential endogeneity issues and estimates a system of equations by identifying the correct channel of governance and risk in the demand for intermediated and non-intermediated debt.[3] Thus our evidence is more robust than much of the prior work. We also contribute to the literature by examining the governance-default risk relation in a market that is systematically different to the prior US centric literature.

We examine the relative proportion of each type of debt contracted by 595 non-financial Australian companies. The analysis finds that companies with higher levels of corporate governance have lower levels of default risk. We use the predicted default risk score from our stage one analysis in subsequent analysis and find that estimated default risk is negatively related to the demand for all debt types: asset finance, bank debt, non-bank debt and non-intermediated debt, albeit that the relationship between default risk and non-intermediated debt is insignificant. Our cross-sectional evidence suggests that higher corporate governance impacts demand for debt via the mitigation of default risk. Although this relationship is uniformly positive, the magnitude of the impact is not uniform across all debt types. Bank and asset finance debt are more responsive to changes in risk levels than non-bank and non-intermediated debt. As risk increases the level of bank debt and asset finance that companies can contract decreases at a faster rate than for non-bank and non-intermediated debt. Our evidence suggests that while all debt categories are responsive to the governance-default risk characteristics of the firm, a firm with higher default risk is more likely to obtain debt from non-banking institutions or non-intermediated providers. Traditional debt providers, banks and asset finance lenders, are more risk averse, as one would expect, than the less constrained non-bank debt providers. Hence they are more responsive to the governance-default risk relation.

The remainder of the paper proceeds as follows. The second section reviews prior literature and distils the key theoretical relationships between corporate governance, default

[3] Endogeneity issues plague much of the governance (see Brown et al. 2011 for a review) and more generally accounting (see Larcker & Rusticus 2010)for a review) and finance (see Bhagat & Bolton 2008).

risk and demand for the different debt types. The third section develops the analytical models tested in the study. The fourth section describes the research design which includes the sample, variables and the empirical methods. The fifth section presents the estimation of the models and results discussion. The final section offers a summary and conclusion to the paper.

Literature Review

It is well established in the literature that default risk is a significant driver of debt contracting outcomes (Anderson et al. 2004; Byun 2007; Denis & Mihov 2003; Klock, Mansi & Maxwell 2005). However, it is less clear how corporate governance will impact this relationship and the demand for different types of debt, although there is some evidence to suggest governance reduces default risk (Wang & Lin 2010) and hence increases the demand for less risk-sensitive debt.[4] To develop our core proposition we briefly review the prior studies that link default risk and access to debt and then examine how corporate governance influences the drivers of default risk thereby influencing demand for debt. Grenadier (1996) finds that higher levels of default risk impact negatively on secured debt types such as finance lease contracts. Smith (1987) suggests that firms with high default risk encounter difficulties in obtaining bank debt. Furthermore, companies that have low default risk, are larger, older and more successful, tend to demand non-intermediated debt such as corporate bonds and notes (Cantillo & Wright 2000; Denis & Mihov 2003; Diamond 1991). Collectively the evidence suggests that higher levels of default risk restrict demand for all four debt types.

A reduction in risk can be achieved by targeting the drivers of that risk. One of the significant determinants of default risk is the company's cash flow uncertainty (Aziz, Emanuel & Lawson 1988; Gentry, Newbold & Whitford 1985; Scott 1981; Trueman & Titman 1988). Prior research finds a negative relationship between cash flow uncertainty and default risk (Zeitun, Tian & Kean 2007). Minton and Schrand (1999) show that cash flow fluctuations defer capital expenditures and delay debt repayments thereby increasing default risk. The underlying theory is that agency conflicts between managers and stakeholders increase the variance in expected cash flows thereby increasing default risk (Ashbaugh-Skaife et al. 2006; Bhojraj & Sengupta 2003). Managers that are focused on advancing their self-interest are likely to engage in shirking, over-consumption of perquisites, empire building and unprofitable investments in negative net present value projects (Bhojraj & Sengupta 2003; Dechow & Sloan 1991; Fan 2004; Jensen & Meckling 1976; Sengupta 1998; Shleifer & Vishny, 1997). The adverse effects of such self-seeking managerial behaviour reduces the firm's expected cash flows and increases default risk (Ashbaugh-Skaife et al. 2006; Bhojraj & Sengupta 2003; Jensen & Meckling1976; Sengupta 1998).

It is recognised in the literature and embodied in regulatory provisions worldwide that implementing good corporate governance practices mitigates the agency costs of self-serving managers (Ashbaugh-Skaife et al. 2006; Bhojraj & Sengupta 2003). We define corporate governance as the methods employed by the owners via the board of directors to mitigate the debt agency conflict and to align the interests of managers and owners with those of the debtholders. Good corporate governance consists of many systems and process that elevate the monitoring and control functions in the firm thereby reducing default risk (Ashbaugh-Skaife et al. 2006; Byun 2007). Corporate governance practices also enhance the disclosure of quality financial information, thereby bridging the information gap between stakeholders (Armstrong et al. 2010; Ashbaugh-Skaife et al. 2006; Beekes & Brown 2006; Bhojraj & Sengupta 2003; Cohen, Krishnamoorthy & Wright 2004; Sengupta 1998). Higher levels of corporate governance mitigate agency conflicts and reduce information asymmetry between

[4] See Aldamen et al. (2010) for a discussion on the drivers of default risk.

managers and investors, thereby impacting variances in expected cash flows and lowering default risk (Ashbaugh-Skaife et al. 2006; Schultz, Tan & Walsh 2011; Wang & Lin 2010). As a result, higher levels of corporate governance are expected to increase demand for all types of debt.

A more sophisticated proposition is that corporate governance has a differential impact on demand for debt and depends on the degree to which governance mitigates default risk in relation to each type of debt: intermediated versus non-intermediated. In particular, given the differences in monitoring environment there is an argument that the expected impact of corporate governance on non-intermediated debt will be different to the more highly monitored intermediated debt. Uppal (2007) finds that extensive disclosure requirements and better governance are associated with larger bond markets (greater demand for non-intermediated debt). At the other end of the spectrum, demand for asset finance debt is not expected to increase in the presence of higher levels of corporate governance because asset finance providers' capital is secured with assets pledged by borrowers (Grenadier, 1996). As a result of this collateralised debt agreement, the monitoring and informational advantages associated with implementing corporate governance practices are less likely to be a factor in asset finance lending decisions. However, the evidence suggests otherwise with Robicheaux, Fu and Ligon (2008) finding that higher levels of corporate governance increases the demand for lease financing. This evidence discounts the differential corporate governance argument and instead suggests an alternative proposition that corporate governance has a positive influence on demand for all debt types via default risk mitigation. The purpose of this paper is to shed some light on this conflicting expectation within the Australian debt market.

Analytical Model

We theorise that higher levels of corporate governance increase demand for all debt types by reducing managerial opportunistic behaviour and information asymmetry thus reducing default risk (Ashbaugh-Skaife et al. 2006; Byun, 2007). That is, corporate governance systems and processes impact default risk (Wang and Lin, 2010) and this in turn impacts demand for different debt types as follows:

$$DRISK_i = f\left(GOVERNANCE_{ji}\right) \quad (1)$$

$$DEBT_{ji} = f(DRISK_i) \quad (2)$$

where, default risk, $DRISK_i$, corresponds to the default risk measure for firm *i* in the sample and $GOVERNANCE_{ji}$ represents the corporate governance signal *j* corresponding to the firm *i* in the sample. In equation (2) $DEBT_{ji}$ refers to the debt portfolio *j* corresponding to the respective firm *i* in the sample and includes both intermediated and non-intermediated types of debt. The alternative types of debt we examine are asset finance debt (*ASFIN*), bank debt (*BANK*), non-bank debt (*NBANK*) and non-intermediated debt (*NONINT*). Expanding equation (1) and (2) a simple simultaneous model of governance, risk and debt demand can be produced as follows:

$$DRISK_i = \alpha_0 + \alpha_1 GOVERNANCE_{ji} + \upsilon_i \quad (3)$$

$$DEBT_{ji} = \beta_0 + \beta_1 DRISK_i + \beta_2 CONTROL_{ji} + \varepsilon_i \quad (4)$$

where, αs measure the impact of a vector of corporate governance systems and processes on the firm's default risk. Similarly the βs measure the structural effects of corresponding risk variables to the relative debt type while controlling for other variables, $CONTROL_{ji}$, including collateral in place, age and size of the firms. Finally υ_i and ε_i are the error terms for equations (3) and (4) respectively. We derive a reduced form debt model by substituting $DRISK_i$ from equation (3) into equation (4). Therefore,

$$DEBT_{ji} = \beta_0 + \beta_1(\alpha_0 + \alpha_1 GOVERNANCE_{ji} + \upsilon_i) + \beta_2 CONTROL_{ji} + \varepsilon_i \quad (5)$$

collecting terms

$$DEBT_{ji} = \underbrace{\beta_0 + \beta_1\alpha_0}_{\omega_0} + \underbrace{\beta_1\alpha_1}_{\omega_1} GOVERNANCE_{ji} + \beta_2 CONTROL_{ji} + \underbrace{\beta_1\upsilon_i + \varepsilon_i}_{\xi_i} \quad (6)$$

giving

$$DEBT_{ji} = \omega_0 + \omega_1 GOVERNANCE_{ji} + \beta_2 CONTROL_{ji} + \xi_i \quad (7)$$

where, ωs are the reduced coefficients measuring the effect of corporate governance on demand for the *j* different debt types. Equation (7) is the reduced equation in implied non-linear form which models debt demand for each type as a function of governance characteristics and controls. In order to estimate the structural parameters we adopt a two stage method of estimation. In stage one, we estimate the corporate governance and risk model shown by equation (3) and substitute the estimated $\widehat{DRISK_i}$ for default risk $DRISK_i$ in equation (4) in stage two. Thus the estimable equations can be reproduced as in the following equations (3′) and (4′).

$$\widehat{DRISK_\iota} = \widehat{\alpha_0} + \widehat{\alpha_1} GOVERNANCE_{ji} \quad (3')$$

$$DEBT_{ji} = \beta_0 + \beta_1 \widehat{DRISK_\iota} + \beta_2 CONTROL_{ji} + \varepsilon_i \quad (4')$$

The dependant variable, $DEBT_{ji}$, in equation 4′represents either a categorical variable for intermediated versus non-intermediated debt (*CHOICE*) or the demand for each of the four debt types: asset finance debt (*ASFIN*), bank debt (*BANK*), non-bank debt (*NBANK*) and non-intermediated debt (*NONINT*). In stage two of the analysis we examine whether estimated default risk, $\widehat{DRISK}$ from stage one, is related to the demand for different debt types via individual models for each debt type (ie equations 4′a, 4′b, 4′c and 4′d below).

$$ASFIN_i = \phi_0 + \phi_1 \widehat{DRISK_\iota} + \phi_2 CONTROL_{ji} + \varepsilon_i \quad (4'a)$$

$$BANK_i = \lambda_0 + \lambda_1 \widehat{DRISK_\iota} + \lambda_2 CONTROL_{ji} + \varepsilon_i \quad (4'b)$$

$$NBANK_i = \gamma_0 + \gamma_1 \widehat{DRISK_\iota} + \gamma_2 CONTROL_{ji} + \varepsilon_i \quad (4'c)$$

$$NONINT_i = \theta_0 + \theta_1 \widehat{DRISK_\iota} + \theta_2 CONTROL_{ji} + \varepsilon_i \quad (4'd)$$

Finally, we estimate these equations as a system of equations and impose cross equation constraints to test the relative magnitude of the risk impacts for each debt type.

Data and Variables

The sample consists of public companies listed on the Australian Stock Exchange in 2007, the last available year prior to the Global Financial Crisis of 2008 – 2009. Only one year's worth of data is used because corporate governance characteristics tend to be sticky and not change very quickly over time (Black, Jang & Kim 2006; Brown, Beekes & Verhoeven 2011). The initial sample frame which includes 1,824 listed companies is reduced to 595 companies after applying data and sample constraints.[5] The data is collected from annual reports and database information from AspectHuntley's DatAnalysis and FinAnalysis and Thomson Reuters Tick History (TRTH).

Debt Types

Demand for the different debt types is measured by the company's relative ability to contract intermediated or non-intermediated debt. At an aggregate level, this is captured as a binary

[5] The sample was reduced by the following restrictions: (1) 257 companies from the banking, insurance and financial sectors are excluded; (2) 328 companies without a 30 June balance date are excluded; (3) 618 companies without interest bearing debt are excluded; (4) 16 companies did not report cost of debt in their annual reports; (5) 10 outliers were omitted(see McDonald 1973; Subramanyam 1996).

variable, *CHOICE* ,which is one if more than 50% of the company's debt financing is non-intermediated debt and zero otherwise. *CHOICE* therefore represents those firms with the majority of their debt being non-intermediated debt. To capture the richness in the data, debt types are separated into demand for asset finance debt (*ASFIN*), bank debt (*BANK*), non-bank debt (*NBANK*) and non-intermediated debt (*NONINT*). Demand for the different debt types are measured as the proportion of each debt type relative to the total interest bearing debt for the firm (Bougheas, Mizen & Yalcin 2006; Cantillo & Wright 2000; Denis & Mihov 2003; González, Lopez & Saurina 2007) as defined below:

$$ASFIN_i = \frac{AFDEBT_i}{IDEBT_i} \quad \text{(a)}$$

$$BANK_i = \frac{BKDEBT_i}{IDEBT_i} \quad \text{(b)}$$

$$NBANK_i = \frac{NBKDEBT_i}{IDEBT_i} \quad \text{(c)}$$

$$NONINT_i = \frac{NINDEBT_i}{IDEBT_i} \quad \text{(d)}$$

where, $AFDEBT_i$ corresponds to asset finance debt for firm *i* which includes hire purchase and finance lease liabilities, $BKDEBT_i$ refers to bank debt for firm *i* which includes bank loans, facilities, and overdraft, and $NBKDEBT_i$ denotes non-bank debt for firm *i* which includes loans made by non-bank financial institutions. Similarly, $NINDEBT_i$ is non-intermediated debt for firm *i* which includes commercial papers, notes, and bonds and finally $IDEBT_i$ is the total interest bearing debt for firm *i*.

Default Risk

We employ an accounting-based measure of default risk for several reasons. Firstly, the study is motivated by Armstrong et al.'s (2010) call for further investigation of the relationship between accounting information and debt contracting. Secondly, there is an extensive body of accounting literature that links the quality of a firm's governance 'mosaic' (board, audit committee, internal auditor, external auditor and management characteristics) and financial reporting quality (Cohen et al. 2004). The quality of a firm's accounting information is the link between its level of corporate governance, default risk and type of debt demanded which is captured by our accounting ratio based default risk measure. Finally, while there are alternative market risk measures such as bond ratings (for non-intermediated debt), share price changes and recent multi-factor models (Schultz et al. 2011; Wu et al. 2010), our focus is on governance-enhanced accounting information and hence we use an accounting based risk measure rather than the most comprehensive or predictive default model per se.

Default risk, *DRISK*, is measured via an accounting ratio based out-of-sample Australian Z-score model identified using multivariate linear discriminant (MLD) consistent with extensive prior literature (Altman, 1968, 1983). A paired sample of failed and non-failed Australian companies that are similar in size, industry and time period are employed to estimate a five factor accounting ratio model. The five accounting ratios are working capital to total assets (*WORKCAP*), retained earnings to total assets (*RETEARN*), earnings before interest and tax to total assets (*ROA*), book value of total debt to total assets (*LEVERAGE*) and sales to total assets (*ASSTURN*).[6] The estimated *DRISK* captures both the profitability (via retained earnings, return on assets and turnover) and financial risk (via leverage and working capital) dimensions of each firm. Hence we do not include additional controls for profitability or financial risk in the analysis.[7] To enhance clarity, the estimated *DRISK* is

[6] The estimated Z-score model is $DRISK_i = -0.38 + 0.16WORKCAP_i + 2.05RETEARN_i + 3.06ROA_i - 2.91LEVERAGE_i + 1.09ASSTURN_i$.

[7] Although the other controls include a collateral variable this is not significantly correlated with leverage.

multiplied by negative one. The transformed *DRISK* ranges from -3.73 to 4.58 with a high *DRISK* representing high default risk and a low or negative score representing low default risk.

Corporate Governance

To capture the multi-faceted nature of the corporate governance construct we draw on fourteen individual governance variables identified in the prior literature and shown in Table 1 (Aldamen & Duncan 2011a; Ang, Cole & Wuh Lin 2000; Daily & Dalton 1994; Davidson, Bouresli & Singh 2006; Fama & Jensen 1983a, 1983b; Kent & Stewart 2008). The governance measures include board independence, duality of the role of board chair and chief executive officer, board size, board meeting, the presence of a nomination committee, the presence of a remuneration committee, audit committee independence, financial expertise of the audit committee, audit committee meetings, size of audit committee, audit committee charter, identity of external auditor, blockholders and insider ownership.

One of the issues facing governance researchers is the dimensionality of the corporate governance construct (Brown et al. 2011). We follow the approach by Larcker, Richardson and Tuna (2007) and Aldamen and Duncan (2011a) and utilise principal component analysis (PCA) to compute two corporate governance factors which summarise the fourteen individual corporate governance variables. Eleven variables are included in PCA but three variables are excluded due to low sampling adequacy and Eigen values that are below 1. The eleven variables show a Kaiser Meyer Olkin (KMO) score of approximately 0.5. The overall sampling adequacy measure KMO is 0.856 and the Bartlett's test of Sphericity is significant at one percent level of significance indicating that the model is appropriate for PCA. Furthermore, the rotation sums of square loading shows that two factors are extracted and they explain 65 percent of variance in the corporate governance variables. Table 1 reports the respective factor loading for each corporate governance variable. The two factors, labelled *GOV1* and *GOV2*, are employed as the governance proxy measures in all subsequent analysis. *GOV1* captures the audit committee and board oversight (remuneration and nomination committee) components of the corporate governance for the firm. While *GOV2* captures the size related elements of governance, namely board size and independence and frequency of hiring a Big4 auditor. The audit-oversight and size governance dimensions are consistent with the first two factors of Aldamen and Duncan (2011a, 2011b) and are key aspects of the governance 'mosaic' identified in much of the prior accounting governance, debt contracting and financial reporting literature (Armstrong et al. 2010; Cohen et al. 2004).

Controls

We also employ the typical controls for company age, collateral and size.[8] Company age, *AGE*, a proxy for reputation, is defined as the number of years since incorporation (Diamond, 1989; Pittman and Fortin, 2004). We expect *AGE* to be negatively related to the level of asset finance but positively related to other debt types. Young firms will have a higher proportion of leased assets relative to older more established firms that can use one or more of the other debt types. We also employ a control for collateral. Asset collateral provides the borrower with greater access to credit markets (Bougheas et al. 2006) and impacts perceived risk and

[8] Profitability and leverage are also considered significant drivers of cost of debt. However, *ZSCORE*, measured as a composition of different accounting ratios, includes return on assets which is a common profitability measure and debt to asset which is a leverage measure. As a result, the study does not include separate profitability and leverage control variables.

thus should be positively related to debt type demanded. In accordance with prior research, we measure collateral, *COLLT*, as property plant and equipment divided by total assets (Berger, Ofek & Yermack 1997; Wen, Rwegasira & Bilderbeek 2002). As well as being a standard control, company size is an important factor which influences the relationship between corporate governance practices and demand for all debt types (Brewer 2007; Cantillo & Wright, 2000; Minton & Schrand 1999). We measure company size, *SIZE*, as the log of total assets (Pittman & Fortin 2004; Sengupta 1998) which is expected to be positively related to debt types.

Table 1
Corporate Governance Variables and Rotated Component Matrix

Variable Name	Variable Description	Principal Components	
		GOV1	***GOV2***
INDP	Proportion of non-executive independent directors on the board.		0.723
DUAL	One if the CEO is separate from chair of the board, and zero otherwise.		
BDSIZE	Number of directors on the board.		0.787
BDMEET	Number of board meetings.	0.575	
NOM	One if the company has a nomination committee, and zero otherwise.	0.537	
REM	One if company has a remuneration committee, and zero otherwise.	0.693	
AUDCHRT	One if the company has an audit committee charter, and zero otherwise.	0.658	
AUDIND	Proportion of non-executive independent members on the audit committee.	0.640	
AUDEXP	Proportion of audit committee members with accounting and finance qualifications.	0.549	
AUDSIZE	Number of directors on audit committee.	0.634	
AUDMEET	Number of audit committee meetings.	0.600	
AUDITOR	One if the auditor is a Big Four, and zero otherwise.		0.675
BLOCK	Percentage of shares owned by investors owning 5 percent or more of the company's shares.		
INSIDER	Percentage of company's shares owned by insiders.		

Note: PCA procedure: Varimax Rotation with Kaiser Normalization

Three variables, *DUAL, BLOCK* and *INSIDER* were dropped from the Principle Components Analysis.

Estimation and Result Discussion

Descriptive Statistics

Table 2 reports the aggregate levels for each debt type (i.e. asset finance, bank debt, non-bank debt and non-intermediated debt). The aggregate debt types are further broken into short-term and long-term debt where the former comprises 21% of total interest bearing debt while the latter makes up 79%. Additionally, non-intermediated debt, which includes convertible and non-convertible notes, bonds and commercial paper, comprises the largest debt type in terms

of aggregate value at $54.2 billion or 43.3% of total interest bearing debt. Bank debt which includes bank loans, facilities and overdrafts totals $42.4 billion or 33.9% of the total interest bearing debt thereby making it the second largest type of debt. Non-bank debt which includes loans from non-bank financial institutions, directors and related entities is the third largest debt type at $24.2 billion or 19.3% of total interest bearing debt. Finally, asset finance which is represented by finance lease and hire purchases amounts to $4.3 billion or 3.4% of total interest bearing debt making it the smallest debt type relative to the other types of debt. However these aggregate dollar levels are distorted by firm size and can be misleading. Hence we measure the demand for the different debt types as the proportion of each debt type relative to the total interest bearing debt for the firm. Thus our analysis is based on the relative demand for each type of debt in a firm's debt funding mix rather than the dollar value per se. This allows us to compare the cross-sectional association between relative debt levels and the governance-default risk driver.

Table 2
Breakdown of Interest Bearing Debt by Type and Term

Type	(Billions)	% of Total
Short Term Debt		
(i) Asset finance	$1.0	0.8
(ii) Bank	16.4	13.1
(iii) Non-bank	3.4	2.7
(iv) Non-intermediated	5.9	4.7
Total	**26.7**	**21.3**
Long Term Debt		
(i) Asset finance	3.3	2.6
(ii) Bank	26.0	20.8
(iii) Non-bank	20.8	16.6
(iv) Non-intermediated	48.3	38.6
Total	**98.4**	**78.7**
Total Interest Bearing Debt	**$125.1**	**100.0**

Note: *N=595 firms. The largest 20 companies account for $47.8 billion of the total non-intermediated (88% of the total $54.2 billion in non-intermediated debt).*

The binary variable *CHOICE* represents the aggregate demand for non-intermediated versus intermediated debt and equals one if the majority of the company's debt is non-intermediated and zero otherwise. The results reported in Table 3 show 116 companies have a majority of non-intermediated debt. Demand for the different debt types is further examined by the use of four variables which represent the proportion of each debt type relative to the total interest bearing debt as presented in Table 3. The dominant type of debt accessed is *BANK,* with a mean of 33% across the sample. The mean proportion of total interest bearing is similar across the other three debt types: *ASFIN, NBANK* and *NONINT*. However the mix of debt varies across companies as indicated by the wide range for each type of debt with different companies having between zero to one hundred percent of each kind of interest bearing debt. That is, some companies have only *ASFIN* or only *NONINT* and so on while other companies have more of a mix. The median levels also imply most companies have some form of *BANK* debt.

Descriptive statistics for *DRISK* and the controls are also reported in Table 3. The mean for default risk, *DRISK*, is 0.49 and ranges from -3.73 to 4.58. *AGE* ranges between 1 and 124 years with an average of 19.98 years. The collateral control, *COLLT*, has a mean of 0.33 and ranges between zero and 1.18. The average *SIZE* is 7.78 which equates to assets of about $60 million.

Table 3
Descriptive Statistics

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
ASFIN	0.27	0.03	0.40	0.00	1.00
BANK	0.33	0.01	0.41	0.00	1.00
NBANK	0.19	0.00	0.35	0.00	1.00
NONINT[1]	0.20	0.00	0.35	0.00	1.00
CHOICE [2]	0.20	0.00	0.40	0.00	1.00
DRISK	0.49	0.75	1.46	-3.73	4.58
AGE	19.98	15.00	18.33	1.00	124.00
COLLT	0.33	0.26	0.29	0.00	1.18
SIZE	7.78	7.67	0.93	5.71	10.87

Note: N: 595

[1]183 companies have some non-intermediated debt in their finance mix which represents 31% of the total sample. Of these 38 or 6.4% of the sample have only non-intermediated debt.

[2] *CHOICE* equals 1 if the majority of the company's debt is non-intermediated and zero otherwise. 116 companies have a majority non-intermediated debt.

Corporate Governance and Default Risk

Stage one of the analysis tests whether corporate governance is related to default risk. The results presented in Table 4 indicate that *GOV1* (audit and board oversight governance) and *GOV2* (size related governance such as board size, independence and Big4 auditor) are negatively related to *DRISK* at the 1% significance level. This implies that an increase in both audit-oversight and size aspects of corporate governance results in a decrease in default risk as expected. Similar results are reported by Bhojraj and Sengupta (2003), Wang and Lin (2010) and Ashbaugh-Skaife et al. (2006) who also find that corporate governance decreases default risk. We save the estimated values for default risk, $\widehat{DRISK}$, and use them in the next phase of the analysis.

Default Risk and Demand for Debt Types

Stage two of the analysis examines whether estimated default risk, $\widehat{DRISK}$, is related to the demand for different debt types. We estimate equations (4′ a through d) for the four debt types. The results shown in Table 4 suggest that *ASFIN* is negatively related to $\widehat{DRISK}$ at the 5% significance level. This indicates that a decrease in $\widehat{DRISK}$ results in an increase in *ASFIN*. Additionally, *AGE* and *SIZE* are negatively related to *ASFIN* at the 1% significance level which indicates that the demand for asset secured finance such as lease liabilities and hire purchase decreases with an increase in company age and size. For *BANK,* the $\widehat{DRISK}$ coefficient is negative and statistically significant at the 5% significance level. Demand for bank debt therefore increases when estimated default risk decreases. Additionally, *SIZE* is positively related to *BANK* which indicates that demand for bank debt increases as companies become larger. The results in Table 4 suggest that *NBANK* and $\widehat{DRISK}$ are negatively related at the 10% significance level. This further supports the overall negative relationship between estimated default risk and demand for all intermediated debt types. Finally the relationship between *NONINT* and $\widehat{DRISK}$ is negative, but unlike the previous default risk-debt type relationships, it is not statistically significant. The final model relates the choice of intermediated versus non-intermediated debt to the debt choice drivers $\widehat{DRISK}$, age, collateral

and size. The results show that a significantly negative relationship between debt type, *CHOICE*, and estimated default risk. The significant negative coefficient means that companies with higher estimated default risk are more likely to choose intermediated debt. This implies that the proportion of intermediated debt is more sensitive to the governance-default risk relation, $\widehat{DRISK}$, than is the case for non-intermediated debt.

Table 4
Corporate Governance, Default Risk and Demand for Debt Types

STAGE ONE (Equation 3′)	***STAGE TWO (Equation 4′)***					
	DRISK	*ASFIN*	*BANK*	*NBANK*	*NONINT*	*CHOICE*[v]
Intercept	4.269*** (0.00)	1.359*** (0.00)	-0.423*** (0.00)	0.183 (0.30)	-0.089 (0.79)	0.043 (0.16)
GOV1	-0.216*** (0.00)					
GOV2	-0.171*** (0.01)					
$\widehat{DRISK}$		-0.084** (0.03)	-0.076** (0.04)	-0.05* (0.10)	-0.104 (0.16)	-0.026** (0.01)
AGE		-0.002*** (0.00)	0.001 (0.40)	0.002** (0.04)	0.001 (0.84)	-0.001*** (0.00)
COLLT		0.070 (0.21)	-0.042 (0.49)	0.080 (0.25)	-0.026 (0.74)	0.04* (0.06)
SIZE		-0.129*** (0.00)	0.101*** (0.00)	-0.005 (0.83)	0.041 (0.31)	0.02** (0.02)
Adj. R-Squared	0.21	0.08	0.08	0.04	0.06	0.09
F-statistic	33.17*** (0.00)	14.09*** (0.00)	11.84*** (0.00)	2.684** (0.03)	12.01*** (0.00)	2.48** (0.04)
Obs*R^2	0.32 (0.85)	0.05 (0.82)	2.12 (0.15)	6.60 (0.16)	2.87 (0.57)	16.22 (0.30)

Notes:

i. *Stage One refers to the corporate governance and default risk model corresponding to equation (3′).*
ii. *Stage Two presents estimates of default risk (estimated) and debt type model equation (4′a-d) plus a fifth model where the dependant variable is the binary CHOICE variable (see vi below).*
iii. *The corporate governance components have been reduced to two factors using principal component method. These reduced factors satisfy all necessary properties before to be utilized in the stage one estimates.*
iv. ****, ** and * respectively significant at 1 %, 5% and 10% level of significance. P-values are presented in brackets.*
v. *We pass these estimates through the battery of different statistical tests including F-statistics showing overall significance of the coefficients corresponding to each model estimated in the above. Further we take care of heteroskedasticity the potential problem in cross-sectional estimations. White hetroskedasticity test and Breusch-Pagan Godfrey Tests produce the consistent results and do not allow to reject the null hypothesis of no hetroskedasticity shown as Obs*R^2*
vi. *CHOICE is a binary variable defined as one if the company has more than 50% of its financing mix from non-intermediate debt and zero otherwise. 116 or 19.5% of the companies in the sample have more than 50% non-intermediated debt.*

To more fully explore the implications of this result we re-estimate the stage two system of equations with cross equation restrictions to test the hypothesis that the coefficient for $\widehat{DRISK}$ is equal for all debt types. The results reported in Table 5 show that all risk coefficients corresponding to *ASFIN*, *BANK*, *NBANK* and *NONINT* are significantly different from each other. To determine the relative impact of governance-default risk across the debt types we impose pairwise restrictions on the cross equation $\widehat{DRISK}$ coefficients. The results in Table 5 show that ϕ_1 and λ_1 are not different from each other suggesting governance-default risk has a similar impact on the demand for both *ASFIN* and *BANK* debt. We also find that parameters γ_1 and θ_1 are not significantly different which implies the demand for non-bank debt, *NBANK*, and non-intermediated debt, *NONINT*, have a similar responsiveness to the governance-default risk relation.

We also find that the estimated coefficient ϕ_1 is significantly larger than both γ_1 and θ_1 which means that the level of asset finance, *ASFIN*, is more responsive to increases in governance-default risk than both *NBANK* and *NONINT*. Similarly the coefficient for λ_1 is significantly larger than both γ_1 and θ_1. The statistical results in Table 5 suggest the following relationship between the parameters: $\phi_1 = \lambda_1 > \gamma_1 = \theta_1$. In total these results imply that there is a cascading effect of governance-default risk across the debt types. The governance-default risk relation has a larger impact on the proportion of *ASFIN* and *BANK* relative to *NBANK* and *NONINT* debt. The evidence from the restricted estimation is consistent with the *CHOICE* model and suggests that a higher governance-default risk relation has more of an impact on the proportion of *ASFIN, BANK* and *NBANK* debt relative to *NONINT*. Overall these results are consistent with governance mitigating accounting based measure of default risk and the resultant risk negatively impacting debt levels, more so for asset finance and bank debt than non-bank and non-intermediated debt. Hence we can conclude that governance positively impacts asset and bank debt more than non-bank and non-intermediated debt.

Table 5
Cross Equation Restrictions to Test Differential Impact of Governance-Default Risk on Debt Type Demanded

Coefficient Hypothesis	$\chi^2 - Test$ $(P-value)$	***Decision***	***Comments***
$H_0 : \phi_1 = \lambda_1 = \gamma_1 = \theta_1$ $H_1 : \phi_1 \neq \lambda_1 \neq \gamma_1 \neq \theta_1$	64.31 (000)	Reject H_0	All risk coefficients $\phi_1, \lambda_1, \gamma_1$ and θ_1 corresponding to *ASFIN*, *BANK*, *NBANK* and *NONINT* are different from each other.
$H_0 : \phi_1 = \lambda_1$ $H_1 : \phi_1 > \lambda_1$	0.0002 (0.985)	Fail to reject H_0	ϕ_1 and λ_1 are not statistically different from each other.
$H_0 : \gamma_1 = \theta_1$ $H_1 : \gamma_1 > \theta_1$	0.268 (0.604)	Fail to reject H_0	γ_1 and θ_1 are not statistically different from each other.
$H_0 : \phi_1 = \gamma_1$ $H_1 : \phi_1 > \gamma_1$	29.10 (0.000)	Reject H_0	ϕ_1 and γ_1 are different from each other and ϕ_1 is relatively greater than γ_1.
$H_0 : \phi_1 = \theta_1$ $H_1 : \phi_1 > \theta_1$	34.30 (0.000)	Reject H_0	ϕ_1 and θ_1 are different from each other and ϕ_1 is relatively greater than θ_1.

$H_0 : \lambda_1 = \gamma_1$ $H_1 : \lambda_1 > \gamma_1$	29.93 (0.000)	Reject H_0	λ_1 and γ_1 are different from each other and λ_1 is relatively greater than γ_1.
$H_0 : \lambda_1 = \theta_1$ $H_1 : \lambda_1 > \theta_1$	35.05 (0.000)	Reject H_0	λ_1 and θ_1 are different from each other and λ_1 is relatively greater than θ_1.

Conclusion

The purpose of this study is to investigate the impact of corporate governance, via default risk mitigation, on the demand for different debt types in Australia. Companies choose between intermediated debt, such as asset finance, bank debt and non-bank debt, and non-intermediated debt. While there are many potential drivers for this choice we explore the role of governance and default risk, two primary drivers, on the relative proportion of each type of debt contracted by companies in a two-stage analysis.

The results for stage one show that companies with higher levels of corporate governance have lower levels of default risk, consistent with the prior evidence (Wang & Lin 2010). We use the predicted default risk from our stage one analysis to examine the differential demand for four debt types. The results for stage two show that estimated default risk is negatively related to asset finance, bank debt, non-bank debt and non-intermediated debt. However, the relationship between default risk and non-intermediated debt is insignificant. Our cross-sectional evidence suggests that firms with higher levels of corporate governance also exhibit lower default risk and this is associated with firms demanding higher levels of all of the intermediated debt types. Similar results are reported by Bougheas et al. (2006) who conclude that firms with higher default risk contract lower levels of bank debt. Furthermore, Gonzalez, Lopez and Saurina (2007) find that default risk is negatively related to the demand for bank debt but the relationship is not statistically significant. In contrast we find a significant negative relationship with all intermediated debt types.

Regulators can benefit from this analysis as it provides evidence with respect to the value of corporate governance. Companies that engage in costly governance practices expect payback benefits including improved financial stability, lower default risk, reduced information asymmetry, improved information quality and thus improved decision making (Aldamen, Duncan & McNamara 2010). More specifically one would expect governance to impact demand for debt over and above other firm specific factors. Our results suggest that corporate governance impacts access to intermediated and non-intermediated debt for Australian companies via the mitigation of default risk. However this relationship is not uniform across debt types. The demand for both bank and asset finance debt is more responsive to changes in governance-default risk levels than non-bank and non-intermediated debt. As default risk increases the level of bank debt and asset finance that companies can contract decreases at a faster rate than for non-bank and non-intermediated debt. So while all debt categories are responsive to the governance-default risk characteristics of the firm, if a firm has higher risk it is more likely to obtain debt from non-banking institutions or non-intermediated providers. Traditional debt providers, banks and asset finance lenders, are more risk averse, as one would expect, than the less constrained non-bank debt providers. Hence the level of corporate governance potentially has a larger impact on the demand for these intermediated debt types relative to other types of debt.

We expected that Australia's intermediated debt market, with its unique continuous disclosure requirements, might not be as responsive to governance as other markets such as the US where non-intermediated debt is more prevalent. The increased monitoring by intermediaries, in the banking sector in particular, serves as an alternative form of control and

thus mitigates the demand for formal corporate governance mechanisms (Aldamen & Duncan 2011a; Armstrong et al. 2010). The US public debt market, the focus of much prior research, is likely to be more responsive to governance than the Australian market. However our findings suggest that higher levels of corporate governance mitigate default risk even in Australia's information-rich intermediated debt market. This supports the ASX's pursuit of governance best practices within the local market.

Finally our analysis has implications for future research. The differential impact of governance and default risk on demand for different debt types suggests that researchers need to control for this non-uniform relationship when examining debt contracting. Researchers need to control for the co-variation between governance and default risk via instrumental or two-stage analysis by first modelling the risk drivers then the impact of this relationship on the focus variables of the research. However, the current cross-sectional study is but one limited piece of evidence. Future research needs to consider the relationship over time to shed further light on the causal links between changes in governance and resultant changes in debt contracting outcomes.

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Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 4

2012

Risk and Return in Hedge Funds and Funds-of-Hedge Funds: A Cross-Sectional Approach

Hee Soo Lee
Yonsei University, South Korea, heesoo@yonsei.ac.kr

Recommended Citation
Lee, Hee Soo, Risk and Return in Hedge Funds and Funds-of-Hedge Funds: A Cross-Sectional Approach, *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 43-64.

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Abstract

The objective of this study is to examine whether the available data on individual hedge funds (HFs) and funds-of-hedge funds (FOHFs) can reveal the risk-return trade-off and, if so, to find an appropriate risk measure that captures the cross-sectional variation in HF and FOHF returns and compare the risk-return relationship in HFs and FOHFs. Using the "live funds" and the "dead funds" datasets provided by Hedge Fund Research Inc. (HFR), we concentrate on alternative risk measures such as semi-deviation, VaR, expected shortfall and tail risk and compare them with standard deviation in terms of their ability to describe the cross-sectional variation in expected returns of HFs and FOHFs. Firstly, the risk measures are analysed at the portfolio level of HFs and FOHFs by adopting the Fama and French (1992) approach. Secondly, the various estimated risk measures are compared at the individual HF and FOHF levels by using univariate and multivariate cross-sectional regressions. The results show that the available data on HFs and FOHFs exhibits different risk-return trade-offs. The Cornish-Fisher expected shortfall or Cornish-Fisher tail risk could be an appropriate risk measure for HF return. Although appropriate alternative risk measures for the HFs are found, it is difficult to determine the risk measures that best capture the cross-sectional variation in FOHF returns.

Keywords

Hedge funds; funds-of-hedge funds; VaR; expected shortfall; tail risk

Cover Page Footnote

I am grateful to the comments from participants in the Finance and Corporate Governance Conference, Melbourne (2010) on the early version of the paper. I would also thank to the two blind reviewers for their insightful comments and suggestions.

Risk and Return in Hedge Funds and Funds-of-Hedge Funds: A Cross-Sectional Approach

Lee, Hee Soo[1]

Abstract

The objective of this study is to examine whether the available data on individual hedge funds (HFs) and funds-of-hedge funds (FOHFs) can reveal the risk-return trade-off and, if so, to find an appropriate risk measure that captures the cross-sectional variation in HF and FOHF returns and compare the risk-return relationship in HFs and FOHFs. Using the "live funds" and the "dead funds" datasets provided by Hedge Fund Research Inc. (HFR), we concentrate on alternative risk measures such as semi-deviation, VaR, expected shortfall and tail risk and compare them with standard deviation in terms of their ability to describe the cross-sectional variation in expected returns of HFs and FOHFs. Firstly, the risk measures are analysed at the portfolio level of HFs and FOHFs by adopting the Fama and French (1992) approach. Secondly, the various estimated risk measures are compared at the individual HF and FOHF levels by using univariate and multivariate cross-sectional regressions. The results show that the available data on HFs and FOHFs exhibits different risk-return trade-offs. The Cornish-Fisher expected shortfall or Cornish-Fisher tail risk could be an appropriate risk measure for HF return. Although appropriate alternative risk measures for the HFs are found, it is difficult to determine the risk measures that best capture the cross-sectional variation in FOHF returns.

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JEL Codes: G32

[1] Yonsei University
Email:heesoo@yonsei.ac.kr
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Introduction

The hedge fund industry has grown significantly over the past 60 years. Extended from US based investments to Europe, Asia and Australia, the hedge fund industry expanded dramatically during the period of 1980s through to early 2000s. The rapid growth of hedge fund industry was achieved through increased number of new financial instruments and improved technology, which helped to develop sophisticated investment strategies, during the same periods. In addition, the performance based incentive fee structure has attracted high-skilled professionals to invest in hedge funds. Both assets under management (AUM) in hedge funds and the number of funds increased from around US$39 billion with 610 funds in 1990 to US$1,900 billion with 9,237 funds in 2010 (HFR 2010). Following a decade of notable growth, assets under management (AUM) of the hedge fund industry decreased remarkably in 2008 due to the Global Financial Crisis (GFC). The International Financial Services London (IFSL) estimated that AUM would decline by more than 20% to US$1,500 billion in 2008. Being the biggest on record, the decrease was caused by the combination of negative performance, rush in redemptions and liquidations of fund (IFSL 2009).

Traditional investment strategies adopted by institutional investors had failed to satisfy their objectives in terms of return and risk, which had led investors to seek new ways of diversification. Many high-net-worth individuals, as well as institutional investors, have shown growing interest in hedge funds. With fund-of-hedge funds (FOHFs) being vehicles that provide combined investments in individual hedge funds (HFs), investment in them has been open to a wide range of investors. On the other hand, only institutions and high-net-worth individuals are allowed to invest in HFs. A large part of growth in the hedge fund industry was due to an increase in the number of FOHFs. The HFR Industry Report in 2010 reported that most investors have increasingly adopted FOHFs as the preferred investment vehicles and they were estimated to account for 20% to 25% of global hedge fund industry assets at the end of 2009.

FOHFs became more favoured by various investors given that FOHFs usually demand less initial investment than the HFs. As the name indicates, FOHFs invest in a number of HFs for the purpose of diversifying fund risk. This allows investors to allocate assets in dynamic market conditions. Additionally, FOHFs have a different fee structure from that of HFs. While a HF charges a management and incentive fee, a FOHF charges extra fees at the underlying HF level as well as management and incentive fees at the FOHF level. As a consequence, in some cases, FOHF investors might pay more fees than the total realised return in the investment. It is an interesting question as to whether it is worthwhile for investors to pay these extra fees.

Theoretically, holding a portfolio of HFs must be less risky than investing in HFs. Despite the increasing significance of FOHFs in the development of the hedge fund industry, the risk and return characteristics of FOHFs are not well established in the literature. Most existing research on hedge fund performance showed that hedge funds exhibited better performance on a risk-adjusted basis relative to standard asset categories such as equity and bonds (Ackerman, McEnally & Ravenscraft 1999; Asness, Krail & Lie 2001; Brown, Goetzmann & Ibbotson 1999 among others). On the other hand, the extant evidence on FOHF performance was that they had a tendency to underperform hedge fund indices by small but significant amounts (Brown, Goetzmann & Liang 2004; Liang 2004). Furthermore, a number of studies showed that the returns announced by HFs and FOHFs were not normally distributed with excess kurtosis and negative skewness (Agarwal & Naik 2004; Amin & Kat 2003; Fung & Hsieh 1997). Due to the nature of negative skewness and excess kurtosis in HFs and FOHFs returns, any risk estimation which assumes a normal distribution of returns would severely underestimate the actual risk exposure. Nevertheless, according to Amenc et

al. (2004) only 2 % of European multi-managers have paid attention to the skewness and kurtosis of the return distribution. Also, they revealed that most European multi-managers have continued to prefer the traditional mean-variance framework to monitor manager performance. This was confirmed by the fact that 82% of multi-managers adopted the Sharpe ratio as an important indicator (Amenc et al. 2004).

The objective of this study is to examine whether the available data on HFs and FOHFs can reveal the risk-return trade-off and, if so, to find an appropriate risk measure that captures the cross-sectional variation in HF and FOHF returns. The current research extended Liang and Park (2007) by focusing on the comparison of the risk-return trade-off in HFs and FOHFs and including recent hedge fund data which covers a period of Global Financial Crisis. Understanding the risk-return relationship in HFs and FOHFs will greatly help investors build more profitable investment strategies.

With the dramatic growth of HFs and FOHFs, it is essential to find the most appropriate risk measures that capture the cross-sectional variation in these types of funds. Traditional risk management such as mean-variance analysis, the Sharpe ratio and Jensen's alpha assume a normal distribution measure of returns. As a consequence, the traditional measures of returns incorporate the standard deviation. This would appear to be inappropriate for risk measures of HFs and FOHFs. In order to overcome this problem, the focus in this study is on alternative risk measures such as semi-deviation, Value-at-Risk (VaR), expected shortfall and tail risk. They were compared with standard deviation in terms of their ability to describe the cross-sectional variation in expected returns of HFs and FOHFs.

Firstly, the various estimated risk measures were analysed at the portfolio level of HFs and FOHFs by adopting the Fama and French (1992) approach. Secondly, the estimated risk measures were compared at the individual HF and FOHF levels by using univariate[2] and multivariate cross-sectional regressions. Additional independent variables were incorporated into the analysis in order to distinguish age, size and liquidity effects from the relationship between risk and expected return. These regressions were run with and without investment strategy dummy variables. The results from both HF and FOHF data were then analysed to show if any difference existed between them.

Liang and Park (2007) analysed the risk-return trade-off with the same risk measures adopted in this study but using only HF data. They found that the expected shortfall using the Cornish-Fisher expansion captured the cross-sectional variation in expected returns of HFs better than did other risk measures studied. In the present study, the risk and return characteristics of FOHFs turned out to be different from those of HFs. However, the cross-sectional regression results using HFs were similar with those of Liang and Park (2007) except for the regression involving VaR.

There is invariably a clear trade-off between risk and expected return. One cannot be viewed without consideration of the other. A risk-return target employed by hedge funds is not the same as that of traditional investments such as stocks, bonds and mutual funds. Most hedge fund investors expect high returns to compensate them for the corresponding risks to which they are exposed. Risk measures for HF and FOHF investments are particularly important due to the illiquid character of the investments due to the long lock-up periods on capital and the infrequent redemption notice periods enforced on investors.

In the next section the data, descriptive statistics and results of normality testing of HF and FOHF returns are described. The methods used to estimate risk measures and to test

[2] The univariate regression model is a simple regression model where one variable is regressed on another variable.

the cross-sectional relation between hedge fund returns and risk measures are then presented. Subsequently, the empirical results are presented before concluding in the last section.

Data

It is difficult to identify a representative hedge fund database among a number of hedge fund databases. It is well known that hedge funds report their information only on a voluntary basis due to limited regulatory oversight. Since hedge funds are not permitted to advertise publicly, they report fund information voluntarily to a data collection agency in order to attract potential investors. As a result, conflicting results of studies based on different databases have been produced (Ackermann et al. 1999; Brown et al. 2004; Malkiel & Saha 2005 among others). This makes the comprehensive nature and integrity of hedge fund data questionable.

This study adopted the Hedge Fund Research (HFR) database, which is a database that is commonly used by academics and practitioners. There are three major hedge fund databases employed in the literature, namely the HFR, Lipper TASS and CISDM (Centre for International Securities and Derivatives Markets) databases. Each database supplies its own family of indices. HFR provides two separate databases. One is the Dead Fund Database, while the other is called the Live Fund Database. As indicated in the name, the Live Fund database includes information about all hedge funds which are currently reporting to HFR, while the Dead Fund database consists of information regarding all hedge funds which have discontinued reporting to HFR.

In the empirical investigation carried out in this study, the monthly returns of HFs and FOHFs in the HFR database were examined over the period from January, 1990 to December, 2009. The estimation period starts in January, 1990 and test period runs from January, 1995 to December, 2009. Monthly returns are defined as the difference in net asset value during the month divided by the net asset value at the beginning of the month. Returns are net of fees including management fees, incentive fees and other fund expenses. In reality, the actual returns that investors receive differ from reported returns owing to factors such as redemption fees and the bid-ask spread offered by fund. It should be noted that reported returns are the basis for actual returns investors obtain in practice. The utilisation of monthly returns creates substantial advantages over annual returns due to the increased accuracy of the risk measures. Accuracy of the risk measure is crucial for risk management purposes.

It has been acknowledged in the literature that hedge fund databases have trouble with several biases (Ackermann et al. 1999; Brown et al. 1999; Malkiel & Saha 2005). The sample of HFR data adopted in this study included dead funds as well as live funds in order to moderate survivorship bias. To guarantee a sufficient number of appropriate observations for estimating risk measures, the sample was restricted to funds with a minimum of 36 months of data. The majority of funds in the database reported returns net of all fees on a monthly basis, whereas some funds reported only gross return quarterly. To provide data with consistency, those funds reporting gross returns or quarterly returns were removed from the sample. Additionally, funds with missing data were deleted.

For the purpose of this research the hedge fund database was divided into two classes. One class contained the HF data, while the other was comprised of the FOHF data. The original database consisted of 6297 live funds and 8520 dead funds with monthly return and assets under management (AUM) from January, 1990 to December, 2009. The live fund database included 4413 HFs and 1884 FOHFs, while the dead fund database contained 6350 HFs and 2170 FOHFs. HFs were categorised into 4 classes according to their investment strategies. They were Equity Hedge, Event Driven, Macro, and Relative Value. Two index funds were deleted from the live HF sample to make HFs distinct from portfolio hedge funds.

The FOHFs adopted one of the four strategies including Conservative, Diversified, Market Defensive and Strategic. After the removal of funds which did not meet the data requirements of this research, 2003 HFs and 879 FOHFs remained in the Live Fund database, while 2303 HFs and 816 FOHFs comprised the Dead Fund database. Table 1 shows the descriptive statistics for the returns of the live, dead and combined fund data (of the other two).

Table 1
Statistical Summary of HF and FOHF Returns: January, 1995 to December, 2009

		Live Fund		Dead Fund		Combined Fund	
		HF	FOHF	HF	FOHF	HF	FOHF
Number of Funds		2003	879	2303	816	4306	1695
Average Monthly return (%)	Mean	0.83	0.34	0.73	0.40	0.77	0.37
	Median	0.76	0.4	0.64	0.38	0.71	0.39
Standard Deviation (%)	Mean	4.45	2.43	4.37	2.41	4.41	2.42
	Median	3.74	2.04	3.41	1.96	3.58	2.02
Skewness	Mean	-0.36	-1.24	-0.21	-0.95	-0.28	-1.10
	Median	-0.18	-1.13	-0.07	-0.82	-0.12	-0.98
Kurtosis	Mean	7.86	8.08	6.71	7.64	7.24	7.86
	Median	5.32	6.37	4.67	5.43	4.94	6.02
Maximum Monthly Return (%)	Mean	14.41	5.91	13.79	6.92	14.08	6.40
	Median	11.22	4.58	9.23	4.05	10.18	4.33
Minimum Monthly Return (%)	Mean	-14.17	-9.11	-12.56	-8.01	-13.31	-8.58
	Median	-11.44	-7.74	-9.40	-6.67	-10.42	-7.22

Table 1 presents the number of funds, the mean and median values of the average monthly returns, standard deviation, skewness, kurtosis[3], as well as maximum monthly return and minimum monthly return in the Live, Dead and Combined HFR databases. Summary statistics are presented for HF returns and FOHF returns. As can be seen from this Table 1, the average return of HFs was higher than that of FOHFs and HFs were more volatile than FOHFs. Both HFs and FOHFs showed negative skewness and FOHFs had thicker tails in the return distribution than HFs. The average monthly return and standard deviation of the 4306 combined HFs were 0.77% and 4.41%, respectively, with average skewness of -0.28, and average kurtosis of 7.24. Compared to HFs, 1695 combined FOHFs showed the average monthly return of 0.37%, standard deviation of 2.42%, skewness of -1.10, and kurtosis of 7.86.

It has been well established in the literature that the reported returns of HFs and FOHFs are not normally distributed and exhibit excess kurtosis and negative skewness (Agarwal & Naik 2004; Amin & Kat 2003; Brown et al. 2004; Fung & Hsieh 1997; Lo 2001). Table 2 presents the proportion of rejection in the Jarque-Bera and Lilliefors normality test [4] for HF and FOHF returns.

[3] Skewness and Kurtosis are defined as follows: Skewness = $\frac{E(R-\mu)^3}{\sigma^3}$, Kurtosis = $\frac{E(R-\mu)^4}{\sigma^4}$, where R is returns, μ denotes the mean of R and σ denotes the standard deviation of R.

[4] The Lilliefors test is more appropriate when the sample size is small. The Lilliefors test was conducted as the number of funds in several strategies such as Conservative and Market Defensive is small.

Table 2
Normality Test for HF and FOHF Returns

Fund Group	Investment Strategy	Live Fund		Dead Fund		Combined Fund	
		% rejection in J-B test	% rejection in Lilliefors test	% rejection in J-B test	% rejection in Lilliefors test	% rejection in J-B test	% rejection in Lilliefors test
HF	Equity Hedge	69%	57%	56%	49%	62%	52%
	Event Driven	84%	78%	72%	66%	78%	72%
	Macro	57%	45%	54%	48%	55%	47%
	Relative Value	85%	84%	77%	71%	80%	77%
FOHF	Conservative	96%	93%	80%	76%	88%	84%
	Diversified	83%	77%	67%	58%	75%	68%
	Market Defensive	63%	48%	60%	48%	61%	48%
	Strategic	74%	64%	67%	66%	71%	65%
All Hedge Funds		71%	62%	61%	55%	66%	58%
All Fund-of-Hedge Funds		82%	76%	70%	64%	76%	70%

As expected, rejection rate in the J-B test (Lilliefors test) was high, showing 66% (58%) on average in the combined HFs and 76% (70%) in the combined FOHFs. The average rejection rate of FOHFs was higher than that of HFs, but there was a great fluctuation across investment strategies. Among the strategy classes in the combined HFs, Relative Value and Event Driven showed high J-B test rejection rate of 80% and 76% respectively, while Macro yielded lower rejection rate of 55%. The strategy of Conservative in the combined FOHFs showed high J-B test rejection rate of 88%, while Market Defensive presented rejection rate of 61%. It is interesting to note that the rejection rates for live funds are higher than those for dead funds.

Description of Approach

Estimation of Risk Measures

All the risk measures studied in this article were estimated in order to test cross-sectional variation in HF and FOHF returns. Eight risk measures including the standard deviation, semi-deviation, nonparametric VaR, Cornish- Fisher VaR, nonparametric expected shortfall, Cornish- Fisher expected shortfall, nonparametric tail risk and Cornish- Fisher tail risk were estimated using the same procedure.[5]

Monthly returns over the previous 36 to 60 months (as available) were used to estimate risk measures for each month within the test period. The test period started from January, 1995 and the estimation window started from January, 1990. That is, monthly returns between January, 1990 and December, 1994 were used to estimate risk measures as of January, 1995. This calculation was repeated by rolling the sample forward by one month ahead until the risk measure of December, 2009 was calculated. As a consequence, 180 months of time-series data for each risk measure was obtained. As the number of funds at each month and their available return history were different across the sample, the number of estimated risk measures at each month was not identical. Funds having a return history of less

[5] These eight risk measures are well defined in Liang and Park (2007).

than 36 months at a particular month were excluded from the estimation sample for that month.

Test at the Portfolio Level of HFs and FOHFs: Fama and French Method

As mentioned above, the estimation period for risk measures started in January, 1990 and the test period was between January, 1995 and December, 2009. Having calculated risk measures for each month in the test period using the previous 36 to 60 monthly returns (as available), portfolios were formed on each risk measure at each month. For each month, returns of HFs and FOHFs were ranked on the basis of their risk measure to construct 10 decile portfolios. Portfolio #1 contained the least average risk measure, while portfolio #10 included the highest average risk measure. This portfolio formation method is much the same as Fama and French (1992), with the exception that portfolios were updated on a monthly basis rather than yearly. For example, in January, 1995 risk measures for each fund were estimated by the return history from January, 1990 to December, 1994 and all funds were ranked into 10 equally weighted portfolios based on the rank of estimated risk measures. Once the portfolios were formed, the portfolio returns in January, 1995 (one month ahead estimation window) were calculated as the equal-weighted average of returns on individual funds in the same portfolio. By rolling over one month ahead, the risk measures were estimated for each fund and ranked according to the updated risk measures to form new portfolios. That is, the second estimation window for updating portfolios was from February, 1990 to January, 1995 and portfolios returns were computed in February, 1995. This procedure was repeated until 180th portfolios based on the estimation period between December, 2004 and November, 2009 was constructed. As a consequence, 180 time series of returns for the 10 equally weighted portfolios based on risk measures were obtained. These portfolios were generated and tested for i) live HFs and live FOHFs, ii) dead HFs and dead FOHFs, and iii) combined HFs and combined FOHFs. Then, as in the standard asset pricing literature, the difference between the returns of the most risky portfolio (portfolio #10) and the returns of the least risky portfolio (portfolio #1) were used in order to test the risk-return trade-off for each risk measure.

Test at the Individual Level of HFs and FOHFs: A Cross-sectional Regression

The cross-sectional regression approach of Fama and Macbeth (1973) was used to test the risk-return trade–off in HFs and FOHFs. The test period began in January, 1995 and finished in December, 2009 (180 months). Similar to Fama and French (1992), the cross-sectional one-month-ahead predictive regression was run to investigate the predictive power of risk measures at the individual fund level. The data from January, 1990 to December, 1994 was used to estimate the risk measures and then the January, 1995 cross-sectional returns were regressed on the lagged calculated risk measures. This procedure was repeated by rolling the sample forward by one month to generate risk measures and run the cross-sectional regressions until the whole sample was exhausted by December, 2009. For each month, the cross-sectional returns of the HFs and the FOHFs were separately regressed on the eight risk measures discussed above in order to compare their ability for describing the cross-sectional variation in expected returns. As a consequence, each fund group had 180 sets of time series coefficient estimates of the eight risk measures which were used in the corresponding 180 cross-sectional regressions.

Univariate cross-sectional regressions were run for the 180 months using the following model:

$$R_{it} = \alpha_t + \beta_t RM_{i,t-1} + \varepsilon_{it} \quad (1)$$

where R_{it} is the realised return of fund *i* in month *t* and $RM_{i,t-1}$ is the risk measure for fund i in month *t-1*. $RM_{i,t-1}$ is specified by the standard deviation (SD), semi-deviation[6] (SEMD), nonparametric VaR[7] (VaR_np), Cornish-Fisher VaR[8] (VaR_cf), nonparametric expected shortfall[9] (ES_np), Cornish-Fisher expected shortfall[10] (ES_cf), nonparametric tail risk[11] (TR_np) and Cornish-Fisher tail risk[12] (TR_cf) measures.

Additional independent variables were incorporated into the analysis in order to distinguish age, size and liquidity effects from the relationship between risk and expected return. These characteristics of funds were reported to be related to the cross-section of hedge fund returns in the literature. Ammann and Moerth (2005), Hedges (2003) and Herzberg and Mozes (2003) found that fund size impacted on hedge fund performance. Bali, Gokcan and Liang (2007) and Liang and Park (2007) showed that fund age as well as size explained, to some extent, the expected return of a fund. Liang (1999), Liang and Park (2007) and Aragon (2007) found the liquidity premium in hedge fund returns using the lockup provision of the fund, so it was an another explanatory variable. Accordingly, monthly cross-sectional regressions were performed for the following univariate specifications to demonstrate the relationship between return and fund characteristics.

$$R_{it} = \alpha_t + \beta_t Age_{i,t-1} + \varepsilon_{it} \quad (2)$$

$$R_{it} = \alpha_t + \beta_t Ln(AUM)_{i,t-1} + \varepsilon_{it} \quad (3)$$

$$R_{it} = \alpha_t + \beta_t Lockup_i + \varepsilon_{it} \quad (4)$$

Age was calculated on a daily basis. Fund size was measured by ln(AUM), where AUM is a fund's assets under management and fund liquidity was measured by the lockup period on a daily basis.[13]

Age, size and lockup effects were, therefore, controlled in order to study the relationship between expected return and risk measure for HFs and FOHFs. Multivariate cross-sectional regressions for 180 months were run using the following model.

$$R_{it} = \alpha_{i,t} + \beta_{1t} RM_{i,t-1} + \beta_{2t} Age_{i,t-1} + \beta_{3t} Ln(AUM)_{i,t-1} + \beta_{4t} Lockup_i + \varepsilon_{i,t} \quad (5)$$

For each risk measure, empirical tests were performed for i) live HFs and live FOHFs, ii) dead HFs and dead FOHFs, as well as iii) combined HFs and combined FOHFs using both the Live and Dead Fund databases. Following Fama and MacBeth (1973), the time series of the parameter estimates from the cross-sectional regression were used to test the risk-return trade-off. That is, the time series means of the monthly regression slopes were used to determine which risk measures on average have non-zero expected premiums during the January, 1995 to the December, 2009 periods.

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[6] Compared to the standard deviation, semi-deviation is derived only from negative deviation from the mean. That is returns below the mean return increase semi-deviation, whereas returns above mean return do not.

[7] Nonparametric VaR with 95% confidence level (VaR_np (95%)) was calculated as the 5th percentile of all observations in an estimation window.

[8] This is a parametric VaR using the Cornish-Fisher expansion with 95% confidence level (VaR_cf (95%)).

[9] Once VaR_np (95%) was estimated within a monthly estimation window from January, 1995 to December, 2009, all returns less than or equal to VaR_np (95%) became the sample. Nonparametric expected shortfall with 95% confidence level (ES_np (95%)) was computed as the average of the new sample.

[10] Cornish-Fisher expected shortfall with 95% confidence level (ES_cf (95%)) was calculated with the same method as ES_np (95%), except the returns from the estimation window were sorted on the basis of VaR_cf (95%) instead of VaR_np (95%).

[11] Tail risk is derived from the deviation of returns from the mean return within each estimation window, for returns less than VaR. Nonparametric tail risk at the 95% confidence level (TR_np (95%)) was estimated with returns lower than VaR_np (95%).

[12] Cornish-Fisher tail risk at the 95% confidence level (TR_cf (95%)) was calculated with returns below VaR_cf (95%).

[13] The lockup period of a fund without a lockup provision was set to 0.

Despite the fact that all funds in the HF and FOHF databases are regarded as a single asset class, the HFs and FOHFs are heterogeneous according to their strategies. Thus, the style effects were adjusted by adding strategy dummy variables to the univariate regression as well as multivariate regression. The univariate regression model for HFs and FOHFs with strategy dummy variables[14] is as follows:

$$R_{it} = \sum_{s=1}^{4} D_s \, \alpha_{s,t} + \beta_t RM_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

In addition, univariate regression models for HFs and FOHFs with strategy dummy variables for age, size and liquidity effects are as follows.

$$R_{it} = \sum_{s=1}^{4} D_s \, \alpha_{s,t} + \beta_t Age_{i,t-1} + \varepsilon_{i,t} \quad (7)$$

$$R_{it} = \sum_{s=1}^{4} D_s \, \alpha_{s,t} + \beta_t Ln(AUM)_{i,t-1} + \varepsilon_{i,t} \quad (8)$$

$$R_{it} = \sum_{s=1}^{4} D_s \, \alpha_{s,t} + \beta_t Lockup_{i,t-1} + \varepsilon_{i,t} \quad (9)$$

Similarly, the multivariate regression model for HFs and FOHFs with strategy dummy variables is specified as follows.

$$R_{it} = \sum_{s=1}^{4} D_s \, \alpha_{s,t} + \beta_{1t} RM_{i,t-1} + \beta_{2t} Age_{i,t-1} + \beta_{3t} Ln(AUM)_{i,t-1} + \beta_{4t} Lockup_i + \varepsilon_{i,t} \quad (10)$$

Empirical Results

Results at the Portfolio Level of HFs and FOHFs

Table 3 shows the cross-sectional relation at the portfolio level between the Cornish-Fisher expected shortfall (ES_cf) at the 95% confidence level and expected returns for all HFs and FOHFs based on the sample of live, dead and combined funds. The time-series (180 months) average returns and ES_cf of the ten portfolios formed by ranking the ES_cf are presented in the Table 3.

The results from the alternative eight risk measures are similar[15]. As an example of monotonicity of average returns, we focused on a particular risk measure, Cornish-Fisher expected shortfall, given in Table 3. The results in Table 3 indicated that, for ES_cf, when moving from a low risk portfolio to a high risk portfolio, there was almost a monotonic increase in the average return of HFs in the live and the combined fund. The monotonically increasing risk-return relation did not appear for the case of dead HFs. This might be caused by the fact that some funds with very high risk and negative return eventually joined the Dead Fund database. By contrast, all the samples of live, dead and combined FOHFs rarely showed this monotonically increasing risk-return relationship. It can be observed in Table 3 that when they were compared within the same portfolio, the average value of the ES_cf risk measures for all HFs were always greater than that corresponding to the FOHFs except for the low ES_cf portfolio.

[14] The HF strategy dummy variables are categorised into Equity Hedge, Event Driven, Macro, and Relative Value, while the FOHF strategy dummy variables are categorized into Conservative, Diversified, Market Defensive, and Strategic.

[15] The results for the other risk measures are not presented due to limited space. These results are available from the author upon request.

Table 3
Average Returns of HF and FOHF Portfolios Formed According to 95% Cornish-Fisher Expected Shortfall: January, 1995 to December, 2009

			Low ES_cf	2 ES_cf	3 ES_cf	4 ES_cf	5 ES_cf	6 ES_cf	7 ES_cf	8 ES_cf	9 ES_cf	High ES_cf	All
HF	Live	ES_cf	0.64	2.16	3.30	4.47	5.71	6.98	8.58	10.57	13.66	23.16	7.92
		Return	0.82	0.74	0.79	0.94	1.00	0.99	1.12	1.07	1.21	1.56	1.02
	Dead	ES_cf	0.56	2.03	3.17	4.29	5.46	6.83	8.52	10.76	14.10	23.85	7.95
		Return	0.64	0.48	0.52	0.49	0.48	0.65	0.57	0.63	0.54	0.41	0.58
	Combined	ES_cf	0.60	2.09	3.23	4.39	5.63	6.96	8.64	10.84	14.01	23.40	7.98
		Return	0.76	0.63	0.70	0.73	0.78	0.84	0.91	0.96	0.98	1.12	0.84
FOHF	Live	ES_cf	0.84	1.65	2.22	2.76	3.35	3.95	4.55	5.26	6.36	10.47	4.14
		Return	0.63	0.63	0.69	0.69	0.72	0.68	0.76	0.73	0.73	0.60	0.68
	Dead	ES_cf	0.71	1.72	2.35	2.93	3.54	4.19	4.90	6.10	8.13	14.50	5.58
		Return	0.66	0.51	0.61	0.53	0.49	0.56	0.62	0.33	0.61	0.31	0.57
	Combined	ES_cf	0.74	1.64	2.24	2.79	3.39	4.01	4.67	5.52	7.02	12.75	4.47
		Return	0.63	0.62	0.68	0.66	0.59	0.62	0.67	0.65	0.53	0.49	0.62

Note: Portfolios are formed on a monthly basis. For each month, 10 equally weighted portfolios are formed on the basis of ranked values according to 95% Cornish-Fisher expected shortfall estimated from the previous 36 to 60 monthly returns (as available) for each HF and FOHF. This table shows the 95% Cornish-Fisher expected shortfall and returns of each portfolio calculated from HFs and FOHFs. The reported 95% Cornish-Fisher expected shortfall is the time-series (180 months) average of the average 95% Cornish-Fisher expected shortfall of all HFs and FOHFs in each portfolio. The reported return is the time-series (180 months) average of the monthly equal-weighted portfolio returns (in percent).

Table 4 shows the average return differential between low risk portfolio and high risk portfolio. The p-value in bracket was obtained from the nonparametric Wilcoxon test[16] for the average return differential for live funds, dead funds, and combined funds.

Although the return differentials between the high risk portfolio and the low risk portfolio were not the same across the eight risk measures, the test results were, nevertheless, similar. From Table 4, the live HF samples showed that the average return of the low risk portfolio differed significantly from the average return of high risk portfolio at the conventional significant level. This was true for all risk measures. In the case of the dead HFs, there were no significant differences between the average returns of the low risk portfolio and the high risk portfolios. Funds in the combined HFs presented similar results across all the risk measures except for the portfolio formed by VaR_cf which showed insignificant result. The differences in the average returns of the low risk and the high risk portfolios for risk measures including the SD, SEMD, VaR_np, ES_np, TR_np and TR_cf were all significant at the 5% level, whereas, for ES_cf they were significant at the 10% level.

[16] It is well established in the literature that the reported returns of HFs and FOHFs are not normally distributed and, therefore, a parameter t-test is not appropriate.

Table 4
Test for Average Return Differential Between the Most Risky Portfolio and the Least Risky Portfolio

Return Differential	HF			FOHF		
	Live	Dead	Combined	Live	Dead	Combined
High SD - Low SD	0.9459% (0.0099)	0.1104% (0.2234)	0.6567% (0.0108)	0.1683% (0.1229)	-0.0812% (0.8474)	-0.0799% (0.6290)
High SEMD - Low SEMD	0.9367% (0.0104)	0.1283% (0.2499)	0.6126% (0.0114)	0.1405% (0.0931)	-0.1312% (0.7466)	-0.0854% (0.5129)
High VaR_np - Low VaR_np	0.8742% (0.0540)	-0.1744% (0.2622)	0.4081% (0.0287)	0.0236% (0.3706)	-0.4198% (0.5651)	-0.2345% (0.9427)
High VaR_cf - Low VaR_cf	0.7354% (0.0554)	-0.2204% (0.5367)	0.3828% (0.1254)	-0.0078% (0.3509)	-0.3355% (0.4097)	-0.2098% (0.9411)
High ES_np - Low ES_np	0.9234% (0.0143)	-0.1481% (0.4260)	0.4281% (0.0399)	-0.0170% (0.3006)	-0.3134% (0.6398)	-0.1605% (0.5970)
High ES_cf - Low ES_cf	0.7466% (0.0169)	-0.2220% (0.3239)	0.3634% (0.0614)	-0.0331% (0.2834)	-0.3477% (0.5234)	-0.1402% (0.7245)
High TR_np - Low TR_np	0.9715% (0.0130)	-0.0089% (0.1799)	0.5840% (0.0127)	-0.0089% (0.1799)	-0.1633% (0.7713)	-0.1033% (0.5012)
High TR_cf - Low TR_cf	0.8794% (0.0087)	-0.0620% (0.2461)	0.5185% (0.0245)	0.0085% (0.2566)	-0.1161% (0.9394)	-0.0979% (0.4493)

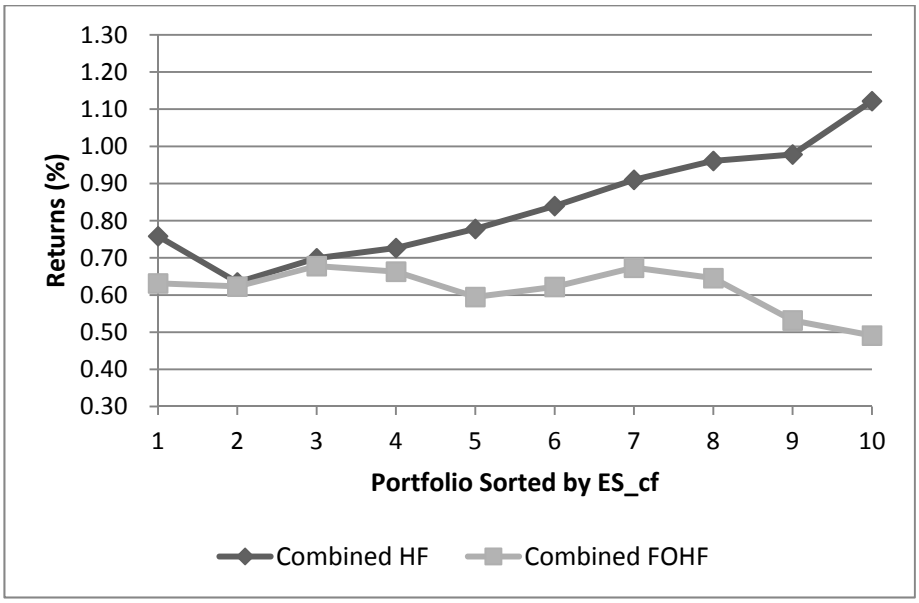
The results for the FOHFs contrasted with those of HFs. All portfolios in the live, dead, and combined FOHFs did not indicate a significant average return differential between the low risk portfolio and the high risk portfolio in all eight risk measures. These results can be expected from the fact that the FOHFs did not show any monotonically increasing relationship between risk and return as shown in Table 3. It should be noted that in almost all of the FOHF portfolios, the average differential calculated by subtracting the average return of the low risk portfolio from the average return of the high risk portfolio was a negative value[17]. Also, it can be observed that the value of return differential for all HFs was always higher than that corresponding to the FOHFs. This was true for all eight risk measures.

As a consequence, the cross-sectional relationship between risk and return of FOHFs was observed to be not the same as that of HFs. Figure 1 presents returns of the combined HF and combined FOHF portfolios formed by ranking the ES_cf in order to compare the cross-sectional relationship between the risk and return of HFs and FOHFs. The figures for the alternative eight risk measures were very similar[18].

[17] For the live FOHF portfolios formed by SD, SEMD and VaR_np, the average return differential between the low risk portfolio and high risk portfolio was a positive value.

[18] The figures for the other risk measures are not presented due to limited space. These figures are available from the author upon request.

Figure 1
Returns of Portfolios Sorted by ES_cf: January, 1995 to December, 2009



As can be seen from the Figure 1, the ES_cf risk measure presented different risk-return trade-off between HFs and FOHFs. The generally accepted risk-return relationship was found in the case of the HFs. However, FOHFs did not show the monotonically increasing risk-return relationship. This result suggested that, even though HFs were more volatile than FOHFs, investing in FOHFs could be riskier than investing in HFs if the investment decision was only based on this risk-return relationship.

Overall, while the risk-return trade-off for HFs can be found from the available data, the FOHFs barely disclose a clear relationship between risk and return. As indicated above, the results from the analysis across the eight alternative risk measures at the portfolio level were similar. This made it difficult to conclude that there was an appropriate risk measure capturing cross-sectional relationship between risk and return for both HFs and FOHFs. One lesson from this analysis is that investors should bear in mind the different risk-return relationships between FOHFs and HFs, and be more cautious about investment in the FOHFs than in HFs due to the unanticipated risk-return relationship of FOHFs.

Results at the Individual HF and FOHF level: A Cross-sectional Regression

According to the empirical results from the analysis at the portfolio level, the available data on HFs seemed to reveal the risk-return trade-off. However, all risk measures presented a similar significance level for testing the difference of average returns between the low risk portfolio and the high risk portfolio. This result made it difficult to determine an appropriate risk measure to capture the cross-sectional variation. Furthermore, it should be noted that fund specific information could be lost when we test at the portfolio level, although aggregating may produce more reliability in the statistical testing process.

Before conducting cross-sectional regressions for risk measures, univariate cross-sectional regressions of HF and FOHF returns on age, size and liquidity were performed to

test the significance of these fund characteristics. Table 5 shows the results of these regressions.

Table 5
Univariate Cross-sectional Regressions of HF and FOHF Returns on Age, Size and Liquidity: January, 1995 to December, 2009

Panel A : Cross-Sectional Regressions for HFs

Model		Age		ln(A)		Lockup	
		Beta	R^2	Beta	R^2	Beta	R^2
Without Fund Strategy Dummy Variables	Live	-0.0001 (0.0002)	0.62%	-0.1102 (0.0000)	0.57%	0.0002 (0.0316)	0.83%
	Dead	-0.0001 (0.0000)	1.03%	-0.1036 (0.0000)	0.61%	0.0006 (0.0094)	1.89%
	Combined	-0.0001 (0.0000)	0.39%	-0.0996 (0.0000)	0.40%	0.0005 (0.0044)	0.70%
With Fund Strategy Dummy Variables	Live	-0.0001 (0.0000)	7.01%	-0.1013 (0.0000)	7.32%	0.0002 (0.0608)	6.93%
	Dead	-0.0001 (0.0000)	5.79%	-0.1036 (0.0000)	6.04%	0.0005 (0.0011)	5.86%
	Combined	-0.0001 (0.0000)	5.53%	-0.0937 (0.0000)	5.74%	0.0005 (0.0000)	5.51%

Panel B : Cross-Sectional Regressions for FOHFs

Model		Age		ln(A)		Lockup	
		Beta	R^2	Beta	R^2	Beta	R^2
Without Fund Strategy Dummy Variables	Live	0.0000 (0.9171)	0.63%	-0.0150 (0.1971)	1.57%	0.0002 (0.0283)	0.92%
	Dead	0.0000 (0.1074)	1.40%	0.0407 (0.0180)	2.20%	0.0002 (0.2648)	1.98%
	Combined	0.0000 (0.4256)	0.54%	0.0202 (0.0978)	1.09%	0.0001 (0.2495)	0.73%
With Fund Strategy Dummy Variables	Live	0.0000 (0.9590)	10.40%	-0.0041 (0.7179)	11.56%	0.0002 (0.0309)	10.66%
	Dead	0.0000 (0.3981)	9.71%	0.0235 (0.0668)	9.60%	0.0001 (0.6371)	9.80%
	Combined	0.0000 (0.4949)	8.89%	0.0239 (0.0591)	9.54%	0.0001 (0.1850)	8.99%

Note: The average slope is the time-series (180 months) average of the monthly cross-sectional regression slopes for January, 1995 to December, 2009. The p-value in brackets is obtained from a standard t-test. Age is calculated on a daily basis. Fund size is measured by ln(A) where A is funds' assets under management. Fund liquidity is measured by lockup period on a daily basis. Panel A shows the results from univariate cross-

sectional regressions for HFs without HF strategy dummy variables as defined in equation (2) to (4) and with HF strategy dummy variables as defined in equation (7) to (9). Panel B shows the results from univariate cross-sectional regressions for FOHFs without FOHF strategy dummy variables as defined in equation (2) to (4) and with FOHF strategy dummy variables as defined in equation (7) to (9).

For HFs, all three variables were significant at the 1% level in all regression models except for the lockup period variable for live HFs. The younger HFs provided significantly higher returns than the older HFs. The smaller the HFs, the higher the returns. The HFs with longer lockup period had significantly higher returns than the HFs with shorter lockup period. This was the case for the live, dead and combined HFs. The results for FOHFs were different from those for the HFs. It is interesting to note that the age appeared not important to all FOHF returns. Fund size seemed to be a significant factor for dead and combined FOHF returns, while it seemed not to be for live FOHF returns. In contrast, lockup variable showed significance at the 5% level only for the live FOHF returns. Results from the cross-sectional regression model for the dead and the combined FOHFs showed that the direction of the time-series average of the regression slope for size was different from that for the dead and the combined HFs. The larger FOHFs in the dead and the combined sample provided higher returns than the smaller FOHFs.

Table 6 shows the results of univariate and multivariate cross-sectional regressions of HF and FOHF returns on the ES_cf with a set of fund characteristics that include fund age, size and liquidity. [19]

The time-series average of the coefficients from the cross-sectional regressions of the one-month ahead returns on the risk measure were used to determine which explanatory variables on average had non-zero expected premiums. Panel A presents the results from cross-sectional regressions for the HFs, while Panel B shows the results from cross-sectional regressions for the FOHFs. In each regression model in Table 6, the first row indicates the average of the time-series coefficients, β_t, for one or more covariates over the 180 months from January, 1995 to December, 2009. The p-values from a standard t-test appear in parentheses and the average R^2 for each regression model is presented in the last column of Table 6.

It is interesting to note that the R^2 of the univariate regression model with an independent risk measure variable in Table 6 was much higher than that of the corresponding univariate regression model using fund characteristics as explanatory variables in Table 5. This result meant that risk measures had much higher ability to explain hedge fund returns than fund characteristics such as fund age, size and liquidity.

[19] The results from univariate and multivariate cross-sectional regression of HF and FOHF returns on the other risk measures are not reported due to limited space. These results are available from the author upon request.

Table 6
Average Values of the 180 Regression Slopes from the Month-by-month Regressions of HF and FOHF Returns on 95% Cornish-Fisher Expected Shortfall, Age, Size and Liquidity: January, 1995 to December, 2009

Panel A : Cross-Sectional Regressions for HFs

Model			ES_cf	Age	ln(A)	Lockup	R^2
Univariate Regression	Without Strategy Dummy Variables	Live	0.0380 (0.0058)				7.34%
		Dead	0.0144 (0.3511)				6.26%
		Combined	0.0256 (0.0043)				5.24%
	With Strategy Dummy Variables	Live	0.0342 (0.0060)				13.89%
		Dead	0.015 (0.2567)				10.17%
		Combined	0.0219 (0.0127)				10.31%
Multivariate Regression	Without Strategy Dummy Variables	Live	0.0379 (0.0034)	0.0000 (0.6203)	-0.0633 (0.0009)	0.0001 (0.6813)	9.84%
		Dead	0.0078 (0.6110)	0.0000 (0.2764)	-0.0102 (0.5962)	0.0003 (0.1475)	7.04%
		Combined	0.0243 (0.0902)	0.0000 (0.4232)	-0.0231 (0.1368)	0.0003 (0.1211)	6.57%
	With Strategy Dummy Variables	Live	0.0353 (0.0412)	0.0000 (0.4726)	-0.0585 (0.0008)	0.0000 (0.6715)	15.82%
		Dead	0.0129 (0.3323)	0.0000 (0.2299)	-0.0101 (0.5436)	0.0004 (0.0262)	11.46%
		Combined	0.0209 (0.0349)	0.0000 (0.1920)	-0.0193 (0.1454)	0.0003 (0.0146)	11.25%

Table 6 *(Continued)*

Panel B : Cross-Sectional Regressions for FOHFs

Model			ES_cf	Age	ln(A)	Lockup	R^2
Univariate Regression	Without Strategy Dummy Variables	Live	0.0049 (0.8076)				11.43%
		Dead	0.0073 (0.7112)				8.48%
		Combined	0.0008 (0.9665)				8.33%
	With Strategy Dummy Variables	Live	-0.0051 (0.7709)				17.79%
		Dead	0.0007 (0.9710)				15.74%
		Combined	-0.0034 (0.8393)				14.65%
Multivariate Regression	Without Strategy Dummy Variables	Live	0.0006 (0.9779)	0.0000 (0.5202)	-0.0061 (0.6187)	0.0002 (0.1287)	15.11%
		Dead	0.0099 (0.6349)	-0.0001 (0.1801)	0.0347 (0.0883)	0.0003 (0.1300)	13.78%
		Combined	0.0051 (0.7883)	0.0000 (0.2290)	0.0272 (0.0762)	0.0002 (0.1873)	11.69%
	With Strategy Dummy Variables	Live	-0.0099 (0.5917)	0.0000 (0.3735)	-0.0025 (0.8328)	0.0002 (0.0641)	21.71%
		Dead	0.0023 (0.9140)	-0.0001 (0.1040)	0.0302 (0.1243)	0.0001 (0.4564)	20.66%
		Combined	-0.001 (0.9579)	0.0000 (0.1265)	0.0253 (0.0850)	0.0002 (0.1471)	17.74%

Note: The average coefficients are the time-series (180 months) average of the monthly cross-sectional regression slopes for January, 1995 to December, 2009. The p-value in brackets is obtained from a standard t-test. Age is calculated on a daily basis. Fund size is measured by ln(A) where A is funds' assets under management. Fund liquidity is measured by lockup period on a daily basis. Panel A shows results from univariate and multivariate cross-sectional regressions for HFs without HF strategy dummy variables as defined in equation (1) and (5) and with HF strategy dummy variables as defined in equation (6) and (10). Panel B shows results from univariate and multivariate cross-sectional regressions for FOHFs without FOHF strategy dummy variables as defined in equation (1) and (5) and with FOHF strategy dummy variables as defined in equation (6) and (10).

In order to compare alternative risk measures the univariate and multivariate cross-sectional regression results are summarised in Table 7. Panel A shows results from HF regression, while Panel B presents those from FOHF regression. In each regression model in Table 7, the first row indicates the average of the time-series coefficients, β_t, for risk measure covariate over the 180 months from January, 1995 to December, 2009. The symbols ***, ** and * indicate whether the risk measure coefficient for each regression model is significantly different from zero at the 1%, 5% and 10% level of significance, respectively. The average R^2 for each regression model appears in parentheses.

Table 7

Average Values of the 180 Regression Slopes from the Month-by-month Regressions of HF and FOHF Returns on Eight Risk Measures: January, 1995 to December, 2009

Panel A : Regressions for HFs

Risk Mesure	Without Strategy Dummy Variables						With Strategy Dummy Variables					
	Univariate Regression			Multivariate Regression			Univariate Regression			Multivariate Regression		
	Live	Dead	Combined	Live	Dead	Combined	Live	Dead	Combined	Live	Dead	Combined
SD	0.1012**	0.0341	0.0724*	0.0966**	0.0180	0.0701*	0.1037*	0.0413	0.0701*	0.1007	0.0351	0.0668
	(8.93%)	(5.83%)	(6.31%)	(11.36%)	(7.65%)	(7.64%)	(15.25%)	(10.88%)	(11.24%)	(17.09%)	(12.20%)	(12.21%)
SEMD	0.1504**	0.0538	0.1101*	0.1441**	0.0338	0.1073*	0.1509**	0.0634	0.1053*	0.1468*	0.0558	0.1013*
	(9.57%)	(6.46%)	(6.90%)	(12.03%)	(8.26%)	(8.24%)	(15.84%)	(11.36%)	(11.75%)	(17.71%)	(12.64%)	(12.72%)
VaR_np	0.0568*	0.0117	0.0370	0.0534*	0.0034	0.0354*	0.0556	0.0137	0.0334	0.0536	0.0104	0.0315
	(8.77%)	(6.15%)	(6.24%)	(11.28%)	(7.85%)	(7.62%)	(15.03%)	(11.08%)	(11.16%)	(16.95%)	(12.38%)	(12.14%)
VaR_cf	0.0578*	0.016	0.0415	0.0547*	0.008	0.0405	0.0547	0.0186	0.0376	0.0531	0.0162	0.0365
	(8.92%)	(7.33%)	(6.45%)	(11.36%)	(8.09%)	(7.82%)	(15.13%)	(11.16%)	(11.30%)	(17.00%)	(12.46%)	(12.29%)
ES_np	0.0447**	0.0126	0.0295*	0.0435**	0.0083	0.0283*	0.0418**	0.0161	0.0258*	0.0422*	0.0137	0.0247*
	(8.46%)	(5.71%)	(5.93%)	(11.06%)	(7.50%)	(7.29%)	(14.78%)	(10.63%)	(10.88%)	(16.80%)	(11.91%)	(11.85%)
ES_cf	0.038***	0.0144	0.0256**	0.0379***	0.0078	0.0243*	0.0342***	0.0150	0.0219**	0.0353**	0.0129	0.0209**
	(7.34%)	(6.26%)	(5.24%)	(9.84%)	(7.04%)	(6.57%)	(13.89%)	(10.17%)	(10.31%)	(15.82%)	(11.46%)	(11.25%)
TR_np	0.0449**	0.0148	0.0307*	0.0438**	0.0103	0.0294*	0.0430**	0.0187	0.0279*	0.0431*	0.0160	0.0266*
	(8.74%)	(5.78%)	(6.16%)	(11.31%)	(7.58%)	(7.51%)	(15.10%)	(10.69%)	(11.10%)	(17.08%)	(11.97%)	(12.06%)
TR_cf	0.0390***	0.0150	0.0268**	0.0388**	0.0089	0.0254*	0.0363***	0.0169	0.0238**	0.0370**	0.0144	0.0226*
	(7.76%)	(6.19%)	(5.53%)	(10.27%)	(7.17%)	(6.86%)	(14.32%)	(10.29%)	(10.58%)	(16.25%)	(11.58%)	(11.51%)

Table 7 *(Continued)*

Panel B : Regressions for FOHFs

Risk Mesure	Without Strategy Dummy Variables						With Strategy Dummy Variables					
	Univariate Regression			Multivariate Regression			Univariate Regression			Multivariate Regression		
	Live	Dead	Combined	Live	Dead	Combined	Live	Dead	Combined	Live	Dead	Combined
SD	0.0344	0.0212	0.0238	0.0354	0.0453	0.0446	0.0032	0.0141	0.0100	0.0001	0.0363	0.0299
	(14.73%)	(10.53%)	(11.16%)	(18.13%)	(16.18%)	(14.61%)	(19.60%)	(17.32%)	(16.22%)	(23.34%)	(22.34%)	(19.47%)
SEMD	0.0522	0.0265	0.0222	0.0535	0.0612	0.0514	0.0098	0.019	0.0055	0.0047	0.0463	0.0310
	(15.63%)	(10.77%)	(11.56%)	(18.96%)	(16.27%)	(14.93%)	(20.47%)	(17.37%)	(16.57%)	(24.18%)	(22.30%)	(19.72%)
VaR_np	0.0158	-0.0260	-0.0103	0.0131	-0.0053	0.0036	-0.0014	-0.0364	-0.0230	-0.0040	-0.0217	-0.0117
	(14.02%)	(8.83%)	(9.82%)	(17.35%)	(14.47%)	(13.01%)	(19.24%)	(15.99%)	(15.11%)	(22.96%)	(20.94%)	(18.20%)
VaR_cf	0.0144	0.0015	0.0023	0.0125	0.0175	0.0153	-0.0068	-0.0081	-0.0096	-0.0107	0.0004	-0.0006
	(14.64%)	(8.72%)	(9.67%)	(18.07%)	(14.22%)	(13.03%)	(19.96%)	(15.78%)	(15.18%)	(23.73%)	(20.76%)	(18.34%)
ES_np	0.0102	-0.0003	-0.0003	0.0056	0.0103	0.0087	-0.0032	-0.0057	-0.0072	-0.0081	0.0010	-0.0002
	(13.57%)	(9.54%)	(9.94%)	(17.06%)	(15.05%)	(13.42%)	(18.99%)	(16.22%)	(15.34%)	(22.86%)	(21.29%)	(18.58%)
ES_cf	0.0049	0.0073	0.0008	0.0006	0.0099	0.0051	-0.0051	0.0007	-0.0034	-0.0099	0.0023	-0.0010
	(11.43%)	(8.48%)	(8.33%)	(15.11%)	(13.78%)	(11.69%)	(17.79%)	(15.74%)	(14.65%)	(21.71%)	(20.66%)	(17.74%)
TR_np	0.0132	0.0104	0.0067	0.0111	0.0188	0.0144	0.0013	0.0079	0.0025	-0.0026	0.0135	0.0087
	(14.10%)	(10.39%)	(10.68%)	(17.56%)	(15.81%)	(14.09%)	(19.29%)	(16.88%)	(15.96%)	(23.12%)	(21.89%)	(19.11%)
TR_cf	0.0078	0.0127	0.0058	0.0053	0.0156	0.0097	-0.0016	0.0087	0.0029	-0.0053	0.0099	0.0049
	(12.16%)	(9.49%)	(9.40%)	(15.80%)	(14.81%)	(12.67%)	(18.20%)	(16.55%)	(15.41%)	(22.10%)	(21.35%)	(18.38%)

Compared with the results from the test at the portfolio level in Table 3 and Table 4, the cross-sectional regression results made it possible to distinguish risk measures in terms of their ability to describe the cross-sectional variation in expected returns of HFs. As can be seen in Panel A of Table 7, the semi-deviation, expected shortfall and tail risk measures represented greater levels of significance than the standard deviation in both the univariate and multivariate regressions for HFs. Particularly, the Cornish-Fisher expansion was marginally better than the nonparametric measures for both expected shortfall and tail risk. The results were consistent with those of Liang and Park (2007). The multiple regression coefficients (average R^2) of ES_cf and TR_cf with fund strategy dummy variables for combined HFs were 0.0209 (11.25%) and 0.0226 (11.51%), respectively. They were positive and significantly different from zero at the 5% and 10% level, respectively. By contrast, the coefficient on standard deviation from the same model was not significant.

Contrary to the results showing that semi-deviation, expected shortfall and tail risk were superior to the standard deviation, VaR failed to reveal as much explanatory power as standard deviation. Interestingly, the VaR_cf explained less cross-sectional variation than the VaR_np[20] in the multivariate model without strategy dummy variables. This was consistent with the results of VaR at the portfolio level in Table 4[21]. In addition, the inclusion of the strategy dummy variables in the regression models made it possible to compare the results for the standard deviation measure with the other risk measures, except for VaR. ES_cf and TR_cf retained their significance levels after the adjustment of strategy effects, while the other risk measures lost explanatory power due to inclusion of investment strategy dummy variables. The average R^2 increased after the inclusion of strategy dummy variables in all regression models of HFs. This showed that each investment strategy tended to provide explanatory power for expected returns.

When the FOHFs were examined separately, the results were found to be different from those of HFs. Unfortunately, none of the risk measures exhibited predictive ability for FOHF returns as shown in Panel B of Table 7. This was consistent with the results of FOHFs at the portfolio level in Table 4. Therefore, the risk and return characteristics of FOHFs were also found to be different from those of HFs when the eight risk measures were analysed at the individual level.

Conclusions

The collapse of some high profile hedge funds such as the Long Term Capital Management (LTCM) in 1998, the Soros Fund in 2000 and two Bear Stearns Hedge Funds in 2007 has emphasised the importance of downside risk management in the hedge fund industry. Due to dynamic trading strategies, traditional risk management measures were not appropriate risk measures to be applied to HFs and FOHFs. In this study, the risk-return trade-off in HFs and FOHFs were investigated and compared by alternative risk measures such as semi-deviation, Value at Risk, expected shortfall and tail risk. Also these risk measures were compared with the standard deviation in terms of their ability to explain the cross-sectional variation in the HF and FOHF returns.

As presented in the empirical results at the portfolio and individual levels, the FOHFs did not show the generally accepted risk-return trade-off. These results could be explained by the following facts. Firstly, as FOHFs were diversified portfolios of HFs, the variations of

[20] This is different from the results of Liang and Park (2007) where VaR_cf showed more significance than VaR_np.

[21] For combined HFs, the p-value of testing average return differential between low VaR_np and high VaR_np portfolio (0.0287) is lower than that between low VaR_cf and high VaR_cf portfolios (0.1254).

risk among FOHF portfolios formed by ranking a risk measure would be much less than risk variations among HF portfolios. Secondly, FOHF investors were observed to achieve less return than HF investors due to the different fee structure between HFs and FOHFs. While a HF charges a management and incentive fee, a FOHF charges extra fees at the underlying HF level as well as management and incentive fees at the FOHF level. Lastly, the negative relationship between risk and return in dead FOHFs would considerably affect the risk-return trade-off in overall FOHFs. Therefore, it can be expected that FOHFs did not display the statistically significant positive relationship between risk and return under the circumstances numerated above.

When the HFs were examined separately, the live and the combined HFs presented monotonically increasing risk-return relationships across the portfolios based on the estimated risk measures. The results at the individual level for the live and the combined HFs showed that semi-deviation, expected shortfall and tail risk were superior to the standard deviation in terms of their ability to explain the cross-sectional variation in expected returns, while VaR did not reveal as much explanatory power as did standard deviation. The Cornish-Fisher expansion was slightly better than nonparametric measures for both expected shortfall and tail risk. Furthermore, ES_cf and TR_cf kept their significance level when the investment strategy effects were included in the models, while the other risk measures decreased their explanatory power after controlling strategy effects.

The fund characteristics such as size, age and liquidity displayed explanatory power in cross-sectional variation for both combined HF and FOHF returns. However, the directions of age and size effects on expected returns were found to be different between combined HFs and FOHFs. The risk measures explained HF and FOHF returns better than the fund characteristics such as age, size and liquidity. Also the inclusion of the investment strategy dummy variables in all regression models of HFs increased average R^2. This meant that each investment strategy tended to provide explanatory power for expected returns.

It can be concluded from the empirical results that the available data on HFs and FOHFs exhibited different risk-return trade-offs. The ES_cf or TR_cf could be an appropriate risk measure for HF return. While appropriate alternative risk measures for the HFs could be found, it was difficult to determine the risk measures that best captured the cross-sectional variation in FOHF returns. Therefore, FOHF investors should apply different investment strategies from those adopted when investing in HFs. Also they should be more cautious about investment in FOHFs than that in HFs in terms of the risk-return relationship.

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Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 5

2012

Partnership Versus Public Ownership of Accounting Firms: Exploring Relative Performance, Performance Measurement and Measurement Issues

Mark E. Pickering
Swinburne University, mpickering@swin.edu.au

Recommended Citation
Pickering, Mark E., Partnership Versus Public Ownership of Accounting Firms: Exploring Relative Performance, Performance Measurement and Measurement Issues, *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 65-84.

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Abstract

Despite theoretical arguments that partnerships are the most efficient ownership form for professional service firms (PSFs), PSFs are increasingly moving to other ownership structures, such as publicly listed companies (PLCs). Research on the comparative performance of PSF, PLCs and partnerships is sparse with conflicting results suggesting that some segments of PSFs are moving to a less efficient form. This study explores the performance of two Australian accounting PLCs compared to a sample of similar sized mid tier accounting firms. The accounting PLCs achieved substantially higher revenue growth rates but lower productivity than the partnership sample. Measurement issues were identified in the use of closing resource numbers and different treatment of reporting merger and acquisition revenues which may partially explain the underperformance of publicly owned PSFs in prior studies. The need for research at a more detailed level exploring the market and service focus, organisational structures, resources utilised and resource costs across different PSF ownership forms is suggested.

Keywords

Professional services, partnership, public ownership, accounting firms, performance, publicly quoted

Cover Page Footnote

This research was carried out while the author was a doctoral student at RMIT University and while teaching at Swinburne University. The author would like to acknowledge the support of David Kimber, formerly of RMIT, and Judy Oliver of Swinburne.

Partnership Versus Public Ownership of Accounting Firms: Exploring Relative Performance, Performance Measurement and Measurement Issues.

Mark E Pickering[1]

Abstract

Despite theoretical arguments that partnerships are the most efficient ownership form for professional service firms (PSFs), PSFs are increasingly moving to other ownership structures, such as publicly listed companies (PLCs). Research on the comparative performance of PSF, PLCs and partnerships is sparse with conflicting results suggesting that some segments of PSFs are moving to a less efficient form. This study explores the performance of two Australian accounting PLCs compared to a sample of similar sized mid tier accounting firms. The accounting PLCs achieved substantially higher revenue growth rates but lower productivity than the partnership sample. Measurement issues were identified in the use of closing resource numbers and different treatment of reporting merger and acquisition revenues which may partially explain the underperformance of publicly owned PSFs in prior studies. The need for research at a more detailed level exploring the market and service focus, organisational structures, resources utilised and resource costs across different PSF ownership forms is suggested.[2]

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JEL Codes: L22, L25, L84, M41.

[1] Swinburne University, Australia
Email:mpickering@pickeringbyrnes.com.au
[2] This research was carried out while the author was a doctoral student at RMIT University and while teaching at Swinburne University. The author would like to acknowledge the support of David Kimber, formerly of RMIT, and Judy Oliver of Swinburne.

Introduction

Since American Express started acquiring accounting firms in the 1990s (Shafer, Lowe & Fogarty 2002), publicly listed accounting companies have emerged as substantial organisations. Through rapid growth, accounting publicly listed companies (PLCs) have become larger than all but the 'big four' accounting firms in Australia (King 2010) and the US (Accounting Today 2011) and include the seventh largest accounting firm in the UK (Grant 2010).

More broadly, there has been a trend across a number of other professions away from the partnership form of ownership to other structures including limited liability partnerships, incorporation and PLCs (Greenwood, Deephouse & Li 2007; Greenwood & Empson 2003; Von Nordenflycht 2007). While the partnership form has been theorised to be an important attribute of the performance of professional service firms (PSFs) (Greenwood & Empson 2003), there has been limited research of the relative performance of different forms of ownership of these types of organisations (Greenwood et al. 2007; Von Nordenflyct 2007). Despite the significant size of PLCs providing accounting as their dominant service no previous studies were identified exploring the performance of these organisations.

Related studies of the relative performance of different forms of ownership of large consulting firms (Greenwood et al. 2007) and advertising firms (Von Nordenflycht 2007) conclude that for some segments the movement to publicly owned companies is to a less efficient form. Measuring the relative performance of different ownership forms is problematic due to the lack of access to financial information on private partnerships with innovative researchers using proxies of profitability sourced from published industry surveys (eg. Greenwood et al. 2007; Von Nordenflyct 2007).

There have been calls for further research to gain an insight as to why PSFs are moving to a less profitable ownership form (Greenwood et al. 2007). The limited research to date, information constraints, use of inconsistent proxy measures of performance and somewhat confusing prior findings suggest the need for exploratory analysis into performance measures themselves and the use of published industry survey data.

This paper explores the performance of two Australian publicly owned accounting companies in comparison to a sample of ten second tier accounting partnerships using publicly available proxy measures, revenue growth and revenue per person, adapted from prior studies (eg. Greenwood et al. 2007; Von Nordenflycht 2007). Performance is taken from the perspective of the residual claims of owners rather than the professionals (agents). The measures themselves and underlying data sourced from industry survey data published in Business Review Weekly, were carefully examined to identify any data or measurement issues. Finally, for the two sample publicly owned companies the proxy measures were compared to explore whether they were reflective of the relative underlying financial performance of the companies as reported in company annual reports.

While the study is exploratory it makes a number of contributions on the performance of publicly owned accounting companies in comparison to partnerships and on measurement issues of using these publicly available proxy performance measures to analyse relative performance. It is the first research to consider the performance of the newly emerged accounting PLCs. The research suggests that public ownership enables substantially faster growth than partnership by providing access to company shares as consideration for acquisitions. Rapid growth through acquisition carries risks as indicated by the failure of one of the sample companies and the high failure rate of Australian publicly owned accounting companies. The publicly owned accounting companies were less productive in terms of revenue per person than the sample partnerships. However, limited conclusions can be drawn

on relative profitability across ownership forms due to measurement issues and different market focuses across samples as discussed below.

The study provides insights into potential challenges of using published industry surveys and proxy measures of performance of different ownership forms of accounting and other PSFs. Different approaches to reporting revenues related to mergers and acquisitions by partnerships and PLCs and the use of year end resource (persons/ professionals) numbers rather than annual averages understate the relative productivity of fast growing PLCs when compared to slower growth partnerships.

As theorised (eg. Greenwood & Empson 2003) the PLC sample focused on providing more commoditised services requiring low levels of tailoring of solutions to less sophisticated clients than the sample accounting partnerships. This suggests that lower revenue per person of the PLCs may not reflect lower productivity (hours charged per person) but lower hourly rates related to the types of services provided and customers served. This lower revenue per person noted in the study may therefore be offset by lower employee costs per person than partnership due to the lower specialisation required for less complex services. In this study, proxy measures adapted from prior studies of PSF performance were not found to be representative of the underlying performance of the PLC sub-sample per published financial information.

These identified measurement issues may partially explain prior findings of the underperformance of large publicly owned consulting companies compared to large consulting partnerships (Greenwood et al. 2007). For future research on the relative performance of different ownership forms of accounting and other PSFs this study suggests the need for care in the use of revenue based proxy measures of performance, the need to control for service/client focus across samples and for detailed case studies and researcher surveys to provide a greater understanding of the underlying performance of these entities.

Literature Review

This section examines the literature on partnership as an optimal form of managing professionals, the trend of accounting firms and other large PSFs to other ownership structures, prior studies of the ownership structure and performance relationship and measures used in prior studies.

Partnerships as an Optimal Form for Managing Professionals

Professional service firms, such as accounting, law, engineering and consulting firms have traditionally been structured as professional partnerships (Greenwood, Hinings & Brown 1990). In these organisations, partners act in multiple roles as owners, managers and key professionals which is different to large corporations where ownership, management and operational employment is separated (Greenwood et al. 1990). Partnerships also involve unlimited liability where partners are liable for the actions of other firm partners (Empson and Chapman 2006). The predominance of this form of ownership is due to legal constraints and professional body requirements (Empson & Chapman 2006: Von Nordenflycht 2007) and due to partnership being theorised to be the optimal structure to manage professionals and balance the conflicting needs of shareholders, professionals and clients (Empson & Chapman 2006; Greenwood & Empson 2003).

Partnership has been theorised to balance the potential agency issues (Fama & Jensen 1983) and conflict between firm owners and key professionals over ownership of knowledge assets and client relationships by combining both roles and enabling key professional participation in decision making (Empson & Chapman 2006; Hart & Moore 1990). The

difficulty in applying formal controls due to the complex and non-routine nature of professional activities is addressed in partnerships by the sharing of profits and the use of peer control and self-monitoring processes encouraged by unlimited liability (Empson & Chapman 2006; Greenwood & Empson 2003). The up-or-out approach to promotion is often used in professional partnerships (Galanter & Palay 1991; Gilson & Mnookin 1989; Morris & Empson 1998). The small percentage of juniors making partner and the high rewards of partnership (compensation, involvement in decision making and status (Greenwood & Empson 2003)) represents the 'tournament' system of motivation (Becker and Huselid 1992; Lambert, Larcher & Wielgelt 1993) which has been associated with greater work effort and productivity (eg. Galanter & Palay 1991; Gilson & Mnookin 1989).

Internal ownership, unlimited liability and the up-or-out promotion policy of partnerships provide reassurance to clients even with asymmetric knowledge (Empson & Chapman 2006). Personal liability and their ownership of the firm aligns partners interests with those of clients in terms of ensuring quality standards and not placing external shareholder needs above clients (Shafer et al. 2002). The tournament system provides a safeguard on the professionalism of individual partners for both partners and clients (Covaleski et al. 1998; Galanter & Palay 1991; Gilson & Mnookin 1985).

The above attributes of partnerships have been theorised to result in partnerships having lower internal agency costs than the external agency costs of PLCs that separate ownership from management and the organisation's professionals, remove personal partner liability and detract from the motivational power of the quest to achieve partner status (Greenwood & Empson 2003).

Moves to Other Forms of Ownership

Despite the theorised benefits of partnerships in managing professional service firms, there has been a trend in large professional service firms moving from traditionally being structured as professional partnerships to other forms of ownership, such as unlimited partnerships, private corporations and PLCs (Greenwood & Empson 2003; Greenwood et al. 2007; Von Nordenflycht 2007).

Even traditional professions such as accounting and law have seen some change to public ownership. Accounting firms had traditionally been constrained to partnership and sole trader forms by legislation and the regulations of accounting professional associations (Von Nordenflycht 2007). During the late 1980s and 1990s, due to large legal settlements, accounting firms and professionals lobbied to use ownership structures which limited accounting firm liability and the personal liability of firm partners (Accountancy Age 1986; Bruce 1995). During the 1990s and early 2000s legislative and regulatory changes were introduced in many countries enabling incorporation of accounting firms and the registration of firms as Limited Liability Partnerships in the United States (Hamilton 1995) and the United Kingdom (Linsell 2001).

The late 1990s saw a trend towards the public ownership of accounting firms in the US through the acquisition of thousands of firms by companies such as American Express, H&R Block and CBIZ Inc. (Shafer et al. 2002; Wootton, Wolk & Normand 2003). American Express subsequently exited the accounting business in 2005 selling the business to H&R Block subsidiary RSM McGladery (H&R Block 2005). In Australia in 1998, publicly owned WHK Group (then named Investor Group) acquired its first accounting firm going on to acquire another 150 accounting and financial planning firms over the next twelve years (Pickering 2010). Four other publicly owned companies with major accounting focus were listed in Australia between 2000 and 2003 with all except WHK Group collapsing by 2005 (Drury 2007; Fraser 2005). Survivor WHK Group was recently joined on the Australian

Securities Exchange in December 2010 by CountPlus Limited (Hatch 2011). In the UK early in the 2000s four publicly owned accounting firms were listed and grew rapidly by acquisition (Hanney 2005A; Hinks 2008) with one of these, Numerica PLC, collapsing in 2005 (Hanney 2005B) and a second, Vantis PLC, going into administration in mid-2010 (Armistead 2010). RSM Tenon and insolvency firm Begbies Traynor remain listed in the UK as of early 2011.

While the number of accounting PLCs remains low globally they now represent some of the largest accounting firms outside of the Big 4 in Australia, the US and the UK. In Australia, WHK Group Limited is the 5th largest accounting firm with revenues in 2010 of Aus$348 million (King 2010), RSM and the related McGladery and Pullen are combined the 5th largest firm in the US with revenues of US$1,379 million (Accounting Today 2011) and RSM Tenon PLC is the 7th largest firm in the UK with revenues of UK£225 million (Grant 2010).

In Australia, the first legal services PLCs (Integrated Legal Holdings and Slater and Gordon Limited) have emerged while in the UK the Legal Services Act has recently been passed allowing the ownership of law firms by non-lawyers (Faulconbridge & Muzio 2009).

Factors that may result in the move towards incorporation of PSFs include the growth in the size and complexity of firms resulting in collegiate decision making becoming more difficult and requiring the addition of further controls, the expansion in types of services offered resulting in professionals with different values joining the organization and creating difficulty obtaining agreement and the growing need for capital to fund increasing technology costs (Greenwood & Empson 2003). Environmental factors such as increasing risk of litigation (Van Lent 1999), reduced incentives for professionals to aspire to partnership due to opportunities for greater rewards outside of partnership and a preference for a balanced lifestyle reducing the relative benefits of partnership (Greenwood & Empson 2003).

This is supported by ownership structure related benefits expected by partners of accounting partnerships selling their firms to PLCs. These include: gaining access to capital to enable growth by acquisition and investment in information technology systems; addressing partnership succession issues with firms struggling to find new partners willing and able to pay up to $500,000 to buy in; and the ability to pay out retiring partners (Pickering 2010). Overcoming limitations with consensus decision making in partnerships, particularly as firms grew larger, and difficulties in introducing more corporate governance structures into partnerships were also cited as reasons for selling. Removing partners' liability did not emerge as a major reason for selling into a public company (Pickering 2010).

Relative Performance of Different Forms of Ownership of PSFs

While PSFs have been moving to alternative forms of ownership the question as to whether the form of ownership affects the performance of professional service firms has been neglected (Greenwood et al. 2007; Von Nordenflycht 2007). Greenwood et al. (2007) in the study of large consulting firms find that private companies and partnerships outperform PLCs but found no difference in the performance of partnerships and private corporations. Durand and Vargas (2003) suggest that the relative performance of different ownership forms will change with the size and complexity of organisations. Organisational complexity, as defined by the number of offices, was not found to impact the relationship between ownership form and performance in large consulting firms (Greenwood et al. 2007). However, performance was found to be negatively correlated to the number of professionals in the firm suggesting increasing costs of coordination with size (Greenwood et al. 2007) consistent with Nanda's (2004) study of the performance of US legal firms. Moving to public ownership was not found to lower performance of large advertising agencies but had a negative effect on small

to medium sized agencies (Von Nordenflycht 2007). This raises the issue as to why PSFs are moving to what appears to be an inferior legal form, the PSF PLC (Greenwood et al. 2007).

Performance Measures used in Prior Studies of the Ownership Structure/Performance Relationship

Comparative analysis of the profitability of private and public forms of ownership of PSFs is problematic as private firms, including partnerships, do not usually release financial information (Greenwood et al. 2007; Von Nordenflycht 2007). Innovative researchers, such as Greenwood et al. (2007) and Von Nordenflycht (2007), have utilised proxies of performance sourced from industry publications' ranking reports to perform this analysis.

Greenwood et al. (2007) in their study of large consulting firms utilise revenue per professional (a productivity measure), commonly used in prior PSF studies (for example, Nanda 2004) and by industry analysts (Maister 1993), as a proxy for profitability. Strong relationships have been found between revenue per professional and profit per partner in large US law partnerships (Nanda 2004) and between revenue per professional and profit per professional in large consulting PLCs (Greenwood et al. 2007). Von Nordenflycht (2007), by contrast, did not find a relationship between revenue per employee and profit margin for their sub sample of US advertising PLCs. However, a high correlation was identified between growth rate (annual compounded revenue growth rate over three years) and profit margin in the PLC sub-sample leading the researcher to use growth rate as a proxy for performance in the study.

Prior studies are innovative and insightful in an area that has previously been ignored by researchers (eg Greenwood et al. 2007; Von Nordenflycht 2007). However, the findings may be affected by limitations in the measures used. Both studies assume that the relationship identified in the public company sub sample between the publicly available proxy measure (growth rate or revenue per professional) and underlying profitability is consistent with the unknown relationship between these variables in the sub sample of partnerships. It is possible that these assumptions do not hold. For example, perhaps the same level of revenue per professional in a partnership corresponds with a higher or lower level of profit per professional than in a publicly owned company. It has been theorised that PSF PLCs may have higher bureaucracy and external agency costs than partnerships in order to protect the interests of external shareholders (Greenwood & Empson 2003; Greenwood et al. 2007). This may result in additional layers of management in PLCs and associated costs that would not be included in revenue per professional nor revenue growth measures.

The use of the ratio of inputs to outputs to measure the performance of different ownership forms has been used more broadly in many industry and geographic settings. As well as consulting (Greenwood et al. 2007) these include manufacturing (Durand & Vargas 2003), hotels (Vroom & Gimeno 2007) and in emerging economies (Estrin & Rosevear 1999; Megginson & Netter 2001). Supporting the use by Von Nordenflycht (2007) of revenue growth rates in evaluating the performance of advertising firms, this measure has been used in ownership and performance studies of family businesses (Shulze et al. 2001). Care has been suggested in using profitability based measures due to concerns of manipulation for tax purposes (Durand & Vargas 2003; Shulze et al. 2001) and where accounting standards are poorly enforced (Estrin & Rosevear 1999).

This paper seeks to explore the relative performance of the partnership and public corporation forms of ownership for accounting firms. It seeks to contribute to the knowledge of performance measures and data sources used in comparing the performance of different legal forms of PSFs.

Approach

Table 1
Summary of Research Steps

Question Explored	Research Method
Comparable performance across ownership form How do publicly listed accounting firms perform compared to partnerships?	1. Compared revenue growth (1999 to 2005) and revenue per person (2000 to 2005) measures for a sample of two Australian Publicly Listed Accounting Companies and 10 mid-tier partnerships. A shorter period was used for one of the PLCs (Stockford) that collapsed during the period studied.
Exploring the validity of proxy measures Do proxy measures of performance reflect the underlying performance of accounting firms?	2. Compared the underlying financial performance of the two sample publicly listed accounting firms to the performance as measured by publicly available proxy measures (revenues growth rate and revenue per person) for the year ended 30 June 2002. Proxy measures were not found to be reflective of the disparate underlying financial performance of the companies (see findings). 3. Reviewed reported revenue per person per BRW surveys for outlier firms with extremely high or low revenue per person and investigated reasons by reviewing published media reports in the Factiva electronic database of newspaper and magazine articles (see findings). 4. As productivity measures reported in BRW utilises end of year staffing, numbers may understate the productivity of high growth PLCs. Revenue per person was recalculated using average staff numbers for the year and compared to measures using year end staff numbers. Using year end personnel numbers was found to understate PLC productivity compared to partnerships (see findings). 5. Utilised management theory to explore potential alternative causes of lower revenue per person found for PLCs than partnerships and whether this lower calculated productivity necessarily reflects lower profitability.
Exploring the quality of published industry survey data Do budgeted revenue numbers reported in the published industry surveys reflect actual revenues achieved?	6. For the publicly listed company sample compared published BRW survey data to that published in the annual reports (1999 to 2005 for WHK and 2001 and 2002 for Stockford). Significant differences were identified (see findings). 7. Compared budgeted revenue numbers for each of the 10 partnership sample firms in the BRW survey to the prior year actual revenues reported in the following year's BRW survey (for the period 1999 to 2005) to explore the implications of using reported budgeted revenues. Nine observations were identified where actual partnership revenues for the prior year differed by + or – 10% from budgeted revenues reported in the prior year BRW survey. Reviewed articles in Factiva for the exception firms and years to identify potential reasons for discrepancies. Differences were found to be due to the treatment of revenues from mergers and demergers (see findings).
Were consistent measures and calculations of measures used across the period of BRW Top 100 surveys?	8. Examined survey headings in the BRW accounting survey from 1999 to 2005. Some inconsistencies were noted (see findings). 9. Recalculated BRW reported revenues per professional and per person based on survey reported revenues and resource numbers. Some erroneous calculations were identified (see findings).

Publicly owned accounting companies only started to emerge globally from the mid-1990s with the combined total of this type of entity across Australia, the UK and the US still in

single figures. As a consequence of this early stage of evolution and small numbers preventing statistical samples an exploratory approach was used for this research. While limiting the conclusions that can be drawn, benefits can be gained from insights of studying these organisations as they emerge.

The approach used reflects the dual objectives of the research of exploring the relative performance of accounting PLCs and partnerships and examining the validity of, and potential issues with, proxy measures and published industry surveys as a data source for this analysis. The approach used is summarised in Table 1. Data sources, samples and measures used are discussed below.

Data Sources

Data used for this study was extracted from three sources. The first source was the Business Review Weekly (Australia) annual Top 100 Accounting Firm Surveys from 1999 (the first year the survey was published) to 2005 that were used as the primary source of accounting partnership revenues and personnel numbers. The second source was annual financial reports for the two accounting PLCs. Financial data and personnel numbers from the annual reports were used to test the accuracy of the BRW survey data and to examine the degree to which proxy measures of performance used reflected underlying financial performance of the PLCs. Due to issues identified with the PLC revenues and personnel numbers reported in BRW, numbers from the audited annual reports were utilised for the PLC sample. The final source of data was the Factiva electronic data base of newspaper and magazine articles which was used to explore the potential reasons for the particularly low reported revenue per person of H&R Block (Australia) and for significant differences between budgeted revenues and subsequently reported actual revenues by firms in the BRW survey.

Using different sources of data for the performance measures for the two sub samples (partnerships: BRW surveys and PLCs: annual reports) is not ideal. Unfortunately, the BRW survey data was not reflective of the audited data in the PLC annual reports and audited financial data was not available for the partnership sub-sample. The magnitude of the difference across sub-samples suggests that these data issues do not affect conclusions on the revenue growth rates of the two sub samples. While the partnership revenue per person appears reasonable over time and across firms for the partnership sample, potential measurement issues including the quality of the BRW data suggest care in conclusions of the study on the relative productivity of partnerships and PLCs as discussed in the findings. Identifying this type of issue to inform future research was an objective of this study.

Sample Used

Two similarly sized publicly owned accounting companies, the two largest to operate in Australia were selected. WHK Group (named Investor Group at the time of the study) and Stockford Limited were of a similar size by revenues (2002 Stockford: $110 million, WHK $101 million), geographic reach (Australia and New Zealand), number of offices (June 2002 Stockford 53, WHK 60) and the source of the bulk of their income from accounting services (2002 Stockford 70%, WHK 74%) and financial services (2002 Stockford 20%, WHK 24%). Both companies grew rapidly through over 50 acquisitions. This strategy of rapid growth through acquisition of small to medium firms using company shares and capital as consideration appears consistent with most publicly owned accounting firms and a characteristic of the ownership form.

Rapid growth through acquisition can be a risky strategy and is reflected in the high failure rate of publicly owned accounting firms in Australia (80% from 2000 to 2005). To

avoid potential survivor bias of only including the sole surviving PLC (WHK Group), Stockford, which went through an IPO and collapsed in the period of this study, was included in the PLC sample. As the collapse (as opposed to mergers) of accounting partnerships appears very rare it was not considered necessary to seek out a failed partnership for the sample. Including Stockford also enabled exploration of whether the publicly available proxy measures of performance for the two companies reflect the divergent actual financial performance of the two companies as reported in annual accounts.

Ten Australian second tier accounting partnerships – ranked between the top 4 and top 20 were selected as comparators. Second tier accounting partnerships were considered the closest size match to the publicly owned companies with size important to performance (Greenwood et al. 2007; Nanda 2004). However, due to the rapid growth of the accounting PLCs, a size difference existed between the samples over time. For example, in 1999 publicly owned WHK was approximately one sixth of the size of the average partnership in the sample but by 2002 had grown to almost twice the size of the average partnership analysed. No accounting partnerships could be identified which match the size, national reach and the market focus of the accounting PLCs on individual and small to medium enterprises. The inability to control for these factors limits conclusions that can be made on performance but highlights measurement issues for this type of study.

Measures Used

Due to the lack of availability of financial information for accounting partnerships, this study followed prior studies of PSF performance and used publicly available proxy measures of performance sourced from published industry survey data (eg Greenwood et al. 2007; Von Nordenflycht 2007). This was augmented by additional financial data related to the publicly owned accounting companies.

Two proxy measures of performance were utilised for this study, revenue growth (following Von Nordenflycht 2007) and a productivity related measure. Revenue per person – including partners and all staff (adapted from revenue per professional as used by Greenwood et al. 2007) was used as a productivity measure. Revenue per person (including partners) as opposed to per professional was used as it was considered more likely to capture the potential impacts of potentially higher costs of bureaucracy for PLCs. The move to public ownership has been theorised to replace or augment the peer control of partnerships with more costly formal controls (Greenwood et al. 2007) potentially adding significant non-professional staff such as executives and managers to protect external shareholder interests and address potentially reduced professional motivation. Revenue per professional measures would not effectively capture the performance implications of any added non-professional executives and managers in measuring relative performance.

Revenue per person measures were calculated by dividing annual revenues by reported year end personnel numbers (including partners for partnerships) following the method of calculating in the BRW surveys. Measures were recalculated by the researcher to address calculation issues identified in the published surveys. Prior studies, such as Greenwood et al. (2007) are silent on the method of calculation of productivity measures. As further discussed in the findings, sample partnerships were found to report revenues including full year revenues related to mergers regardless of when in the financial year the merger took place while the PLCs report revenues from acquisitions from the date of the acquisition to the end of the financial year. To examine the implications of this difference, revenue per person for PLC WHK Group was recalculated for 2003 to 2005 (the years that data was available) including annualised revenues for acquired firms. The difference in reporting was found to understate the productivity of PLCs in comparison to partnerships by 6.0% in 2005 to as high

as 10.8% in 2003. As discussed in the findings this difference may partially explain lower productivity of large consulting PLCs than large partnerships (see findings for further discussion).

To further understand the potential implications of using end of year personnel numbers to measure the performance of the high growth PLCs, revenue per person was recalculated using simple average personnel numbers for the year. WHK Group productivity was between 5% and 33% higher over the years using average rather than closing personnel numbers (see findings). The treatment of revenues from mergers by the partnerships in the sample prevented the recalculation of revenue per person using average personnel numbers for this sub sample.

Financial measures were utilised to explore whether the proxy measures performance measures were consistent with the relative underlying performance of the two sample publicly owned companies for the year ended 30 June 2002. 2002 was used as it was the only full financial year for which the failed Stockford reported results. Profit margin included EBITA margin (earnings before interest, tax and amortisation as a percentage of client service revenues) and net profit margin (net profit after tax as a percentage of client service revenues). Turnover measures included return on assets and return on equity. Financial measures were also calculated excluding amortisation of goodwill established on acquisition of firms. Measures were calculated using data sourced from the companies' annual reports. As indicated in the findings the comparative financial performance of the two companies was not reflected in the proxy measures used suggesting limitations with the publicly available measures.

Findings

This section first summarises issues identified in the proxy measures and source survey data used. It then discusses findings in terms of publicly available proxy measures of performance used for the two forms of ownership and compares the underlying financial performance of the two PLCs to proxy performance measures used.

Survey Data Issues Identified

The review of the BRW Top 100 Accounting Firm Survey data identified a number of issues with consistency across years, consistency with annual report information, how revenues per resource category were calculated and differences in how partnerships and publicly listed companies reported revenues. The issues identified in Table 2 suggest care is required in using published industry survey data including examining the quality of data reported (eg Greenwood et al. 2007) but also the consistency and methods used for reporting. Industry surveys, such as those in BRW (Australia), may not report research methods, including actions taken to ensure the reasonableness of survey results, as would be expected of academic research.

Table 2
Summary of Data Issues: BRW Top 100 Accounting Firm Surveys:1999-2005

Survey Data Issues	**Examples**
Inconsistency in survey reporting over time.	Survey reports number of professionals and revenue per professional 1999 to 2004 but number of accountants and revenue per accountant in 2005. 2004 survey calculations exclude partners in total professionals to calculate revenue per professional while other years include partners.
Discrepancies between the revenue numbers reported in the survey and to annual reports of PLCs.	Stockford revenues reported: Survey $m — Annual Report $m 2001 80.58 — 67.8 2002 81.04 — 110.8 2002 survey Stockford reported revenues excludes financial services. However, 2001 Stockford accounting services revenues per the annual report were $49.4m and not consistent with $80.58m survey revenues. This indicates inconsistencies in survey reported revenues across years and across PLCs with WHK survey revenues including financial services.
Discrepancies between number of staff reported by PLCs in surveys and annual reports .	WHK (Investor Group) staff numbers reported: Survey — Annual Report 2001 550 — 1080 2002 993 — 1220
Inconsistencies in partner and professional numbers reported across years.	WHK numbers of professionals reported in the survey: Professionals 2000 145 2001 Not reported 2002 678 2003 144 2004 725 2005 804 (accountants) Gap in data in 2001 and inconsistent number for 2003.
Use of staff numbers rather than full time equivalents.	H&R Block reports revenues per person less than half of virtually all of the firms in the Top 100. However, H&R Block in Australia generates 90% of its revenues in 4 months (Lindhe, 2010) using substantial casual labour. This suggests that use of absolute staff numbers rather than full time equivalents may understate the performance of firms with significant part time or casual staff.
Use of year end partner/ professional/ staff numbers to calculate revenue per resource.	Due to WHKs very high growth rates using year end personnel numbers results in revenue per person calculated at between 5% and 33% lower than that using average personnel numbers (using annual report data) for the period 2001 to 2005. This understates the productivity of firms with significant growth, in the cases this was PLCs.
Different reporting of revenues from mergers with partnerships backdating the transaction to the start of the period (or even the period before) and PLCs recording revenues from the date of the transaction.	Pitcher Partners reporting full year revenues for mergers occurring in year ended 30 June 2004 being reported in the survey as having occurred at the beginning of the financial year. This understates the relative productivity of publicly listed companies versus partnerships.

Revenue Growth

As indicated in Table 3, both WHK Group and Stockford Limited significantly exceeded the revenue growth of the sample second tier accounting firms. For the period 1999 to 2005, WHK Group grew total revenues 3,150%, 30 times more than the total partnership sample and 18 times greater than the highest growth partnership in the sample. Stockford grew revenues from the fees of approximately $8m reported by the two founding firms in 2000 (approximate annualised company revenues on listing) to the $110m reported in 2002, a growth of 1,285% in two years with most of this growth occurring in one year.

Table 3
Revenue Growth – Partnerships versus Public Companies (Australian financial year end 30 June)

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**Growth 1999 – 2005**
Partnerships (source: BRW budgeted fees)	**$ m**	**$ m**	**$ m**	**$ m**	**$ m**	**$ m**	**$ m**	
BDO Services	48.00	63.70	74.00	81.40	86.00	94.00	102.00	113%
PKF Australia	41.39	47.37	56.90	65.20	74.60	95.10	108.00	161%
Moore Stephens Australia	44.85	50.60	62.11	64.40	68.53	80.62	92.55	106%
Grant Thornton Australia	45.00	48.00	60.00	60.00	67.00	69.00	76.00	69%
William Buck	25.80	37.00	50.00	44.00	59.00	69.00	70.50	173%
Ferrier Hodgson	40.00	43.00	45.00	54.80	55.30	55.30	55.30	38%
Pitcher Partners	28.40	33.00	38.11	42.40	54.00	74.50	77.70	174%
Bentleys MRI	34.00	38.00	48.00	46.00	51.00	52.00	70.00	106%
Hall Chadwick	31.00	34.22	38.75	46.20	51.00	28.00	29.00	-6%
RSM Bird Cameron	34.00	38.20	46.22	48.50	50.54	66.00	72.60	114%
Average Budgeted Revenues	*37.24*	*43.31*	*51.91*	*55.29*	*61.70*	*68.35*	*75.37*	*102%*
Public Companies (Annual Reports)								
WHK Fee and Commission Revenues	6.20	28.55	64.03	100.52	130.60	156.9	201.50	3150%
Stockford Fee and Commission Revenues		8.00	67.83	110.81				

A search of Factiva for events related to the partnerships where significant differences between budgeted and subsequently reported prior year revenues variances were identified suggested that this was predominantly due to how revenues from mergers and de-mergers were reported by these firms. In Australia during this period most of the second tier accounting firms were in reality national affiliations of local partnerships. During the period there was substantial merger activity and changes in local firm affiliations. It appears that when the national affiliations gained or lost firms that revenues for the period in which the change occurred were backdated to reflect the merger occurring at the start of the period and the prior period actual revenues adjusted to reflect the change.

For example, Hall Chadwick lost two Queensland practices, which joined William Buck, in October 2003. Budgeted fees reported in BRW in July 2004 for Hall Chadwick for the period ended 30 June 2004 appear to treat the transaction as if it occurred on 1 July 2003. Prior year reported numbers appear to backdate the transaction further to 1 July 2002, removing revenues from the lost practices for the prior year even though the departing

practices were affiliated for the whole year. Likewise, Melbourne based Pitcher Partners added firms in Sydney, Brisbane and Perth during the year ended 30 June 2004 with the prior year revenues reported reflecting these changes as if they occurred at 1 July 2002.

This treatment of mergers and exits from partnership affiliations has some potentially significant implications for the study of these firms and the comparison of partnerships and other ownership forms as follows:

- Accounting PLCs report in their financial accounts the revenues from acquisitions from the date of the acquisition. Where the revenues reported in these surveys are consistent with the annual statutory accounts (as were WHK Group revenues) then publicly listed companies will report relatively lower revenues and revenue per professional and per person than partnerships that backdate transactions to the start of the period. This may partially explain the poorer performance of large publicly owned consulting companies versus large consulting partnerships reported by Greenwood et al. (2007).
- Using revenue growth rates as reported in the BRW Top 100 survey for a given year as an indicator of performance is potentially problematic. For example, as mentioned earlier Hall Chadwick suffered a reduction in budgeted revenues from $51m in 2003 to $28m in 2004 with the loss of Queensland offices. However, by revising prior year actual revenues an increase in revenues of 7% for Hall Chadwick was reported in BRW for 2004 and discussed in the publication text.

Revenue per Person

As indicated in Table 4, accounting PLCs earned lower revenue per person than the average for the sample of ten accounting partnerships and, in most cases, lower than each of the firms in the sample for the period studied. This may reflect publicly owned PSFs being less profitable than the sample partnership firms due to a greater number of staff required for formal controls (as theorised for example by Empson & Chapman 2006; Greenwood & Empson 2003), due to lower professional motivation (Greenwood et al. 2007) or alternatively due to measurement or other reasons as discussed below.

MEASUREMENT ISSUES

The differential treatment of revenues gained from mergers/ acquisitions across the organisational ownership forms indicated earlier negatively impacted on the reported revenue per person reported by the public companies.

This issue is magnified by the seasonality of accounting revenue during the year. In Australia the taxation year end is the 30th of June with many companies using the same reporting date to reduce the need for duplicated reporting. Consequently, revenue for accounting firms is weighted towards the first six months of the financial year (1 July to 31 December. For example, WHK Group firms earned approximately 55% of annual revenue in that period and 45% in the second half of the financial year (1 January to 30 June) (Investor Group 2000). Acquisitions after the start of the year will not only earn the PLCs revenues for new employees for a shorter period in the year but also a lesser proportion of revenues from the peak accounting/ taxation season. Partnerships back dating of revenues from mergers results in peak period revenues being included in revenues per personnel. Recalculating WHKs revenue per person for 2003 to 2005 on a similar basis, the difference indicates that for those years the differential reporting across forms understated the productivity of PLCs between 6% and 10.8% and when calculated on an equivalent basis PLC WHK Group's productivity was higher than a small number of sample partnerships.

Table 4
Revenue per Person for Sample (Australian Financial Year Ended 30 June)

Partnerships (source BRW)	**1999** **$**	**2000** **$**	**2001** **$**	**2002** **$**	**2003** **$**	**2004** **$**	**2005** **$**	**Growth 2001 to 2005**
BDO Services	101,695	88,842	99,462	111,813	113,158	113,253	117,241	18%
PKF Australia	83,112	99,722	101,246	112,027	125,589	123,346	122,034	21%
Moore Stephens Australia	120,241	98,635	107,086	90,577	92,085	104,295	112,182	5%
Grant Thornton Australia	109,489	99,585	122,951	111,317	125,704	135,294	150,198	22%
William Buck	103,200	115,625	106,383	117,115	123,950	129,213	131,530	24%
Ferrier Hodgson	151,515	151,943	156,974	172,327	179,545	211,877	208,679	33%
Pitcher Partners	110,078	114,583	117,274	125,444	125,000	123,960	130,588	11%
Bentleys MRI	88,312	115,501	94,118	95,436	100,791	100,386	127,737	36%
Hall Chadwick	96,350	98,893	105,022	113,793	152,239	146,597	161,111	53%
RSM Bird Cameron	103,976	94,789	108,491	110,984	113,065	126,437	125,606	16%
Partnership Averages	*106,797*	*107,812*	*111,901*	*116,083*	*125,113*	*131,466*	*138,691*	*24%*
Public Companies (Annual Reports)								
WHK Group								
- calculated on year end personnel		51,909	59,287	82,393	93,687	102,750	105,895	79%
- calculated per reported partnership revenue#.					105,032	114,905	112,699	
Stockford								
- calculated on year end personnel			52,154^	92,333				

^Most acquired firms were only with Stockford for 6 to 7 months.

 # Includes annualised revenues for acquisitions and year end personnel numbers.

Use of year end professional and personnel numbers becomes problematic in calculating and comparing revenue per professional and per person across ownership forms when revenue growth rates vary across ownership forms. These productivity numbers should represent as accurately as possible the resources utilised during the period. At WHK Group high growth rates result in author recalculated revenues per average number of personnel being between 5% and 33% higher than revenues per person using the end year personnel numbers. The use of year end personnel numbers is likely to have a greater impact on reported revenue per person for PLCs than for partnerships due to the PLCs higher growth rate. While these measurement issues understated the productivity of the PLCs, performances using adjusted measures were still on the low end of partnership sample productivity.

POTENTIAL ALTERNATIVE CAUSES OF LOWER PLC PRODUCTIVITY MEASURES

The PLCs and partnerships targeted different market segments with some potential implications for charge-out rates and the costs of professionals employed. WHK and Stockfords specifically targeted the individual and small to medium enterprise market. The second tier firms included in the sample also focussed on medium to larger corporate clients. This different market focus may result in the PLCs not being able to charge as high a rate per hour but also requiring less specialised and therefore less costly staff offsetting lower revenues per person. In the cases lower productivity of the public companies may not

translate to lower profitability than the sample partnerships. Public ownership may be more suitable for more commoditised services (Greenwood & Empson, 2003) therefore PLCs may provide different services and target different market segments than partnerships. The high use of casual staff by H&R Block, which provides relatively commoditised taxation services, suggests that PLC productivity may be understated where the service lends itself to the use of part time or casual staff.

Based on year end personnel numbers, WHK Group revenues per person increased 79% (or 49% using average personnel numbers for the year) between 2001 and 2005 compared to 24% for the sample accounting partnerships suggesting improved relative profitability of PLC WHK relative to the sample partnerships. Analysis of WHK Group's profit margins over the period indicate that the increased revenue per person was not reflected in increased profit margins as a percentage of revenues. This suggests that either the partnerships suffered a substantial drop in profitability over the period or that revenue per person does not reflect the relative profitability across the ownership forms.

Comparing the Performance of the Two PLCs

This section compares the performance of WHK and Stockford Group along multiple financial measures for 2002 (the only year for which a full year of Stockford data is available) and compares these financial measures to publicly available proxy measures of performance growth rate and revenue per employee to explore whether the proxy measures reflect the divergent financial performance of the companies.

As can be seen in Table 4, WHK outperformed Stockford on financial measures used. This relative performance is not reflected in the proxy measures used. While being less profitable, Stockford reported a higher growth rate due to the bulk of acquisitions occurring in the first 6 months of the prior year and the year end 30 June 2002 revenues including twelve months revenue from these acquisitions. WHK's revenue growth rate for 2002 of 57% is lower than the 75% cumulative annual growth rate that the company achieved from 1998 to 2005 but overall more representative than Stockford's 63.4% growth for the year. Stockford was unable to sustain this growth rate, collapsing shortly after.

Revenue per person was also not representative of the relative profitability performance of the two companies. As indicated earlier, the BRW survey numbers were found to be erroneous. Table 5 shows that recalculating revenue per person using annual report data and using average personnel numbers for the year (beginning of year plus end of year divided by 2) shows Stockford as being marginally more productive rather than less productive than WHK. Stockford's higher productivity measure would be more pronounced if reliable professional numbers were available with Stockford having a higher number of 'non professionals' in a substantially larger head office than WHK's.

Reviewing 2002 financial data for both companies indicates that WHK's employee related costs were 64.7% ($56,579 per person based on average employee numbers for the year) of revenues compared to 78.5% for Stockford ($69,900 per person). This reflects a much larger head office at Stockford with high cost specialists (up to 150 staff compared to less than 20 at WHK Group). Stockford had much higher head office costs, $12.15 million, than $2.38 million for WHK Group. Stockford practices were also less profitable with EBITDA (earnings before interest, tax, depreciation and amortisation) margin adjusted for head office costs and write-offs of 14% compared to 19% achieved by WHK Group. Stockford collapsed in early 2003 while WHK continued to grow acquiring a further 80 firms in the five years from 2005 to 2010. This indicates the limitations of performance measures, such as revenue per person or revenue growth rates, that do not consider additional resources nor differential costs of resources.

Table 5
Relative Performance of Two Publicly Owned Accounting Firms - 2002

	WHK	Stockford
	$000s	**$000s**
Revenues		
Client revenues (fees & commissions)	100,520	110,813
Margins		
EBITA	16,210	-10,216
% Revenue	16.1%	-9.2%
Net Profit	6,300	-123,871
% Revenue	6.3%	-111.8%
Returns		
Return on Assets	6.2%	-95.6%
Return on Assets (Before goodwill amortisation)	9.8%	-7.9%
Return on Equity	8.5%	-125.7%
Return on Equity (Before goodwill amortisation)	13.3%	-10.4%
Revenue Growth for Year	57.0%	63.4%
Revenues per Professional/ Staff		
Revenues per Professional (per BRW Top 100)	141.59	164.04
Revenue per person (per BRW Top 100)	96.68	70.10
Revenue per person calculated based on average personnel numbers (inputs from annual reports)	87.41	88.64

Conclusions

The publicly available proxy measures utilised in this study provide a conflicting picture of the performance of the two sample publicly listed accounting companies in comparison to the sample of partnerships. The publicly owned companies achieved substantially higher growth but a lower level of productivity (revenue per person) than the partnerships. This supports the call for the use of multiple measures in examining complex constructs (Cording, Christmann & Weigelt 2010).

The higher growth rate of publicly owned PSFs is consistent with Von Nordenflycht (2007) findings that larger publicly owned advertising corporations achieve higher growth rates than comparative partnerships. The high short term growth and subsequent failure of Stockford also supports Von Nordenflycht (2007) in the use of longer period growth rates and in the assertion that growth rate is not always representative of profitability.

Potential ways that public ownership enabled greater growth than the sample partnership firms included access to capital and the use of the companies' shares as currency for acquisitions with both companies rapidly acquiring in excess of 50 firms. The change of structure may also have enabled faster acquisition processes and decision making. The governance of partnerships with partners voting on decisions such as mergers and acquisition (Empson & Chapman 2006; Greenwood et al. 1990,1994) can slow decision making when partnerships become larger (Greenwood & Empson 2003; Pickering 2010) and more diverse (Greenwood & Empson 2003). Perhaps, the corporate governance of public ownership enabled faster decision making on acquisitions by removing this vote and placing acquisition decisions in the hands of a limited number of executives.

The publicly owned accounting companies achieved lower levels of reported productivity (revenue per person) than the average for the sample of accounting partnerships. This is consistent with Greenwood et al.'s (2007) findings of lower productivity (based on revenue per professional) of large publicly owned consulting companies in comparison to

large partnerships. However, a number of measurement related factors were found in the current study that under estimated the productivity of publicly owned companies in comparison to partnerships. If these issues are also applicable to published global consulting surveys this may partially explain the underperformance of large publicly owned consulting companies as identified by Greenwood et al. (2007).

Differences in the cost of resources across ownership forms may be important in comparing the profitability of different forms of ownership of PSFs. Different career opportunities, with removal of the lure of partnership in PLCs, and even differences in risks for senior professionals across partnerships (with unlimited liability) and PLC PSFs may lead to different cost structures for professionals. The specialist skills required may differ in each type of ownership structure depending on services provided and clients targeted further differentiating cost structures with the degree of commoditisation of services theorised to affect the the suitability of public ownership (Greenwood & Empson 2003). Even within ownership structures, the Stockford and WHK cases suggest that the cost of personnel can differ substantially. Revenue based measures do not capture cost structure differences across ownership structures.

The significant difference in the financial performance between the two PLCs of a similar size, operating in the same industries and same geographic markets at the same time supports the call by Greenwood et al. (2007) for research that examines organisational strategies, structures, governance and processes and their impacts on professional behaviour and company performance.

For practitioners considering selling their firms to PLCs this research indicates that public ownership can enable rapid growth of their firms, an objective of selling firm partners identified in prior research (Pickering 2010), but that this growth has risks. Practitioners need to consider their tolerance for risk and the plans and track records of PLCs in order to decide whether to sell to a PLC, which PLC to sell to and whether to accept PLC shares as consideration. For regulators it suggests the need for care in determining performance measures and data to use and the comparability of samples when evaluating the performance of different ownership forms of accounting and other PSFs.

Limitations of the Research

This study was exploratory in nature limiting the conclusions that can be drawn and the ability to generalise the findings. The sample size of two Australian accounting PLCs and 10 accounting partnerships is too small to perform statistical analysis. However, it should be reiterated that while some substantial publicly owned accounting companies have emerged in Australia, the UK and the US, the total population of this recently emerged form of ownership of accounting firms remains small. Conclusions were limited by the lack of accounting partnerships in Australia of a similar size, geographic reach and market focus as the sample accounting PLCs. This does, however, highlight potential issues of prior studies which have not controlled for all of these factors (eg Greenwood et al 2007). Like previous studies this research was limited by the lack of publicly available financial information for private partnerships.

Issues were identified in the BRW Australia accounting survey data including different reporting of merger revenues and the use of year end resource numbers to calculate productivity which understated publicly owned accounting company productivity. These issues may not be replicated in published survey data for accounting firms in other countries or for other professions.

Further Research

Our understanding of the relative performance of publicly owned PSFs in comparison to partnerships is in its infancy. Research remains constrained by the lack of publicly available financial performance information of partnerships. Innovative research (Greenwood et al. 2007; Von Nordenflycht 2007) has commenced but has been limited by data availability and has resulted in some confounding findings. Greater understanding is required on measurement of performance and under what circumstances public ownership outperforms or underperforms partnerships.

Further large scale studies such as those performed by Greenwood et al (2007) and Von Nordenflycht (2007) are required. However care is required on measures used. Findings here suggest that where productivity measures are utilised, multiple resources are considered. High level revenue based measures or those based on a single resource, such as number of professionals, may fail to capture the very differences that researchers are seeking to identify across organisational forms such as increased external agency costs in publicly owned PSFs. The study also suggests that published industry surveys are carefully analysed or verified for reasonableness before the data is used. This includes ensuring consistent recording of merger revenues by different forms of ownership and using resource numbers that are representative of average resources utilised during the period. It would appear beneficial to follow the example of Greenwood et al. (2007) who tested the survey data by contacting a sample of firms.

There is also a need for detailed researcher survey work and case studies to support large scale studies. This includes gaining a greater understanding of the underlying actual financial performance of the different forms and the relationship to measures used. This requires clear definitions of performance and reconciling different accounting methods across organisational forms. Also important is a greater understanding of the causes of differences in performance between different forms of ownership of PSF including research on organisational strategies, services, structures, governance, processes and the impacts on professional behaviour, service quality, costs of resources and their linkages to organisational performance (Greenwood et al. 2007).

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Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 6

2012

Assessing the Value of Graphical Presentations in Financial Reports

Arabella Volkov
RMIT University

Greg Laing
University of the Sunshine Coast, glaing@usc.edu.au

Recommended Citation
Volkov, Arabella and Laing, Greg, Assessing the Value of Graphical Presentations in Financial Reports, *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 85-108.

Assessing the Value of Graphical Presentations in Financial Reports

Abstract

The purpose of this study was to replicate the research of Davis (1989) to test the decision usefulness of different information presentations as alternatives to financial information that would normally be represented as numbers. A laboratory experiment, based upon Davis' (1989) study, was conducted using a within subject experimental design to test for information effects. The experiment consisted of two groups with fifteen subjects in each. Decision usefulness was measured from the perspective of a user's efficiency and effectiveness (operationalised as accuracy and response time) in answering questions of different levels of complexity. Evidence of the superior effectiveness and efficiency of one form of information presentation over another was found only at the lowest level of question complexity. The results of this study are not consistent across the range of findings expressed by Davis (1989) and So and Smith (2004). The model does however provide a robust tool for assessing the decision usefulness of different forms of information presentations. The restricted number of subjects and the use of surrogates may present as a limitation to generalisability. However, the nature of the financial information and the task were suitably matched to the expectations of the knowledge and experience of the student surrogates. The results suggest that tables, bar graphs and line graphs are appropriate information presentations to use in general purpose financial reports when decision performance is being measured in terms of a user's efficiency and effectiveness.

Keywords

Information presentations, decision usefulness, tables and graphs, general purpose financial reports

Assessing the Value of Graphical Presentations in Financial Reports

Arabella Volkov[1] & Gregory K. Laing[2]

Abstract

The purpose of this study was to replicate the research of Davis (1989) to test the decision usefulness of different information presentations as alternatives to financial information that would normally be represented as numbers. A laboratory experiment, based upon Davis' (1989) study, was conducted using a within subject experimental design to test for information effects. The experiment consisted of two groups with fifteen subjects in each. Decision usefulness was measured from the perspective of a user's efficiency and effectiveness (operationalised as accuracy and response time) in answering questions of different levels of complexity. Evidence of the superior effectiveness and efficiency of one form of information presentation over another was found only at the lowest level of question complexity. The results of this study are not consistent across the range of findings expressed by Davis (1989) and So and Smith (2004). The model does however provide a robust tool for assessing the decision usefulness of different forms of information presentations. The restricted number of subjects and the use of surrogates may present as a limitation to generalisability. However, the nature of the financial information and the task were suitably matched to the expectations of the knowledge and experience of the student surrogates. The results suggest that tables, bar graphs and line graphs are appropriate information presentations to use in general purpose financial reports when decision performance is being measured in terms of a user's efficiency and effectiveness.

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JEL Classification: C91; M40

[1] RMIT University
[2] University of the Sunshine Coast
Email: GLaing@usc.edu.au

Introduction

The issue of providing general purpose financial reports has for the most part been examined from the perspective of the relevance of information to assist decision making in regards to allocation of scarce resources. This has been criticised for not considering whether there are aspects of financial reporting presentation that might provide greater assistance to decision makers (Alfredson 2000; Burgess 2002). The imperative for decision usefulness underpins the qualitative characteristics of accounting information as expressed in the Australian Conceptual Framework and the Statement of Accounting Concepts (ICAA & CPA 2011). The Australian Framework "Objective of General Purpose Financial Reporting" (SAC 2 2011, p.11) states that:

> "General purpose financial reporting focuses on providing information to meet the common information needs of users …".

SAC 2, paragraphs 28 to 40, elaborate on the objective of general purpose financial reporting by describing the types of information that will be useful to the users of general purpose financial reports (ICAA & CPA 2011). However, SAC 2 does not provide guidelines that specify how the information provided in general purpose financial reports should be presented.

The presentation of information in financial reports may be achieved using more than just numbers. International research has shown that the use of graphs in annual reports is widespread, with in excess of eighty percent of companies found to be using graphs to present some form of information, (Beattie & Jones 1992, 1999, 2000, 2002; Frownfelter-Lohrke & Fulkerson, 2001). In the case of Australian companies Beattie and Jones (1999) reported that eighty percent of Australian companies had used financial graphs in their annual reports. More recently Davison (2008 p. 792) observed that:

> The corporate annual report is an exercise in communication, in both the traditional and the modern-day sense of the term. An increasing proportion of that communication is carried by the discretionary words and pictures that surround the financial statements and other regulated disclosures. Despite the growing quantity and sophistication of such material released by the business community annually, and despite research that has revealed its importance to both lay and expert readers, it remains inadequately researched.

In a study investigating the use of concise financial reports in Australian companies, Hrasky and Smith (2008) reported that the use of graphs in financial reports by the largest 500 Australian companies ranged from none to 67, with the mean use of graphs being six per annual report in the year 2001. This use of financial graphs and other visual presentations in annual reports has occurred without sufficient research into the benefits to the users for the purpose of decision-making. It is of concern that the inclusion of graphical representations in general purpose financial reports has not been addressed by the International Accounting Framework, nor have the potential benefits received any consideration regarding their potential usefulness for meeting the objective of SAC 2.

Presumably, the objective of 'providing information to meet the common information needs of users' is applied by general purpose financial report designers when choosing how to represent accounting information in financial reports. In an early review of the literature, Laing

(1991) raised the need for further research on the role of different presentation formats to better convey meaning to decision-makers. One problem highlighted by the literature was the lack of a single theory or model to test the differences between various presentation methods (Laing 1991; Penrose 2008; Wainer & Thissen 1981).

This study contributes to the literature by building on prior research (Courtis 1997; Davis 1989; DeSanctis & Jarvenpaa 1989; Green, Kirk & Rankin 1993; Uyar, 2009) in order to formulate a model that examines the effects of different information presentations. The generalisability of the prior research by Benbasat et al. (1986) and Davis (1989) is assessed through replication and by the introduction of aspects not included in the previous studies. The justification for replication research is that it plays a pivotal role in the advancement of theory development through cross validation and contributing to the generalisability across a diverse or broader spectrum of society (Sing, Ang & Leong 2003; Liyanarachchi 2007; Kane & Reece 1984; Smith 1970; Thompson 1994).

Literature Review

Prior research suggests the existence of a relationship between the type of task undertaken and the effectiveness of a particular information presentation (Benbasat & Dexter 1985; Benbasat et al. 1986; Coll, Coll & Thakur 1994; Vessey 1991). This is consistent with literature on semiotics that holds that symbols play an important role in the process by which individuals produce or become conversant with mathematical objects (MacGregor & Stace, 1995; Radford 2003). Semiotic objectification implies that objects, artefacts, linguistic devices and signs are intentionally used by individuals to derive meaning in language and mathematics (Radford 2003). Similarly, research into congruence between task and display format has reiterated the importance of matching the demands of a given task to the display format (Jarvenpaa, 1989). Davis (1989) investigated the response rate to different methods of presenting accounting data. This research allowed for the monitoring and manipulation of the variables that were used in the experiment. The results obtained by Davis (1989) indicated that the decision task and the forms of presentation of the information affected performance interactively and that no one type of presentation was superior in all situations.

Research into information presentations and decision-making performance has mainly focused on the differences between the use of graphs and tables. Early research by Moriarity (1979) and supported by Leivian (1980) found that decision-makers, regardless of their amount of experience at interpreting financial reports, could discriminate results better using graphs than financial balances or ratios. Research by Schulz and Booth (1995) comparing graphical to tabular representations of financial information and their effects on auditors' analytical review judgements supported Moriarity's findings (1979) that a significant time advantage was found using graphical representations. Stock and Watson (1984) also found that the use of graphs facilitated the users' understanding and interpretation of data for decision-making.

Research conducted by Meyer, Shinar and Leiser (1997) employed a multi-factorial experiment to determine performance with tables and graphs. Their findings suggested that a possible explanation for the inconsistent results in prior studies could be due to multiple factors that have not been considered in research design influencing the decision-making performance of subjects in these studies. Their study revealed the importance of considering multiple variables

as an approach to the study of different displays to ensure that valid display guidelines are developed.

Research has suggested (Beattie & Jones 2002; Iselin 1995) that the provision of relevant cues in a financial report to a decision-maker would make the decision environment more predictable. Iselin (1995) argued that as the decision environment becomes more predictable then uncertainty will be reduced and decision quality will be improved. However, Iselin's description of the decision environment is very broad and needs further definition in order to understand the potential effects on performance with an information presentation. Meyer et al. (1997) detailed other factors that may affect the decision environment such as the visual conditions under which the information presentation is seen, the presence of time pressure for the decision-maker, and large quantities of information being provided which are additional to the relevant decision-making information. They suggested that an information presentation that may be appropriate under one set of environmental conditions might not be appropriate under another set of conditions. The suggestions of Iselin (1995) and Meyer et al. (1997) regarding the effects of the decision environment on decision-making performance are consistent with the finding that time pressure degrades the performance of a subject in the decision-making process while a complete information set (reducing uncertainty) will usually improve performance (Ahituv 1998).

The manner in which information is presented to a user has been suggested to affect the efficiency and effectiveness of the decisions being made using the information provided. However, studies concerning selection of an appropriate presentation relevant to a particular decision-making task have been inconclusive (DeSanctis 1984; Schaubroeck & Muralidhar 1991). Bertin's (1983) theory has been identified as the only complete theory concerning performance with different forms of presentation (Wainer & Thissen 1981).

For the purpose of this study the hypotheses from Davis (1989) are re-examined with some modifications being made to accommodate changes to the data collection and to overcome perceived scaling problems that have been identified as existing in the original analysis. In the research by Davis (1989) the efficiency of an information presentation was measured by the time taken to answer a question as suggested by Bertin (1983), and the effectiveness of an information presentation was measured by the accuracy of the answers for a given information presentation as suggested by Lusk (cited in Davis 1989: p. 497). Following from Davis' (1989) propositions the hypotheses derived for testing these aspects were:

> *H_1- The form of information presentation that allows a question to be answered in the least amount of time will be different for questions of different levels of complexity.*
>
> *H_2- The form of information presentation that results in the most accurate answers to a question will be different for questions of different levels of complexity.*

The effectiveness and efficiency of the use of colour is still debatable with previous research resulting in conflicting results (Benbasat et al. 1986, Montazemi & Wang 1989). Research by Benbasat, Dexter and Todd (1986) indicated that colour has a positive influence on the effectiveness of performance with an information presentation, especially graphical presentations. Further it has been suggested by Tan and Benbasat (1993) that the addition of colour to graphical representations (in particular bar graphs) would aid the user to discriminate the lines or bars on a graph better than shaded or hatched graphs. Field dependent subjects and

subjects working under time constraints appear to derive the greatest benefit from colour information presentations (Benbasat et al. 1986). These propositions led to the following hypotheses:

> *H_3- The amount of time taken to answer a question using a colour information presentation will be different to the time taken to answer a question using a monochrome presentation.*
>
> *H_4- The accuracy of answers to questions using a colour presentation will be different to the accuracy of answers to questions using a monochrome presentation.*

Method

The experiment was conducted using two groups consisting of fifteen subjects**.** The experiment was divided into two parts. The first part of the experiment uses a full-factorial within-subject experimental design to test hypotheses one and two and used the data from group A of the study. The second part of the experiment used a full-factorial between-subject experimental design to test hypotheses three and four and used the data from groups A and B to compare between groups. The subjects were randomly assigned to either group A (monochrome treatment) or group B (colour treatment). Group A received fifteen monochrome experimental treatments (five questions manipulated over the three forms of presentation). Group B received fifteen colour experimental treatments (five questions manipulated over the three forms of presentation). In both groups the questions and information presentations were presented in random order for each subject. Subjects who undertook the colour treatment were screened for colour-blindness using the colour discrimination test developed by Ishihara (1976). Colour-blind subjects were placed in the monochrome treatment, as the use of colour blind subjects in the colour treatment group would confound interpretation of the results for hypotheses one and two.

Students were used in this experiment as surrogates for the users of financial reports. According to Trotman (1996) students may be suitable surrogates where the research does not rely solely on prior learning and the task can be completed by the surrogates. Liyanarachchi's (2007) review of the use of students as surrogates in experiments supports their use in decision-making studies and suggests that maintaining the realism of experiments and replication of prior results is more critical with respect to generalisability than the use of real subjects. Students with an accounting major were chosen on the basis that they had been exposed to the concepts covered in financial information and in particular the notion of 'profit' which was important because interpretation of this term was required by a number of the tasks in the experiment.

The subjects were instructed to complete the questions at their own pace and that while no time limits applied, the speed and accuracy of their responses to their questions were equally important. For each of the fifteen treatments the subject was presented with an information presentation and a question on a standard fifteen-inch computer monitor. The subject was asked to respond to the question using the information presentation displayed at that time. The subject's response to a question was recorded using the computer keyboard and the computer recorded the time taken to respond to a question without displaying the time to the subject. The computer software package used to display the fifteen treatments allowed the subject to control

when the next question would be displayed and cleared the previous information presentation and question once a response has been entered by the subject.

This study consisted of one control variable, two independent variables and two dependent variables. The control variable was the information set. The two independent variables were the information presentation and the question to be answered. The two dependent variables were the time taken to answer the question and the accuracy of the answer to the question.

The information set was derived from the information set used in the study conducted by Davis (1989). This was composed of one categorical, one ordinal and one quantitative variable. Specifically, the data used was a time series of four companies' profits over an eleven-year period.

Six forms of information presentation were used in this experiment: bar charts (monochrome and colour), line graphs (monochrome and colour) and tables (monochrome and colour). Using poorly designed information presentations or poor resolution of the medium used to display the information presentation has potentially confounded previous studies (Benbasat et al. 1986). Accordingly, in order to minimise any confounding effects in the design of the information presentation, the design guidelines of Bertin (1983) for graphics and Ehrenberg (1977) for tables were used to design the information presentation.

Two graphic representations commonly used to report these indicators were bar and line graphs. These are in common use by reporting entities in Australia and Bertin (1983) identified these representations as appropriate for the display of the time-series data as used in this experiment.

The colour and monochrome information presentations included identical tables and graphs, presented identically apart from colour treatment. In order to ensure that the results of colour treatment did not confound the results all patterns, line widths and bar widths were held consistent between the monochrome and colour treatments. Additionally, the colour schemes for all three information presentations were consistent with each company represented by the same colour scheme. For the group receiving the colour report formats the colours used in the presentations were chosen according to two criteria (Benbasat et al. 1986). The first criterion was that the four colours should allow for easy discrimination. The second required the avoidance of colours that have context specific connotations (for example, Red as this is deemed to have special meaning in a business environment).

Consistent with Davis' (1989) study, in order to minimise testing effects, the superficial characteristics of the information presentations were changed so that the ability of the subject to realise that she/he is being asked the same five questions repeatedly is reduced. The superficial characteristics that were changed for each information presentation were:

1. The years to which the profit figures referred (e.g. 1991-2001 for the bar graph presentation and 1985-1995 for the line graph presentation)[3].
2. The companies' profit data was arithmetically manipulated so that the profitability of one company was held constant relative to the other companies across all three information presentations (e.g.. the profit figures for the bar chart presentation were calculated by adding five to the profit figures for the table presentation).

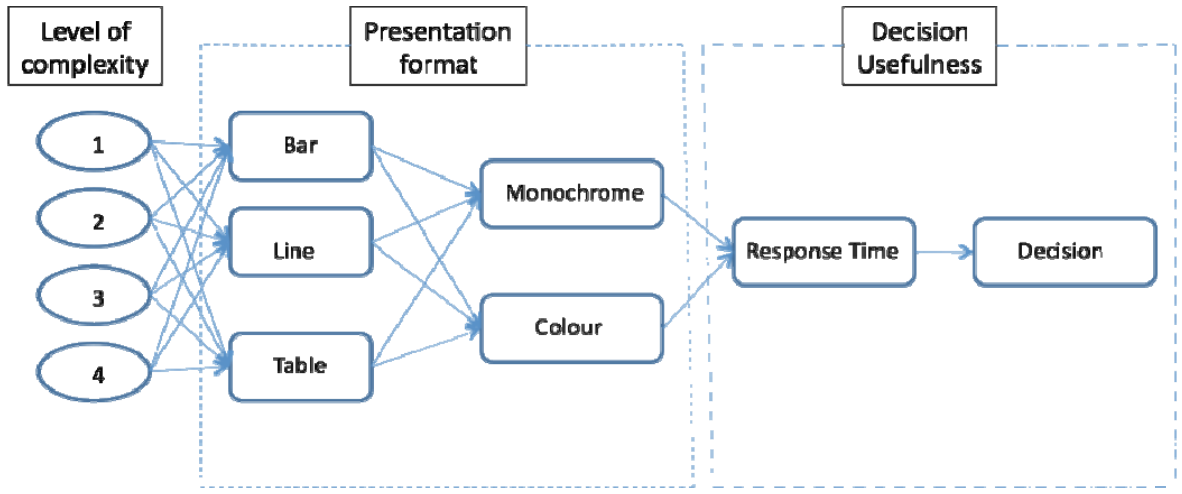
[3] The periods were used as a matter of convenience and are not representative of actual financial periods. They form part of the test and in that regards act as a distraction to direct attention away from the information being the same just presented differently.

Arithmetically manipulating the data also reduces the effects of maturation making it more difficult for the subject to memorise the correct responses as testing progresses. According to Davis (1989), as the relative complexity of the questions increases two things occur: first, the difficulty of the steps the subject performs to arrive at an answer increases; second, the number of times a particular step is performed increases. The questions employed in this study are based upon those used by Davis (1989) with modifications to the wording. The two dependent variables in this experiment are accuracy and the time taken to respond to a question.

Accuracy is defined as a correct response to the question asked. While there is only one correct answer to each question, responses to a question were assigned a maximum score of three and a minimum score of zero. Responses that gave the correct answer were assigned a score of three. Responses that gave the second most correct answer were assigned a score of two and responses that gave the third most correct answer were assigned a score of one. All other responses were assigned a score of zero.

Davis (1989) assigned the variable 'accuracy' a score of one for a correct answer and a score of zero for an incorrect answer. Parametric statistical tests were then conducted on this variable even though the accuracy scores were dichotomous and measured at an ordinal level. While the measurement scale used in this study appears to better approximate an interval scale, to assume that the accuracy scores have a common and constant unit of measurement is erroneous. To define accuracy as being measured on an interval scale it would be necessary to assume that a correct answer at one level of complexity is exactly equivalent (in terms of effectiveness) to a correct answer at a different level of complexity (Siegel & Castellan, 1988). As no theoretical basis to make this assumption was found in the literature the measurement scale for accuracy was treated as an ordinal scale. The structure of the research model is presented in Figure 1 below.

Figure 1.
Research Model



A software program was developed to administer the fifteen treatments. This program allowed for the fifteen questions to be presented in either monochrome or colour.

The use of the software also measured in seconds the time taken to respond to a question and was calculated as being the seconds that elapse from when the subject clicks 'next' to view a question until the subject clicks 'continue' to indicate they have finished the question.

The use of computers has a number of advantages for experimental research (Trotman 1996) such as:

- Increased realism (increasing external validity);
- Better measurement of dependent variables (increasing internal validity);
- Standardisation of timing of subjects;
- Reduction in omitted answers in factorial design; and
- Facilitation of randomisation of treatments and data collection.

In view of the type of variables being examined the use of a computer to administer the treatments was deemed appropriate for this experiment. On-screen instructions explained how to proceed through the fifteen questions. To commence answering a question the subject clicked on a command button, the software then commenced timing the subject's responses in seconds. As soon as the subject clicked a command button to indicate completion of the question, the timer stopped. Both the answer and the time taken to complete the question were then written back to a database for analysis. A response was mandatory for each question and subjects could not terminate the program until all fifteen questions were answered.

The delivery of the treatments via a software application minimised, as far as practical, interference in the treatments by the researcher and the threat to internal validity of the experiment caused by instrumentation effects. The timing of answers to the questions were standardised through the use of a timer built into the software program. The software randomised the order of delivery of the questions and the information presentations.

Results

Descriptive statistics were generated for both the monochrome and colour treatments. The statistics are summarised in Table 1 (response time) and Table 2 (accuracy). The descriptive statistics are divided according to the complexity of the question (question one being the least complex and question five the most complex) and then by the type of presentation (bar graph, line graph or table).

For both the monochrome and the colour treatment the information presentation that resulted in the fastest mean time varied according to the complexity of the question (Table 1). For example, for the least complex question in the monochrome treatment the table presentation resulted in the fastest mean time (12 seconds), while for the most complex question the fastest mean time was for the line graph presentation (35 seconds). A comparison of the mean response times calculated for the monochrome and colour treatments revealed some unexpected results. Overall, the colour treatment resulted in slower mean response time to the questions when compared to the mean response time for the monochrome treatment.

The descriptive statistics for accuracy (Table 2) suggest that the most marked differences in accuracy between the information presentations occur at the lowest level of complexity (question one) and at the third most difficult level of complexity (question three). For question one, the median score for accuracy was the highest for the table presentation for both the colour and monochrome treatments. For question three a comparison of the median scores between the

two treatments reveals that for the monochrome treatment the median scores were higher for both the line graph and the table while there was no difference for the bar graph.

Table 1
Descriptive Statistics – Response Time

		Monochrome Treatment (Seconds)				**Colour Treatment (Seconds)**			
		Min	**Max**	**Mean**	**Standard Deviation**	**Min**	**Max**	**Mean**	**Standard Deviation**
Q1	Bar	8	42	18	11	10	60	24	12
	Line	9	53	25	14	9	29	16	6
	Table	5	30	12	7	8	47	18	10
Q2	Bar	6	70	22	17	8	41	24	10
	Line	6	41	17	9	5	50	19	13
	Table	7	47	23	12	21	61	33	12
Q3	Bar	14	103	38	23	13	159	61	46
	Line	14	54	32	12	18	72	43	19
	Table	9	61	28	15	19	74	40	18
Q4	Bar	15	85	46	25	16	94	37	20
	Line	19	59	35	12	15	114	40	27
	Table	16	56	35	12	28	101	56	25
Q5	Bar	14	135	55	36	17	113	63	32
	Line	14	75	35	16	8	141	50	33
	Table	10	101	52	24	28	131	73	32

In order to draw inferences from these results and to test the hypotheses parametric and nonparametric tests were conducted on the data. All analyses involving the dependent variable 'response time' were transformed by taking the base ten log of each case. This transformation was used to ensure that the assumption of normality was not violated.

H1 *The form of information presentation that allows a question to be answered in the least amount of time will be different for questions of different levels of complexity.*

To test this, a two-way repeated measure ANOVA was conducted on the data collected for the group receiving the monochrome treatment. The results of this test are contained in Table 3. Examination of the descriptive statistics reveals that although the data exhibits some skewness and kurtosis, both are minimal and thus the normality assumption has not been violated. Examination of the variances shows that the F-max is greater than three, as a result homogeneity of variance was not assumed. For this reason a higher significance level of 0.001 was used.

Table 2:
Descriptive Statistics – Accuracy

		Monochrome Treatment		Colour Treatment	
		Median	**Mode**	**Median**	**Mode**
Q1	Bar	1	2	2	2
	Line	2	2	2	2
	Table	3	3	3	3
Q2	Bar	3	3	3	3
	Line	3	3	3	3
	Table	3	3	3	3
Q3	Bar	3	3	3	3
	Line	3	3	0	0
	Table	2	3	0	0
Q4	Bar	3	3	3	3
	Line	3	3	3	3
	Table	3	3	3	3
Q5	Bar	3	3	2	2
	Line	3	3	2	2
	Table	3	3	3	3

The Mauchly test of sphericity was not significant for complexity, the type of information presentation or the interaction effect, indicating that the assumption of sphericity has not been violated. The main effect for complexity was significant at $p<0.001$. This indicates that the complexity of a question did affect the response time to a question. The main effect for information presentation was not significant indicating that the type of information presentation used to ask a question did not affect the time taken to respond to the question asked. The interaction effect for complexity and information presentation was significant at $p<0.001$, suggesting that response times to questions using different information presentations did vary as the complexity of the question varied. These results are summarised in Table 3 below.

The interaction between the type of information presentation used and the complexity of the question asked was investigated to determine which forms of information presentation resulted in the fastest response times for each level of question complexity. This was achieved by conducting *post hoc* comparisons of the pairs of cell means using the Scheffé method. The response times to questions using one form of information presentation were compared to the response times to questions using the other forms of information presentations. The results of these comparisons are summarised in Table 4 below.

Table 3
Results of Two-way Repeated Measures ANOVA for the DEPENDENT VARIABLE Response Time

	Sum of Squares	df	Mean Square	f	p
Complexity	6.105*	4	1.526	43.001	<.001
Information Presentation	0.139	2	6.969E-02	1.638	0.212
Complexity X Information Presentation	0.984*	8	0.123	5.361	<.001

* Significant at p= 0.001

Table 4
Results of Post-hoc SCHEFFÉ TEST Comparing RESPONSE TIMES Using DIFFERENT INFORMATION PRESENTATIONS AT DIFFERENT LEVELS OF COMPLEXITY

PAIRED PRESENTATIONS	QUESTION NUMBER	MEAN DIFFERENCE	SIG.
Bar graph & line graph	1	-0.1300	0.289
Bar graph & table	1	0.1567	0.169
Line graph & table	1	0.2868*	0.004
Bar graph & line graph	2	0.0662	0.777
Bar graph & table	2	-0.0566	0.831
Line graph & table	2	-0.1229	0.424
Bar graph & line graph	3	0.0417	0.878
Bar graph & table	3	0.1209	0.344
Line graph & table	3	0.0792	0.628
Bar graph & line graph	4	0.0731	0.557
Bar graph & table	4	0.0760	0.532
Line graph & table	4	0.0029	0.999
Bar graph & line graph	5	0.1501	0.270
Bar graph & table	5	0.0020	1.000
Line graph & table	5	-0.1481	0.280

* Significant at p = 0.05

The only significant difference in response times was between the line graph and the table information presentations at the lowest level of complexity (question one). Examination of the mean response times revealed that the table (mean response time 12 seconds) resulted in faster response times to question one when compared to the line graph (mean response time 25 seconds). However, the table presentation did not produce response times that were significantly

different to the bar graph presentation. At all other levels of complexity the response times to the questions were not significantly different regardless of the information presentation used. Therefore no one presentation could be stated as resulting in a significantly faster response times at these levels of complexity. These results suggest that the hypothesis should be rejected and that the form of information presentation that allows a question to be answered in the least amount of time was not different for questions of different levels of complexity.

H2 *The form of information presentation that results in the most accurate answers to a question will be different for questions of different levels of complexity.*

As the data collected for the accuracy of responses was measured on an ordinal scale a nonparametric test was chosen to test this hypothesis. According to Siegel and Castellan (1988) the statistical test of choice for k related samples measured on an ordinal scale is the Friedman two-way analysis of variance by ranks. This test was used to test for differences in response times in the monochrome treatment for all five levels of complexity. The results of these tests are presented in Table 5 below.

Table 5
Results of Friedman Two-way Analysis of Variance by Ranks Comparing Accuracy of Answers to Questions using Different Information Presentations at Five Levels of Question Complexity

	MEAN RANK				
QUESTION NUMBER	BAR GRAPH	LINE GRAPH	TABLE	CHI-SQUARE	ASYMP. SIG
1	1.37	1.93	2.70	15.50*	<0.001
2	2.07	1.90	2.03	0.70	0.705
3	2.20	2.03	1.77	2.53	0.282
4	2.13	2.03	1.83	1.75	0.417
5	1.97	1.87	2.17	2.80	0.247

* Significant at p= 0.05 (N= 15, df = 2)

The results of this test suggest that the accuracy of question answers using different information presentations was only significantly different at the lowest level of complexity. As a significant difference was found at the lowest level of complexity, the Dunn procedure with the Bonferroni correction (as recommended by Polit 1996) was used to isolate the pairs of information presentations that resulted in significantly different accuracy score.[4] After correction a significance level of 0.017 was used. The result of this procedure is summarised in Table 6 below.

[4] The Dunn procedure uses the Mann-Whitney *U*-test to compare the ranks for all the possible pairs of information presentations. The Bonferroni correction avoids a higher than desired risk of Type I error by revising the significance level such that the desired α is divided by the number of pairs being compared. Therefore, the significance level used for this test was 0.05/3 or 0.017.

Accuracy scores were significantly different when the table presentation was compared to both the line graph and the bar graph. Examination of the mean ranks from the Friedman test suggests that use of the table presentation (mean rank 2.70) resulted in more accurate responses than either the bar graph (mean rank 1.37) or the line graph (mean rank 1.93).

Table 6

Results of Duncan Procedure with Benforroni Correction for Paired Information Presentations at Lowest Complexity Level (Question 1)

PAIRED PRESENTATIONS	Mann Whitney *U*	Z	Sig.
Bar graph & line graph	61.50	-2.311	0.21
Bar graph & table	27.00*	-3.875	<0.001
Line graph & table	36.00*	-3.617	<0.001

* Significant at p= 0.017

The results of these statistical analyses suggest that the table presentation was the most effective presentation for the lowest level of complexity. However, no difference in effectiveness was found at any other level of complexity. A significant difference in the accuracy of responses using different information presentations at only one level of question complexity does not support the hypothesis and it is therefore rejected.

H3 *The amount of time taken to answer a question using a colour information presentation will be different to the time taken to answer a question using a monochrome presentation.*

In order to test this hypothesis an independent t-test was performed on the data collected. The analysis was conducted on all fifteen questions that the subjects were asked regardless of the level of complexity or the type of information presentation. Based upon this result the hypothesis should be accepted ($t = -3.276$ with a significance level of $p < 0.05$). The result indicated that there is a significant difference between the time taken to answer a question using a colour presentation when compared to the time taken to answer a question using a monochrome presentation. Further analysis of the mean response times of the two groups indicates that the monochrome information presentations (mean response time 31.56 seconds) resulted in a faster response times to the questions asked than the colour information presentations (mean response time 39.78 seconds).

Further Analysis of Response Times

To further analyse the significant findings both univariate and multivariate statistical analyses were conducted on the data collected.

UNIVARIATE ANALYSIS

Grouped independent t-tests were performed on the data collected for the monochrome and colour treatments. These tests assisted in isolating which levels of complexity and which

information presentations accounted for the significant differences between the response times for the monochrome and colour treatments. The results of these t-tests are presented in Tables 7 and 8 below.

Table 7
Results of t-tests Comparing Mean Response Times Grouped by Complexity for Colour and Monochrome Treatments

QUESTION	t	Sig. (Two-tailed)
1	-1.028	0.307
2	-1.905	0.06
3	-2.990*	0.004
4	-0.879	0.382
5	-2.018*	0.047

* Significant at p = 0.05 (df = 88)

Significant differences in the mean response times for the different treatments were found for two levels of complexity: question three ($t = -2.990$, $p = 0.004$) and question five ($t = -2.018$, $p = 0.047$). When grouped by type of information presentation the only significant difference in mean response time between the two treatments was found with the table presentation ($t = -3.720$, $p < 0.001$). Examination of the mean response times using the table presentation revealed that response times using the monochrome tables were faster than those using the colour tables.

Table 8
Results of t-tests Comparing Mean Response Times grouped by Information Presentation for Colour and Monochrome Treatments

INFORMATION PRESENTATION	t	Sig. (Two-tailed)
Bar graph	-1.623	0.107
Line Graph	-0.313	0.755
Table	-3.720*	<0.001

* Significant at p= 0.05 (df = 148)

Another independent t-test was conducted that grouped the data by both the complexity of the question asked and the information presentation used. The results of this test are presented in Table 9 below.

Table 9
Results of t-tests Comparing Mean Response Times (transformed)

INFORMATION PRESENTATION- QUESTION COMPLEXITY	t	Sig. (two-tailed)
Bar graph- Question 1	-1.724	0.096
Line graph- Question 1	0.619	0.541
Table- Question 1	-2.177*	0.038
Bar graph- Question 2	-1.240	-0.1117
Line graph- Question 2	-0.026	0.979
Table- Question 2	-2.582*	0.015
Bar graph- Question 3	-1.549	0.133
Line graph- Question 3	-1.571	0.127
Table- Question 3	-2.155*	0.04
Bar graph- Question 4	0.988	0.331
Line graph- Question 4	-0.095	0.925
Table- Question 4	-3.049*	0.005
Bar graph- Question 5	-0.776	0.444
Line graph- Question 5	-0.944	0.353
Table- Question 5	-1.985	0.057

*Significant at p=0.05 (df = 28)

At four levels of question complexity (questions one, two, three and four) the response times for answering the questions was significantly different for subjects using a table presentation and undergoing the monochrome treatment when compared to the subjects using a table presentation and undergoing the colour treatment. These results suggest that when using a table information presentation the time taken to answer the question will be faster if the presentation is monochrome rather than colour.

MULTIVARIATE ANALYSIS

Multivariate analysis was performed to further explore the influence of the independent variables used in this study upon the dependent variable ‘response time’. This analysis should further explicate the effect of introducing colour into an information presentation while also allowing for an examination of the other independent variables namely the ‘information presentation’ and ‘question complexity’. Therefore, a standard multiple regression was performed on the dependent variable ‘response time’ using the independent variables ‘question complexity’,

'colour' and 'information presentation'. The independent variable 'information presentation' was nominal and was recorded into dummy variables for the analysis (Table 10).

Table 10
Dummy Codes for Multiple Regression

		New coding in dummy variables	
		Bar graph	Line graph
	Previous coding		
Bar graph	1	1	0
Line graph	2	0	1
Table	3	0	0

Based upon the univariate analysis a multiple regression was performed using the transformed data for response time. The results of this analysis are presented in Table 11. Multivariate checks were performed on the data. Examination of the residual scatterplots did not suggest that the assumptions of normality, linearity or homoscedasticity had been violated. Examination of the Mahalanobis distance for each case revealed no outliers in the space of the predictors ($df = 4$, $p<0.001$). Similarly, examination of Cook's distance for each case suggested that no data point could be considered influential[5].

One outlier with a standard deviation of -3.277 was identified, however deletion of this case from the regression analysis did not significantly alter the results so it was included in the final analysis. Examination of Pearson's correlation for the variables revealed that no two variables had a correlation greater than 0.7 indicating that no multicollinearity was present[6].

The regression was significant with $F = 59.545$ and $p<0.001$. The four independent variables had an R^2 of 0.349 indicating that 34.9 percent of the variation in subjects' response times to the questions asked could be attributed to the independent variables used in the study. Three of the variables contributed significantly to predicting a subject's response time (i.e. question complexity, colour and line graph information presentation). The β coefficients for 'question complexity' and 'colour information presentation' were positive while the β coefficient for line graph was negative. This indicates that increasing the question complexity and/or using colour in an information presentation will increase response time (while holding all other variables constant). Interestingly, the results also indicate that the use of a line graph will decrease response time compared to the use of a bar graph or a table when all other variables are held constant. This result conflicts with the findings for hypothesis one for which the only significant difference in response times was found at the lowest level of complexity where the

[5] Cases with influence scores greater than 1.00 would have been suspected of being influential as recommended by Tabachnick and Fiddel (1996).

[6] As a 'rule of thumb' Tabachnick and Fiddel (1996) recommend that two variables with a bivariate correlation of 0.70 or more may indicate multicollinearity. In the experiment by Fischer (2000) decision times using two-dimensional and three-dimensional bar graphs were compared. The use of three dimensions in a graph was considered by the researcher to introduce irrelevant cues into the decision-making task

table presentation was significantly faster than the line graph presentation. This conflicting result could be due to the small amount of shared variance found in the regression model.

Table 11
Results of Standard Multiple Regression for the Dependent Variable Response Time (transformed)

								95% confidence interval for b		
	R	R^2	Adj R^2	Unstandardised β weights	F or t statistic	df	Sig.	Lower bound	Upper bound	sr
Model Summary	0.59	0.349	0.343	na	59.545*	4	<0.001	na	na	na
Question complexity				0.12	14.633*	445	<0.001	0.101	0.132	0.56
Colour				0.09	3.997*	445	<0.001	0.046	0.135	0.153
Bar graph				0.01	0.395	445	0.693	-0.043	0.065	0.015
Line graph				-0.06	-2.239*	445	0.026	-0.116	-0.008	-0.086

*Significant at p=0.05

The semi-partial correlations indicate that question complexity explained 31.4 percent of the variance while the use of colour explained 2.3 percent of the variance. The other two dummy variables, 'bar graph information presentation' and 'line graph information presentation' explained very little of the variance (0.02 percent and 0.70 percent respectively). The shared variance was only 0.44 percent indicating that only a very small amount of the variance was shared.

H4 *The accuracy of answers to questions using a colour presentation will be different to the accuracy of answers to questions using a monochrome presentation.*

In order to test this hypothesis a Mann Whitney U test was performed on the data collected. The analysis was conducted on all fifteen questions that the subjects were asked regardless of the level of complexity or the type of information presentation. The result indicates that there was no significant difference between the accuracy of answers to questions using a colour presentation when compared to the answers to questions using a monochrome presentation ($Z = -1.453$, $p > 0.1$)

Discussion

The results indicate that the efficiency and effectiveness of an information presentation was not dependent upon the complexity of the question to be answered. This finding contrasts with that of Davis (1989) who found that the efficiency of an information presentation did vary as the complexity of the questions asked varied. The results further contradict Davis' findings and suggest that the three types of information presentations used in this study were appropriate for all five questions asked. This conclusion assumes that the decision performance measurement

criteria being used are response time to the question asked and the accuracy of the answers to the questions asked. Conclusions cannot be drawn from this study regarding whether the appropriate form of an information presentation will vary as the question to be answered varies when other decision performance criteria such as problem comprehension, memory for information or viewer preference are used.

The inconsistencies in the results from this study and those of Davis (1989) could be due to at least two factors: the interactive effects of other variables and the statistical methods used. The first explanation with regard to hypotheses one and two considers the possible interactive effect of the decision-maker on decision performance. Meyer et al. (1997) suggested that a person's experience with an information presentation and the task being undertaken will interactively affect their performance. This proposition could explain the differences in findings between the studies. The experience levels of subjects undertaking the prior study could have differed significantly due to the following factors:

The shorter learning and adjustment process could account for the absence of significant differences in the response time using the three types of information presentations for the different task complexities.

The statistical tests employed by Davis (1989) differed from the current study in one particular aspect. Davis assumed that the scores for accuracy were measured on an interval scale and conducted parametric tests on the data obtained. This assumption was considered erroneous. In the current study the accuracy data was assumed to be at an ordinal level and therefore parametric testing was considered inappropriate. It is possible that the different findings for hypothesis one in the Davis study are due to inappropriate statistical testing. However, it is not possible to reach any conclusions as to whether nonparametric testing of the prior study's data would have altered the research findings, as the full data set for that study is unavailable. Alternatively, the different results for hypothesis one for the two studies may be due to sampling error and differential range restriction as suggested by Schaubroeck and Muralidhar (1991).

The results of this study do provide support for the conclusions of Schaubroeck and Muralidhar (1991) which were that task complexity does not moderate the effect of an information presentation where decision accuracy is the performance criterion. The results also suggest that task complexity does not moderate the effect of an information presentation where response time is the performance criterion. It is possible that the experience levels of the subjects used in this research differed from those used by Davis (1989).

Further research could incorporate differing experience levels, as an independent variable, to clarify whether experience level, task complexity and the form of information presentation interactively affect decision performance. Such research may be relevant to the designers of general purpose financial reports because the users may have varied backgrounds and prior experience using graphical and tabular information presentations.

Response Time - Monochrome vs Colour Presentation

The results of this study indicated that the response time using colour information presentations was significantly slower than the response times using monochrome information presentations. This suggests that colour information presentations reduces the efficiency of information presentations which contradicts the suggestion by Lohse (1993) that visual primitives such as colour could reduce the information-processing load on short-term memory.

Further analysis on the data suggested that the significant differences in the response times for the monochrome and colour treatments occurred in the table presentation. While the mean response times using the colour bar and line graph were slower than the monochrome equivalents in all but one question the slower response times in the colour treatment group was therefore related to the table presentations.

The addition of colour to the table presentation did not appear to assist the subjects in identifying, scanning, estimating or comparing the data presented. Research by Fischer (2000) found that that the inclusion of irrelevant depth cues increased the response times of the subjects, and that increasing the complexity of the graphic display generally slowed down comprehension[7]. The addition of colour was an irrelevant cue that affected performance in much the same way as colour had affected performance with graphic presentations. It is suggested that this increased data load (Iselin 1995) may have required the subjects to filter out more irrelevant cues than was necessary using the monochrome table information presentation reducing decision performance in terms of the user's response time.

In terms of response time, the introduction of colour into an information presentation would appear to be detrimental to decision performance when this addition does not provide more relevant cues to the decision-maker. The use of colour in table presentations appears to increase the data load of this information presentation.

The regression analysis indicated that the use of colour in an information presentation would slow response time. Further, the regression provided confirmation that the independent variable 'question complexity' had been correctly operationalised. As expected, the regression also indicated that most of the variance in response times was due to question complexity and that as question complexity increased response time also increased (assuming all other variables were held constant).

The independent variables explained only 34.9 percent of the variation in response times. The model developed from the literature review suggests that other variables such as the cognitive style of a decision-maker or the decision environment also affect decision performance. The results of the multiple regression indicates that other variables affect response time and future research may seek to incorporate the variables suggested in the model.

Accuracy - Monochrome vs Colour Presentation

The results indicated that there was no difference in the effectiveness of monochrome information presentations when compared to colour presentations. This finding suggests that the use of colour in general purpose financial reports does not detract from or enhance a users' decision performance with an information presentation when measured in terms of the accuracy of decisions.

The addition of colour to the information presentations did not improve performance with graphical presentations in terms of accuracy as was proposed by Tan and Benbasat (1993). The ability of the subjects using colour information presentations to discriminate trends was not different to the ability of the subjects using monochrome information presentations in terms of the accuracy of the answers to the questions.

[7] Fisher (2000) compared two-dimensional and three dimensional bar graphs to evaluate decision times.

Research Limitations

The information presentations used in this study were two-dimensional time-series bar graphs, line graphs and tables displayed to the subjects on a 15-inch computer monitor. The findings of this study are therefore only applicable to these three types of information presentations. However, these information presentations are commonly used in Australian financial reports (Beattie & Jones 1999; Hrasky & Smith 2008). Further, the tasks undertaken by the subjects were elementary data extraction tasks, undertaken by individuals, and may have limited applicability to more complex data extraction tasks involving group decision-making.

The small sample size may not be representative of the population and future research may seek to obtain a wider audience by the use of the Internet. The computerised instrument could be developed for Internet use and this would allow for access to a greater number of subjects to be involved. Future research could also examine whether differing experience levels of the subjects has an influence on the variables. Another consideration is the respective intelligence of the participants in addition to their experience; further research incorporating consideration of intelligence and the assigning of participants to ensure an equal 'group intelligence' would improve the implementation of the testing model.

Another possible limitation of the research design was not allowing the participants to 'skip' questions they were unable to answer; this may have resulted in participants randomly selecting answers to these questions and skewing the results obtained. This flaw in the software package employed could be easily remedied in future testing.

Further research could be undertaken to study the interactive effects of task complexity and information presentations using other criteria such as viewer preference or memory for the information provided. This research should also consider the possible effects of a decision-maker's experience level and intelligence on the decision-making task. The relevance of this research would be dependent upon how decision performance is defined by the user of a financial report and the designer of a financial report.

Implications

The results of this study indicate that when decision usefulness is measured in terms of the accuracy of answers or response time to reach a decision both tables and graphs are equally suitable methods for representing accounting information regardless of the level of question complexity. However, the use of colour in information presentations appears to slow response times where the colour does not provide relevant cues to the decision-maker. There appears to be no increase in the accuracy of decisions made when a colour information presentation is used rather than a monochrome information presentation.

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Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 7

2012

The Effect of IFRS Adoption on the Financial Reports of Local Government Entities

Kamran Ahmed
La Trobe University, k.ahmed@latrobe.edu.au

Manzurul Alam
Murdoch University, Australia

Recommended Citation
Ahmed, Kamran and Alam, Manzurul, The Effect of IFRS Adoption on the Financial Reports of Local Government Entities, *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 109-120.

The Effect of IFRS Adoption on the Financial Reports of Local Government Entities

Abstract

This paper aims to analyse the changes in accounting surplus (loss), equity and assets, and liabilities as a result of accounting policy changes from the Australian Accounting Standards (AAS) to the International Financial Reporting Standards (IFRS) in Australian local government entities. Using the reconciliation notes disclosed by 117 local government entities, evidence is provided on the effects of IFRS adoption by identifying the key items that of difference between IFRS and AASB. The results show some differences between two sets of accounts prepared under these different accounting standards. While the average surplus (loss) of local councils has decreased, their equities, assets and liabilities have increased, with no major significant changes in their overall financial position, except for liabilities. These results indicate the possible consequences of the adoption of IFRS by local government entities in other countries on performance indicators who have or are yet to implement these standards.

Keywords

AASB, IFRS, Accounting policies, Local government entities

Cover Page Footnote

Comments from seminar participants at La Trobe University and financial support from La Trobe and Murdoch Universities are acknowledged

The Effect of IFRS Adoption on the Financial Reports of Local Government Entities

Kamran Ahmed*[1], Manzurul Alam[2]

Abstract

This paper aims to analyse the changes in accounting surplus (loss), equity and assets, and liabilities as a result of accounting policy changes from the Australian Accounting Standards (AAS) to the International Financial Reporting Standards (IFRS) in Australian local government entities. Using the reconciliation notes disclosed by 117 local government entities, evidence is provided on the effects of IFRS adoption by identifying the key items that of difference between IFRS and AASB. The results show some differences between two sets of accounts prepared under these different accounting standards. While the average surplus (loss) of local councils has decreased, their equities, assets and liabilities have increased, with no major significant changes in their overall financial position, except for liabilities. These results indicate the possible consequences of the adoption of IFRS by local government entities in other countries on performance indicators who have or are yet to implement these standards.

Keywords: AASB, IFRS, Accounting policies, Local government entities.

JEL Classification: M40, M41

[1] La Trobe University, Melbourne, Australia

* Corresponding author: K.ahmed@latrobe.edu.au

[2] Murdoch University, Perth, Australia

Acknowledgements: Comments from seminar participants at La Trobe University and financial support from La Trobe and Murdoch Universities are acknowledged.

Introduction

In this study we examine how the adoption of the International Financial Reporting Standards (IFRS) impacted on equities, surpluses, assets and liabilities of local government entities in Australia. This research is particularly important for many reasons, not least of which that there is a paucity of research using annual reports of local government entities. For example, Pilcher & Dean (2009a) pointed out that accounting for infrastructure assets, such as roads, bridges, parks and heritage buildings, and the preparation of accounts under accrual accounting are currently a source of debate confronting public sector practitioners and regulators in many countries. Hoque (2004) showed the controversies of including land under roads as assets in financial reports in his study of local councils. The adoption of IFRS has brought this debate into the limelight as many western developed countries are yet to adopt IFRS for local government entities. PricewaterhouseCoopers (PwC) (2008) suggests that the implementation of IFRS is a complex process involving understanding differences between country-specific accounting standards and IFRS for local government entities. For example, in the context of the U.K., PwC has identified several differences that need to be considered before evaluating the annual report performance of local government entities which will move to accounting on an IFRS basis by 2010/11. This includes: controversies remaining on the valuation of fixed assets on fair value as opposed to current value; accounting leases of land and buildings; pension plans; and joint venture and associates. Pilcher & Dean (2009) pointed out that infrastructure can comprise up to 90% of a council's total assets and a changeover to IFRS from AASB-based reporting can have a major impact on the performance of Australian local government entities.

In 2004, Australia became one of the first countries to adopt IFRS for local government entities with full compliance taking place for the 2005/06 financial year. The decision to implement IFRS by the Financial Reporting Council (FRC) in Australia generated much public debate. There seemed to be general agreement among the various interest groups and the wider community that its introduction would materially affect Australian entities' financial performance and accounts quality (Buffini 2005; Clarke & Dean 2005). One of the reasons for such concern was that the adoption of IFRS would lead to significant changes in several existing Australian standards and minor changes in others (Deegan 2005, p.32-35) reporting requirements.

In the context of local government entities, changes to accounting standards were expected to impose significant and major modifications to the way these entities previously reported financial performance to their stakeholders. Like profit-seeking entities, local government entities were uncertain of the impacts prior to the implementation of changes in financial reporting in line with the adoption of IFRS (Pilcher & Dean 2009a). These changes required a rethink of many underlying concepts and methods, changes in accounting processes and systems and new presentation formats. Further, local government entities were expected to prepare for the changes, explain them to respective councillors, staff and the public, meet audit office expectations, review and revise policies, effectively prepare two sets of financial statements for the year to 30 June 2005 and still do all their normal work. Indeed, a study based on a survey of Director of Corporate Services (or similar) in all councils of NSW in 2006 by Pilcher & Dean (2009b) found that the implementation of IFRS by local councils was a costly and time-consuming exercise. It is questionable whether there are significant benefits as claimed by AASB in the adoption of IFRS standards by all sectors, especially the local government entities.

There have been numerous studies on the costs and benefits of IFRS adoption on profit-seeking corporations. For example, in Australia, Goodwin, Ahmed & Heaney (2008) examined the effect of adopting IFRS on the accounts and accounting quality in listed firms,

relying on retrospective reconciliations between numbers prepared under Australian Accounting Standards and IFRS. They found that the adoption of IFRS increased total liabilities, decreased equity and more firms experienced decreased surpluses. Becis, Ng & Roca (2006) using a much smaller dataset of listed companies found that for medium and small firms a positive relationship exists between the impact of IFRS on net profit after tax (NPAT) and market value. For large firms, this relationship was negative. However, there has been very little evidence available on this issue for local government entities in Australia. Pilcher & Dean (2009a) examined the effects of IFRS in the decision-making process of local government entities. Their study concluded that large councils could adopt IFRS standards and develop organisational processes to introduce such changes. The smaller councils with limited resources were not ready for such changes, and as a result their normal activities were affected and this shift was found to be time-consuming and expensive.

This study will contribute significantly to our understanding of the effect of IFRS adoption on significant accounting measures in Australian local government entities. This study provides insights into the effects of IFRS adoption which would be a valuable source of information for other countries which are either adopting or yet to adopt IFRS for reporting entities. For example, local government bodies in the United Kingdom are expected to adopt IFRS-based reporting by 2010/2011. Similarly, in Canada, the IFRS will be fully adopted by reporting entities in 2011. In the U.S. the Securities and Exchange Commission (SEC) has proposed allowing and eventually requiring public U.S. issuers to report financial results in accordance with IFRS.

This paper analyses the changes in accounting surplus, equity, assets and liabilities as a result of accounting policy changes from Australian Accounting Standards (AAS) to IFRS in local government entities. The selection of surplus (loss), earnings, assets and liabilities as a focus of study is justified on the grounds that the calculation of these indicators has a cumulative effect on the financial position and financial performance of local government entities. The adoption of IFRS affects the treatment of many issues such as: property plan and equipment (PPE); intangible assets; depreciation; proceeds of disposal of assets; written value of assets sold; recognition of previously unrecognised assets; share of net profit/losses of associates and joint ventures; accumulated surplus; retained surplus (loss); error correction prior year; both short-term and long-term liabilities; interest; and other expenses. Earnings and surpluses are used interchangeably in this study. Thus, the IFRS numbers focussing on surplus (loss) and the balance sheet are compared with those under AASB for the period immediately prior to IFRS adoption, to get an understanding of the consequences of the adoption of IFRS by local government entities. Specifically, this study aims to gain insights into whether local government surpluses are affected by the adoption of IFRS standards. Secondly, to examine significant items that can influence earnings/surpluses and equity as a result of accounting policy changes. Finally, this study aims to examine, whether there are significant variations among local government entities on these changes in surplus (loss), equity, and assets and liabilities.

The remaining sections are organised as follows. The following section provides background information about the adoption of IFRS by local government entities. The next section reports on the data collection. The following section presents the results of the effect of IFRS on surplus (loss), equity, assets and liabilities of local government entities. Finally, conclusions are drawn.

IFRS and Local Government

The introduction of IFRS accounting standards is applicable to all sectors of the Australian economy, which means that such standards are sector neutral. The same standards are applicable to all entities including public and not-for-profit entities. Public sector entities are different compared to their private sector counterparts, not least, in terms of ownership and organisational objectives. Such differences raise questions as to whether the same accounting standards are suitable for public sector organisations.

The Australian public sector is composed of three tiers of government: local government, state government, and the commonwealth government. Prior to the introduction of accrual accounting, all public sector entities maintained their accounts on a cash basis. As with all other tiers of the public sector the local government entities adopted accrual accounting with the introduction of *AAS 27*. Public sector financial reporting was mainly guided by three accounting standards in Australia and these were: *AAS 27 (Financial Reporting by Local Government); AAS 29 (Financial Reporting by Government Department);* and *AAS 31 (Financial Reporting by Governments)*[3]. As IFRS has no separate accounting standards for public and not-for-profit entities, the AASB needed to consider specific guidelines and additional notes as part of the adoption process. Such initiatives were aimed at eliminating duplications in accounting standards, integrating Government Financial Statistics (GFS), comparing exiting standards with IFRS standards, and issuing specific guidance. The introduction of IFRS standards in local government entities can be seen as complicated when compared to the private sector since these entities have social objectives and complex arrangements, such as private/public partnership programs and the dominance of infrastructural assets.

Data Collection

As discussed earlier, local government entities were required to prepare financial statements in accordance with IFRS and existing accounting standards, such as *AAS 27 (Financial Reporting by Local Governments)*. The *AASB 1047 "Disclosing the Impacts of Adopting Australian Equivalents of the International Financial Reporting Standards (AEIFRS)"* required certain disclosures to be made in the Notes to the Financial Statements for the initial adoption periods. The Australian equivalents to IFRS were applicable for reporting periods beginning after 31 December 2004 and local government entities were required to restate comparatives and provide reconciliations to AASB in the first year of adoption (AASB 1). This requirement permits comparison between accounting earnings/surpluses, equity, assets and liabilities dollar amounts prepared under AASB and those under IFRS for the same set of entities. Such presentation of accounts under two different standards for the same periods provided a significant opportunity to see the effects of IFRS on local government financial reporting.

As this paper aims to locate the changes in earnings/surpluses, equity, assets and liabilities as a result of accounting policy changes, the annual reports produced by local government entities in 2005 provided the required data to assess these changes as these reports showed accounting information in comparative figures. We obtained a list of all local government entities in New South Wales (NSW), Queensland (QLD), South Australia (SA) and Victoria (VIC) from their respective Offices of Local Government, who as state bodies are responsible for the administration and regulation of local government. From this list,

[3] *AAS 27, AAS 29* and *AAS 31* were withdrawn in 2008.

only annual reports for the year ended 30 June 2005 containing reconciliation notes in accordance with AASB 1 were identified. Table 1 shows the data for 117 local councils comprising City, Shire and Regional councils. There are 39, 10, 20 and 48 councils from NSW, QLD, SA and VIC respectively. The City, Shire and District councils represent 52%, 43% and 5% respectively. The reconciliations from AASB to IFRS form the basis for this study.

Table 1
Description of Sample

	N	Percentage	NSW	QLD	SA	VIC
City Council	61	52%	18	6	12	25
Shire Council	50	43%	15	4	8	23
District Council	6	5%	6	0	0	0
Total	**117**	**100%**	**39**	**10**	**20**	**48**

Empirical Results

Reconciliations of Surplus and Equity

Table 2 (Panels A and B) shows the aggregated reconciliations for the last year surplus (loss) and for equity at the most recent balance date under AASB. For example, for a 31 December annual balance date council surplus (loss) is for the year to 31 December 2004 and equity, liabilities and assets as are 31 December 2004. We selected the most frequent reasons for differences and ranked from greatest to least changes in average surplus (loss) and equity. Some items were found to be income-increasing and others as income-decreasing. Using the AASB surplus (loss), the most common income-increasing items were: depreciation and amortisation, employee benefits, other revenue, borrowing cost, net gain/loss on PPE, and materials; and income-decreasing items were: written value of assets sold, other expenses, and share of net profit/losses of associates and joint ventures.

Using the AASB equity, the most common items that increased the equity were: accumulated surplus, retained surplus (loss), error correction prior year, and council interest. The most common items that reduced the equity were: recognition of previously unrecognised assets, reserves, and PPE/capital (Panel B). The table also shows that the highest positive mean change from AASB surplus (loss) to IFRS surplus (loss) in dollar terms is due to materials previously expensed followed by recognition of other revenue items. The highest negative average change is associated with written assets sold followed by other expenses. For equity, the highest positive change is due to the transfer of balance to retained surplus (loss), followed by interest capitalisation.

Table 2
Effect of Most Significant Items on Surplus (loss) and Equity

	Mean	Median	Std Dev	N=117
Panel A: Surplus (loss)				
AASB	36,561.32	4,454.56	204,516.4	
Materials	556.33	890.80	31,525.29	24
Depreciation and amortisation	1,231.21	2.22	9,199.32	64
Net gain/loss on PPE	999.80	36.80	5,219.73	22
Other revenue	697.35	4.71	2,330.09	35
Employee benefits	449.85	12.20	3,124.11	36
Borrowing cost	138.28	36.56	345.22	29
Share of net profit/losses of associates and joint ventures	-15.09	33.53	295.89	10
Other expenses	-211.51	2.00	744.82	10
Recognition of previously unrecognised assets	2,234.76	700.06	5,656.89	20
Proceeds on disposals of assets	24,981.70	597.01	14,519.70	36
Written value of assets sold	-31,405.90	664.20	157,576.20	25
IFRS	33,748.71	3,241.00	201,765.30	
Panel B: Equity				
AASB	1,973,419.0	412,592.90	12,153,621.00	
Retained surplus (loss)	22,765.37	54.32	67,955.90	17
Council interest	12,200.0	-5.04	30,236.79	7
Accumulated surplus	4,011.49	41.50	35,176.29	74
Error correction prior year	3,257.37	60.25	14,497.18	15
PPE/capital	-1,844.20	120.05	4,824.79	5
Recognition of previously unrecognised assets	-1,0114.0	-6.13	54,883.31	27
Reserves	-14,232.90	-1,187.35	58,398.21	18
IFRS	1,989,462.0	427,626.88	12,321,798.26	

Table 3 shows the overall effect of IFRS adoption on local government surplus (loss) and equity. The mean effect on surplus (loss) is negative amounting to $1.89 million while the mean effect on equity is positive to the extent of $6.6 million. Overall, the stakeholder wealth was better off following the adoption of IFRS in 2005. The mean changes in surplus (loss) and equity are divided by population and total rate income. The mean per capita loss is $25 and $0.042 per dollar of rate received by the councils during the year 2005. This loss has been more than compensated by the increase in equity to the extent of $47 per capita and $0.88 per dollar of rate revenue.

Table 3
Effect of Most Significant Items on Assets and Liabilities

	Mean	Median	Std Dev	N=117
Panel A: Assets				
AASB	1,894,675.87	419,073.05	12,503,366.03	
Receivables	18,976.56	-17.00	74,646.10	16
Investment property recognition	13,474.93	2,777.00	55,031.76	29
Other items	9,639.33	531.00	48,368.48	43
PPE non-current	6,486.56	523.00	46,023.42	43
Other assets	2,819.94	3,845.00	9,122.65	17
Inventory	2,479.43	5,245.50	10,122.68	14
Investment property current	2,347.24	3,493.00	8,225.88	21
Land valuation adjustments	1,401.31	676.00	10,375.70	13
Employee entitlements	1,330.17	-17.00	3,365.05	6
Non-current assets held for resale	748.36	527.00	9,840.62	14
Intangible assets	-230.57	221.50	9,252.93	14
Cash or cash equivalent	-679.34	531.00	10,350.92	35
Adjustments for infrastructural assets	-859.46	-80.00	9,314.13	13
Investment non-current	-1,949.00	-1,632.50	14,300.64	6
IFRS	1,950,019.52	433,502.50	125,15,430.00	
Panel B: Liabilities				
AASB	41,412.37	20,922.01	122,530.2	
Trade payables	2,734.82	528.50	9,941.28	23
Provisions short-term	2,253.22	832.20	4548.37	31
Others	649.83	82.5	1255.58	6
Employee benefits	56.38	6.23	1,777.30	39
Provisions long-term	26.778	-3.30	8,827.87	67
Payables short-term	25.17	113.09	3,746.91	18
Payables long-term	-2,672.55	-905.30	6,843.60	20
IFRS	44,486.83	20,947.30	123,019.30	

Reconciliation of Assets and Liabilities

Table 4 (Panels A and B) shows the most frequent assets and liabilities items extracted from reconciliation statements prepared by the first-time local government adopters. The difference between the average total assets under IFRS and AASB is $55.34 million. The most frequent items that increased assets are: other items; PPE non-current; investment property recognition; other assets; receivables; inventory; non-current asset held for resale; land valuation adjustments; and employee entitlements. The most frequent items that decreased assets are: cash or cash equivalent; intangible assets; adjustments for infrastructural assets; and investment non-current.

Panel B shows that the average liabilities under IFRS are higher than those under AASB and the difference is about $3.07 million. The most frequently items that increased liabilities are: provisions long-term; employee benefits; provisions short-term; trade

payables; payables short-term; and other items. The only item that reduced liabilities is the reduction in long-term payables. We tested for the difference in the aggregate effect of the adoption of the IFRS on assets and liabilities and found that the difference in total liabilities prepared under AASB and IFRS is significant at the 5% level while the difference in total assets is not significant. These results suggest that the implementation of the IFRS caused some change in the capital structure of local bodies within local government bodies in Australia.

Table 4
Effect of IFRS Surplus (loss) and Equity on Population and Rates

	Average ($'000)	**Median ($'000)**	**Standard Deviation**
Change in Surplus (loss) (IFRS-AASB)	-1,894.209	0.000	15,639.281
Change in Equity (IFRS-AASB)	6,572.564	0.000	42,506.909
Population	79,721.255	58,050.000	104,070.660
Rates	48,435.941	30,943.000	99,849.906
Surplus (loss) effect			
Population	-0.025	0.000	0.167
Rates	-0.042	0.000	0.284
Equity effect			
Population	0.047	0.000	0.303
Rates	0.088	0.000	0.403

Size Effect

Prior to the adoption of IFRS, several commentators argued that smaller firms would be disadvantaged. For example, the Australian Institute of Company Directors (AICD 2004, p.6) stated that smaller companies are at ". . . a greater disadvantage in moving to IFRS than larger companies", primarily due to resources constraints. The Institute of Chartered Accountants in Australia also supported some relief for small- and medium-sized entities in its submission to the Committee (ICAA 2005, p.2). Wayne Cameron, Technical Director of RSM Bird Cameron, claimed that generally small firms' balance sheets will be weakened by Australian IFRS except for intangibles (Andrews 2005). In contrast, the chairman of the AASB, David Boymal, was of the view that small firms would be surprised to see no significant effect on their financial position due to the adoption of IFRS (Andrews 2005). Because of the conflicting views, we examined whether or not small councils were worse off. Goodwin and Ahmed (2006), using data from 135 listed firms, found that more than half of small listed firms on the Australian Stock Exchange have no change in net income or equity from IFRS, and that there is an increase in the number of adjustments to net income and equity with firm size. Their study also finds that IFRS has increased net income for small- and medium-sized firms. Equity has increased (decreased) under IFRS for small (large) firms. Small firms experience higher surplus (loss) variability than medium-sized or large firms under IFRS.

Table 5
Effect of IFRS Surplus (loss) and Equity on According to Size

	Average ($'000)	Median ($'000)	Standard Deviation
Small Council			
Surplus (loss) effect	-981.760	0.000	4,794.350
Equity effect	574.311	5.750	3,595.445
Medium Council			
Surplus (loss) effect	-1,309.892	0.000	5,416.144
Equity effect	5,013.795	0.000	15,843.591
Large Council			
Surplus (loss) effect	126.000	0.000	2,681.795
Equity effect	1,273.620	0.000	5,703.295
Test of difference (ANOVA): Surplus (loss)	F=1.125, Sig =0.328		
Test of difference (ANOVA): Equity	F=2.145, Sig =0.122		

As reported in Table 5, we divided the councils into three equal groups based on population. The table shows that while small and medium councils experienced loss in surplus (loss) amounting to $981,760 and $1,309.892, respectively, these losses have been offset by an increase of $574,311 and $5,013,795 in equity respectively. On average, large councils had a positive effect in surplus (loss) and equity. With respect to equity no major deviation has been noted, and ANOVA tests do not show any significant impact on both surplus (loss) and equity across the three groups of councils. With respect to assets and liabilities, we also undertake similar analysis and do not find any size effect.

Summary and Conclusions

The adoption of the IFRS in Australia has been a significant event in Australian financial reporting history and generated much debate about the implications of IFRS adoption with regard to material effect on Australian entities' financial performance and accounts quality. Changes to accounting standards in local government entities were expected to impose significant and major modifications to the way these entities reported their financial performance and position to their stakeholders. This study makes a significant contribution to our understanding of the effect of the adoption of IFRS for local government entities and examines the changes in accounting surplus (loss) and equity as a result of accounting policy changes from AASB to IFRS. Using the 2005 annual reports of 117 local government entities in Australia, evidence is provided of the effect of adoption of IFRS by such entities by identifying the key items reported in the reconciliation notes that caused differences between IFRS and AASB surplus (loss) and equity. The results show some differences between the two sets of accounts. Using the AASB surplus (loss), the most common income-increasing items are: depreciation and amortisation; employee benefits; other revenue; borrowing cost; net gain/loss on PPE; and materials. Income-decreasing items are: proceeds on disposals of assets; written value of assets sold; recognition of previously unrecognised assets; other expenses; and share of net profit/losses of associates and joint ventures.

Overall, while the surplus (loss) of local councils decreased, their equities show a significant increase, with no major significant changes in overall financial position. The results also show that while small and medium councils experienced a loss in surplus (loss), these losses have been offset by an increase in equity. On average, large councils had a positive effect in both surplus (loss) and equity. With regard to the effect on total assets and total liabilities, we find that total assets and total liabilities have increased by about $55 million and $3.07 million, and only the increase in total liabilities is significant at the 5% level. Our findings are consistent with other studies on the effect of IFRS adoption in private sectors entities in Australia.

The findings from this study contribute to our understanding of the effects of the implementation of the adoption of the IFRS on reported figures of surplus, equity, assets and liabilities using a large number of local government entities. The results also shed insight into the possible effect on reported numbers by local councils in countries such as Canada, Malaysia and the U.K. who are about to implement IFRS for local government entities.

Further studies need to be undertaken to investigate other areas of the IFRS adoption process. It may be useful to undertake one or two in-depth case studies to see the adoption process from a longitudinal perspective. Nevertheless, the contribution made by this study is highly significant; not least because it shows the effects on performance. It is also expected that other studies on IFRS adoption in local government entities in other countries will be undertaken and that this will provide significant opportunities for comparative understanding of different adoption strategies and their amplifications.

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Australasian Accounting, Business and Finance Journal

Volume 6 | Issue 3 Article 8

2012

Reply to "Response: Board Composition and Firm Performance: Evidence from Bangladesh - A Sceptical View"

Afzalur Rashid
University of Southern Queensland, afzalur.rashid@usq.edu.au

Anura De Zoysa
University of Wollongong, Australia, anura@uow.edu.au

Sudhir Lodh
University of Wollongong, Australia

Kathy Rudkin
University of Wollongong

Recommended Citation
Rashid, Afzalur; De Zoysa, Anura; Lodh, Sudhir; and Rudkin, Kathy, Reply to "Response: Board Composition and Firm Performance: Evidence from Bangladesh - A Sceptical View", *Australasian Accounting, Business and Finance Journal*, 6(3), 2012, 121-131.

Reply to “Response: Board Composition and Firm Performance: Evidence from Bangladesh - A Sceptical View”

Abstract

This paper replies to Chowdhury’s (2010) response to the paper "Board Composition and Firm Performance: Evidence from Bangladesh" (2010). It challenges the strength of the criticisms, arguing that the factors discussed in Chowdhury (2010) do not necessarily impair the outcome of the research. The authors elucidate issues raised, and in so doing, reproduce the results incorporating the commentator’s suggestions.

Keywords

Board composition, independent directors, firm performance, Bangladesh

Reply to “Response: Board Composition and Firm Performance: Evidence from Bangladesh - A Sceptical View”

Afzalur Rashid[1] , Anura De Zoysa[2] , Sudhir Lodh[2] & Kathy Rudkin[2]

Abstract

This paper replies to Chowdhury’s (2010) response to the paper "Board Composition and Firm Performance: Evidence from Bangladesh" (2010). It challenges the strength of the criticisms, arguing that the factors discussed in Chowdhury (2010) do not necessarily impair the outcome of the research. The authors elucidate issues raised, and in so doing, reproduce the results incorporating the commentator’s suggestions.

Keywords: Board composition, independent directors, firm performance, Bangladesh

JEL Codes: G34; G39

[1] University of Southern Queensland
Email: afzalur.rashid@usq.edu.au
[2] University of Wollongong

Introduction

We thank the commentator (Chowdhury 2010) for recognising the contribution of our study, and providing specific recommendations for our research. In this response, the authors elucidate issues raised, and in doing, reproduce the results incorporating the commentator's suggestions. We recognise Chowdhury has an economic discipline's perspective on the accounting study, and argue that the contextual factors discussed in his reply do not necessarily impair the outcome of the Rashid et al. (2010) paper.

Points of Clarification

Focus of the Paper

Chowdhury (2010) identifies the results of Rashid et al. (2010) as complementing the findings of Bhuiyan and Biswas (2007), that the age and size of the board of directors do not have significant impact on corporate governance disclosures. However, the authors clarify that a comparison of the findings cannot be drawn, because the focus of our research is examining a different aspect. Rather than examining the impact of governance attributes on *disclosur*e, Rashid et al. (2010) examine the effect of *board composition* on *firm performance*.

Limitation of Literature Review

Chowdhury (2010), in acknowledging the comprehensive nature of the literature review, suggests that inclusion of studies on South Asian countries would improve the contribution of the study. The authors concur. Regrettably, there is a dearth of published empirical studies on the impact of corporate governance on firm performance in South Asia in general, and specifically on the impact of corporate board composition and its effects on firm performance. Our research did not discover any directly comparable literature for South Asia. However, there are limited more general studies such as Shah, Zafar and Durrani (2009), who investigate the earnings management motives of independent directors in Pakistan. This is recognised as an area for further research.

Sample Size

The authors thank the commentator for his observation in his first footnote, of inconsistent terminology regarding sample size. We confirm that the sample size on page 77 of our paper should be 274 firm-years, consistent with page 76 and Table 1 on page 83.

The Model: Theoretical Underpinnings.

Rashid et al. (2010) make reference to established research on board composition and firm performance, premised on the tenets of agency theory. These studies provide theoretical justification for the explanators of the model used in our study that targets the Bangladeshi

context. In this respect we refute the allegation our model is ad hoc with no theoretical underpinnings.

The Model: Discussion of Variables

Chowdhury (2010) argues that the regression model of Rashid et al. (2010) may be misspecified, as it leaves out some important variables such as retained earnings and R&D expenditure, and that this will result in omitted variable bias (p. 104). Further, he suggests that the explanators used only capture the managerial aspects of the firm, and ignore demand-supply, innovation and technological aspects which also contribute to profit (Chowdhury 2010, p.105).

The authors acknowledge these points. In any linear regression model, many variables may be included. However, any study must put a limit to the number of variables, and make choices as to their relevance. There is inevitably inherent bias as not all explanatory variables are known or can be incorporated. The authors chose the explanatory variables based upon those identified in the findings of previous literature (Rashid et al. 2010, pp.84-85). The authors' aim was to limit the independent variables within the corporate governance attributes, subject to availability of data. For example, while R&D is a recognised explanatory variable, many listed firms in Bangladesh do not appropriately disclose R&D expenditure in their disclosure documents, despite adopting a process of convergence with international accounting standards in 1999 (see for example Mir & Rahman 2005).

Chowdhury (2010) suggests the Hausman test or Ramsy's RESET (Regression Specification Error Test) be run (p.108) to justify the appropriateness of the variables in the model. The authors conducted the Ramsay's RESET by using E-Views to determine if additional variables could be fitted within the regression model (see Table 1). The results suggest while additional variables could be fitted within the Tobin's Q model, this is not so for the ROA model. It is worthy to note that Ramsay's RESET does not suggest which variable(s) should be included and the inclusion of another variable into the model may even increase the bias.

Acknowledging these limitations, we also conducted the 'omitted variable-likelihood ratio' test to determine whether the omitted variables 'retained profit' (as suggested by Chowdhury 2010), 'firms growth' and 'firms risk' (measured as Standard Deviation of movement of stock price per month or stock price volatility) play an important role in the Rashid *et al.* (2010) model. From the results of the test in Table 1, the authors notice that, except for risk in ROA model, inclusion of all of these variables did not play an important role in either of the models. Asteriou and Hall (2007, p.344) while mentioning the advantages of 'panel data' noted that, "the basic idea behind panel data analysis comes from the notion that the individual relationship will all have same parameters. This is sometimes known as pooling assumptions". They maintain that, if the pooling assumption is correct, the problem of omitted variables which may cause biased estimates in a single individual regression may not occur in a panel context. Because we have already conducted Ramsey's RESET and 'omitted variable-likelihood ratio', the CUSUM and CUSUM Square Test would be repetition and thus are not conducted. The preference for a dynamic model is contestable.

Table 1
Diagnostics

	Model	F-Statistics	*P- Value*	
Ramsey RESET	ROA	1.5227	0.2183	
	Tobin's Q	9.8009	0.0000	***
Ramsey RESET	ROA	9.865109	0.0019	
[after including Growth, Risk, and Retained Profit]	Tobin's Q	18.4319	0.0000	***
Omitted Variable-likelihood Ratio (Growth)	ROA	0.040859	0.8400	
	Tobin's Q	0.029430	0.8639	***
Omitted Variable-likelihood Ratio (Risk)	ROA	20.07498	0.0000	***
	Tobin's Q	39.62854	0.0000	***
Omitted Variable-likelihood Ratio (Retained Profit)	ROA	2.237619	0.1359	
	Tobin's Q	48.03429	0.0000	***

* $p < 0.10$; ** $p < 0.010$; *** $p < 0.001$.

Relationship between Firm Age and Performance

Chowdhury (2010) questions the inclusion of firm age as a control variable within Rashid et al.'s (2010) model, arguing a "a non-monotonic relationship is implied between age of the firm and firm's profitability" (p.105); "it may be misleading to relate profitability with the age of the firm" arguing that "older firms suffer from inertia and a failure to innovate and thus they degenerate into oblivion" (p.106). He further argues that the "over-concentration of family ownership control is the surest sign of a non-monotonic relationship between firm-age and profitability. For instance, the death of a family patriarch and/or falling-out among feuding family members often leads to disintegration within the firm management and adversely affects the profitability and viability of the firm" (pp.105-106). He subsequently mentions the examples of Quasem Group of Companies, Ilias Brothers and the Partex Group of firms which experienced such a disintegration and/or division.

The authors note that the relationship between firm age and performance has been clearly established in the literature (for example, Ang, Cole & Lin 2000; Eisenberg, Sundgren & Wellset 1998; Harjoto & Hoje 2008; Loderer & Waelchli 2009; Majumdar & Chhibber 1999; Tian & Lau 2001). Because of the possible influences of firm age on firm performance, many of these studies have included it as a control variable in their models. In his commentary on the relationship between firm age and firm performance, Chowdhury neglects to not distinguish between different corporate forms. Chowdhury's (2010) arguments are based upon Private Limited Companies (which are not listed on any stock exchanges) and as such have a fundamentally different governance structure and legal requirements to the firms included in the Rashid et al. study, which is based on public limited companies listed on Bangladesh stock exchanges. Private Limited Companies are not required to appoint outside independent directors, while publically listed companies are required to have outside independent directors. These companies have a formal accountability structure (have a formal board and management), hold annual general meetings, and prepare disclosure documents (subject to financial audit and scrutinised by the regulatory body Securities and Exchange Commission Bangladesh). A listed company and a private company have different ownership and oversight and an equivalent non-monotonic relationship cannot be inferred. Furthermore, the minimum firm age in Rashid et al. (2010) is 8 years (antilog of 2.079 from minimum LOGAGE in the descriptive statistics in p. 86). This indicates our sample firms have survived competition. There is insufficient evidence to support Chowdhury's (2010) argument for the impact of rent extraction. Even if rent extraction

by newer firms from older firms was occurring, the authors argue it cannot be inferred that there is no relationship between firm age and performance.

We have not provided the theoretical or statistical justification for transforming some variables into logarithms. We have done so to neutralise the variability in data and we have not provided the explanation as we assumed that readers will be aware of such practice. Rashid et al.'s (2010) results are presented in Table 5 of that paper.

Composition of Error Term

Chowdhury (2010) questions how homogeneity and independence are possible for firms in different industry groups in the sample (p.106). We have acknowledged this limitation within our paper (Rashid et al. 2010, p.89*)*. In this regard we again quote from Asteriou and Hall (2007):

> The basic idea behind panel data analysis comes from the notion that the individual relationship will all have same parameters. This is sometimes known as pooling assumptions as we are in effect pooling all the individual together into one dataset and imposing a common set of parameters across them (Asteriou & Hall, p.344).

They further maintain that, if the pooling assumption is not correct, the panel is often referred to as a heterogeneous panel (as the parameters are different across the individuals). Even if this is the case, (except certain circumstances) it is normally expected that the panel data estimator will give some representative estimate of the individual parameters. The only problem we have in our data is the violation of pooling assumptions, as we have used an unbalanced panel (as there are not 90 firms in all years) that may lead to 'unobserved heterogeneity'.

In response to the reviewer regarding the issue of variation across the firms and within a firm (or firm specific characteristics) the authors carried out further analysis using a panel data model. First, a Hausman Specification Test using E-Views was done to test the significance of the difference between the fixed effect estimates and the random effect estimates. The Chi Square (χ^2) statistics and corresponding p-values of both the ROA and Tobin's Q model rejects the null hypothesis that random effects are consistent (see Table 2). As such the authors have now run the regression with a 'fixed effect model' (to capture the firm specific characteristics) under both ROA and Tobin's Q models. The results of the ROA model are consistent with the conclusion of the Rashid *et al.* (2010) paper, that is, there is no significant relationship between board composition and firm economic performance in Bangladesh. However, the results of the Tobin's Q model in this test show that there is a significant negative relationship between board composition and firm performance. This additional analysis strengthens our original finding that independent directors do not add potential economic value, by now suggesting that independent directors may even reduce potential economic value to firms in Bangladesh.

Table 2
Board composition and firm performance

	Dependent Variables (Before capturing firm specific characteristics)				Dependent Variables (After capturing firm specific characteristics)			
	(a) ROA		**(b) Tobin's Q**		**(a) ROA**		**(b) Tobin's Q**	
Intercept	-0.078		-1.798	***	-0.206		-7.896	***
	(-1.061)		(-5.855)		(-0.602)		(-7.646)	
BDCOMP	0.144		0.418		-0.152		-1.195	**
	(1.560)		(1.088)		(-0.890)		(-2.312)	
DIROWN	0.039		0.020		0.154		-0.451	
	(1.087)		(0.132)		(0.723)		(-0.701)	
LOGBDSIZE	-0.042	*	0.384	***	0.014		0.286	
	(-1.724)		(3.765)		(0.204)		(1.345)	
CEOD	0.011		-0.110	*	-0.026		0.035	
	(0.757)		(-1.842)		(-0.672)		(0.301)	
DEBT	-0.080	***	0.886	***	-0.103	***	1.123	***
	(-6.356)		(16.966)		(-3.417)		(12.346)	
LOGSIZE	0.020	***	0.049	***	-0.027	**	0.024	
	(6.237)		(3.731)		(-2.922)		(0.888)	
LOGAGE	0.045	*	0.492	***	0.148		2.785	***
	(1.934)		(5.096)		(1.283)		(8.000)	
Adjusted R^2	0.302		0.586		0.585		0.888	
F-Statistic	17.468	***	54.887	***	5.000	***	23.554	***
Hausman Test (χ^2)					27.3409		48.1144	
P-value					0.0003	***	0.0000	***

This table presents the summary results of the board composition and firm performance under different performance measures. Column (a) and (b) represent the coefficients of performance measures. The *t*-statistics are presented in parentheses.
* $p < 0.10$; ** $p < 0.010$; *** $p < 0.001$.

Sample Period

Chowdhury (2010, p.107) questions the inclusion of the years 2007 and 2008 in our sample. He identifies them as being 'abnormal' years for the Bangladesh economy and politics, because in 2007 there was both a Bangladesh military coup which established a military-backed caretaker government, and a severe flood followed by the devastating cyclone Sidr.

The authors are perplexed as to why Chowdhury identifies these factors as significant, but then provides contradictory evidence to this argument in his selection of a quotation from the Ministry of Finance Bangladesh (2009) which states "The economy of Bangladesh continue[s] to demonstrate considerable resilience during FY 2008-09 despite the twin shocks arising from global recessions and the adverse effects of the consecutive floods and the cyclone-Sidr" (as cited in Chowdhury 2010 p.107). Floods and cyclones are very common in Bangladesh, and it is questionable whether such natural disasters have an abnormal impact on overall business activity. Furthermore, while Chowdhury (2010 p.107) contends "business confidence was low and many businessmen 'sat on their hands' until the term of the caretaker government was over" he offers no evidence supporting his conclusion that business activity was in the doldrums. Indeed, this observation also is directly contradictory to evidence he later quotes referring to the

FY 2008-09 "The economy is estimated to have grown at a rate of 5.9 percent, slightly below the growth rate (6.2 percent) of FY2007-08". The two performance indicators (sales and Tobin's Q) of the sample firms over 2008-09 also indicate that the overall performance is not abnormally low during the "abnormal" 2007-08 period. Refer Figure 1 below.

Figure 1
Average Sample Firm Performance 2000-2009

Institutional context is pivotal to the variables and sample size selected. Mandatory corporate governance disclosures were introduced in 2006 by Securities and Exchange Commission Bangladesh. A period of 2005-09 was selected for this study to capture the possible impact over the period of this specific regulatory change. This point was missed by the commentator.

Chowdhury (2010) argues that the Corporate Governance Notification 2006 (CGN) for the appointment of outside independent directors was issued on 20 January 2006 and its effect will only be known after a lag. In the Rashid et al. (2010) sample, 10 firms have outside directors even before the CGN 2006 was issued. All other firms in the sample acknowledged their obligation, which is evident from their disclosure documents by their respective year end. It is contended the period is sufficient to capture any lag. The firms whose financial years end on 30 June had almost 6 months lag, while the firms whose years end on 31 December had almost one year lag. Furthermore, although the condition of such appointment was not mandatory, non-compliance requires mandatory disclosure in the Director's Report as per schedule 5.00 of the CGN 2006, by order of the Securities and Exchange Commission of Bangladesh.

Results

Chowdhury (2010, p.108) contends an emphasis is placed on the statistical significance of the coefficient in arriving at the conclusions, while ignoring its magnitude. The study found the coefficient BDCOMP was positive but not statistically significant. Contrary to Chowdhury positing that "the magnitude of the estimated coefficient of BDCOMP is substantial (0.144 and 0.418 respectively)", the impact of an increase in this variable on firm performance is minute (an increase of 0.118 (one standard deviation) in this variable is associated with mere 0.0118 increase in ROA and 0.0343 on Tobin's Q). Therefore, the coefficient of BDCOMP in our results is neither statistically significant (i.e. does not provide sufficient evidence to conclude that there is a relationship between board composition and firm performance) nor practically significant.

Table 3: Board composition and firm performance under different performance measures

	Dependent Variables (Before correcting for heteroscedasticity)				**Dependent Variables** (After correcting for heteroscedasticity)			
	(a) ROA		**(b) Tobin's Q**		**(a) ROA**		**(b) Tobin's Q**	
Intercept	-0.078 (-1.061)		-1.798 (-5.855)	***	-0.102 (-1.070)		-1.824 (-6.265)	***
BDCOMP	0.144 (1.560)		0.418 (1.088)		0.146 (1.883)	*	0.414 (1.306)	
DIROWN	0.039 (1.087)		0.020 (0.132)		0.031 (0.798)		0.008 (0.048)	
LOGBDSIZE	-0.042 (-1.724)	*	0.384 (3.765)	***	-0.029 (-0.829)		0.415 (4.301)	***
CEOD	0.011 (0.757)		-0.110 (-1.842)	*	0.008 (0.689)		-0.117 (-2.187)	**
DEBT	-0.080 (-6.356)	***	0.886 (16.966)	***	-0.065 (-1.285)		0.914 (21.396)	***
LOGSIZE	0.020 (6.237)	***	0.049 (3.731)	***	0.018 (5.884)	***	0.046 (3.882)	***
LOGAGE	0.045 (1.934)	*	0.492 (5.096)	***	0.046 (2.795)	**	0.483 (4.460)	***
Adjusted R^2	0.302		0.586		0.286		0.641	
F-Statistic	17.468	***	54.887	***	16.636	***	70.761	***

This table presents the summary results of the board composition and firm performance under different performance measures. Column (a) and (b) represent the coefficients of performance measures. The *t*-statistics are presented in parentheses.
* $p < 0.10$; ** $p < 0.010$; *** $p < 0.001$.

Chowdhury (2010) also suggests running a diagnostic test for heteroskedasticity, and a Jarque-Bera Test for normality. A Breusch–Pagan-Godfrey (BPG) test was conducted through E-Views. This test confirms the presence of heteroscedasticity. It is noted that heteroscedasticity is very common in panel data (Asteriou & Hall 2007). Wrigley (1977 p.13) states "heteroscedasticity does not result in biased parameter estimates, but it does result in a loss of efficiency". Despite heteroscedasticity, OLS estimators are linear, unbiased and are (under general conditions) in large samples, normally distributed (Gujarati 2003, p.427). It is argued that "heteroscedasticity has never been a reason to throw out an otherwise good model" (Mankiw

1990, p.1648); "unequal error variance is worth correcting only when the problem is severe" (Fox 1997, p.306); and "unless heteroscedasticity is very severe, one may not abandon OLS in favour of GLS or WLS" (Gujarati 2003, p.400). Despite these considerations, we ran the regressions by using the correction techniques of White (1980) for unknown heteroscedasticity. The results show a change for the ROA performance measure, significant only at the 10% level. Refer to Table 3 above.

The normality assumption requires that observations should be normally distributed in the population. Coakes and Steed (2001) argue that the violations of this assumption are of little concern, when the sample size is large (greater than 30). There were 90 firms in the sample and the assumption of normality is confirmed through a Normal Q-Q Plot. The Residual Test/Histogram-Normality Test of all equations produced a 'bell shape'. Normality was also checked by using Kolmogorov-Smirnov and Shapiro-Wilk tests. Both tests do not reject the null hypothesis of normality (at p <0.001). Also carried out was the Jarque-Bera test (Table 4), using E-Views. It also does not reject the null hypothesis of normality (as p <0.001 in most cases).

Table 4
Descriptive Statistics of the Sample

Variables	*Mean*	*Minimum*	*Maximum*	*Std. Deviation*	*Skewness*	*Kurtosis*	*Jarque-Bera*	*Probability*
ROA	0.057	-1.494	0.287	0.132	-6.278	69.833	55270.08	0.000
Tobin's Q	1.290	0.335	6.226	0.769	2.566	9.873	1372.42	0.000
BDCOMP	0.109	0.000	0.333	0.082	-0.077	-0.751	8.126	0.017
DIROWN	0.423	0.000	0.960	0.190	0.069	0.423	2.065	0.356
LOGBDSIZE	1.857	1.099	2.485	0.304	-0.269	-0.102	3.530	0.171
CEOD	0.416	0.000	1.000	0.494	0.344	-1.896	45.921	0.000
DEBT	0.774	0.073	5.619	0.629	4.061	22.483	6266.395	0.000
SIZE	5.459	-4.200	10.724	2.398	-0.937	1.132	53.172	0.000
AGE	2.858	2.079	3.466	0.312	-0.082	-0.836	8.686	0.012

Although it is not mentioned in Chowdhury (2010), we would like to address the possible presence of endogeneity (the relationship between the independent variable with the error term) in our model. In the presence of endogeneity OLS estimates can be biased and inconsistent. While the endogeneity is an important factor, it is not fatal in doing empirical corporate governance research (Denis 2001, p.198). Despite this consideration, we have checked the possible presence of endogeneity in our model by carrying out a Hausman test. The output of the Hausman test suggests that both the OLS and TSLS are consistent.

Discussion and Conclusion

Rashid et al. (2010, p.88) concluded that there is no statistically significant relationship between board composition in the form of representation of outside independent directors and firm performance, implying that the outside independent directors did not add potential economic value to firms in Bangladesh. This conclusion is based upon the results shown in Table 5 (p.88). Although the BDCOMP coefficient found in Rashid et al. (2010) is not statistically significant, its positive sign is consistent with the literature presented (pp.77-82) which

demonstrates independent directors positively contribute to performance through good monitoring of management.

Chowdhury (2010, p.108) argued that "I am not sure how the authors can claim that external independent directors are '*good monitors'* as this has not been tested in this paper". However, in referring to our results he states "design of the β1 is POSITIVE indicating the independent directors' positive contribution to profitability; however, this substantial positive contribution of independent directors is rejected by the authors on the grounds of its statistical significance". In Chowdhury's own admission, we have tested the relationship between board independence and firm performance, a well recognised indicator of good monitoring in corporate governance literature (Bathala & Rao 1995; Kaymak & Bektas 2008; Luan & Tang 2007; Nicholson & Kiel 2007; Zahra & Pearce II 1989).

While acknowledging the potential contribution of a "properly specified econometric model" (Chowdhury 2010, p.108), the authors contend studies in the accounting discipline are artefacts of temporal contextual and social processes (Hines 1988). Acknowledging the limitations of a modelling tool, the authors see the contribution of this study as an exploration of the circumstance of a developing economy. In a practical sense generalisability in the form of a specified model is neither sought nor possible.

Based on the above analytical presentation, we question the strengths of Chowdhury's (2010) criticisms and argue that the factors discussed in Chowdhury (2010) do not necessarily impair the outcome of the Rashid et al. (2010) paper. This study seeks to contribute to the increasing literature by recognising the interests of readers in gaining more insight and understanding of empirical corporate governance research, with special reference to the Bangladesh context.

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