2013 New Zealand Capital Markets Symposium

31 May 2013

AUT Business School, Auckland, New Zealand

Hosted by the Auckland Centre for Financial Research

AUCKLAND CENTRE FOR FINANCIAL RESEARCH
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Introduction

2013 New Zealand Capital Markets Symposium

The Auckland Centre for Financial Research is pleased to welcome you to its first New Zealand Capital Markets Symposium. In recent years, there have been increasing discussions and efforts to develop the New Zealand capital market into a vibrant and liquid market. Efforts have included the formation of the Capital Market Development Taskforce, the creation of the Financial Markets Authority, the enactment of a number of legislative changes to securities laws, and indirectly the introduction of KiwiSaver and the partial privatisations of State Owned Enterprises. The development of vibrant and effective capital markets are of interest to the finance industry, policy makers and academic researchers, yet discussion among the three groups seems to be limited.

One of the aims of the Auckland Centre for Financial Research is to bridge the gap between finance academia and industry in New Zealand, and to engage in interactions that will be mutually beneficial. Hence, the purpose of this symposium is to add to the discussion on the New Zealand Capital Markets by bringing together leading New Zealand practitioners, policymakers, and academics. The setup of this symposium is quite unique in New Zealand, where academics present their research, and are then discussed by an industry participant or policy maker. The whole aim of this event is to bring the two sides, academia and industry, closer together.

An event like this predominantly relies on the participants in the event, and we are very thankful to all of you who are participating. A special thanks goes to our keynote speaker, **Mr Tim Bennett**, CEO of the NZX; and our panel members: **Ms Sue Brown**, Head of Primary Regulatory Operations of the Financial Markets Authority; **Mr Rob Cameron**, Executive Chairman of Cameron Partners and former Chairman of the NZ Capital Markets Development Taskforce; and **Mr Simon Botherway,** Former Head of FMA Establishment Board and former CIO of ANZ Wealth. Of course, we thank all presenters and discussants for their contributions to this event.

Symposium Organisers
Prof. Bart Frijns
Dr. Aaron Gilbert
Ms. Annie Zhang

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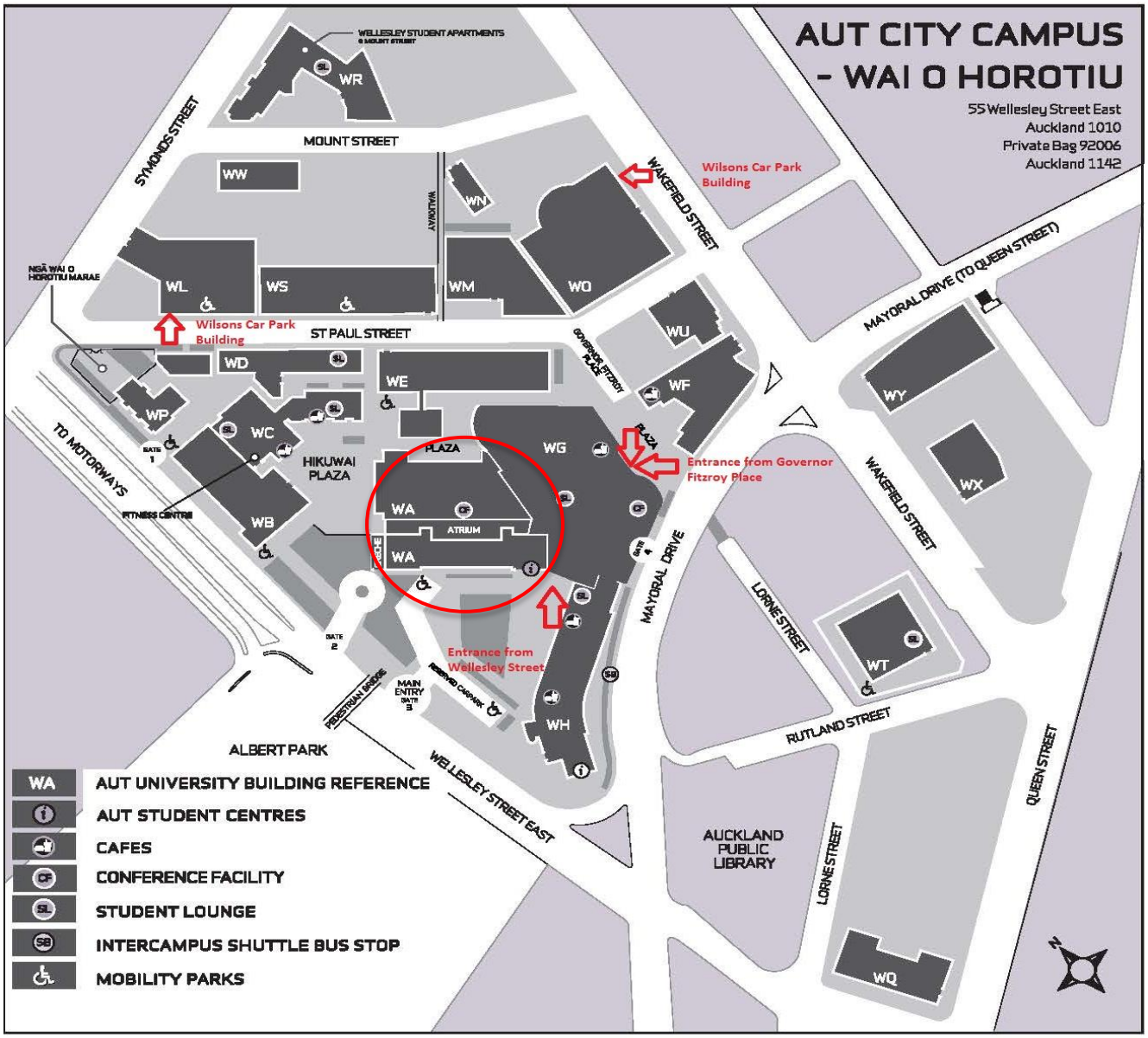
Venue Information



Venue: WA224 – Auckland University of Technology Conference Centre

Address: 55 Wellesley Street East, Auckland University of Technology (see map above)

Parking: Available at Wilsons Parking Building in St Paul Street, and the Civic Car park.

Programme Overview

Friday 31 May 2013

8.30-9.00AM	**Welcome**	Room WA224
• Dr Geoff Perry: Dean of AUT University Faculty of Business & Law • Keynote Presentation: Tim Bennett – CEO of the New Zealand Exchange Developing a better understanding of the New Zealand Capital Markets		
10-10.30AM	**Morning Tea**	
10.30-12.30 PM	**Session 1**	
• Privatisation: The New Zealand Experiment of the 1980's. • KiwiSaver Member Behaviour: A Quantitative Analysis • Financial Advice and Asset Allocation of KiwiSaver Investors		
12.30-1.30PM	**Lunch**	
1.30-3.30PM	**Session 2A**	
• From cents to half-cents and its impact on liquidity • Light-handed Regulation in New Zealand Banking and Financial • Crossing the Tasman: Determinants of Price Discovery for Australia-New Zealand Cross-listed shares		
1.30-3.30PM	**Session 2B**	
• The Impact of Holdings Disclosure on Portfolio Performance: A New Perspective • New Zealand Venture Capital Funds and Access to New Financing: An Exploratory Study • Identifying Extreme Performers Stocks in New Zealand		
3.30-3.50PM	**Afternoon Tea**	
3.50PM-5.30PM	**Panel Discussion**	
• Panel Discussion – The role of research on the development of New Zealand capital markets		
Refreshments will be served in WG201. Please join us.		

Detailed Programme

8.30-9.00AM	**Welcome**	Room WA224

8.45am	Dr Geoff Perry Dean of AUT University Faculty of Business & Law
9.00am	Keynote Presentation Tim Bennett – CEO of the New Zealand Exchange Developing a better understanding of the New Zealand Capital Markets

Keynote Speaker: Tim Bennett

Tim Bennett was appointed as Chief Executive Officer of the NZX on 7 May 2012. Tim joined the NZX after 20 years financial services consulting experience concentrated in Asia where he was a Partner of Oliver Wyman and led the Boston Consulting Group strategy practice in Asia Pacific.

Tim sees the next few years as a once-in-a-lifetime opportunity to accelerate development of the NZX and will offer pointers on what industry should focus on.

He has advised on a broad range of financial institutions on topics from strategy and organisational transformation through mergers and acquisitions. A particular area of focus has been financial markets where Tim has worked with a number of different exchanges, governments and private companies in expanding domestic capital markets and developing new asset classes.

One of Tim's most notable achievements has been supporting the development of the iron ore derivatives market. This entailed working with key sector stakeholders, including the physical traders, investment banks and potential participants on a market that reached $10 billion a year in cleared contracts three years after launch.

10-10.30AM	**Morning Tea**	Room WA202

10.30-12.30	**Session 1**	Room WA224
10.30am	**Privatisation: The New Zealand Experiment of the 1980's. How did Retail Investors Fare?** *Andrew Cardow - Massey University* ***William Wilson- Massey University – PRESENTER*** ***Jim McElwain – INFINZ - DISCUSSANT***	
11.10am	**KiwiSaver Member Behaviour: A Quantitative Analysis** *Callum Thomas - Massey University* ***Claire Matthews- Massey University – PRESENTER*** ***Roger Clayton – ASB Bank - DISCUSSANT***	
11.50am	**Financial Advice and Asset Allocation of KiwiSaver Investors** ***Annie Zhang – Auckland University of Technology – PRESENTER*** ***Diane Maxwell – Commission for Financial Literacy and Retirement Income - DISCUSSANT***	

12.30-1.30	**Lunch**	Room WA202

1.30-3.30	**Session 2A**	Room WA224
1.30pm	**From cents to half-cents and its impact on liquidity** ***Hamish Anderson – Massey University - PRESENTER*** *Yuan Peng – Massey University* ***Amelia Wong – NZX - DISCUSSANT***	

2.10pm	**Light-handed Regulation in New Zealand Banking and Financial Services: Does it work?** ***David Tripe – Massey University - PRESENTER*** ***Toby Fiennes – RBNZ - DISCUSSANT***
2.50pm	**Crossing the Tasman: Determinants of Price Discovery for Australia-New Zealand Cross-listed Shares** *Bart Frijns – Auckland University of Technology* ***Aaron Gilbert – Auckland University of Technology – PRESENTER*** *Alireza Tourani-Rad – Auckland University of Technology* ***Chris Swasbrook – Elevation Capital – DISCUSSANT***
1.30-3.30	SESSION 2B ROOM WA224
1.30pm	**The Impact of Holdings Disclosure on Portfolio Performance: A New Perspective** *Kathleen Brown – Bancorp Treasury* ***Russell Gregory-Allen- Massey University – PRESENTER*** ***Sue Brown – FMA - DISCUSSANT***
2.10pm	**New Zealand Venture Capital Funds and Access to New Financing: An Exploratory Study** *Sujit Kalidas – BioPacific Ventures* *Andrew Kelly – BioPacific Ventures* ***Alastair Marsden – University of Auckland – PRESENTER*** ***Paul Hocking – NZICA - DISCUSSANT***
2.50pm	**Identifying Extreme Performers Stocks in New Zealand** ***Sazali Abidin – University of Waikato - PRESENTER*** *Ron Bird – University of Technology Sydney and University of Waikato* *Danny Yeung – University of Technology Sydney* *Tat Thang Nguyen – University of Waikato* ***DISCUSSANT TBC***

3.30-3:50PM	**Afternoon Tea**	Room WA202

3.50PM-5.30PM	**Panel Discussion**	Room WA224
3.50pm	Panel Discussion – The role of research on the development of New Zealand capital markets <u>Panel Members:</u> *Rob Cameron - Executive Chairman of Cameron Partners* *Simon Botherway - Former Chair of FMA Establishment Board* *Sue Brown - Head of Primary Regulatory Operations of FMA* *Dr Aaron Gilbert – Panel MC*	

Panel Member

Rob Cameron

Rob Cameron is the Executive Chairman of Cameron Partners, a leading New Zealand investment bank. Rob established Cameron Partners in 1995. With more than 25 years' experience he is recognised as one of New Zealand's most skilled investment bankers and has led and advised on many high profile transactions. He recently chaired the Capital Markets Development Taskforce. Many of its recommendations have, or are in the process of, being implemented by the Government.

Major mandates at Cameron Partners have included advising the Independent Directors of Carter Holt Harvey in relation to the takeover offer from Rank Group Limited, the Board of Fletcher Challenge Forests on the sale of forest assets and the Crown in relation to the restructuring and recapitalisation of Air New Zealand. Rob has also led the firm's advice to a number of other major clients including Fonterra in relation to its long term capital structure and NGC in relation to its asset disposals and strategic repositioning.

Before he became an investment banker Rob was a senior advisor in the New Zealand Treasury and was one of the principal architects of the New Zealand 'SOE Model' in the early 1980s.

Rob has a BCA in Economics with First Class Honours from Victoria University and an MPA (Finance & Economics) from Harvard University. He is a Harkness Fellow, a Hunter Fellow of Victoria University and a Fellow of INFINZ. His past board memberships include Chairman of the Capital Markets Development Taskforce, Chairman of the New Zealand Institute for the Study of Competition and Regulation, a member of the Board of Trustees of Special Olympics New Zealand and a member of the Advisory Board for the Victoria University Faculty of Commerce and Administration.

Panel Member

Simon Botherway

Simon Botherway, a former boutique fund manager and one-time shareholder activist has held roles as Head of ANZ Wealth, Chair of the Financial Markets Authority Establishment Board, a member of the Securities Commission and a Director of Fisher & Paykel Appliances Limited.

Simon has a B.Comm from Otago University and holds the Chartered Financial Analyst designation from the US-based CFA Institute. He has served on the Asia-Pacific Advocacy Committee for the CFA Institute and was President of the CFA Society of NZ. He also chaired the NZX's Asset Management Advisory Committee and was a member of the Electricity Authority Establishment Board.

His background is in Investment Management, he is the former chair of Brook Asset Management a leading equities investment management company that he co-founded in 2002.

Panel Member

Sue Brown

Sue leads and oversees the development of FMA's regulatory strategies and activities relating to the primary and retail financial markets, including financial advisers. Sue is a senior lawyer with experience in the UK, Australia and New Zealand. Until 2010, she was a partner of DLA Phillips Fox.

Please join us for drinks in WG201

Thank you for your participation

With special thanks to our supporting partner:

INFINZ

Institute of Finance Professionals New Zealand Inc.

Privatisation: The New Zealand Experiment of the 1980's.

How did Retail Investors Fare?

Andrew Cardow, School of Management, Massey University
William Wilson, School of Economics and Finance, Massey University

Abstract

Many would judge the privatisation program, a significant feature of the *"New Zealand Experiment"* of the 1980's and 1990's in which both Labour and National governments adopted extreme right wing policies, a failure. In looking at the privatisation of state assets we find they were, at least from an investors' perspective reasonably successful. Returns to investors who held a portfolio of privatised assets outperformed the NZ share market as a whole. An investment strategy of buying each privatisation, on the market on day one, yielded a return of 7.99% representing an XHPY was 1.19% over a similar investment in the entire NZ market. There can be little doubt; the nine privatisations in this sample had a considerable impact on the NZ stock market, following the listing of Telecom in 1991 total privatised assets comprised 49% of the NZ total market, for twenty years the capitalisation of the privatisation sample averaged 37% of the NZ total market. Analysis of government papers of the day reveals the government's overall objective was increased efficiency, flowing from a fundamental belief that government couldn't and shouldn't run commercial businesses. In this they were successful, but at what cost?

Introduction

The New Zealand economy, in the late 1980s and early 1990s, was subject to what has become known as the *'New Zealand experiment'* (Kelsey, 1995). Despite New Zealand being recognised leaders in the provision of social welfare the 1984 (re-elected 1987) Labour government made an extreme shift to the right, largely abandoning New Zealand's traditional welfare state, instead adopting neoliberal policies which ultimately resulted in a state based on competition (Larner, 1997). The neoliberal agenda introduced by Labour was then continued, if not finished, by the centre right National government elected in 1990.

It would be an error to assume the neoliberal programme introduced by the Labour government was accepted Labour party policy. For the most part the government was relying upon and following the advice of the New Zealand Treasury. In 1987 the incoming labour government was presented with a briefing paper entitled 'Government Management'. This briefing paper was in effect a book of some 400 pages that outlined a *blueprint* that Treasury suggested the government adopt. The *blueprint* contained chapters such as 'The Role and Limits of Government', 'Social Policy', and more importantly for what was to come – 'The Public Sector'.

Upon even a superficial reading 'Government Management' could not simply be considered advice. It is in essence an argument for the adoption of orthodox neoliberal ideology. The core of the argument was one of deregulation and an appeal to market forces market forces. For example Treasury advise "*it is only sensible to organise economic and social activities…if the particular form of organisation chosen enables these activities to be provided more cheaply, more effectively or more equitably…than would provision through the market*" Treasury (NZ Treasury, 1987, p. 3).

As well as a move to deregulate the New Zealand economy, there was also a desire to make the business of government more efficient. In other words government departments were to be operated as corporate business units. It was a requirement under the State Owned Enterprise Act (1986) for SOEs to operate as successful business operations. To enable this, government departments were *corporatised* by being converted into State Owned Enterprises (SOEs), and under the State Sector Act (1988) CEOs and board directors appointed. As with private businesses, the performance of SOEs was to be measured in terms of profitability

and as long as they returned profits to the shareholding minister and operated within the boundaries of the Companies Act, SOE's were given carte blanche to largely compete as they saw fit.

Government Management was published in response to the increasing levels of government debt. Debt was a major concern for the 1984 labour government and the spectre of privatisation was first raised in its 1987 budget speech as a solution (Wilson, 2010). This was most likely as a result of advice received within the pages of Government Management in a section entitled "The Case for Privatisation" Treasury (NZ Treasury, 1987, pp. 112-113). The other two solutions identified were raising taxes and or cutting government spending. Both alternatives were at first considered unacceptable to this Labour government, who were philosophically opposed to any increase in taxes, believing tax increases would discourage job creation and investment. Reduced government spending was also not an option at this time, the only areas of government spending large enough to provide meaningful savings were health, education and welfare, areas viewed as core government business by most labour politicians and their voters.

The government, acting upon advice from both Treasury and powerful business lobbies such as the Business Roundtable, eventually followed neoliberal orthodoxy. It was also becoming apparent that the first corporatisations had not yielded the expected efficiencies, as returns from SOE's to the government were expected to remain below the New Zealand Stock Exchange (NZX)[1] market average (Wilson, 2010). Privatisation was viewed by the government as a sensible solution. The 1988 budget speech outlined the government's privatisation policy, which would reduce government debt and signalled the move to private sector ownership of SOEs. Such a move it was argued would improve their efficiency and raise economic growth. Rodger Douglas then admitted, "*the mix of politics and commerce has proved to be a recipe for failure*" (cited in Wilson, 2010). It was a path that deeply divided the party members and was a contributing factor to Labour's electoral loss in 1990.

The privatisation push for efficiency continued under the subsequent National governments with privatisation program extended to local body business units[2], such electricity lines companies, ports and airports. This was enabled by amendments to the Local Government Act (1974), which established Local Authority Trading Enterprises[3] (LATE), now known as a Council Controlled Organisations. A LATE, like an SOE, was required to make a profit and follow recognised business practice. In addition the amendments established the CEO as the employing agent for all local government employees rather than the council. This followed the separation of operations and policy which was in vogue in central government at the time.

As the capital market New Zealand was comparatively small and undeveloped and in order to achieve the highest price possible, the early privatisations of SOE's were via trade sales to internationals businesses or syndicates who then on sold a portion in local and international markets. This policy of trade sales was halted in 1996 when a coalition elected under New Zealand's newly introduced mixed member proportional election system resulted in a National and NZ First coalition government. The balance of power held by NZ First enabled it to extract a high price from National with the NZ First leader, Winston Peters, able to secure roles as Deputy Prime Minister and Treasurer. NZ First was fundamentally opposed the sale of state assets, particularly their sale to foreigners, which bought about a softening of the asset sales program, with the identification of *strategic assets* which would not be sold and those assets which were sold should be sold to New Zealanders.

In 1998 privatisation proved to be the undoing of the coalition, when Peters refused to support the sale of Wellington Airport, resulting in his sacking, by Prime Minister Jenny Shipley, from his positions as Deputy Prime Minister and Treasurer. Although Peters and NZ First terminated the coalition agreement, Shipley was able to

[1] The name New Zealand Stock Exchange was changed to the NZX in 2003 – for simplicity the NZ stock market is referred to as the NZX regardless of the time period.

[2] The privatisation of local body assets was often not about raising funds as often shares in these privatised bodies were given to residents or vested in community trusts.

[3] The particular legislation was Local Government Amendment Act No 1 (1989) and Local Government Amendment Act No 2 (1989).

continue the privatisation program, up to the 1999 election, with support from other NZ First MPs who were unwilling to follow Peters out of government.

Overall in the period from March 1988, when NZ Steel was sold to Equitycorp until September 1999 when Vehicle Testing NZ was sold to the Motor Trade Association $19.122 billion was raised from government asset sales (NZ Treasury, 1999). It is worth considering that the assets sales were initiated by a Labour government, continued by both a National and National NZ First coalition before finally ending under a Labour led coalition in 1999. Clark and Cullen (Prime Minister and Finance Minister respectively) turned their backs on the privatisation policies they had supported when last in power in the 1984 and 1987 Labour governments. The culmination of this reversal was the buying back of rail fixed infrastructure for a dollar from Toll holdings in 2004, followed by the rolling stock and inter-island ferries[4] in 2008 for $665 million (Espiner, 2008).

Overall, New Zealanders looking back on this neoliberal experiment largely view it as a failure while accepting reform was necessary and New Zealand is a more efficient economy as a result (Schick, 1998). A common criticism raised is that the social costs of the reforms were too great with Quiggin (1998) saying, "*the New Zealand Labour government dug the grave of social policy, even if the burial was left to its National successors*"(p. 86). A second major criticism is the privatisation program resulted in New Zealand's assets being sold too cheaply and largely to foreigners. Despite criticisms raised over previous New Zealand privatisations the prospect of privatisations is again on the political agenda, with the Key led second term government claiming a mandate to privatise.

SOEs slated for partial[5] sale are Air New Zealand[6] and energy utilities Genesis Energy, Meridian Energy, Mighty River Power and Solid Energy. Two decades on from New Zealand's first privatisations there are similarities in the privatisation rhetoric, with its primary purposes listed as; 1) Providing a future investment fund, which will reduce the need to borrow, while still providing investment capital needed to grow the economy and improve public services, 2) Giving New Zealanders the opportunity to invest in significant New Zealand assets, and 3) Deepening New Zealand capital markets (NZ Government, 2012). Even while there are the claims that the political landscape has changed over the last twenty–five years, there is still the 20th century rhetoric regarding the inadvisability government ownership of revenue generating assets. However unlike the last neo-liberal Labour government, the current neo-liberal National government has recognised the public is unwilling to see strategic state assets sold out of New Zealand hands. The government's stated intention is to retain a 51% government interest and encourage retail investors, putting them at the head of the queue in the IPO and giving a loyalty bonus shares if they maintain their holding (Key, 2012).

Despite the reluctance of the New Zealand public to see public New Zealand revenue generating assets sold overseas, they have appeared reluctant to venture into equity investment, preferring banks, finance companies and direct property investment. Whether this is because of lessons learnt from the 1987 share market crash and the excesses of big business which were continually highlighted through the 1990s is unknown. What is known is that attitudes to saving and investment have changed. New Zealanders appear to have accepted the likelihood of a state funded pension, sufficiently large to enable a reasonable quality of life in retirement, is unlikely. Consequently many have started making provision for their own retirement, either by saving directly

[4] Toll Holdings retained its profitable road transport assets. Furthermore the claim was made in 2009 that they continued to receive preferential treatment from Kiwirail with discounted freight forwarding and zero property costs for some Toll freight depots on rail land.

[5] Key has stated on numerous occasions that no more than 50% of any state asset will be sold.

[6] Air New Zealand was originally privatised and then listed on the NZX in the NZ's first round of privatisation, but after a disastrous investment in Ansett Airlines which was liquidated in 2002 the NZ government recapitalised the Airline resulting in a 74% government holding (Wilson 2010).

or joining various Kiwi Saver schemes[7]. The current Prime Minister expects the new public share offers will renew New Zealander's interest in investing in shares (Key, 2012).

Privatisations a Quantitative View

Given the government's desire for New Zealand investors to be at the front of the queue in this new round of privatisation this is an opportune time to re-evaluate the privatisations of the 1980s and 1990s as a retail investment vehicle. The basic research question is how retail New Zealand investors would have fared if they had bought into the public offerings of these privatisations. We update a study by Kerr, Qiu and Rose (2008) and track the performance of their privatisation sample until either the eve of the 2011 New Zealand general election[8] or until they were delisted. Rather than measuring the medium return result this paper focuses on the long term, with holding periods for listed privatised assets ranging from 7.3 years to 22.1 years. The aim being to calculate the returns a retail investor would enjoy if they followed a *buy & hold* strategy of being fully invested in a portfolio of privatised assets rather than the market portfolio[9] as a whole.

From an investment viewpoint some privatisations were more successful than others. This analysis looks for factors which may distinguish a successful privatisation investment from those which were less so. Further, we consider the contribution the first privatisation program had on the NZ share market as a whole. This research should prove valuable to government policy makers and investors alike when future privatisations are undertaken.

Long Run Performance

Kerr, et al., (2008) detail the impact of privatisation programs in both Australia and New Zealand in the late 1980s and 1990s and serves as a base point for this analysis of New Zealand privatisations. The aim of the Kerr paper was to examine, in both countries, the relationship between privatisation and share market capitalisation, liquidity and share ownership. The research also evaluated the long-run risk-return performance of the privatised companies' portfolios, though performance was only measured for five years at most. Their findings show a significant increase in share market capitalisation and increased liquidity, while also demonstrating an investment in a portfolio of privatised companies generated significantly higher returns than the market portfolio as a whole, for 4 out of 5 years (Kerr, et al., 2008).

As the Kerr, et al., (2008) results[10] were completed using data only up to the 2001 year returns to the privatised portfolio were only evaluated in the short or medium term. To evaluate the long term performance of interest in this study holding period yields (HPYs) and excess holding period yields (XHPYs) are recalculated with DataStream Return Index data up the date a privatised firm was delisted or the eve of the 2011 NZ General Election on November 25 2011.
Results are presented in Table 1 (shown graphically in Appendix Figure 2) for each firm in privatised sample with HPYs and excess XHPYs reported. The overall or average HPY for the listing period was 7.99% representing an XHPY was 1.19%, though this result was not statistically significant. However these results contain extreme negative values for BNZ -9.47, AIR -6.20% and TRH -4.40% which are balanced by the like of TPW 23.10%, POA 18.48% and CNZ 18.25%.

[7] Kiwi Saver is a government sponsored but not guaranteed superannuation scheme, which was a policy initiative of the 5th Labour government.

[8] Prime Minister John Key claims the election on November 26, 2011 gave him a mandate to privatise state assets.

[9] The market portfolio is taken to be the DataStrean NZ Total Market Index.

[10] Results obtained indicated some errors in the analysis of Kerr, et al., (2008) the most obvious of which was with BNZ for which they used data from BNZ Finance which was a small subsidiary of the BNZ first listed in 1966.

Table 1 Sample Firms HPYs and XHPYs

Sample Firms	BNZ	AIR	TEL	POA	TPW	TRH	AIA	CNZ	CEN	Avg
First Listed	31/03/87	24/10/89	18/07/91	19/10/93	18/04/94	14/06/96	28/07/98	27/11/98	11/05/99	
Day 1 Price Premium	2.86%	14.58%	17.50%	8.75%	N/A	14.70%	13.89%	9.00%	10.97%	
End or Delisted	22/12/92	25/11/11	25/11/11	19/07/05	25/11/11	20/09/07	25/11/11	28/03/06	25/11/11	
Years	5.73	22.10	20.37	11.76	17.62	11.27	13.34	7.34	12.55	
Listing Period HPY	-9.47%	-6.20%	6.58%	18.48%	23.10%	-4.40%	15.68%	18.25%	9.89%	7.99%
Listing Period XHPY	-7.38%	-12.18%	-1.75%	9.54%	17.15%	-15.10%	10.00%	5.79%	4.67%	-1.19%

As these results were obtained over different periods of time and time lengths (5.73 years to 22.10 years) a better measure of performance is obtained by calculating the yield or internal rate of return (IRR[11]) of an equally weighted privatisation portfolio. This is calculated to be 12.71% which can be compared to the alternative strategy of investing in the market portfolio which returned a yield of 7.01% over the same time period. In looking at individual listings those which are the greatest disappointment to investors, with negative XHPYs are, TRH -15.10%, AIR -12.18, BNZ -7.38% and TEL -1.75%. Three of these privatisations, AIR, TEL and TRH, were in the first instance trade sales by the Crown (AIR and TEL by Labour and TRH by National) who believed that method would yield the greatest value. As part of the trade sale process there was requirement for a portion of the firm's equity to be sold publicly on the NZ market.

TRH, originally NZ Rail and was sold to a consortium, comprising of Wisconsin Central Transportation Corporation, Berkshire Partners III L.P., and Fay, Richwhite & Company Ltd. on 20 July 1993, for $328.191 million (NZ Treasury, 1999). As part of the sale process the Crown received assurances that a public share float would take place and that the new owners saw the rail passenger network as a key part of the business (NZ Treasury, 1999).

AIR was sold, for $660 million in October 1988, to a consortium of Brierley Investments Ltd. (65%), Qantas Airlines (19.9%), Japan Airlines (7.5%), and American Airlines (7.5%) (NZ Treasury, 1999). The Crown's requirement for this sale was that the Crown retained one special rights share (Kiwi Share) and 65% remained in NZ hands with Brierley Investments Ltd. to sell down their portion initially (NZ Treasury, 1999).

TEL was initially sold for $4.250 billion to Ameritech and Bell Atlantic Corp in September 1990 who were required to sell 50% of its equity within 3 years as well as a requirement for one Kiwi share (NZ Treasury, 1999). Fay Richwhite and Freightways then agreed to buy 5% each over three years and Ameritech and Bell Atlantic Corp were required to offer shares publicly until they reduced their holding to 49.9% (NZ Treasury, 1999).

The BNZ was not initially a trade sale in that an issue of 15% was made by the BNZ to the public as a capital raising in March 1987 at a price of $1.80 (NZ Herald Staff, 1987) and closed on day 1 at a 3% premium. The intention of the was to sell the remainder later (New Zealand Government, 1988), however the BNZ announced a loss of $648 million for the 1989 year and the government moved to recapitalise the bank by way of a rights issue, with 30% of the bank being taken by Capital Markets Ltd (Singleton, Grimes, Hawke & Holmes, 2006).

[11] This was calculated in

The first public sale of AIR was an offering of 30% (5% reserved for airline staff and 25% for the NZ public) of the shares in October 1989 at a price of $2.40 (Reuters News, 1989). The public issue of shares in TEL took place in July 1991 was at $2.00 and prompted the size of the float to be increased from 19% to 27% (Reuters News, 1991), heavy demand in NZ and overseas markets resulted in the closing price on day 1 being a 15% premium.

The remaining 5 listings all out performed the NZX market over the period of this study. POA, initially owned by the Auckland Regional Council (ARC) (80%) and the Waikato Regional Council WRC) (20%) was privatised in October 1993 when the WRC sold its 20% stake on the NZX at $1.60 resulting in a one day premium of 9% (Reuters News, 1993a). In July 2005 the ARC purchased all outstanding shares at $8.00 per share and delisted the port. Overall investors in POA would have received a XHPY of 9.54% if they had bought on day 1 or 10.39% if they were part of the IPO. TPW was formed out of the corporatisation of the Tauranga Power Board with half of the share in TPW distributed to its customers with the remainder held in a community trust (Reuters News, 1993b). Shares in TPW were first listed in April 1994 and customers who retained their *free*[12] share have received an XHPY of 17.15% over 17.62 years. The Crown which owned a 51.6% stake in (AIA other owners were various Auckland regional local body councils) sold it airport shares in a public offering at $1.80 per share with 60% going initially to local investors (Reuters News, 1998). The AIA was subject to considerable demand, both internationally and domestically, and share traded on day 1 at $2.05 for a day1 premium of 14%. Winston Peters, Treasurer of the National NZ First coalition government described the float as an unprecedented success which was more than four times oversubscribed with 20.6% of AIA owned by retail NZ investors, 9.9% NZ institutions, 47.5% Auckland councils and only 20.6% international institutions (Reuters News, 1998). Following the its success with AIA the Crown moved to list its property holding in central Wellington, nine building occupied by government officials and managed by Government Property Services were grouped as Capital Properties NZ Ltd. (CNZ) and listed in November 1998. Investors buying into the IPO were required to pay a first instalment $0.50 with a second and final instalment of $0.50 due in June 2000 (NZPA, 1998), share ended the first day trading at $1.09 to give a 9% day 1 premium on the $1.00 listing price. The final listing for a New Zealand privatisation was Contact Energy (CEN) which went to the market in May 1999 after the Crown sold a 40% cornerstone holding to U.S. energy giant Edison Mission for $1.2 billion. While Edison Mission paid $5.00 per share for its stake participants in the IPO paid $3.10 (with 70% of the float going to NZ individuals and institutions)(Reuters News, 1999), with strong demand resulting in the price finishing day 1 at $3.44 giving a premium of 11%.

Contribution to the NZ Share Market

The New Zealand share market is small in comparison to markets in other developed countries. Total market capitalisation (Capitalisation of the NZ total market and privatisation sample are shown in Figure 2 in the Appendix) at the end of quarter 1 1988 (6 months after the 1987 share market crash) was only NZ$6 billion which the BNZ, as the first and only listed privatisation, comprised $1.2 billion of which only $240 million was free float or investable. The next privatisation to hit the NZ share market was that of Air New Zealand in the latter half of 1989 with a free float of $117 million. The privatisation with the largest impact on the NZ market was that of Telecom, the total market capitalisation of the NZ market was just over $8 billion in quarter 2 1991 but the $6.274 billion listing of Telecom (free float $2.196 billion) in quarter 3 pushed the total market to $15.532 billion.

Coincidental to the listing of Telecom the NZ market capitalisation grew rapidly, reaching $56 billion in quarter 3 1997 of which $18.139 billion was privatised firms with a free float $7.710 billion. The NZ economy suffered something of a decline at the end of the 1990's, impacted first by the Asian currency crisis followed by the collapse of the dot com bubble at the beginning of the 2000's. Over this period the capitalisation of the NZ market fell to a low of $41.755 billion in quarter 3 2001 with total privatisations at $13.578 billion (free float $7.350). By this point time Port of Auckland, Trustpower, Toll Hlds (NZ Rail), Auckland Airport, Capital

[12] With free shares it is meaningless to attempt to calculate a day 1 premium.

Properties, and Contact Energy had all been privatised and the Government's privatisation program was at an end.

There can be little doubt; the nine privatisations in this sample have had a considerable impact on the NZ stock market. The privatisation of Telecom in 1991 resulted in total privatised assets comprising 49% of the NZ total market (16% free float) and for twenty years the capitalisation of the privatisation sample has averaged 37% of the NZ total market. Over a considerable period of that time Telecom was the largest NZ listing reaching a peak capitalisation in quarter 1 2000 of $15.968 billion. Despite the decline in Telecom's value from its peak in 2000 and the splitting off of its network assets as Chorus both Telecom and Chorus are still in the NZX10 index (a free float index) along with Auckland Airport and Contact Energy. Privatisation stocks are also actively traded, Figure 3 reports quarterly turnover on the NZX for the 48 quarters since the last quarter of 2000. Trading value in the privatisation stocks make up 50% of the value of all trades on the NZX providing much needed liquidity in a small market.

Conclusions

The obvious conclusion from the above quantitative analysis is the privatisation program had a considerable impact on the NZ economy with privatisations comprising over a third of the NZ share market. NZ investors have also fared well long run return to shareholders investing in privatised firms generally doing well, with an overall return of 7.99% compared to the market return of 6.80%. This result is even more creditable when one considers that four of the earliest privatisations, BNZ, AIR, TEL and TRH would by most long term investors be considered failures. Further research is required to identify if there are common features in the underperformance of these four privatisations. An obvious factor could be the time period in which they were sold by the government, as they were the first four privatisations[13]and coincided with the bear market. Another factor could be that they were initially sold to consortiums of large investors; with rail going to Wisconsin Central Rail Transportation Corp, Berkshire Partners and Fay & Richwhite Partners; Air NZ went to Brierley Investments, Qantas Airlines, Japan Airlines, and American Airlines; Telecom was sold to US telecommunication firms Ameritech and Bell Atlantic with Fay & Richwhite and Freightways joining the syndicate quickly. In contrast later privatisations were either listed directly or significant holding were given to local government, and appear to have fared well with all outperforming the NZ total market.

New Zealand governments in the period 1984 to 1999 were reforming governments. Reform was made on the basis of efficiency. Little real thought was given to other factors, such as the need to repay government debt, or investors' long run performance. The government believed they couldn't and shouldn't run commercial businesses. For example, the Minister of SOE's in the labour government of that era Richard Prebble has a chapter in his book entitled, Governments Can't Run Things Because Socialism Doesn't Work, (Prebble, 1996, p35). That a Minister in a labour government could hold such views is an indication of how entrenched the reform movement was and indicates the acceptance of New Zealanders towards the reforms. The sale of assets particularly to 'business interests' or 'the trade' rather than the open stock market makes a great deal of sense when placed within this context. As we have indicated Treasury, in their brief 'Government Management, (1987), also fully supported such an approach.

The privatisations were mooted and undertaken at a time when successive New Zealand governments had convinced the public that economic orthodoxy, justified in the budget speech of 1988 was the only option, (Hansard 1988, July 28). This speech in particular is peppered with references to the New Zealand public sector needing to be efficient, and Government was not the right owner for 'business ownership". Indeed it could be claimed the Labour government had bought into the Thatcherite paradigm "*There Is No Alternative*", the so called TINA paradigm to reform. So closely identified with this paradigm was the New Zealand Minister of finance that his policies became to be known as "*Rogernomics*" in much the same way as Thatcher had Thatcherism and Reagan "*Reganomics*". It is within such an environment for reform, sparked by Government

[13] NZ Rail was first sold in July 1993 but was not listed until July 1996.

management and a capture by neo liberals within the Labour party that resulted in New Zealand State owned Assets being sold.

For today's investors, it appears the current government has learnt from past mistakes. Future privatisations will not be handed directly to foreign investors. The Crown intends to retain a minimum 51% ownership in future privatisations and the Government is expending considerable effort to ensure retail investors have easy access to buy into the new listings. It is only to be expected that some retail investors will sell to foreigners, to earn a quick profit. The magnitude of which will depend on the listing price set by the Government and demand from buyers. If restrictions are put in place, limiting institutional investors, then demand will increase as the new privatisations will form a significant portion of the NZ stock market with many fund managers forced to buy into them to balance their portfolios. Further, after encouraging retail investors to re-enter the share market the Government is likely to be mindful of having disappointed them when the next election is held.

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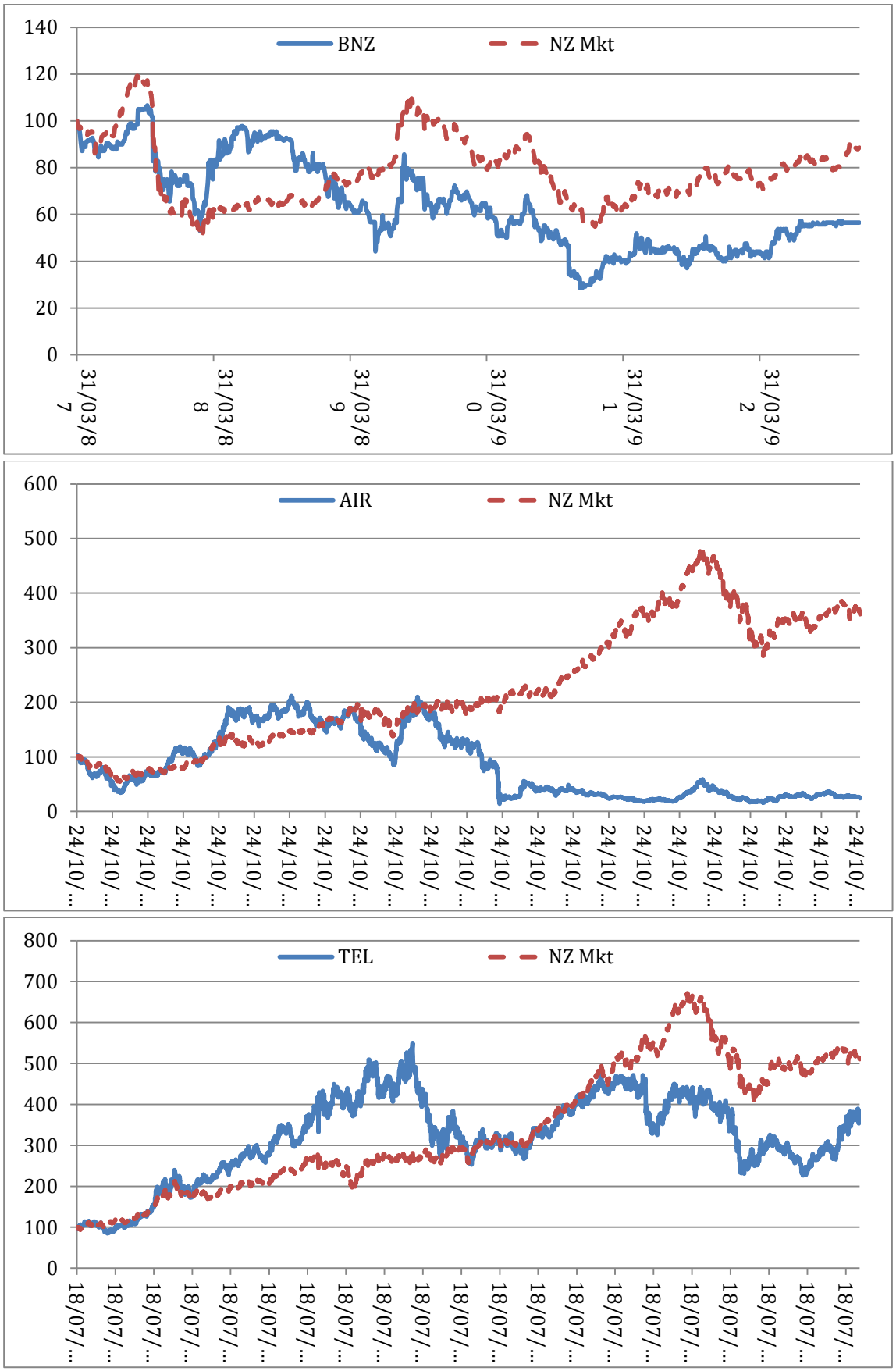
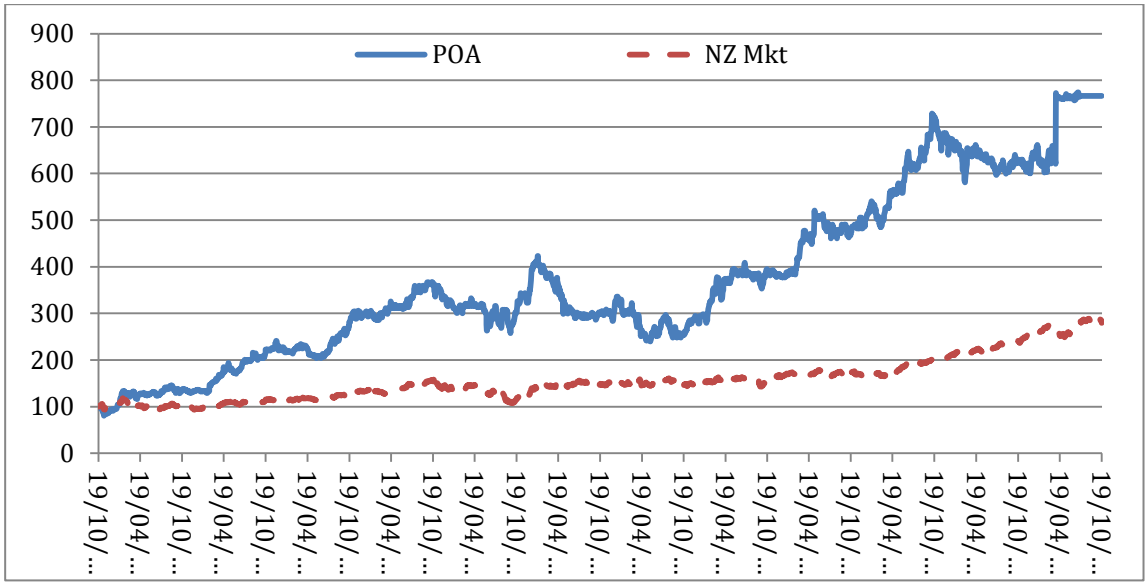
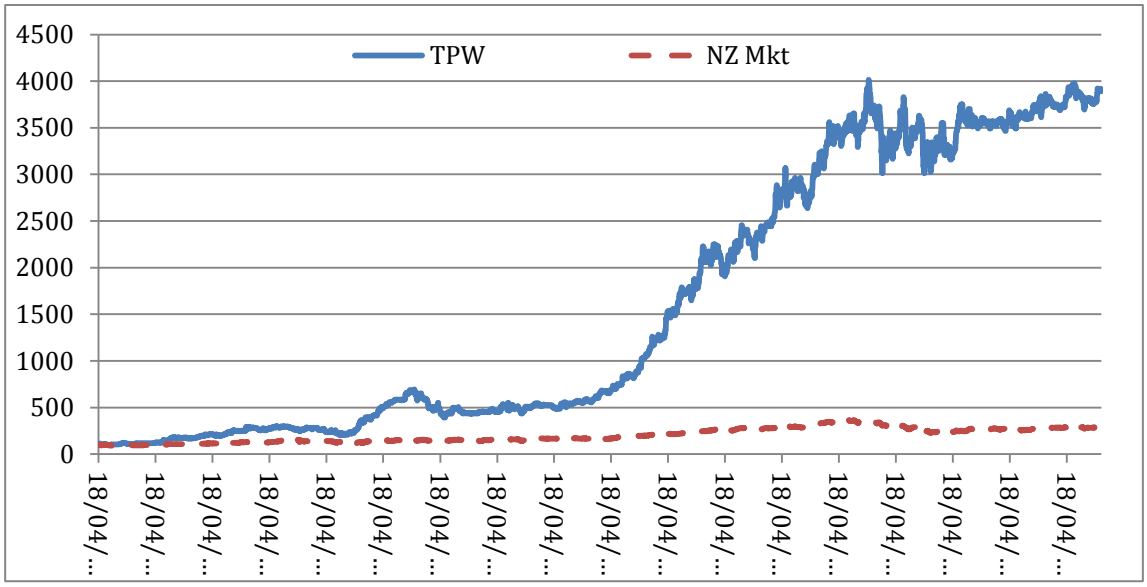
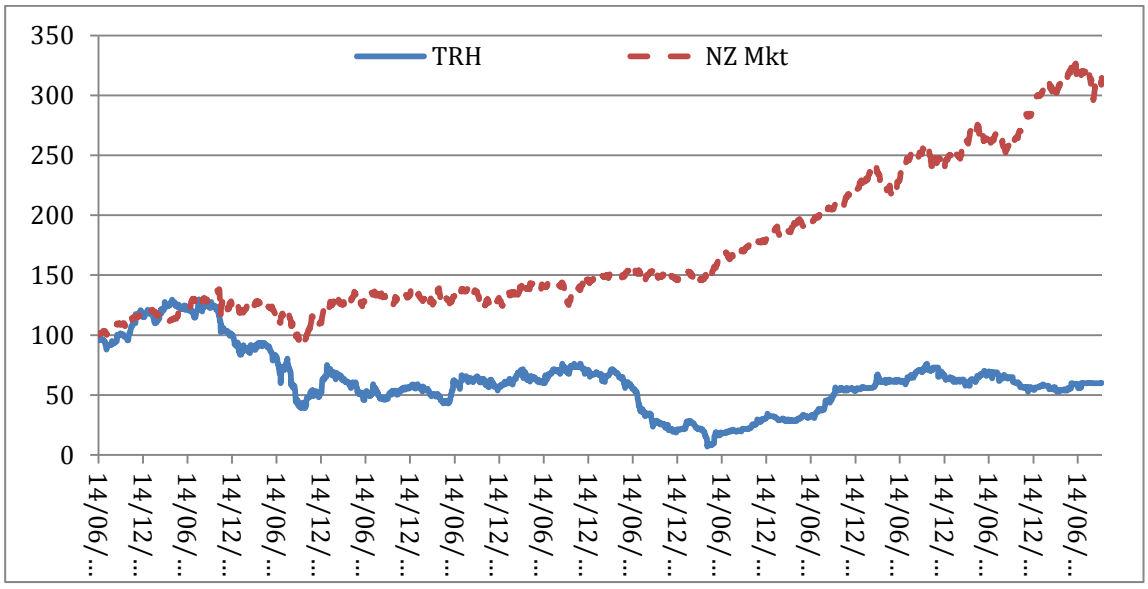
Appendix

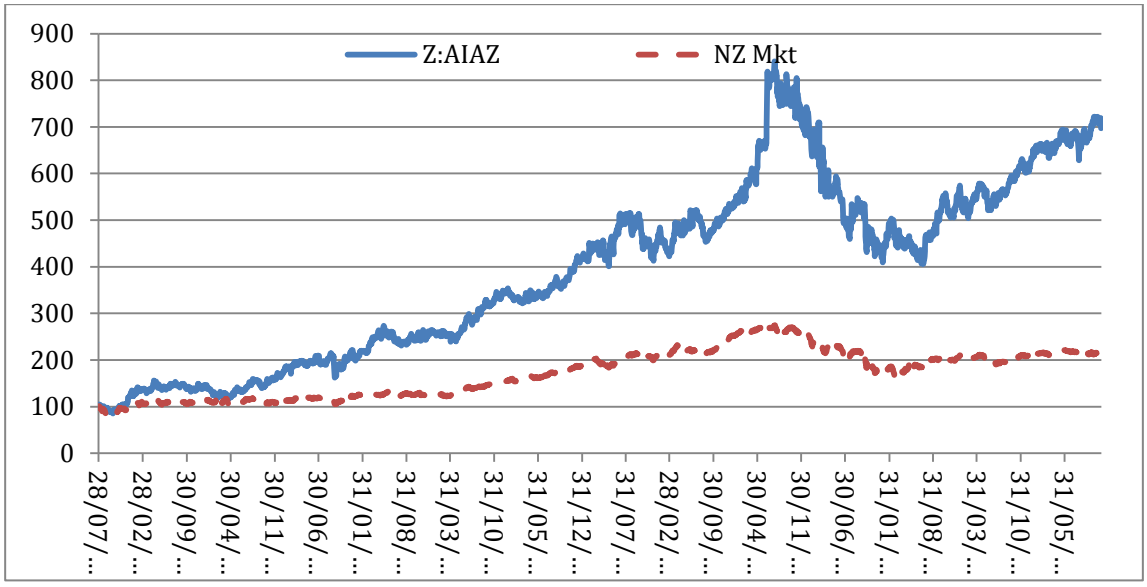
Figure 1 – Individual Privatisation Return Indices vs. DataStream Total Mkt. Index




POA
NZ Mkt
900
800
700
600
500
400
300
200
100
0
19/10/...
19/04/...


TPW
NZ Mkt
4500
4000
3500
3000
2500
2000
1500
1000
500
0
18/04/...


TRH
NZ Mkt
350
300
250
200
150
100
50
0
14/06/...
14/12/...


Z:AIAZ
NZ Mkt
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28/07/...
28/02/...
30/09/...
30/04/...
30/11/...
30/06/...
31/01/...
31/08/...
31/03/...
31/10/...
31/05/...
31/12/...
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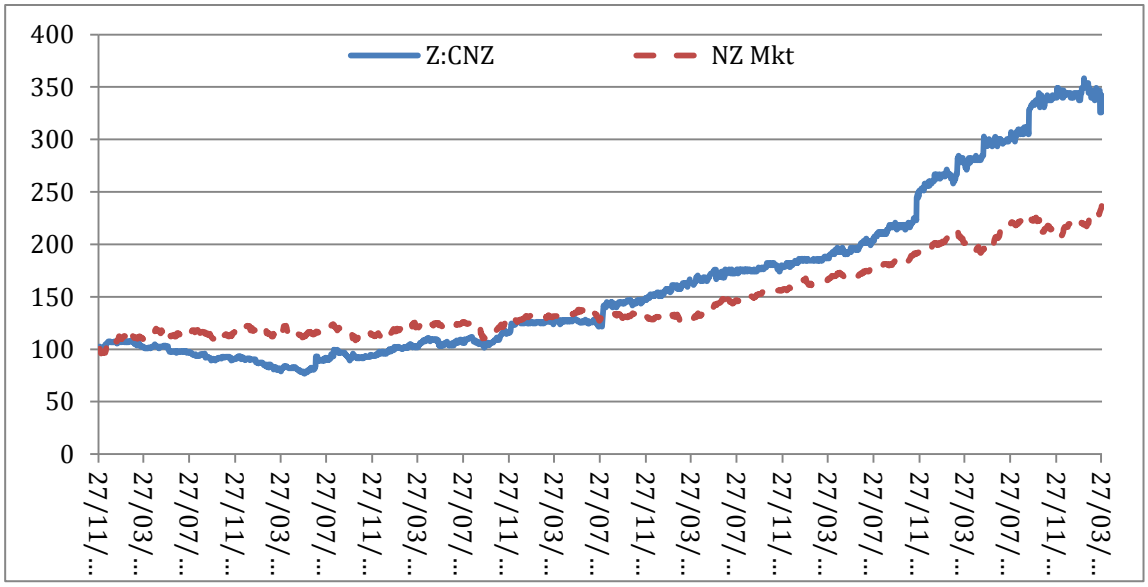
Z:CNZ
NZ Mkt
400
350
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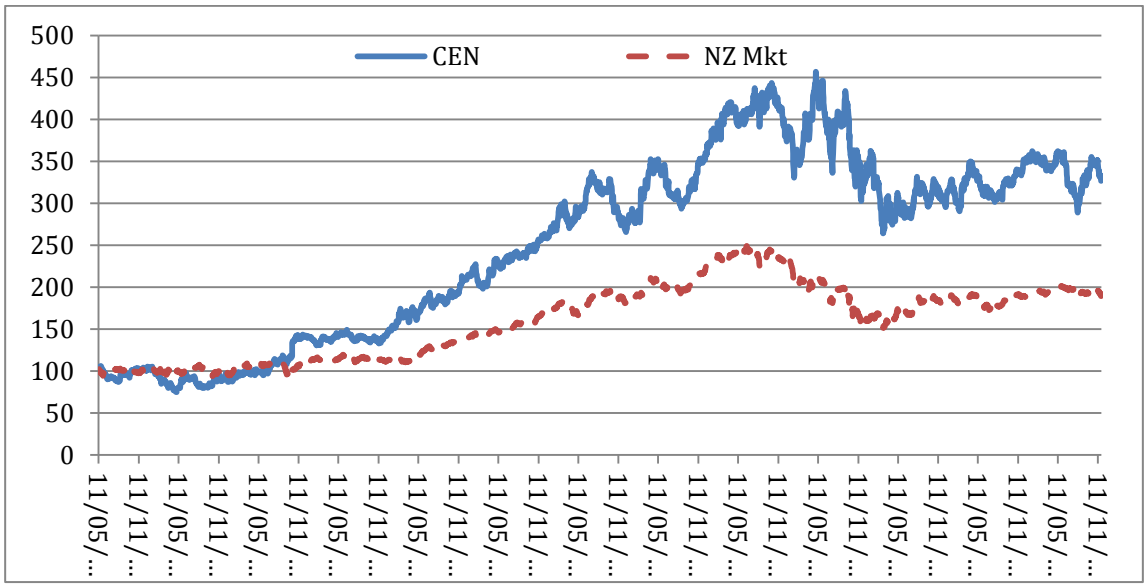
CEN
NZ Mkt
500
450
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350
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200
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11/05/...
11/11/...
11/05/...
11/11/...
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Figure 2 NZ Privatisations Mkt Value – TOTMKNZ, Privatisations, Free Float

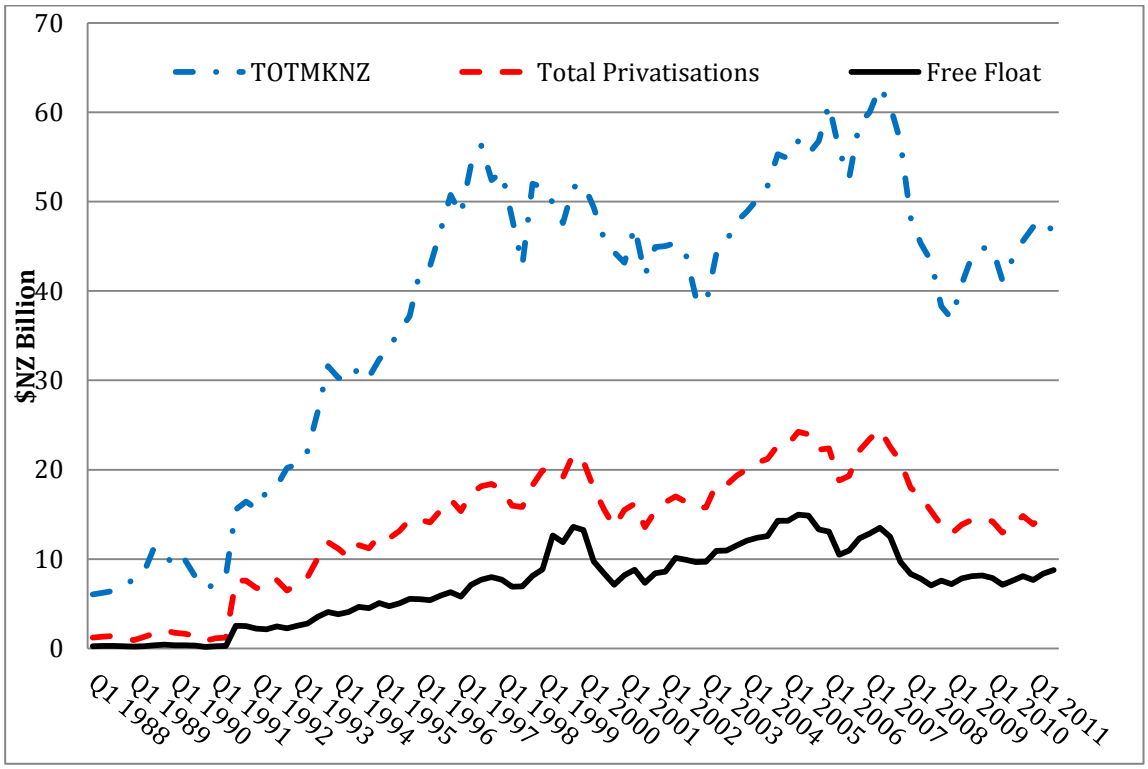
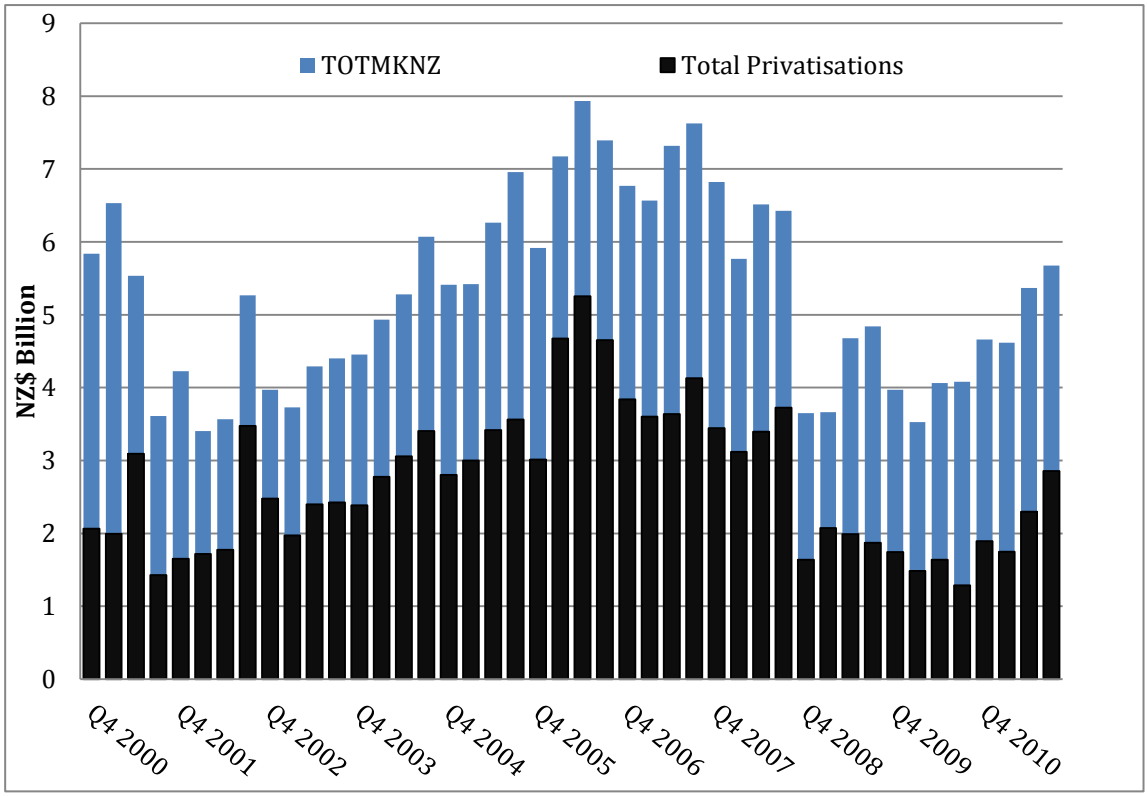


Figure 3 - Quarterly Turnover



KiwiSaver Member Behaviour: A Quantitative Analysis

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Abstract

The KiwiSaver scheme for retirement savings was launched in New Zealand in 2007. This paper examines investor behaviour in the context of that scheme. It uses a unique purpose-built database. The study finds that KiwiSaver members, like other investors, are chasing performance and seeking to avoid fees. However, an unexpected negative relation is found for bank ownership.

Keywords: Investor behaviour; Funds flows; KiwiSaver; New Zealand

JEL Codes: D14; G11; G23

Background

The question of the drivers of investor behaviour continues to be a matter for debate, and the subject of ongoing research. The principal aim of an investor is to receive an economic benefit in exchange for the provision of their capital. In an economic sense, the reason an investor buys an investment product is generally as a means of achieving ends such as increasing wealth, preserving purchasing power, generating income, deferral of spending, etc.

An investor benefits from the performance of their investment, and, holding all else equal, is disadvantaged by fees and expenses. This suggests investors will seek out investments that offer a higher expected performance, while avoiding investments that incur higher fees and expenses. As discussed in the next section, the existing literature largely confirms this reasoning. However, as with most things, it is a little more complicated than that, and international studies have identified a range of other factors that are also important in explaining variation in investment fund flows. Furthermore, the findings related to performance and fees variables are not straightforward.

Studies into investor behaviour can be usefully extended to different markets, products, and contexts. At a minimum this adds robustness to the existing findings, but it may also challenge them and/or have the potential to offer new insights. In particular, there is a strong academic case to extend this type of study to other markets and contexts, and New Zealand's recently introduced KiwiSaver retirement savings scheme offers such an opportunity.

Kiwisaver[14]

KiwiSaver is a government-initiated retirement savings scheme launched in 2007, that has quickly become an important part of the New Zealand investment environment, and it will grow in importance as the scheme grows and matures. The intention behind the introduction of KiwiSaver was to improve low rates of personal savings in New Zealand, improve retirement incomes, and to tackle issues around fiscal sustainability in terms of New Zealand's aging demographic profile.

People become members of KiwiSaver either by being automatically enrolled upon starting a new job, or by actively opting in. Some thought is currently being given to the idea of automatic enrolment for all employed New Zealanders, described as a sort of soft-compulsion (Good Returns, 2011). The original incentives for joining KiwiSaver included matching contributions from the government through tax credits of up to $1042.86 per year, and a $1000 kick-start payment from the government for new members. The government's matching contribution has since been reduced to 50% of the member's contributions, to a maximum of $521.43 per year.

Ongoing contributions for employed members could initially be set at either 4%, or 8% of their gross pay. The minimum member contribution was subsequently reduced to 2%, but is to rise again, to 3%, in 2013. From 1st April 2008, employers were required to begin making matching contributions, starting at a minimum of 1% and stepping up each year to the minimum member contribution.

As a defined contribution scheme, the eventual payment to KiwiSaver members is based on their contributions, plus any other contributions, and net investment returns (positive or negative). Members are able to access their KiwiSaver funds on reaching the age of 65, or after 5 years from joining, whichever is later. It is also possible for some or all funds to be accessed early under specific circumstances, such as first home purchases, significant financial hardship, serious illness, or, permanent emigration. However, the intention and design of the scheme is such that KiwiSaver is a long-term retirement savings vehicle.

An important element of KiwiSaver is the existence of default providers. When Kiwisaver was launched, six default providers were named: AXA (now part of AMP), AMP, ASB, Mercer, Tower, and OnePath (formerly ING). These default providers were tasked with providing a relatively conservative fund for those who were automatically enrolled in KiwiSaver and had not specified a choice of provider. Default schemes are required to charge relatively low fees, but being a default provider in effect guarantees a high stream of new members and fund flows. The default providers will be reviewed in June 2014.

The operation of KiwiSaver is of interest to individual New Zealanders, the financial services industry, policy makers, New Zealand capital markets, and ultimately New Zealand's entire economy. This study provides a first look at the Kiwisaver market, and an initial model for quantitative analysis that is built on and extended over time as the KiwiSaver market evolves and flourishes.

Prior Research

1.1 Investor Behaviour and Fund Flows

Ultimately fund flows studies are concerned with the end investor, because at a basic level fund flows represent an aggregation of investor decisions. Individual decisions to buy/invest or to sell/redeem are what drive net flows to individual funds and to the industry as a whole. Investor behaviour is at the heart of financial markets, being a key factor in asset pricing, investment returns, and a whole host of other capital and financial market related phenomenon, so understanding investor behaviour is a key contribution to financial theory.

Capon, Fitzsimons & Prince (1996) investigated the manner in which consumers make investment decisions for mutual funds via a survey methodology. They note "although past performance and level of risk (safety) were

[14] Details of the Kiwisaver scheme are available online at http://www.kiwisaver.govt.nz/.

rated the most important factors in aggregate, several additional factors were also relevant: amount of sales charge, management fees, fund manager reputation, fund family (e.g. Fidelity, Vanguard), clarity of the fund's accounting statement, recommendation from a financial magazine or newsletter, availability of telephone switching, the fact that funds are already owned in that family, and a friend's recommendation" (p.61). This work helps reconcile some of the findings in the fund flows studies, such as the performance-flows response.

A key reason for taking a fund flows study approach to understanding KiwiSaver investor behaviour is that it provides a means of studying what investors do, versus what they say[15]. It also allows for the construction and analysis of a unique dataset, which will provide additional insight and dimension to the existing literature.

The Variables

A variety of variables have been explored to determine their effect on fund flows in previous studies. One variable is investment return, since the key goal in investing is to generate a suitable return for the amount of risk being taken. Sirri & Tufano (1998) generalised from their findings that "mutual fund consumers chase returns, flocking to funds with the highest recent returns, though failing to flee from poor performers" (p. 1590). However, on the risk side of the equation their evidence was less clear, noting "there is mixed evidence that consumers are sensitive to the ex-post riskiness of fund investments" (p. 1590). Del Guercio & Tkac (2002) conclude that retail investor flows are sensitive to raw performance but not tracking error[16], a measure of return variability. In contrast, Zhao (2005) finds that bond fund investors chase risk-adjusted performance leaders instead of raw return leaders.

Del Guercio & Tkac (2002) also honed in on a curiosity about the performance flows dynamic i.e. the convexity of the relation, noting "the mutual fund flow-performance relation is highly convex, implying that mutual fund investors disproportionately flock to good performers, but do not punish poor performers by withdrawing assets" (p. 525). In the context of KiwiSaver this failure to 'punish poor performers' may be more likely to apply, especially in the early years, as low average balances and low awareness drives a degree of apathy and ignorance. It has been suggested the convexity of the mutual fund flows-performance relation is due to the uninformed or irrational investor (Sirri & Tufano, 1998), but it could also be due to switching costs, comprising the direct and indirect costs of switching to another fund, as posited by Ippolito (1992). While it is clear that performance matters, as it should, it also appears there are other factors involved such as relative fees, distribution channels, marketing and advertising arrangements.

Cashman, Deli, Nardari & Villupuram (2006) confirm the apparent flows-performance pattern, and note on timing: "investors appear to evaluate and respond to mutual fund performance over shorter time spans (a few months rather than years) than previously assessed" (p. 1). They also point out another interesting feature of mutual fund flows: "we document the central role of persistence [of flows] in determining mutual fund flows (whether they are net flows, inflows, or outflows)" (p. 1). Their results suggest investors respond to performance by changing the allocation of a stream of future flows, rather than a single flow.

An explanation for the convexity in the performance-flows dynamics, is suggested by Lynch & Musto (2003), who argue that it is "consistent with fund incentives, because funds discard exactly those strategies which underperform" (p. 2033). Funds that have negative performance have the option to change strategies (and change personnel or management techniques inter alia), so negative performance could signal a change in strategy. Furthermore, "if a bad return and a very bad return both mean that the next return will reflect a new strategy, the magnitude of their difference has little predictive power, and therefore little effect on investment decisions" (p. 2034).

[15] Matthews (2011) provides some clues on investor thought process in regards to KiwiSaver through the use of survey methodology, which allows a look at what investors say is important to them.

[16] Alpha was shown to be significant but lost significance when Morningstar ratings were included as an additional explanatory variable.

Fees and fund expenses detract from investment growth, and investors should opt for lower fees in order to generate better net return outcomes. However, the results from prior research are inconsistent, with some evidence of active fee aversion but also evidence of fee tolerance, especially when the fees are used to pay adviser commissions. Sirri & Tufano (1998), find "consumers are fee-sensitive in that lower-fee funds and funds that reduce their fees grow faster" (p. 1590). However, Barber, Odean & Zheng (2005) note that while expenses may have a negative effect on funds flows, that effect is more than offset when the expenses are marketing related, but fund flows are reduced when the expenses are non-marketing. Nevertheless, there is generally a negative relation between the level of fees and flows, except for when the fees are applied to marketing and sales commissions.

Another possible driver of fund flows is search costs, which were the focus of the work of Sirri & Tufano (1998). Search costs relate to the substantial time commitment to analyse and assess the wide array of funds that are available, which will subsequently have an impact on flows. Search costs are related to marketing and media attention, both of which reduce the amount of investigation an investor needs to do (Sirri & Tufano, 1998). The concept of search costs provides the theoretical underpinning of the rationale for causality in the variables of advertising, communication, media, ratings, and distribution channels. The more a fund provider does to reduce search costs, the greater the probability that investors will allocate funds to that provider. Indeed Kaniel, Starks & Vasudevan (2007) note "research suggests that the search process for mutual funds is extremely costly, implying that attention and learning effects are very important in the decisions" (p. 1). This also underpins the raison d'être for advisers, brokers, and other intermediaries in the industry, i.e. as agents of information dissemination – as minimisers of search costs, but it seems that at some point someone ends up paying.

Several studies confirm a positive relation between flows and advertising (see for example, Korkeamaki, Puttonen & Smythe, 2007 and Cooper, Gulen & Rau, 2005). Jain & Wu (2000) qualify the role of advertising by noting the role of the performance-flow dynamic. While they found that the advertised funds in their sample attracted significantly more inflows than the control group, they found a high incidence of selective reporting, with advertised funds typically characterised by superior performance in the pre-advertisement year. Their evidence suggests a 20% uplift in inflows to advertised funds, and more for funds that advertised more often, but there is no persistence in performance with post-advertisement performance on average inferior relative to benchmark. Advertising could be seen as a means of focusing investor attention on past performance, which could accentuate and encourage the performance-flows relationship. Barber, Odean, & Zheng (2005) note that "all else equal, investors do not prefer to buy mutual funds with high operating expense, but they do buy funds that attract their attention through advertising and distribution" (p. 2095). This supports the findings of Jain and Wu (2000) that mutual fund advertising works.

At the fund family level, Gallaher, Kaniel & Starks (2008) find evidence that advertising expenditure positively influences fund flows, and convexly so (which is similar to the flows-performance relationship). Khorana & Servaes (2007) also confirm this relation in their study using the American 12b-1 fees as a proxy[17].

Another form of communication with investors, that could be described as free advertising, is appearing in the media, which can also have a significant impact on flows. Sirri & Tufano (1998) noted the existence of circumstantial evidence that a larger share of current media citations is related to faster growth of mutual funds. Kaniel et al (2007) explored this relation in much greater detail and found a 1% decrease in inflows for funds with a negative news mention in a month, while funds with a positive media mention are associated with a 1.5% increase in net investor flows. They explain this relation with reference to attention and learning effects, noting "media coverage of mutual funds can contribute to drawing investors' attention to the fund as well as to investor learning about the fund" (p. 27).

An interesting observation has been the power of ratings in attracting flows. Much as a corporate bond issuer would expect higher demand, and a lower interest rate, if it could boast a 'AAA' credit rating from a rating agency such as Standard & Poor's, a fund with a 5-star rating from Morningstar should expect to enjoy similar

[17] 12b-1 fees are charged for the purposes of marketing the fund, and are generally in the range of 0.25-1%.

benefits, including the capacity to charge a higher fee (for the implied high measure of quality), and attracting higher demand (i.e. investor inflows). This is confirmed by Del Guercio & Tkac (2001) in their study of the US mutual fund industry, where "among previously unrated funds, the initiation of a 5-star rating delivers $26 million, or 53% above normal expected flow, to the average fund achieving such a status" (p. 23). However, no significant impact is observed for rating initiations below 5-stars. They find rating upgrades do generate a abnormal positive flow of funds, and an asymmetric negative effect of a downgrade, such that "a downgrade from 5-star status is not symmetric to an upgrade to 5-stars" (p.23). Results from a study of the Finnish mutual fund industry suggest the ratings may simply be another measure of performance, since the "Morningstar rating is based on historical performance with respect to both return and risk relative to peer group" (Knuutila, Puttonen & Smythe, 2007, p.88). Knuutila et al did not find the same relationship between ratings and flows for bank funds, although it did exist for the non-bank fund providers.

In absolute terms fund size should be associated with a relatively greater magnitude of fund flows, but even when flows are standardised (e.g. net flows divided by average FUM) there is a positive relation. Kempf & Ruenzi (2008) observed a positive correlation between fund size and fund flows in their investigation of the impact of intra-family rankings.

Many of the Kiwisaver funds are bank-owned. Matthews (2011) reports "the main reason to switch provider actually related to a preference for having the Kiwisaver account at the member's bank" (p. 10), suggesting bank-ownership will be an important factor in attracting fund flows for Kiwisaver. Frye (2001) notes that existing bank relationships mean search costs may be reduced for bank mutual funds. New investors may also find bank-owned funds attractive because of the perceived trustworthiness of banks according to Holliday (1994, cited in Frye, 2001). Knuutila et al (2007) suggest that the convenience and brand factors possessed by banks are important components driving mutual fund investor decision-making.

Clearly, there is a range of variables that have been found to influence fund flows. The most important of these is performance, which aligns with theory and intuition. Other positive influences are advertising and marketing, media and communications, fund ratings and fund family sizes. Negative influences include fees and expenses, and search costs.

Methodology

The key statistical analysis used in this study is a simple panel data regression analysis, chosen for its provision of an accepted and suitable method of describing the impact of multiple independent/explanatory variables on a dependent variable. The analytical methods used in other studies also suggest that regression is an acceptable method for analysis in this type of study. The analysis loosely takes the form of the following function:

Dependent Variable (e.g. net flow %) = *f* (Constant + Independent Variables)

One disadvantage is the limited size of each panel, comprising approximately 20 observations in the single year regressions. However, this increases to approximately 90 observations in the multi-year regressions.

The core premise of this study is that, in aggregate, investors respond in a near uniform manner in regards to certain key variables such as performance and fees. The concept of 'investor consciousness' is introduced to reconcile the relevance of variables other than fees and performance. Investor consciousness is used to refer to the degree to which investors are conscious of the key attributes of an investment, i.e. fees and performance, compared to other factors such as structural features of the industry, marketing and advertising. It is likely that an immature market, such as KiwiSaver, that is characterised by low levels of investor education would have lower levels of investor consciousness. A mature market would be characterised by average levels of investor knowledge, and higher levels of investor consciousness. Some of the findings discussed in the previous section, could be seen as suggesting that investors are irrational in chasing non-persistent past returns and accepting high fees. However, this could be explained by investor consciousness, whereby the influences of particular variables may not be in line with theoretical expectations. In a market with low investor consciousness,

investors' decisions are driven by structural features, advertising and sales efforts. By contrast, a market with high investor consciousness will see investors' decisions driven by performance and fees.

The core theoretical hypotheses in this study are that investors react positively to performance and negatively to fees. However, with the overlay of the investor consciousness concept, the hypotheses are altered to an expectation that these core theoretical hypotheses will not hold given the immaturity of the KiwiSaver market in New Zealand.

Hypotheses

Performance is a key measure of quality in managed funds, and as discussed in the previous section, many studies have found a positive but convex relation between performance and fund flows. Accordingly, the first hypothesis is that investors chase performance:

$H1_A$: There is a positive relation between performance and fund flows

$H1_B$: There is a positive relation between performance and member flows

Most KiwiSaver providers charge an ongoing asset management percentage fee, as well as a fixed annual administration charge. There are generally no upfront sales charges, although anecdotal evidence suggests some providers pay trailing commissions and one-off sales commissions to advisers (treated as a business expense, rather than a fee). KiwiSaver investors may be somewhat insensitive to fees because they are less evident. As fees and expenses detract from investment performance, it is expected that investors will prefer lower fees and expenses, as found in previous studies.

$H2_A$: There is a negative relation between fees and fund flows

$H2_B$: There is a negative relation between fees and member flows

As noted above, Kiwisaver is an immature market in which investor consciousness is expected to be low. This suggests other variables may also influence fund flows. The influence of other variables is also supported by prior research on fund flows.

One of the structural elements of the Kiwisaver market is the presence of default providers. Their privileged position means that default providers should receive higher than expected numbers of members. However, default provider status is likely to yield different results on outflows, particularly on a pure transfer flows basis. There is no literature on this variable given its uniqueness to the Kiwisaver market.

$H3_A$: There is a positive relation between default provider status and fund flows

$H3_B$: There is a positive relation between default provider status and member flows

Bank ownership is expected to be an important variable in the KiwiSaver context due to the dominant position that banks have in financial services in New Zealand. Furthermore, many of the larger providers are bank-owned. The literature supports this notion, referring to the effect of brand/reputation on search costs. Accordingly, bank ownership is expected to yield similar results to default provider status. The natural distribution network and existing customer base advantages that banks have suggests they will perform better than non-banks on an inflows basis.

$H4_A$: There is a positive relation between bank ownership and fund flows

$H4_B$: There is a positive relation between bank ownership and member flows

The existing member base variable is also effectively a control variable, and is included along with existing Funds Under Management (FUM) base (despite high correlation). Previous research has found some support

for size in terms of FUM being a positive influence, but no studies were found that looked specifically at member bases. A large existing member-base should indicate past success in attracting members and, through size, may signal to new customers a proxy for quality.

$H5_A$: There is no relation between existing member numbers and fund flows

$H5_B$: There is a positive relation between existing member numbers and member flows

$H6_A$: There is a positive relation between existing FUM and fund flows

$H6_B$: There is a positive relation between existing FUM and member flows

Variables

There are six independent variables used, one for each pair of hypotheses. The primary variables are Performance and Fees and Expenses. Dummy variables are used for default provider status and bank ownership. All six variables are used in each regression. Table 1 outlines how each variable is measured

Table 1: Independent Variables

Variable Name	Independent Variable	Operationalization
Perf	Performance	Closing FUM minus open FUM, minus net flows then divided by the average of opening FUM plus net performance, plus closing FUM. Therefore, performance is the net (after fees, expenses, and taxes) economic benefit accruing to the provider's members.
Fees	Fees and Expenses	Any fees and expenses disclosed in the provider's financial statements. The total fees and expenses figure is divided by the average FUM over the year.
Default	Default Provider	Default providers are assigned a value of 1, and non-default providers are assigned a value of 0.
Bank	Bank	Bank providers are assigned a value of 1, and non-bank providers are assigned a value of 0
Memb	Opening Members	The natural log of the number of members enrolled with the provider at the start of the period.
FUM	Opening FUM	The natural log of the total FUM invested with the provider across all funds at the start of the period.

Five different dependent variables are used in this study, with each used separately for members and fund flows, giving a total of 10 dependent variables. Table 2 outlines how these variables are defined and measured for the regression analysis. Each flow is then measured as an all flows figure and in terms of pure transfers. All flows refers to the total flows, which for fund inflows would include transfers, government contributions, lump sum contributions, employer contributions, and on-going member contributions. Pure transfer refers to data on the transfers of members between different KiwiSaver providers, which should provide a more direct, or pure, view of investor behaviour in the sense that it reflects active decisions of members to invest their funds with a different provider.

Table 2: Dependent Variables

Variable Name	Dependent Variable	Operationalization
In	In-flows (%)	The total in-flows for the year divided by the opening figure.
Out	Out-flows (%)	The total out-flows for the year divided by the opening figure.
Net	Net-flows (%)	The total net-flows for the year divided by the opening figure.
TotIn	Total Inflows	The natural log of the total in-flows during the year.
TotOut	Total Outflows	The natural log of the total out-flows during the year.

Each independent variable is used in four models. Table 3 outlines each of the models used in this study.

Table 3: Models

Model	Flow type	Flow	Type
1	Funds	Inflows	All Flows
2	Members		
3	Funds	Outflows	
4	Members		
5	Funds	Net Flows	
6	Members		
7	Funds	Total Inflows	
8	Members		
9	Funds	Total Outflows	
10	Members		
11	Funds	Inflows	Pure Transfers
12	Members		
13	Funds	Outflows	
14	Members		
15	Funds	Net Flows	
16	Members		
17	Funds	Total Inflows	
18	Members		
19	Funds	Total Outflows	
20	Members		

Data

The primary source of data for this study is a purpose-built database compiled using data from KiwiSaver providers' annual reports. This data source allows a more complete view of expenses and fees, and allows a look through to net performance. It also provides a detailed view of membership and fund flow movements, both on a total level, as well as a pure transfers (between providers) level in most cases. All of the annual reports have a balance data of 31 March.

The key limitations of this data source include the low frequency (i.e. annual basis), differing formats and levels of detail disclosed in various annual reports. In addition, there is some missing data, particularly on a pure-transfers basis. Another limitation is that the data is aggregated by provider, and thus is akin to a fund-family study.

The data is analysed in four time periods, being 2011, 2010, 2010-11, and 2009-11. The data for 2009 is not used separately due to some missing data; however, the 2009-11 sample is included as a rough means of testing robustness. Data for 2008 is not used, as many data points are partial and largely abnormal due to 2008 being the first reporting year.

The KiwiSaver annual report database is the primary data source for this study, but information from the Inland Revenue Department[18] is used to identify the default providers. Information from the Reserve Bank of New Zealand (RBNZ) is used to identify the bank-owned providers.

Table 4: Independent Variables – Descriptive Statistics

	2011				2010			
	Perf	Fees	FUM ($m)	Memb ('000)	Perf	Fees	FUM ($m)	Memb ('000)
Mean	5.8%	1.6%	183.8	42.0	13.7%	1.8%	81.9	30.0
Median	5.9%	1.3%	78.3	15.4	13.3%	1.6%	34.5	12.7
St Dev	1.9%	1.0%	233.8	55.6	6.2%	0.8%	108.8	39.7
Max	11.2%	6.1%	967.9	233.1	34.6%	4.8%	447.3	170.3
Min	1.1%	0.4%	0.9	0.1	3.6%	1.0%	0.4	0.1

Key descriptive statistics for the 2011 and 2010 datasets appear in Table 4. There are 30 providers in the 2011 dataset and 32 providers in the 2010 dataset, with 5 bank-owned providers and 6 default providers in both years. One point to note is the better performance achieved in 2010, which reflects the general market conditions, whereby the S&P 500 rose 44% in 2010 compared to 12.5% in the 2011 financial year.

[18] The Inland Revenue Department administers Kiwisaver payments that are made via the tax system, which includes employee and employer contributions.

Table 5: Dependent Variables – Descriptive Statistics

		2011					2010				
		In	Out	Net	TotIn	TotOut	In	Out	Net	TotIn	TotOut
All Flows – FUM	Mean	60.7%	7.4%	53.3%	17.3	14.9	129.8%	9.1%	120.7%	17.1	14.1
	Median	55.3%	6.2%	50.7%	17.7	14.7	101.6%	8.7%	91.1%	17.5	14.7
	St Dev	17.6%	6.1%	19.4%	2.0	2.3	99.6%	6.0%	96.8%	2.0	3.4
	Max	114.5%	28.4%	111.1%	20.2	18.4	632.2%	27.4%	604.8%	20.0	17.4
	Min	38.4%	1.1%	24.2%	13.1	10.4	60.3%	0.0%	54.5%	12.9	-
All Flows - Members	Mean	28.0%	6.4%	21.6%	8.1	6.6	43.0%	6.5%	36.4%	7.9	6.2
	Median	26.4%	5.8%	19.0%	8.7	6.8	33.8%	6.6%	21.3%	8.0	6.4
	St Dev	11.6%	3.5%	12.4%	2.3	2.4	43.1%	3.6%	42.5%	2.6	2.5
	Max	48.2%	13.0%	43.2%	11.1	9.7	199.9%	13.4%	193.6%	11.2	9.4
	Min	7.0%	1.5%	1.1%	2.1	1.8	4.2%	1.1%	-1.1%	1.4	1.1
Pure Transfers - FUM	Mean	9.5%	6.2%	3.0%	14.8	14.9	21.2%	7.6%	13.8%	14.4	14.4
	Median	4.8%	5.6%	0.7%	14.6	14.9	4.2%	7.7%	0.2%	14.4	14.7
	St Dev	10.9%	5.2%	12.3%	2.3	2.2	46.9%	4.4%	47.3%	2.4	2.3
	Max	42.9%	28.3%	35.7%	18.3	17.8	241.1%	15.5%	227.5%	17.6	17.3
	Min	0.4%	1.4%	-18.9%	10.2	10.4	0.5%	0.5%	-14.9%	10.2	8.8
Pure Transfers - Members	Mean	7.7%	5.9%	1.8%	6.5	6.6	9.9%	6.9%	3.2%	6.6	7.0
	Median	6.0%	5.4%	2.7%	6.4	6.8	3.3%	6.8%	-2.4%	6.5	7.2
	St Dev	7.3%	3.5%	9.1%	1.9	2.3	15.9%	3.3%	16.9%	2.2	1.9
	Max	27.5%	12.7%	22.8%	9.7	9.6	73.6%	12.8%	67.6%	9.9	9.4
	Min	0.7%	1.3%	-11.8%	3.3	1.8	0.8%	1.2%	-11.5%	1.9	2.5

Table 5 provides key descriptive statistics for the dependent variables. For all measures, the average inflows as a percentage of the opening balance (In) is lower in 2011 than 2010, indicating a deceleration of activity relative to balances. This is to be expected for All Flows, given the initial surge in KiwiSaver membership in the early years, and the growth in members' balances. However, this is somewhat surprising for the Pure Transfers as it would be reasonable to expect switching activity to increase over time as members become more sophisticated, and more sensitive to key variables such as fees and performance. However, at the median levels, the numbers are more in line with expectations.

Table 6 provides correlation matrices for all of the independent variables for each of the four time periods, while Tables 7 and 8 are the correlation matrices for the dependent variables in 2011 and 2010 respectively.

Table 6: Correlation Matrices – Independent Variables, All Datasets

	2011					
	Perf	Fees	Bank	Default	FUM	Memb
Perf	1.00					
Fees	-0.25	1.00				
Bank	0.10	-0.04	1.00			
Default	-0.31	-0.23	0.00	1.00		
FUM	0.05	-0.36	0.34	0.56	1.00	
Memb	0.04	-0.36	0.41	0.53	0.99	1.00

	2010					
	Perf	Fees	Bank	Default	FUM	Memb
Perf	1.00					
Fees	-0.12	1.00				
Bank	-0.14	0.04	1.00			
Default	-0.22	-0.25	0.01	1.00		
FUM	-0.09	-0.24	0.31	0.57	1.00	
Memb	-0.13	-0.11	0.36	0.53	0.98	1.00

	2010-2011					
Perf	1.00					
Fees	-0.03	1.00				
Bank	-0.07	-0.01	1.00			
Default	-0.17	-0.24	0.01	1.00		
FUM	-0.17	-0.32	0.32	0.55	1.00	
Memb	-0.09	-0.26	0.38	0.53	0.97	1.00

	2009-2011					
Perf	1.00					
Fees	-0.18	1.00				
Bank	0.00	-0.05	1.00			
Default	-0.03	-0.20	0.02	1.00		
FUM	0.19	-0.45	0.31	0.52	1.00	
Memb	0.03	-0.36	0.38	0.53	0.95	1.00

The most apparent point to draw from the independent variables is the high correlation between FUM and Memb. This is to be expected but should not be particularly problematic. Both variables need to be considered, and are expected to operate in slightly different ways in explaining variation in the dependent variables. Also of interest is the consistent, slight negative correlation between fees and performance for each period. Default provider status is also negatively correlated to performance, which can be explained by the large allocation that default providers have to conservative assets (in a time when equity market performance was strong). Default provider status also had a slight negative correlation with fees, which is expected given the lower fees on default funds.

Table 7: Correlation Matrices – Dependent Variables, 2011 Dataset

	All flows - FUM				
	In	Out	Net	TotIn	TotOut
In	1.00				
Out	-0.13	1.00			
Net	0.95	-0.43	1.00		
TotIn	0.18	0.16	0.11	1.00	
TotOut	-0.01	0.45	-0.15	0.93	1.00

	All flows - Members				
	In	Out	Net	TotIn	TotOut
In	1.00				
Out	-0.10	1.00			
Net	0.96	-0.37	1.00		
TotIn	0.45	0.39	0.31	1.00	
TotOut	0.21	0.63	0.02	0.94	1.00

	Pure Transfers - FUM				
In	1.00				
Out	-0.02	1.00			
Net	0.90	-0.46	1.00		
TotIn	0.52	-0.07	0.49	1.00	
TotOut	-0.03	-0.33	-0.14	0.71	1.00

	Pure Transfers - Members				
In	1.00				
Out	-0.31	1.00			
Net	0.92	-0.65	1.00		
TotIn	0.41	0.28	0.21	1.00	
TotOut	-0.21	0.73	-0.48	0.72	1.00

Table 8: Correlation Matrices – Dependent Variables, 2010 Dataset

	All flows - FUM				
	In	Out	Net	TotIn	TotOut
In	1.00				
Out	0.49	1.00			
Net	1.00	0.44	1.00		
TotIn	0.16	0.49	0.13	1.00	
TotOut	0.06	0.58	0.03	0.86	1.00

	All flows - Members				
	In	Out	Net	TotIn	TotOut
In	1.00				
Out	0.20	1.00			
Net	1.00	0.11	1.00		
TotIn	0.54	0.52	0.50	1.00	
TotOut	0.32	0.73	0.27	0.93	1.00

	Pure Transfers - FUM				
In	1.00				
Out	0.18	1.00			
Net	1.00	0.09	1.00		
TotIn	0.39	0.15	0.38	1.00	
TotOut	-0.05	0.68	-0.11	0.65	1.00

	Pure Transfers - Members				
In	1.00				
Out	-0.08	1.00			
Net	0.98	-0.28	1.00		
TotIn	0.55	0.30	0.52	1.00	
TotOut	0.08	0.73	-0.09	0.69	1.00

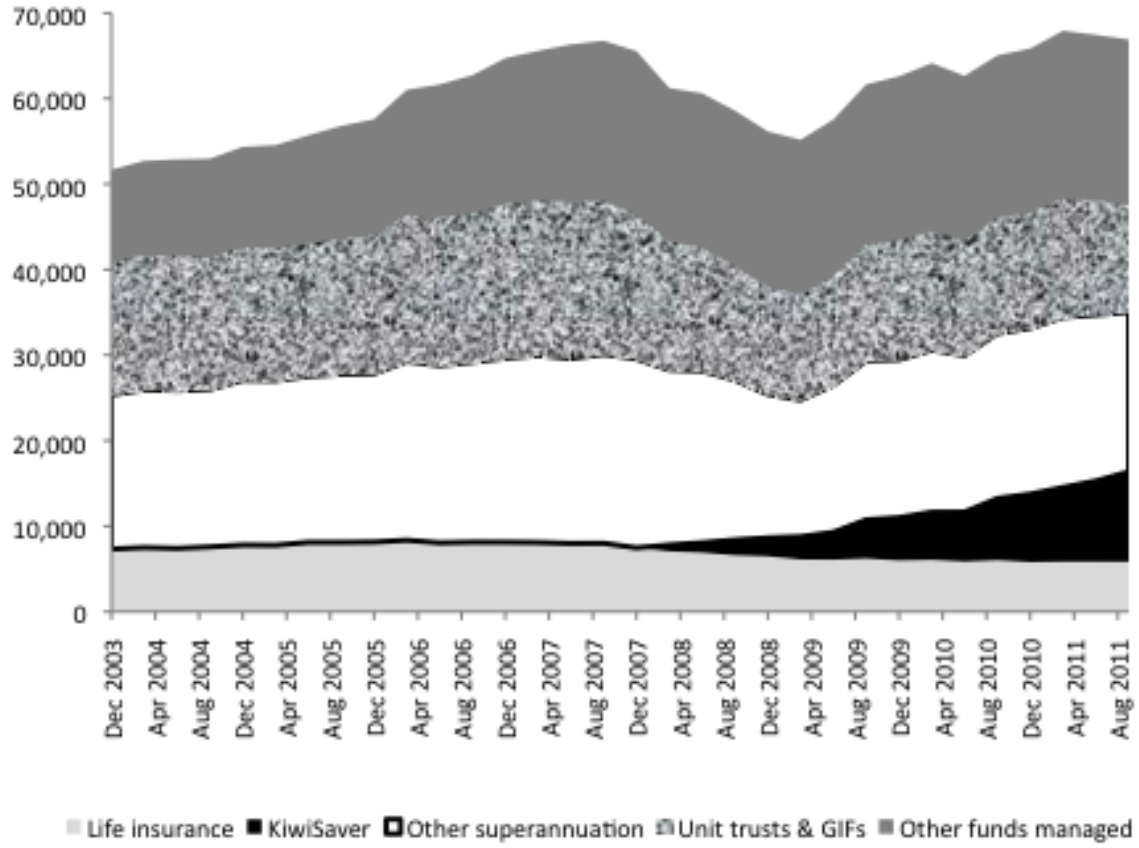
Within the dependent variables there is a high correlation between the inflows ratio (In) and the net-flows ratio (Net), and this provides somewhat of a confirmation bias within the regressions. It is expected, however, that this correlation would decrease over time, as the structural bias transitions to lower overall inflows. Also of note is that there is some, albeit slight, variation in correlations between the All Flows versus Pure Transfers, which is encouraging as the Pure Transfers is expected to yield the most reliable insights on investor switching behaviour.

1.2 Results and Discussion

KiwiSaver FUM reached $10.5 billion at the end of September 2011, according to the RBNZ, and surpassed the growth of all other categories of FUM that the RBNZ records in its statistics.

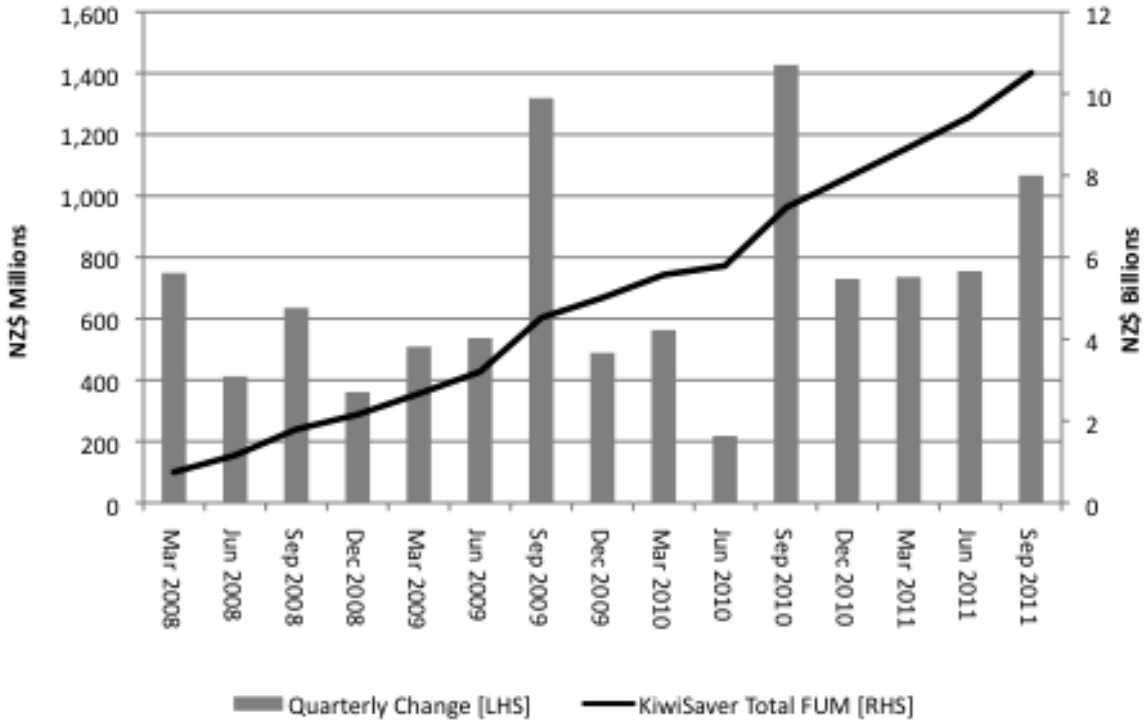
Figure 4: New Zealand Funds Under Management

Source: RBNZ



Quarterly flow patterns show a spike in inflows during the September quarter each year, as shown in Figure 2, as the government-provided member tax credits are remitted to KiwiSaver providers during this period. These patterns are important to understand in forming flows study methodology. There is also ongoing variability in the change in FUM between quarters due to market performance, and to a lesser extent, (other than September) variation in net flows. A spike in contributions from non-employee members can be expected in the June quarter, as the member tax credits are calculated on contributions in the 12 months to 30 June.

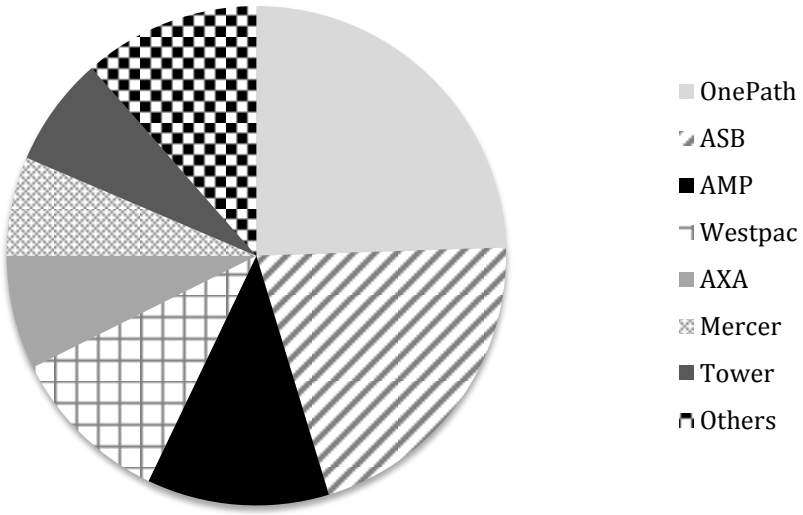
Figure 5: Growth in Total KiwiSaver Funds Under Management



Source: RBNZ

In terms of FUM levels, on a provider basis the market has been dominated to a large extent by a few key players, as shown in Figure 3. OnePath has a dominant market position, aided by offering a default fund, as well as separate offerings through the ANZ Bank and The National Bank distribution channels, and OnePath advisor networks. OnePath has also made significant headway with employer choice schemes, as have ASB and AMP. ASB has obtained a dominant position through a similar combination of default scheme, bank ownership, and adviser channel. AMP's third position is attributed to it being a default scheme and having strong advisor networks. Tower and Mercer are also default providers, and Westpac has leveraged its bank distribution channels (branch networks, and significant existing customer base) and, as revealed in Matthews (2011), an apparent preference by consumers for having their KiwiSaver with their bank.

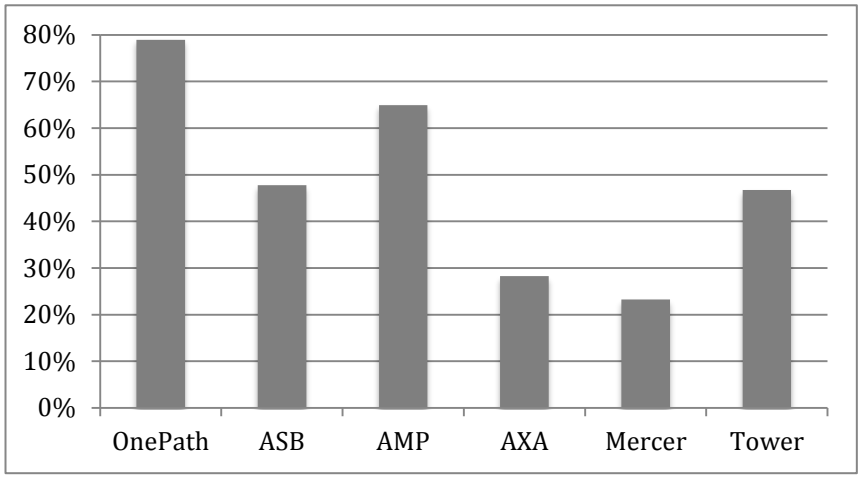
Figure 6: KiwiSaver Funds Under Management by Provider as at 30 June 2011



Source: Morningstar

Figure 4 illustrates the importance of default provider status for AXA and Mercer, in particular, who each have limited quantities of non-default FUM. The providers with superior distribution channels, as noted above, have amassed a substantially larger non-default FUM base.

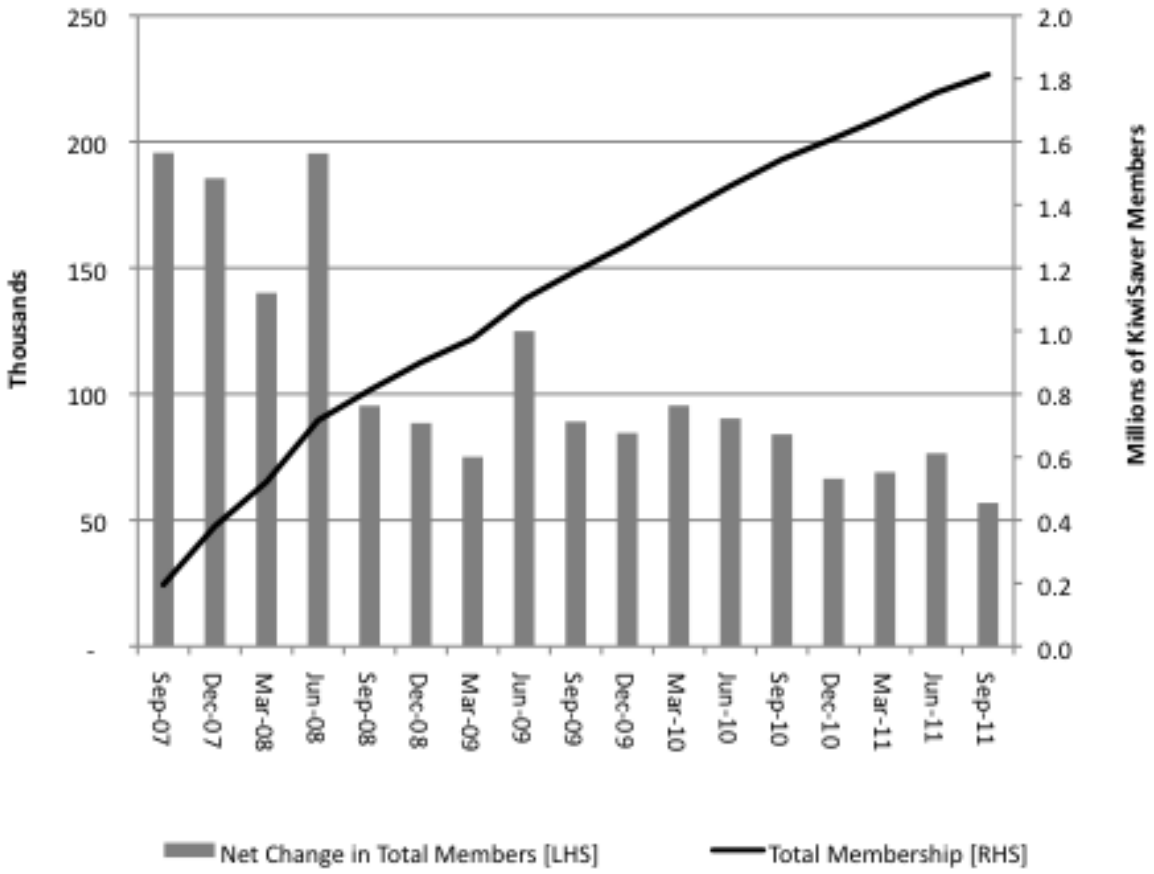
Figure 7: Default Providers – Proportion of Non-Default FUM



Source: Morningstar

Member numbers continue to grow at a strong rate, with net additional growth of 56,863 members in the September 2011 quarter. As at September 2011, there were 1.81 million people enrolled in KiwiSaver. Figure 5 shows the rapid increase in numbers at the commencement of the scheme, with a subsequent, but non-linear, decrease in the rate of new members. This pattern of new members may make findings from analysis of member numbers in the early years less meaningful as there is likely to be much noise from automatic and uninformed enrolments.

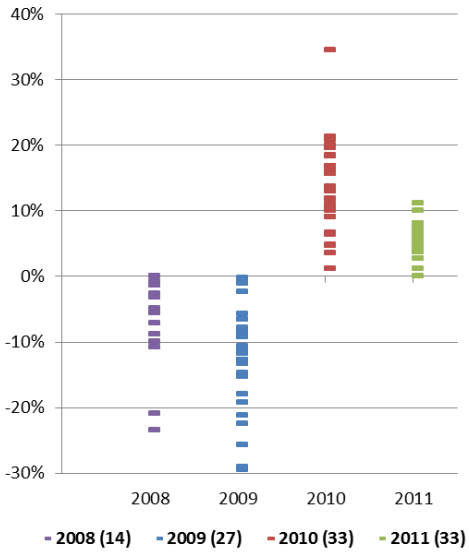
Figure 8: Trends in KiwiSaver Members



Source: Inland Revenue Department

The Net Return, in Figure 6, is the net change in total FUM of a provider, excluding net fund flows, divided by the average of the opening and closing FUM levels. Therefore, the net return includes the effect of tax and fees (and expenses), and it provides a blunt tool for assessing aggregate performance of a KiwiSaver provider in terms of investment performance as well as fee/expense efficiency and tax efficiency. A weakness of this metric is that variation between providers will be strongly influenced by the asset mix and asset allocation the provider offers, as well as the member concentration across their product offering.

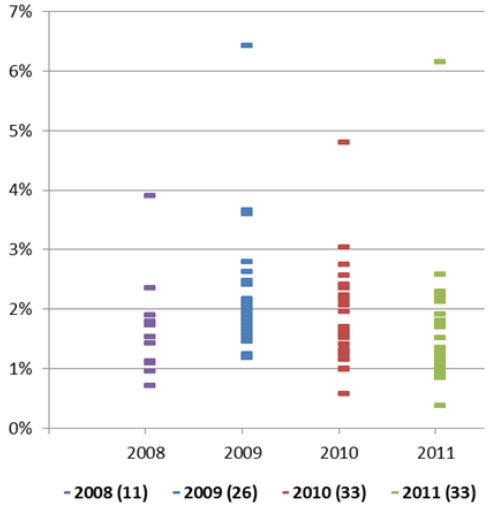
Figure 9: Net Return



The key observations about net return are that 2008 and 2009 were broadly negative years for performance, while 2010 and 2011 were broadly positive. Figure 6 also illustrates the range of net return outcomes among providers.

The total expense ratio, in Figure 7, is calculated as all fees and expenses reported by a provider for all of their KiwiSaver funds, as reported in their annual report, divided by the average of the opening and closing FUM levels. This metric provides a gauge of a provider's overall fee and expense efficiency. A default fund provider could be expected to have a lower ratio, and the default funds could provide a benchmark.

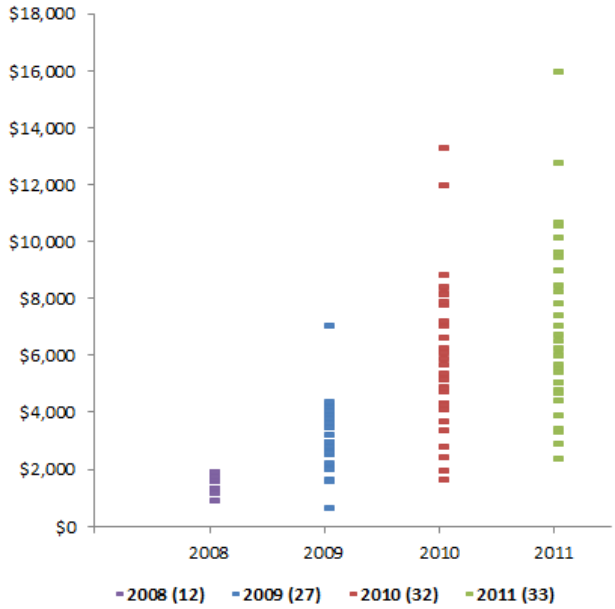
Figure 10: Total Expense Ratios of Providers



A key point in this chart includes the degree of dispersion within the years, and an apparent slightly downward trend in the expense ratios across the years. The initial increase from 2008 to 2009 may be attributed to the relatively higher proportion of funds in default funds at that point in 2008; however, the lesser availability of data may also provide part of the explanation.

The key point in Figure 8 is the rapid growth in average member balances, with several providers having average member balances in excess of $10,000 in 2011.

Figure 11: Average FUM per member



Regression Analysis

The results are discussed for each of the models, in pairs. Each model uses a different dependent variable, which is considered in terms of funds flows and then member flows.

The first pair of models is for all inflows, with the results of the regression analysis shown in Table 9. Clearly the key drivers for inflows are Performance and Fees. The expected relations are found, with Performance having a positive relation and Fees having a negative relation. There is also limited support for a finding of a positive relation for the size of the fund, primarily in terms of the FUM, with significant results for the 2010-2011 period for inflows of both funds and members.

Table 9: Model 1 & 2 – Inflows (All Flows)[19]

	Model 1 - Funds				Model 2 - Members			
	2011	2010	2010 - 2011	2009 - 2011	2011	2010	2010 - 2011	2009 - 2011
Perf	**0.33**	**1.43**	**1.23**	**8.34**	**0.26**	**0.72**	**0.44**	**12.19**
	(0.00)	**(0.00)**	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.05)**
Fees	**-0.34**	**-1.46**	**-1.28**	**-11.76**	**-0.27**	**-0.69**	**-0.42**	**-17.46**
	(0.00)	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.01)**
Bank	-0.11	-0.23	-0.17	5.16	-0.03	-0.16	-0.14	7.63
	(0.71)	(0.49)	(0.37)	(0.36)	(0.63)	(0.18)	(0.08)	(0.36)
Default	-0.01	-0.51	**-0.42**	-0.17	-0.02	-0.07	-0.07	-0.04
	(0.89)	(0.10)	**(0.03)**	(0.98)	(0.71)	(0.51)	(0.37)	(1.00)
FUM	0.15	**40.43**	**21.72**	-157.83	-1.24	11.55	**13.61**	-442.69
	(0.96)	**(0.03)**	**(0.01)**	(0.48)	(0.73)	(0.09)	**(0.01)**	(0.28)
Memb	-1.10	-2.21	-1.98	18.87	1.45	-0.88	**-1.40**	34.33
	(0.48)	(0.21)	(0.08)	(0.29)	(0.20)	(0.18)	**(0.00**)	(0.19)
R2	53%	76%	68%	17%	62%	82%	68%	16%
F-stat	4.3	12.9	19.2	2.6	5.6	18.8	18.2	2.3
d.f.	23	25	55	78	21	24	52	75

The second pair of models is for all outflows, with the results provided in Table 10. The interesting relation here is the significantly positive relation between outflows, particularly of members, and bank ownership. This is contrary to survey findings reported in Matthews (2011) where New Zealanders expressed a preference for bank-owned providers. There is also a significantly positive relation between all outflows of funds and the size of the fund in terms of FUM.

[19] Results that are bold are significant at the 5% level.

Table 10: Model 3 & 4 – Outflows (All Flows)

	Model 3 - Funds				**Model 4 - Members**			
	2011	2010	2010 - 2011	2009 - 2011	2011	2010	2010 - 2011	2009 - 2011
Perf	-0.02	0.04	0.01	**0.11**	0.03	0.01	0.01	**0.02**
	(0.49)	(0.10)	(0.28)	**(0.03)**	(0.06)	(0.63)	(0.18)	**(0.02)**
Fees	0.03	-0.03	-0.01	**-0.16**	-0.03	0.00	-0.01	**-0.02**
	(0.38)	(0.22)	(0.64)	**(0.00)**	(0.11)	(0.87)	(0.43)	**(0.03)**
Bank	0.06	**0.06**	**0.07**	0.14	**0.05**	**0.05**	**0.05**	**0.06**
	(0.06)	**(0.03)**	**(0.00)**	(0.08)	**(0.01)**	**(0.01)**	**(0.00)**	**(0.00)**
Default	0.00	0.02	-0.02	-0.02	**-0.03**	0.00	-0.01	-0.02
	(1.00)	(0.34)	(0.33)	(0.85)	**(0.03)**	(0.99)	(0.17)	(0.10)
FUM	**3.39**	**3.09**	**4.06**	-0.15	0.69	0.84	0.61	-0.22
	(0.00)	**(0.03)**	**(0.00)**	(0.96)	(0.53)	(0.37)	(0.34)	(0.71)
Memb	-0.71	0.17	0.10	0.29	-0.07	0.07	0.00	0.06
	(0.17)	(0.22)	(0.34)	(0.26)	(0.83)	(0.44)	(0.55)	(0.10)
R2	57%	58%	67%	16%	61%	50%	50%	44%
F-stat	5.1	5.7	18.7	2.4	5.5	4.0	8.7	10.0
d.f.	23	25	55	78	21	24	52	75

Moving on to all net flows, we find the results are very similar to those for inflows, with a significantly positive relation between both performance and fees and net flows of both funds and members. Looking more closely at the co-efficients for the inflows and net flows models, we find that they are very similar, suggesting that the net flows are dominated by the inflows. This is confirmed by looking at the quantum of the flows, where we find inflows are much larger than the outflows, which is not surprising for a relatively immature market such as Kiwisaver. The correlation matrices showed a high correlation, greater than 90% in all cases, between inflows and net flows.

Table 11: Model 5 & 6 – Net flows (All Flows)

	Model 5 - Funds				Model 6 - Members			
	2011	2010	2010 - 2011	2009 - 2011	2011	2010	2010 - 2011	2009 - 2011
Perf	**0.34**	**1.38**	**1.21**	**8.23**	**0.22**	**0.71**	**0.42**	12.17
	(0.00)	**(0.00)**	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**	**(0.00)**	(0.05)
Fees	**-0.37**	**-1.43**	**-1.28**	**-11.60**	**-0.24**	**-0.69**	**-0.41**	**-17.44**
	(0.00)	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.01)**
Bank	-0.17	-0.29	-0.24	5.02	-0.08	-0.21	**-0.19**	7.57
	(0.08)	(0.37)	(0.21)	(0.37)	(0.23)	(0.09)	**(0.02)**	(0.36)
Default	-0.01	-0.48	**-0.41**	-0.15	-.02	-0.07	-0.06	-0.02
	(0.89)	(0.11)	**(0.03)**	(0.98)	(0.78)	(0.51)	(0.48)	(1.00)
FUM	-3.24	**37.34**	**17.66**	-157.68	-1.93	10.71	**13.01**	-442.47
	(0.30)	**(0.04)**	**(0.02)**	(0.47)	(0.64)	(0.11)	**(0.01)**	(0.28)
Memb	-0.39	-2.38	-2.08	18.59	1.52	-0.94	**-1.40**	34.27
	(0.81)	(0.17)	(0.06)	(0.29)	(0.25)	(0.14)	**(0.00)**	(0.19)
R2	57%	76%	67%	17%	55%	82%	68%	16%
F-stat	5.1	12.9	18.7	2.6	4.3	18.5	18.2	2.3
d.f.	23	25	55	78	21	24	52	75

Models 7 and 8 use Total Inflows of All Flows as the dependent variable, with the results reported in Table 12. These results are inline with those of the relative inflows measure, with Performance having a significant, positive relation with Total Inflows of funds and members. The results for Fees are less clear cut. There is a significant, negative relation with Total Flows of members, as expected. However, for three of the four time periods considered, there is a negative relation between Fees and Total Inflows of funds. Only two of the four results are significant, one of which shows a negative relation, while the other shows a positive relation. The difference would appear to be the inclusion of data for 2009 and is likely to reflect the higher fees collected in 2009, as shown in Figure 7.

Table 12: Model 7 & 8 – Total Inflows (All Flows)

	Model 7 - Funds				Model 8 - Members			
	2011	2010	2010 - 2011	2009 - 2011	2011	2010	2010 - 2011	2009 - 2011
Perf	**0.48**	**0.76**	**0.80**	**1.08**	**1.96**	**2.54**	**2.01**	**2.15**
	(0.00)	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**
Fees	**0.50**	0.21	0.14	**-0.22**	**-0.99**	**-1.41**	**-0.92**	**-1.21**
	(0.00)	(0.19)	(0.06)	**(0.02)**	**(0.00)**	**(0.00)**	**(0.00)**	**(0.00)**
Bank	-0.15	-0.11	-0.05	0.14	-0.04	-0.34	-0.33	0.17
	(0.23)	(0.45)	(0.59)	(0.33)	(0.88)	(0.21)	(0.08)	(0.53)
Default	0.01	-0.09	-0.09	-0.04	-0.09	-0.02	-0.03	-0.27
	(0.96)	(0.52)	(0.32)	(0.80)	(0.71)	(0.95)	(0.86)	(0.33)
FUM	1.52	5.71	5.01	-3.60	4.39	-9.06	6.01	-10.07
	(0.72)	(0.46)	(0.18)	(0.53)	(0.79)	(0.53)	(0.58)	(0.46)
Memb	-1.14	-0.55	0.53	-0.22	4.15	**-3.30**	**-3.99**	-0.12
	(0.61)	(0.47)	(0.33)	(0.62)	(0.43)	**(0.03)**	**(0.00)**	(0.89)
R2	99%	99%	99%	95%	98%	98%	97%	89%
F-stat	516.8	341.2	737.2	259.9	153.9	169.4	266.7	101.8
d.f.	23	25	55	78	21	24	52	75

The final pair of models for all flows uses Total Outflows as the dependent variable, and the results are reported in Table 13. As with the relative outflows, bank ownership shows a significant positive relation for Total Outflows of members, but is insignificant in terms of Total Outflows of funds. Unexpectedly there is also a positive relation between Performance and Total Outflows of members, which suggests that a better performance is likely to see a greater loss of members. There is no obvious explanation for this. There is some evidence of a significantly positive relation between Fees and Total Outflows of funds, which appears to be strongest in 2011. This suggests that fees may be becoming more of a driver for members to leave a fund, reflecting increased knowledge and interest, i.e. increased investor consciousness.

Table 13: Model 9 & 10 – Total Outflows (All Flows)

	Model 9 - Funds				Model 10 - Members			
	2011	2010	2010 - 2011	2009 - 2011	2011	2010	2010 - 2011	2009 - 2011
Perf	-0.42	2.57	-0.59	0.73	**1.62**	**1.00**	**1.16**	**1.27**
	(0.29)	(0.70)	(0.46)	(0.18)	**(0.00)**	**(0.01)**	**(0.00)**	**(0.00)**
Fees	**1.52**	-0.81	**2.23**	0.54	-0.62	0.11	-0.08	-0.21
	(0.00)	(0.72)	**(0.01)**	(0.34)	(0.13)	(0.78)	(0.69)	(0.17)
Bank	0.69	-0.60	-0.05	0.30	**0.70**	**0.75**	**0.68**	**0.80**
	(0.11)	(0.77)	(0.96)	(0.72)	**(0.05)**	**(0.04)**	**(0.00)**	**(0.00)**
Default	0.35	-0.68	-0.03	-0.32	-0.45	0.22	-0.08	-0.12
	(0.38)	(0.73)	(0.98)	(0.70)	(0.16)	(0.50)	(0.73)	(0.56)
FUM	20.49	-138.06	12.81	-6.76	-4.31	23.52	9.75	-4.38
	(0.15)	(0.22)	(0.77)	(0.85)	(0.85)	(0.23)	(0.46)	(0.66)
Memb	-7.99	**21.97**	12.04	0.00	-1.33	1.83	0.29	0.97
	(0.29)	**(0.05)**	(0.06)	(1.00)	(0.85)	(0.33)	(0.82)	(0.13)
R2	94%	76%	68%	53%	96%	95%	95%	94%
F-stat	57.0	12.9	19.2	14.7	94.9	82.3	176.9	214.0
d.f.	23	25	55	77	21	24	52	75

The remaining models use Pure Transfers, which is a measure of transfers of members between providers, and therefore excludes new members and additional contributions. The lack of data for 2008 means that we are restricted to three time periods. Again, we begin with Inflows, with the results shown in Table 14. As with the All Flows, there is a significantly positive relation for Performance with Pure Transfers of both Funds and Members, while there is a significantly negative relation for Fees. Similarly, there is evidence of a significant positive relation between fund size, in terms of FUM, and the Pure Transfer of fund inflows.

Table 14: Model 11 & 12 – Inflows (Pure Transfers)

	Model 11 - Funds			Model 12 - Members		
	2011	2010	2010 - 2011	2011	2010	2010 - 2011
Perf	**0.18**	**0.48**	**0.37**	**0.11**	**0.27**	**0.14**
	(0.00)	**(0.01)**	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**
Fees	**-0.19**	**-0.47**	**-0.38**	**-0.13**	**-0.26**	**-0.13**
	(0.00)	**(0.03)**	**(0.00)**	**(0.02)**	**(0.00)**	**(0.00)**
Bank	-0.07	-0.14	-0.11	-0.02	**-0.13**	**-0.11**
	(0.22)	(0.44)	(0.24)	(0.63)	**(0.00)**	**(0.00)**
Default	-0.02	-0.20	-0.15	-0.03	-0.06	-0.03
	(0.74)	(0.21)	(0.08)	(0.49)	(0.16)	(0.28)
FUM	2.84	**23.78**	**21.68**	1.49	1.43	**4.79**
	(0.13)	**(0.04)**	**(0.00)**	(0.60)	(0.69)	**(0.03)**
Memb	0.46	-1.27	**-2.52**	0.94	**-1.03**	**-0.92**
	(0.64)	(0.30)	**(0.00)**	(0.29)	**(0.01)**	**(0.00)**
R2	50%	72%	71%	42%	90%	71%
F-stat	3.7	8.2	16.6	2.4	21.6	15.5
d.f.	22	19	41	20	15	39

Table 15 provides the results for models 13 and 14, which looked at Pure Transfers out, and the results are mixed. The size of the fund in terms of FUM appears to have a significant positive relation with transfers out of funds, but while this is found for both 2010 and 2011, it is not significant for the combined 2010-2011 dataset. There is a significant relation between size of fund in terms of number of members and transfers out of funds, but the direction of the relation varies between the data sets. In terms of members transferring out, there are some significant relations found in 2011 but not in 2010. Accordingly, it is difficult to explain what is driving transfers out, which suggests the transfers may be more about where the member is moving to rather than where they are leaving, i.e. the transfer is for positive rather than negative reasons.

Table 15: Model 13 & 14 – Outflows (Pure Transfers)

	Model 13 - Funds			**Model 14 - Members**		
	2011	2010	2010 - 2011	2011	2010	2010 - 2011
Perf	0.01	0.00	**0.03**	**0.05**	0.01	**0.03**
	(0.47)	(0.83)	**(0.02)**	**(0.01)**	(0.65)	**(0.02)**
Fees	-0.01	0.01	-0.02	**-0.04**	-0.01	-0.02
	(0.67)	(0.67)	(0.08)	**(0.02)**	(0.86)	(0.09)
Bank	0.03	**0.05**	**0.04**	**0.04**	0.04	**0.04**
	(0.18)	**(0.00)**	**(0.00)**	**(0.01)**	(0.04)	**(0.00)**
Default	-0.03	-0.02	**-0.03**	**-0.04**	-0.01	**-0.03**
	(0.13)	(0.24)	**(0.01)**	**(0.01)**	(0.44)	**(0.01)**
FUM	**3.87**	**3.04**	0.82	0.44	0.79	-0.06
	(0.00)	**(0.01)**	(0.28)	(0.64)	(0.63)	(0.94)
Memb	**-0.72**	**0.47**	**0.20**	-0.09	0.22	0.03
	(0.05)	**(0.00)**	**(0.03)**	(0.76)	(0.14)	(0.74)
R2	74%	71%	57%	72%	52%	57%
F-stat	10.4	9.2	8.9	8.4	3.1	9.7
d.f.	22	23	41	20	17	44

Models 15 and 16 are for the net flows of the pure transfers, and the results are shown in Table 16. As with the all flows results, the net flows appear to be dominated by the inflows, with the significant relations and the co-efficients generally the same. We find there is a significantly positive relation for Performance with Pure Transfers of net flows for both Funds and Members, although the relation is not significant for Members in 2011. It is unclear why Pure Transfer Net Flows should be dominated by inflows. Similarly, there is a significantly negative relation for Fees, but not for Members in 2011. There is also evidence of a significant positive relation between fund size, in terms of FUM, and the Pure Transfer of fund inflows. There is some evidence of a negative relation between fund size in terms of member numbers and Pure Transfer Net Flows of both funds and members.

Table 16: Model 15 & 16 – Net flows (Pure Transfers)

	Model 15 - Funds			Model 16 - Members		
	2011	2010	2010 - 2011	2011	2010	2010 - 2011
Perf	**0.17**	**0.45**	**0.35**	0.07	**0.23**	**0.11**
	(0.01)	**(0.01)**	**(0.00)**	(0.22)	**(0.01)**	**(0.00)**
Fees	**-0.18**	**-0.46**	**-0.36**	-0.09	**-0.24**	**-0.11**
	(0.01)	**(0.01)**	**(0.00)**	(0.16)	**(0.01)**	**(0.00)**
Bank	-0.10	-0.19	-0.15	-0.06	**-0.16**	**-0.12**
	(0.12)	(0.22)	(0.11)	(0.25)	**(0.01)**	**(0.00)**
Default	0.01	-0.17	-0.12	0.01	-0.03	0.00
	(0.85)	(0.25)	(0.16)	(0.78)	(0.47)	(0.97)
FUM	-1.03	**22.26**	**20.86**	1.06	1.68	**6.14**
	(0.60)	**(0.02)**	**(0.00)**	(0.76)	(0.70)	**(0.01)**
Memb	1.19	-1.76	**-2.73**	1.03	**-1.37**	**-1.06**
	(0.27)	(0.11)	**(0.00)**	(0.33)	**(0.00)**	**(0.00)**
R2	52%	72%	70%	44%	88%	71%
F-stat	3.9	10.0	15.6	2.6	16.6	15.5
d.f.	22	23	41	20	14	38

Moving on to Total Inflows in the Pure Transfers, the results for Models 17 and 18 are presented in Table 17. There is a significant positive relation for performance with Total Inflows on a Pure Transfers basis, supporting the idea that members are chasing better performance. There is also limited evidence of a negative relation between bank ownership and Total Inflows.

Table 17: Model 17 & 18 – Total Inflows (Pure Transfers)

	Model 17 - Funds			Model 18 - Members		
	2011	2010	2010 - 2011	2011	2010	2010 - 2011
Perf	**1.42**	**1.59**	**1.39**	**2.03**	**3.00**	**1.91**
	(0.05)	**(0.04)**	**(0.00)**	**(0.01)**	**(0.00)**	**(0.00)**
Fees	-0.51	-0.75	-0.43	-1.22	**-2.00**	**-0.92**
	(0.52)	(0.39)	(0.33)	(0.11)	**(0.01)**	**(0.02)**
Bank	-1.19	-0.95	**-1.33**	-1.06	**-1.57**	**-1.50**
	(0.14)	(0.23)	**(0.01)**	(0.11)	**(0.00)**	**(0.00)**
Default	0.71	-0.89	0.79	0.56	0.53	0.68
	(0.32)	(0.21)	(0.08)	(0.37)	(0.20)	(0.06)
FUM	36.55	6.73	22.61	10.21	-36.66	10.45
	(0.16)	(0.89)	(0.44)	(0.81)	(0.34)	(0.66)
Memb	6.02	-3.41	-5.93	8.46	**-8.58**	**-6.30**
	(0.66)	(0.52)	(0.09)	(0.53)	**(0.03)**	**(0.03)**
R2	81%	80%	81%	83%	94%	86%
F-stat	13.2	12.5	29.3	13.7	36.9	40.8
d.f.	18	19	41	17	15	39

The final models, 19 and 20, are for Total Outflows on a Pure Transfers basis, with the results shown in Table 18.. There is a significant positive relation for Total Outflows and member flows, as there was in the All Flows model. There is also a significantly positive relation for fund size, in terms of FUM, and the Total Outflow of funds in 2010 and 2011 but not for the two-year period as a whole.

Table 18: Model 19 & 20 – Total Outflows (Pure Transfers)

	Model 19 - Funds			**Model 20 - Members**		
	2011	2010	2010 - 2011	2011	2010	2010 - 2011
Perf	0.49	-0.45	0.26	**1.93**	**1.43**	**1.59**
	(0.16)	(0.25)	(0.28)	**(0.00)**	**(0.03)**	**(0.00)**
Fees	0.62	**1.79**	**0.90**	**-0.85**	-0.24	-0.47
	(0.12)	**(0.00)**	**(0.00)**	**(0.03)**	(0.71)	(0.06)
Bank	0.44	0.69	0.49	0.55	0.56	**0.49**
	(0.24)	(0.08)	(0.10)	(0.10)	(0.16)	**(0.04)**
Default	-0.47	-0.12	-0.39	**-0.63**	-0.29	-0.44
	(0.18)	(0.73)	(0.15)	**(0.04)**	(0.43)	(0.05)
FUM	**34.30**	**74.0**	10.97	-9.38	8.73	-11.85
	(0.01)	**(0.00)**	(0.54)	(0.65)	(0.80)	(0.44)
Memb	-9.37	**10.81**	**4.30**	-1.79	5.63	0.67
	(0.16)	**(0.05)**	**(0.05)**	(0.78)	(0.08)	(0.70)
R2	95%	94%	93%	97%	93%	95%
F-stat	65.6	60.1	85.6	97.3	39.9	129.0
d.f.	22	22	41	20	17	44

Hypothesis Results

The first pair of hypotheses suggested that investors are chasing performance, with a positive relation between performance and fund flows, and between performance and member flows. Both hypotheses are supported, as a consistent finding in the models was a positive relation for performance with inflows and net flows. However, there was also a positive relation between performance and outflows, which is unexpected and needs further investigation.

The second pair of hypotheses proposed that investors wish to avoid high fees and expenses, demonstrated by a negative relation between fees and fund flows, and between fees and member flows. Again, this was supported in terms of inflows and net flows, but no significant relation was found for outflows.

Structural factors in the form of default provider status were the subject of the third pair of hypotheses, which proposed a positive relation between default provider status and fund flows, and between default provider status and member flows. In fact, the co-efficients were generally negative, but were not usually significant. Therefore these hypotheses were not supported, and it appears that being a default provider does not provide the expected benefits.

Bank ownership was also expected to be an advantage for a KiwiSaver provider. The fourth pair of hypotheses suggested a positive relation between bank ownership and fund flows, and between bank ownership and member flows. Contrary to expectation, the primary finding was for a significantly negative relation between bank ownership and member outflows. Generally the other co-efficients were not significant, but the occasional significant co-efficient was negative for some measure of inflows. The reason why bank ownership should be seen as a negative is unclear, and counters previous research that suggested Kiwisaver members saw bank ownership as desirable. One possible explanation could be that banks engage in aggressive cross-selling, which may have resulted in some unsatisfied members. Another possible explanation is that the visibility of a member's KiwiSaver balance, via their usual internet banking page, may have invoked attention effects, which spurred the member to more actively manage their account (i.e. take a more active approach and attitude to selecting their provider).

Two pairs of hypotheses explored the influence of the size of fund, with one looking at the number of members and the other considering the quantity of FUM. It was hypothesised that there would be no relation between existing member numbers and fund flows, but that there would be a positive relation between existing member numbers and member flows. A positive relation was expected between existing FUM and fund flows, and between existing FUM and member flows. The results were inconclusive, with few significant co-efficients, and mixed results where significance was found. The only significant relation found was a negative relation between the total FUM and the out flow of funds, which was the opposite to that expected.

Conclusions

The goals of this research were to probe the early data emerging from the KiwiSaver market and attempt to draw some insights on KiwiSaver investor behaviour. The approach emphasised a focus on the determinants of fund flows and member flows, recognising that at an aggregate level it represents the decisions of many investors. The secondary aim was to establish an initial model and approach for analysing KiwiSaver investor behaviour, which future studies may draw from and build upon as the dataset grows and as the methodology is further developed.

In addition there was a desire to extend the existing literature on the determinants of fund flows, which has to date focused largely on international markets and mutual fund products. It was also considered important to generate insights that may be of interest in an empirical sense, in terms of both providers and associated businesses, but also policy makers, and others with an interest in the industry.

The findings of the study were broadly in line with expectations, given the economics of the product and market, and in respect of the existing literature in the field. As the market develops, theory suggests the relations of performance and fees with flows of funds and members should grow in strength and importance, provided investor consciousness also grows and develops through time.

The basic data on the KiwiSaver market also provided some insights on its structure and dynamics. For example, total expense ratios have tracked downwards, while average FUM per member has grown steadily with several providers reporting average FUM per member in excess of $10,000. There has also been a degree of switching activity between KiwiSaver providers.

However, there are several areas in the study where the results were less than satisfying (i.e. they were unclear, inconsistent, or statistically insignificant), and this provides an opportunity for future research in this area. Future studies may benefit from introducing additional variables and observations in future studies to gain greater insight into KiwiSaver investor behaviour from a

quantitative perspective. An alternative would be to take a fund-by-fund approach, if the necessary data is available. Overtime the dataset will grow, which will also allow for further analysis. In terms of specific findings from this study, it would be useful to explore the data further to try to understand the existence of the unexpected positive relation between performance and outflows. Similarly, it would be helpful to understand the negative effect of bank ownership, given its contrast with members' reported views on bank ownership.

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Financial Advice and Asset Allocation Choices of Individual Investors: Evidence from New Zealand

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Abstract

We explore differences in asset allocation between investors who receive financial advice and those who do not. Using proprietary data from a national investment savings scheme that contains information of 405,107 individual retirement accounts, we find that financial advice is transformative. People who receive advice hold their assets differently compared to people who do not. We report five key findings. (1) Older, wealthier and female investors are more likely to receive financial advice. (2) Advised investors hold more equity assets. (3) Demographic characteristics affect asset allocation. (4) Advisers tend to recommend asset allocations in line with life-cycle based theories. (5) Investors who received advice tend to earn higher returns in years when equity markets perform well.

Keywords: Financial advice, asset allocation, portfolio choice, household finance
JEL codes: G11, E2, D8, D12

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1. Introduction

New Zealand household savings rate is low by world standards.[20] The high imbalance in New Zealander's savings with relative high house investment compared to financial assets creates difficulties for capital markets (New Zealand Treasury, 2007). To combat the low levels of savings, KiwiSaver was introduced in New Zealand as the world's first national auto-enrolment retirement investment savings vehicle. While the key focus of KiwiSaver is to increase household savings, a key medium term goal for the introduction of the investment scheme was to boost the development of New Zealand capital markets.[21] Low saving and wealth accumulation has resulted in little assets available that can be traded on financial markets. In turn, this has contributed to the under-development of New Zealand's capital markets (Savings Working Group, 2011). Research on individual investor behaviour and household finance is been challenged by the measurement of data.[22] As Campbell (2007, p.1555) states, households have complicated finances, with multiple accounts at different financial

[20] New Zealand has the 6th lowest average Gross National Savings as a percentage of Nominal GDP out of 32 OECD countries from between 1992 to 2011. (OECD, 2013) www.oecd.org/eco/outlook/Saving.xls

[21] As stated in New Zealand Treasury (2007, p.8), "over the longer term, KiwiSaver and the Business Tax Reform support economic and fiscal sustainability by promoting a stronger savings culture and encouraging greater investment to create a more productive economy, a deeper capital base, and a more secure retirement future for all New Zealanders."

[22] See Campbell (2007) for a detailed description.

institutions that have different tax status and include both mutual funds and individual stocks and bonds. Even households that wish to provide data may have some difficulty answering detailed questions accurately. In this paper we try to add to the understanding of how households actually invest by using investigating the asset allocation decision of investors who receive advice and compared to investors who do not, in a population of KiwiSaver investors. We address four key questions in this paper using a proprietary dataset containing information of 405,107 KiwiSaver investors. (1) Who receives financial advice? (2) Do people who receive financial advice have a different asset allocation compared to people who do not? (3) What roles can investor gender, wealth and age have on portfolio composition in relation to financial advice? (4) What implications do differences in asset allocation under financial advice have on portfolio returns? Addressing these questions are important because it allows academics, policymakers and financial institutions to assess the impacts of KiwiSaver and the financial advice industry on investor behaviour and therefore the contribution KiwiSaver and financial advisory services provides to the development of New Zealand capital markets.

We contribute a number of key findings to the literature. First, we find that female, wealthier, and older investors are more likely to receive investment advice. Second, investors who receive advice tend to hold a higher portion of equity in their investment accounts compared to those who do not receive financial advice. Third, investors who receive advice hold more equities, with this effect being strongest in male, younger and wealthier investors. Significant differences in portfolio asset allocations also exist between male and female investors. Women tend to hold more cash and bond assets in their portfolios, while men tend to hold more Equity and Property assets. However, when comparing women who receive advice to men who have not we find that women have more aggressive portfolios with higher proportions of equity assets. Fourth, we find that advisers provide recommendations in line with well-known life-cycle based theories introduced by Bodie, Merton and Samuelson (1992). The life-cycle theory explains the effect of the labour-leisure choice on portfolio and consumption decisions over an individual's life cycle, highlighting that the young (with greater labour flexibility over their working lifetimes) may take significantly greater investment risks than the old. Finally, comparing investment fund returns we find that investors who receive advice tend to earn higher returns in years where equity markets perform well.

A handful of empirical studies have analysed the relationship between financial advice and asset allocation. However, the findings are mixed. For instance, Mullainathan, Noth and Schoar (2010) find that advice is positively related to equity exposure compared to Kramer (2012) who finds that advised accounts in the Netherlands contain significantly less equity and more fixed income securities. Recent studies have also reported contrasting results of whether advised trading accounts outperform non-advised accounts. Bergstresser, Chalmers and Tufano (2009) find a negative relationship between adviser involvement and investor performance in US mutual funds. Hackethal et al. (2012) identify that risk-adjusted returns are lower for advised portfolios caused by higher trading costs using German data. And Hoechle et al. (2013) document that advisors hurt performance in Swiss trading accounts. In direct contrast however, studies also show that advised accounts are better diversified and are in line with predefined model portfolios (Shapira & Venezia, 2001; Bluegthen et al., 2007; & Bhattacharya et al., 2012).

This paper makes two contributions to the existing literature. First, we exploit the use of a new proprietary dataset, KiwiSaver, to understand the relationship between financial advice and individual investor decisions in an auto-enrolment setting[23]. Previous studies have not investigated the relation between financial advice in an

[23] KiwiSaver is a defined-contribution retirement savings scheme launched in New Zealand in 2007. KiwiSaver is the world's first auto-enrolment scheme on a national scale which provides a unique setting to be exploring individual investor behaviour. As discussed thoroughly in O'Connell (2009) KiwiSaver contains several innovative features, the most prominent feature is the auto-enrolment of individuals into the investment scheme. Sometimes called "soft compulsion", auto-enrolment is designed to reduce the level of inertia in relation to savings behaviour by automatically enrolling people who may not otherwise make the effort to join KiwiSaver themselves. See Madrian and Shea (2001) for discussion on inertia in 401(k) retirement accounts. Workers enrolled can choose to opt out if they wish, but if they stay in the scheme the employer is compelled to contribute. To date, the impact of KiwiSaver on the world stage can be seen in the United Kingdom which has made a commitment to develop a similar national auto-enrolment savings scheme.

auto-enrolment retirement investment setting before. Our dataset includes information on a nationwide sample that is representative of the population of New Zealand. We have information on wealth, age, gender and the asset allocations of investment funds and our proprietary dataset comes directly from the records within the investment firms. To the best of our knowledge, this is the largest sample size of individual investor accounts that is representative of a nationwide population. Campbell (2006) states that there are five key criteria that an ideal dataset investigating household finance behaviour would need to have, they are: (1) cover a representative sample of the entire population; (2) measure total wealth and a breakdown of wealth categories; (3) distinguish between asset classes; (4) data would be reported at a high level of accuracy and (5) be panel data. Our dataset meets three out of five of Campbell's (2006) check-list, and proportionately more requirements than datasets used in previous studies.[24] Second, this is the first study to look at financial advisers who provide face-to-face investment advice instead of using brokerage firm data. Brokerage firm advisers are typically employees of the banks who are providing the investment product, and therefore not independent.[25] Previous studies tend not to differentiate where advice has come from or what constitutes 'advice', which makes comparisons between results less precise. For instance, advice received from brokers, dealers, bank-employees and computer-generated algorithms in reality are not the same thing but have all been categorized as receiving advice in studies.[26] In our study we adopt a more direct measure to record financial advice which matters because dealers, brokers and advisers face different regulations under the law. The main difference lies in the standard of care which financial advisers must provide. Investment advisers are fiduciaries to their clients which means they have a duty to serve in the best interests of their clients. The standard of care differs for brokers and dealers, who mainly provide execution services and may not provide personalised advice. In New Zealand, only Authorised Financial Advisers (AFAs) are able to provide investment planning and discretionary management services to clients and give personalised advice on KiwiSaver investment products. We are fortunate to measure advice at a more personalised level than studies before us and are void of some of the disadvantages that come from using brokerage data. As suggested by Goeztmann and Kumar (2008), brokerage portfolios may not represent serious investments but investors 'play-money' accounts. Hoechle et al. (2013) argue while evidence based on brokerage accounts are insightful, there are limitations on the conclusions drawn on financial behaviour. And finally the use of online brokerage data may attract only a selected sample of a population that is interested in trading and may not be representative as discussed in Hackethal et al. (2012).

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[24] Hackethal, Haliassos and Jappelli (2012) use panel data from a German brokerage firm and compare the accounts of 32,751 banking customers. Chalmers and Reuter (2010) study 5,807 Optional Retirement Accounts from the Oregon University retirement savings plan. They state that their sample of defined contribution plan participants is not representative of the general population as it includes faculty and university staff only. Bergstresser, Chalmers and Tufano (2009) do not use individual account data but returns of broker-related funds. Bluethgen, Gintschel, Hacklethal, and Mueller (2007) use panel data from a German brokerage house with a sample of 4,363 banking customers. Bhattacharya, Hackethal, Kaesler, Loos and Meyer (2012) use data from a German brokerage containing 8,000 individual accounts.

[25] For example, Hackethal et al. (2012) use data from a German brokerage and bank. They refer to financial advisers as Independent Financial Advisers (IFA) and state that 90% of IFAs in their sample are bank-employees who typically place orders on behalf of the client.

[26] See Bluethgen, Gintschel, Hacklethal and Mueller (2007), Chalmers and Reuter (2010), Hackethal, Haliassos and Jappelli (2012) and Bhattacharya, Hackethal, Kaesler, Loos and Meyer (2012).

Campbell (2006) points out that households are notorious for having low levels of financial literacy and making financial mistakes. A number of papers have tried to explain why such large proportions of families do not hold stocks. For instance, Guiso, Sapienza and Zingales (2008) find that culture and trust are related to factors of financial decisions; Hong, Kubik and Stein (2004) explore the role of neighbours and peers, and van Rooji, Lusardi and Alessie (2011) link financial literacy with stock market participation. Our findings have a range of implications and raise several other questions. One finding we show is that 10% of people involved in retirement investment receive financial advice. While we cannot rule out that some people may obtain financial advice from outside of our advisers, it remains an important question to consider whether those people receiving financial advice are those in the population who are most in need of it? Calvet, Campbell and Sodini (2007) link age, wealth and education with financial sophistication and show that households with greater financial sophistication tend to invest more efficiently. We find that young investors and those with low account balances are not receiving advice and may be among the population who require advice the most. This result is similar to that of Bhattacharya et al. (2012) who find those who need financial advice are the least likely to obtain it. They suggest reasons why investors are not seeking advice which include a lack of financial sophistication, a desire to not increase tax payments and lack of familiarity and trust. This raises the question of whether advice and education should target specific groups in need.[27] Another result we find with potential broad implications is that advised accounts tend to invest consistent with Bodie, Merton and Samuelson's (1992) life-cycle theory, which explains the effect of the labour-leisure choice on portfolio and consumption decisions over an individual's life cycle. In addition, the level of risk taken is also related to gender, and account balance. This adds to the existing argument of whether the default fund option would provide a better strategy than the current conservative fund in New Zealand.[28]

2. Data

KiwiSaver Investor Data

The primary dataset, obtained from four large KiwiSaver investment fund companies, consists of individual investors' retirement savings accounts. We have a large cross-sectional dataset which recorded as at 30 June 2011. The data includes investor accounts of 405,107 individuals (which represents approximately 10% of the total New Zealand population of 4.4 million people).[29] Our data also includes information on 40,776 individuals who have obtained financial advice within the total sample of 405,107. Each individual in our sample holds at least one investment fund, and 13 investment funds at most. Of the 13 investment fund options available to choose, six investment funds are multi-asset funds (including, cash, bond, property and equity asset allocations) and seven single asset-funds (cash, domestic bonds, international bonds, domestic property, international property, domestic equities and international equities). Table 1 shows the distribution of investments fund choice in the sample.

[27] A key outcome of the 2009 Financial Literacy Summit was a call to action that different groups of people have different levels of financial knowledge and require targeted communication (see Retirement Commission, 2019 http://www.cflri.org.nz/financial-literacy/summits/2009-summit)

[28] A review of KiwiSaver Default Provider Arrangements was conducted in 2012. See New Zealand Ministry of Business, Innovation and Employment, 2013) http://www.med.govt.nz/business/business-law/current-business-law-work/changes-to-kiwisaver/default-provider-arrangements

[29] The population of New Zealand is 4,404,500 as at 30 June 2011 according to Statistics New Zealand (2011). http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/demographic-trends-2011/subnational%20population%20estimates.aspx

Table 1. Investor Summary Statistics

	Provider 1	Provider 2	Provider 3	Provider 4*	Total
Number of investors	115,059	152,133	63,823	74,092	405,107
	28%	38%	16%	18%	
Males	53,330	71,688	32,168	36,497	193,683
	28%	37%	17%	19%	
Females	61,729	80,445	31,655	37,595	211,424
	29%	38%	15%	18%	
AgeU16	30,626	35,525	3,570	377	70,098
	44%	51%	5%	1%	
Age16-25	25,326	33,956	9,366	17,112	85,760
	30%	40%	11%	20%	
Age26-40	19,042	32,758	16,839	26,063	94,702
	20%	35%	18%	28%	
Age41-59	26,898	35,050	23,297	24,899	110,144
	24%	32%	21%	23%	
Age60-65	9,903	11,185	7,829	4,501	33,418
	30%	33%	23%	13%	
Age65+	3,264	3,659	2,922	1,140	10,985
	30%	33%	27%	10%	
Total Funds Under Management (FUM)					
Min FUM	100	100	100	100	-
Max FUM	166,628	154,863	221,612	181,010	-
Mean FUM	3,444	4,041	8,799	5,146	-

This table shows a summary of the number of investors enrolled in each of the four KiwiSaver Providers we have in our sample. Provider 1 and Provider 2 are large commercial banks and Provider 3 includes investors who have come through the financial advisor track. Provider 4 is a default provider which means that members enrolled have not actively engaged in the selection process of which investment fund to invest in and have entered the KiwiSaver scheme by default. The members are split into gender and age group categories. Total Funds Under Management (FUM) shows the minimum, maximum and average funds under management for investors in our sample.

The information associated with each investor includes investment fund choice and demographic characteristic features including age, gender, account balance, and tax code. We also have information on the number of investment funds that investors hold, the time period in which they have invested in the KiwiSaver scheme and the method of enrolment into the investment fund. As there are a number of ways investors can enrol into KiwiSaver funds such as through active choice, financial advice channels, employer-preferred provider or via default (a situation where no choice has been made by the individual), we account for differences in enrolment method in our analysis.

A separate data file contains information on financial advice. Financial adviser services include the giving of financial advice—which means the making of a recommendation or provision of advice in relation to acquiring or disposing of a financial product. In New Zealand only Authorised Financial Advisers (AFAs) are allowed to give personalised advice on KiwiSaver, which is a category one[30] investment product under the Financial

[30] Catergory one products are products with more of an investment focus including shares, managed funds and KiwiSaver. http://www.fma.govt.nz/glossary/category-1-products/ (Financial Markets Authority, retrieved March 2013).

Advisers Act 2008. Authorised Financial Advisers are individually registered and authorised by the Financial Markets Authority (New Zealand financial markets regulators) to provide financial adviser services. They can provide investment planning and discretionary management services and will generally provide advice on more complex products. In our data, an individual is flagged as having received financial advice if they received advice from a registered Authorised Financial Adviser.

KiwiSaver provides a novel dataset to investigate investor behaviour in a number of ways. Our dataset includes information on a nationwide sample that is representative of the population of New Zealand and therefore we mitigate the risk of having selection bias in our sample.[31] KiwiSaver provides a unique setting to study individual investor behaviour within the context of retirement savings and financial advice. As discussed in Sunden and Surette (1998) investing retirement assets conservatively could translate into large differences in the accumulation of wealth for retirement in the presence of the equity premium. Therefore understanding the asset allocation of individual investors, in a context of retirement savings and the role that financial advice plays enables a deeper understanding of the national savings behaviour and the ability to meet capital needs in retirement. As stated in O'Connell (2009), KiwiSaver is fast becoming the predominant vehicle for retirement savings in New Zealand and provides a viable working model for other countries seeking to create a simple and unified national lifetime savings scheme. It is important therefore to understand the choices and their implications within such a framework, especially if other countries in the future are going to invest in similar investment schemes, for example, in the United Kingdom.

Of the four KiwiSaver Providers in our sample, two companies are large retail banks, one company is a mutual fund investment firm and the fourth KiwiSaver company is a government default-provider.[32] Investors in the default-provider category are those who have not selected a provider to join (hence by default) while investors in the other three investment funds have joined either via self-appointment, appointment of their employers or through financial advice channels. Three of the four providers (default provider and two bank providers) offer six investment fund options: Cash, Conservative, Conservative-Balanced, Balanced, Balanced-Growth and Growth. The fourth provider offers 13 funds, six of which are identical to the funds offered in the previous funds mentioned, and seven additional single-asset class funds which are: Equity, Property, International Equity, International Property, Bonds, International Bonds and Sustainable Funds. The asset allocations of all funds included in our sample are provided in Table 2.

[31] Our data covers the largest representative sample relative to a country's entire population compared to previous studies who also investigate individual investor behaviour.

[32] Default providers are an important component of KiwiSaver. Default providers have special contracts with Government that requires them to meet additional reporting requirements, and default providers' activities and their default investment funds are closely monitored. This is because KiwiSaver members joining default providers have not specified a choice of provider (or investment fund for that matter), hence are placed in relatively conservative investments. (New Zealand Inland Revenue, 2012) Website http://www.kiwisaver.govt.nz/new/providers/

Table 2. Investment Fund Asset Allocation

Single Sector Funds	Cash	Fixed Interest	Property	Shares	Alternatives
Cash	100				
Fixed Income (New Zealand)		100			
Fixed Income (International)		100			
Property (Australasian)			100		
Property (International)			100		
Equity (Australasian)				100	
Equity (International)				100	
Sustainable Growth Fund				60	40
Multi-Sector Funds					
Conservative	20	60	3	17	
Conservative-Balanced	15	50	6	29	
Balanced	10	40	8	42	
Balanced-Growth	6	29	10	55	
Growth	4	16	12	68	

This table shows the asset allocation of the investment funds offered by the four KiwiSaver Providers. Provider 1, 2 and 4 offer one single sector fund (Cash fund) and five multi-sector funds. Provider 3 offers all the single sector funds and multi-sector funds listed above.

The differentiation of the four KiwiSaver providers in the sample enables cross-sectional comparisons to be made based on investor demographics. Our sample is extensive, covering almost 25% of the KiwiSaver population in New Zealand.

Investment Fund Returns

We obtain KiwiSaver investment fund returns from the Morningstar Direct database from 2007-2012. All returns are reported net of fees. We also use Morningstar return indices from January 2000 to December 2012 to generate monthly, quarterly and annual returns over a 12-year time period in order to extend our returns series to the period before KiwiSaver returns existed. This 12-year time frame includes the longest return series available to best represent KiwiSaver investment fund portfolio returns based on actual KiwiSaver investment fund asset allocations. We apply the ANZ NZ 90 Day Bank Bill to represent Cash returns, ANZ NZ Government Stock to represent domestic Fixed Interest returns, the Barclays Global Aggregate Bond Index to represent International Fixed Interest return, the NZX Property Index and S&P/ASX 200 A-REIT indices to represent the Australasian property market returns, the UBS Global Investors Ex NZL property index to represent the international property market return, the Cat 50% NZX 50 & 50% S&P/ASX 200 index to represent the Australasian Equity returns and the MSCI World Ex Australia to represent the International Equity market returns. The market benchmarks we use in each asset class are in line with the benchmarks used by Morningstar for multi-sector funds and are market indices that are frequently referred to within the Australasian finance industry.

3. Methodology

The following probit regression is used to explore which investors are more likely to receive financial advice based on their demographic characteristics.

$$Financial\ Advice_i = \alpha + \beta_1 Age_i + \beta_2 Female_i + \beta_3 FUM_i + \varepsilon_i \quad (1)$$

The left hand side variable $Financial\ Advice_i$ is a binary variable that takes the value of 1 if an investor received financial advice, and 0 otherwise. α is the constant term, Age_i is the age of the investor in years, $Female_i$ is a dummy variable which equals to 1 if the investor is female and 0 if the investor is male; FUM_i is the value of funds under management in an investor's KiwiSaver account, and ε_i is the error term.

We run t-tests to examine the differences in portfolio asset holdings and their level of significance. We divide the data into subgroups to compare the differences in asset allocation between genders, advised and non-advised investors, and fund enrolment through default and active enrolment methods. We then run univariate and multivariate regressions to identify the relationship between financial advice and holdings within each asset category held within an investor's portfolio. As noted in Jansen, Fischer and Hackethal (2008) and Bluethgen et al. (2007), regressing on the equity asset proportion of an investor's portfolio captures overall portfolio risk. In our model we regress the holdings of each asset class (cash, bonds, property and equity) as the percentage share held in investment fund on financial advice to see whether the relationship differs across asset classes. Our univariate model is:

$$\%\ Asset\ Allocation_i = \alpha + \beta_1 FinancialAdvice_i + \varepsilon_i \quad (2)$$

The left hand side variable *Asset Allocation*$_i$ is the percentage of asset allocation for *j* asset class categories available in the KiwiSaver fund portfolio for investor *i* (where *j* = 4 and asset classes are Cash, Bonds, Property and Equity.) α is the constant term, *FinancialAdvice*$_i$ is a dummy variable that equals to 1 if the KiwiSaver member has received financial advice and ε_i is the error term.

In order to control the effect of investor demographic characteristics on portfolio asset allocation separately from the effect of financial advice, we employ a multivariate framework shown in the equation below:

$$\%\ Asset\ Allocation_i = \alpha + \beta_1 FinancialAdvice_i + \beta_2 Age_i + \beta_3 Female_i + \beta_4 FUM_i + \varepsilon_i \quad (3)$$

The left hand side variable *Asset Allocation*$_i$ is the percentage of asset allocation for *j* asset class categories available in the KiwiSaver fund portfolio for investor *i* (where *j* = 4 and asset classes are Cash, Bonds, Property and Equity). α is the constant term, *FinancialAdvice*$_i$ is a dummy variable, which equals to 1 if the KiwiSaver member has received financial advice, *Age*$_i$ is the age of the investor in years, *Female*$_i$ is a dummy variable which equals to 1 if the investor is female and 0 if the investor is male; *FUM*$_i$ is the value of funds under management in an investor's KiwiSaver account, and ε_i is the error term.

Interaction terms are added for age, gender and funds under management with financial advice in order to control the possible effects between advice and demographic characteristics. We adopt the following mode for robustness of our main multivariate model:

$$\%\ Asset\ Allocation_i = \alpha + \beta_1 FinancialAdvice_i + \beta_2 Age_i + \beta_3 Female_i + \beta_4 FUM_i + \beta_5 Age*FinancialAdvice_i + \beta_6 Female*FinancialAdvice_i + \beta_7 FUM*FinancialAdvice_i + \varepsilon_i \quad (4)$$

The left hand side variable *Asset Allocation*$_i$ is the percentage of asset allocation for *j* asset class categories available in the KiwiSaver fund portfolio for investor *i* (where *j* = 4 and asset classes are Cash, Bonds, Property and Equity). α is the constant term, *FinancialAdvice*$_i$ is a dummy variable which equals to 1, if the KiwiSaver member has received financial advice, *Age*$_i$ is the age of the investor in years, *Female*$_i$ is a dummy variable which equals to 1 if the investor is female and 0 if the investor is male; and *FUM*$_i$ is the value of funds under management in an investor's KiwiSaver account. *Age*$_i$**FinancialAdvice*$_i$, *Female*$_i$**FinancialAdvice*$_i$, and *FUM*$_i$**FinancialAdvice*$_i$ are interaction terms between *Age*$_i$, *Female*$_i$, *FUM*$_i$ and *FinancialAdvice*$_i$, and ε_i is the error term.

Lastly, we compare the differences in performance for advised and non-advised accounts by calculating the average returns for investors who received advice and investors who did not. We then compute t-tests to see whether there are statistical differences in returns between the two groups. The returns used in this calculation are the actual KiwiSaver investment fund returns earned by investors in our sample which were downloaded from Morningstar Direct. In order to check for robustness of our findings, we further generate hypothetical returns using the average asset allocation weights for accounts held and market return indices. The returns indices also come from Morningstar Direct from January 2000 to December 2012.

4. Results

Who seeks advice?

There is a positive and significant relationship between receiving financial advice and variables: age, female and funds under management. This means that older investors are more likely to receive advice. Females are also more likely to receive advice than males, and the propensity to receive advice increases with the amount of funds under management in investment accounts. Table 3 shows the probability of receiving financial advice based on investor characteristics of age, gender and funds under management. The interpretation of the coefficients in a probit model is not as straight forward as in a linear model. The increase in the probability attributed to a one-unit increase in a given independent variable is dependent both on the values of the other predictors and the starting value of the given predictors. Our findings differ from the results of Bluethgen et al. (2007) and Hackethal, Haliassos and Japelli (2012) who find that financial advisers mostly serve younger investors with less wealth. We graph the probability of receiving advice based on funds under management controlling for age and gender to look at the relationship of fund balance and advice in isolation. As shown in Figure 1 in the Appendix, a balance between $20,000-$30,000 of money invested results in the largest change in probability of receiving advice, as indicated by the steepest part of the curve.

Table 3. Who receives advice?

	β	Pr > ChiSq
α	-2.143	<.0001***
Age	0.011	<.0001***
Female	0.078	<.0001***
Funds Under Management	0.00007	<.0001***

This table reports the results from the probit regression with the financial advice dummy as the dependent variable. $Financial\ Advice_i = \alpha + \beta_1 Age_i + \beta_2 Female_i + \beta_3 FUM_i + \varepsilon_i$

Where the left hand side variable $Financial\ Advice_i$ is a binary variable that takes the value of 1 if an investor received financial advice and 0 otherwise. α is the constant term, Age_i is the age of the investor in years, $Female_i$ is a dummy variable which equals to 1 if the KiwiSaver member is female and 0 if the investor is male, FUM_i is the value of funds under management in investor's KiwiSaver account, and ε_i is the error term. *, **, and *** denotes statistical significance at the 10%, 5% and 1% levels respectively.

Figure 1

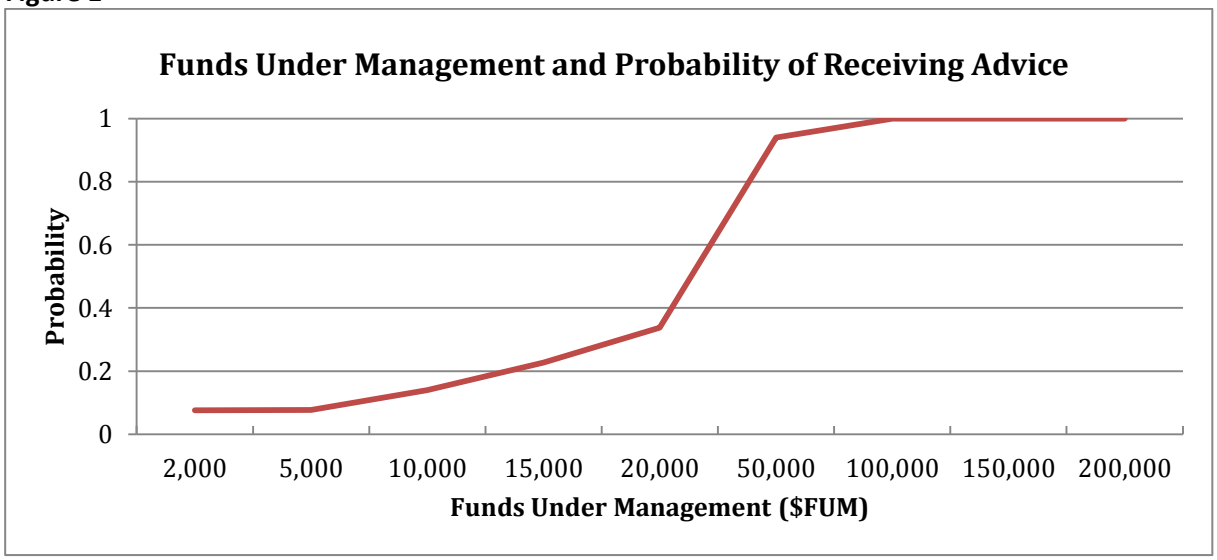

Figure 1 shows the probability of receiving financial advice as a function of funds under management.

Our findings raise a number of questions with possible broad implications. We find that women, older investors and investors with relatively more funds under management tend to receive advice. Why is this? Does it suggest that men, younger investors and investors with smaller investment balances seek are missing out and are in need of advice? Is the purpose of receiving financial advice related to the level of financial literacy a person has? van Rooij, Lusardi and Alessie (2011) find that households with higher financial literacy are more likely to rely on professional financial advisers and households with low financial literacy tend to rely on informal sources of information such as through friends and family. van Rooji et al. (2011) state that financial literacy differs substantially depending on education, age and gender. Poorer, less educated and immigrant households often exhibit lower levels of financial literacy (Calvet, Campbell & Sodini, 2009). Women display much lower basic financial knowledge than men and advanced literacy is low among the young and high among middle-aged individuals (van Rooji, et al., 2011; Lusardi & Mitchell, 2008). If financial mistakes are most prevalent among groups that have low financial literacy as Agarwal, Driscoll, Gabaix and Laibson (2009) suggest, it would seem that those who need financial advice the most are not receiving it. Bhattacharya et al. (2012) find a similar case in Germany where those who receive advice tend to follow it, but those who do not receive advice need the advice the most. One possible policy implication for New Zealand we arrive at is perhaps it is time that financial advice is targeted towards specific groups within the population such as the young and the less affluent. This could be achieved through a multiple policy vehicles and/or institutions operating in different spheres, for example, education, social development and the financial advice sector itself.

One of the key considerations for policy intervention(s) is addressing the role that culture and experience have on investment advice. Any policy interventions that do not address macro-cultural changes may not be effective. We find that only 10% of investors in our sample receive advice in the first place. New Zealanders, it appears, shy away from asking for financial advice. Why is this?[33] While it is difficult to assess the normative behaviour of seeking financial advice between countries, studies in the US and Germany show that people are far more reliant on receiving professional investment advice. For example, Allen (2001) shows that the majority of households in the United States rely on professional investment advice. The Investment Company Institute (2005 & 2007) and DAB Bank (2004) reveal that over 80% of investors in Germany either consult an adviser or employ professional advice. Perhaps, then, an appropriate area for policy intervention is to begin with introducing financial education at a much earlier age such as secondary school to about forward a paradigmatic shift in household investment behaviours. Lewis and Messy (2012) discuss financial education and awareness initiatives and show that personal finance education is included in school curricula in over 20 OECD and non-OECD countries.

What difference does financial advice make on investment fund asset allocation?

We find that financial advice is most transformative in that people who receive advice hold their assets differently compared to people who do not. There is a positive and statistically significant difference between receiving advice and equity and property asset holdings and vice versa, a significantly negative relationship for cash and bond holdings. We also note that gender plays a significant role in asset allocation. Table 4 presents the results from t-tests that show the difference in asset allocation between investor subgroups.

[33] Retirement Commissioner Diana Crossan says, "high profile investment failures have raised questions in New Zealanders' minds about the quality of advice they are getting from financial advisers and how trustworthy it is" (Crossan, 2009) http://www.voxy.co.nz/business/survey-presents-big-039trust039-challenge-financial-services-sector/5/24840 .

Table 4. Asset Allocation T-tests

Asset Allocation T-Tests									
Panel A: Financial Advice									
	N	**Cash**		**Bonds**		**Property**		**Equity**	
		Mean		Mean		Mean		Mean	
Male	19405	0.104		0.305		0.101		0.489	
Female	21371	0.112		0.326		0.096		0.467	
T-Stat		-5.45	***	-12.1	***	5.930	***	11.37	***
Panel B: No Financial Advice									
		Cash		**Bonds**		**Property**		**Equity**	
		Mean		Mean		Mean		Mean	
Male	174278	0.151		0.352		0.076		0.421	
Female	190053	0.160		0.354		0.074		0.412	
T-Stat		-13.32	***	-3.14	**	10.39	***	12.24	***
Panel C: Males									
		Cash		**Bonds**		**Property**		**Equity**	
		Mean		Mean		Mean		Mean	
No Advice Male	174278	0.151		0.352		0.076		0.421	
Advice Male	19405	0.104		0.305		0.101		0.489	
T-Stat		39.72	***	35.05	***	-34.8	***	-42.67	***
Panel D: Females									
		Cash		**Bonds**		**Property**		**Equity**	
		Mean		Mean		Mean		Mean	
No Advice Female	190053	0.160		0.354		0.074		0.412	
Advice Female	21371	0.112		0.326		0.096		0.467	
T-Stat		41.08	***	23.02	***	-34.03	***	-34.03	***
Panel E: Active Fund Enrolment									
		Cash		**Bonds**		**Property**		**Equity**	
		Mean		Mean		Mean		Mean	
Default Enrolment	106252	0.187		0.563		0.038		0.213	
Active Enrolment	298855	0.138		0.273		0.091		0.497	
T-Stat		107.53	***	619.41	***	-453.41	***	-499.66	***

This table reports the T-statistics and means for KiwiSaver members by financial advice, gender, and enrolment method.

We compare women and men with and without advice in Panels A, B, C and D of Table 4. Panel A of Table 4 shows that among those investors who received advice, men tend to hold a higher proportion of equity and property asset classes in their funds and less cash and bond assets than women. Of the investors who received advice, women hold on average 4.7% less equity than men and 7.6% more cash assets in their funds. Panel B shows the average fund holdings of investors who do not have financial advice. Men still hold more risky (property and equity) assets than women, however the difference is smaller. For example, men hold 2.2% more in equity and 6% less in cash than women. When we further split the subsamples to examine the difference between males and females with and without financial advice in Panel C and Panel D, we find that financial advice has a much larger effect on asset allocation. Those who received advice are far more likely to hold more equity and property assets and less cash and bond asset classes. Panel C shows that men who received advice hold 16.2% more equity and a significant 45% less of cash in their investment funds compared with men who

do not receive advice. Panel D shows similar results of that in Panel C for women. Women who receive advice hold 13.3% more equity and 43% less cash than women who have not received advice.

In the bottom Panel of Table 4 we show the asset allocation of investors who have enrolled into their accounts actively and those who enrolled via default. Not surprisingly, actively enrolled investors hold more equity and property assets than default enrolled investors (who are typically invested in the Conservative fund). Actively enrolled investors hold 2.3 times more equity than default enrolled investors and 35.5% less cash assets than default enrolled investors.

We show our univariate regression results in Panel A of Table 5. Financial advice is negatively related to cash and bond asset holdings and positively related to property and equity asset classes. Receiving financial advice reduces cash and bond holdings by 5% and 4%, respectively, while increases property and equity class investment by 2% and 6%. This result is in line with the financial advice audit results that Mullainathan, Noth and Schoar (2010) indicated in their study. They find that advice tends to promote a higher equity mix. Bergstresser, Chalmers and Tufano (2009) and Bhattacharya, et al. (2012) discuss the conflict of interest between adviser remuneration structure and investment product recommendation.

Table 5. OLS Regressions

Panel A: Univariate

	Cash		Bonds		Property		Equity	
α	0.16	***	0.35	***	0.07	***	0.42	***
	460.1		1042.7		1073.3		1054.2	
Financial Advice	-0.05	***	-0.04	***	0.02	***	0.06	***
	-57.1		-40.9		48.6		56.6	

Panel B: Multivariate

	Cash		Bonds		Property		Equity	
α	0.0656	***	0.1984	***	0.1098	***	0.6263	***
	87.4		310.4		678.2		827.3	
Financial Advice	-0.0624	***	-0.0933	***	0.0327	***	0.1230	***
	-71.2		-101.4		69.4		117.4	
Age	0.0032	***	0.0048	***	-0.0012	***	-0.0068	***
	136.1		276.4		-276.8		-408.4	
Female	0.0004		-0.005	***	0.0008	***	0.0041	***
	0.59		-9.24		5.70		6.40	
FUM	-0.000003	***	-0.0000003	***	0.000001	***	0.000003	***
	-56.2		-6.68		31.1		47.9	

Panel C: Interaction Terms

	Cash		Bonds		Property		Equity	
α	0.0651	***	0.1944	***	0.1106	***	0.6299	***
	81.4		292.3		798.1		803.9	
Financial Advice	-0.0540	***	-0.0356	***	0.0197	***	0.0699	***
	-25.9		-14.2		13.4		22.7	
Age	0.0033	***	0.0049	***	-0.0012	***	-0.0070	***
	128.5		256.9		-368.4		-396.9	
Female	0.0003		-0.0073	***	0.0012	***	0.0059	***
	0.40		-11.94		9.62		8.56	
FUM	-0.000004	***	0.0000006	***	0.0000005	***	0.0000	***
	-52.9		9.1		36.4		37.5	
FA*age	-0.0006	***	-0.0011	***	0.0002	***	0.0014	***
	-9.8		-19.0		8.5		22.1	
FA*Female	0.000374		0.0199	***	-0.0035	***	-0.0168	***
	0.23		11.73		-3.68		-8.57	
FA*FUM	0.0000019	***	-0.0000025	***	0.0000004	***	0.0000002	
	16.7		-22.7		7.08		1.45	

This table reports the results from the OLS regression with *% Asset Allocation*$_i$ as the dependent variable. The left hand side variable *Asset Allocation*$_i$ is the percentage of asset allocation for *j* asset class categories available in the KiwiSaver fund portfolio for investor *i* (where *j* = 4 and asset classes are Cash, Bonds, Property and Equity). α is the constant term, *FinancialAdvice*$_i$ is a dummy variable, which equals to 1 if the KiwiSaver member has received financial advice, *Age*$_i$ is the age of the investor in years, *Female*$_i$ is a dummy variable which equals to 1 if the investor is female and 0 if the investor is male; *FUM*$_i$ is the value of funds under management in an investor's KiwiSaver account. *Age*$_i$**FinancialAdvice*$_i$, *Female*$_i$**FinancialAdvice*$_i$, and *FUM*$_i$**FinancialAdvice*$_i$ are interaction terms between *Age*$_i$, *Female*$_i$, *FUM*$_i$ and *FinancialAdvice*$_i$ and ε_i is the error term. *, **, and *** denotes statistical significance at the 10%, 5% and 1% levels respectively based.

When we add demographic characteristics of age, gender and the level of funds under management in the multivariate regression, we find that the relationship between demographic characteristics and asset allocation are statistically significant in all the models except for the relationship between cash allocation and gender. As shown in Panel B of Table 5, age is positively related to cash and bond asset allocation and negatively related to property and equity asset allocation. This means that as investors increase in age they tend to hold relatively safer assets than riskier assets. This finding provides support to the life-cycle theory which states that the younger an investor the more flexible he is in his future savings rate and therefore can afford to take more risks (Bodie, Merton & Samuelson, 1992, Cocco, Gomes & Maenhourt, 2005). The opposite trend is shown for funds under management. We find that as the balance of investor's account increases they will hold more equity and property assets and less cash and fixed interest assets. This finding is in line with academic literature which links wealth to financial sophistication. Using Swedish data, Calvet, Campbell and Sodini (2007) find that households with greater financial sophistication, as measured by wealth or education, tend to invest more efficiently but also more aggressively (riskier). These households tend to invest more in risky assets and choose more diversified portfolios, however, at times at the expense of bearing higher return losses than unsophisticated households that have not invested in risky assets. Furthermore, Hilgerth, Hogarth and Beverly (2003) demonstrate a strong link between financial knowledge and financial behaviour, showing that those who know more are likely to engage in recommended financial behaviours—such as paying all bills on time, reconciling the checkbook every month, and having an emergency fund.

When we examine the results from our pooled findings in Panel C of Table 5, we find that the financial advice dummy coefficients are robust and do not change when we add demographic variables and interaction terms. We find that interaction term between age and financial advice is negative for cash holdings and positive for equity holdings. Because the coefficient for the interaction term between advice and age must be interpreted with the coefficient of age, we find that as a whole advised-accounts tend to invest more in equity and less in cash assets compared to non-advised accounts, however, the proportion of risky-assets held decreases relatively with age and the proportion of cash assets held increases with age, as shown in Figure 2 and Figure 3 in the Appendix. This suggests that advisers tailor their recommendations in relation to the life-cycle theory. That is, reducing the proportion of riskier assets (e.g. equities) as people get closer to retirement age (age 65).

Figure 2

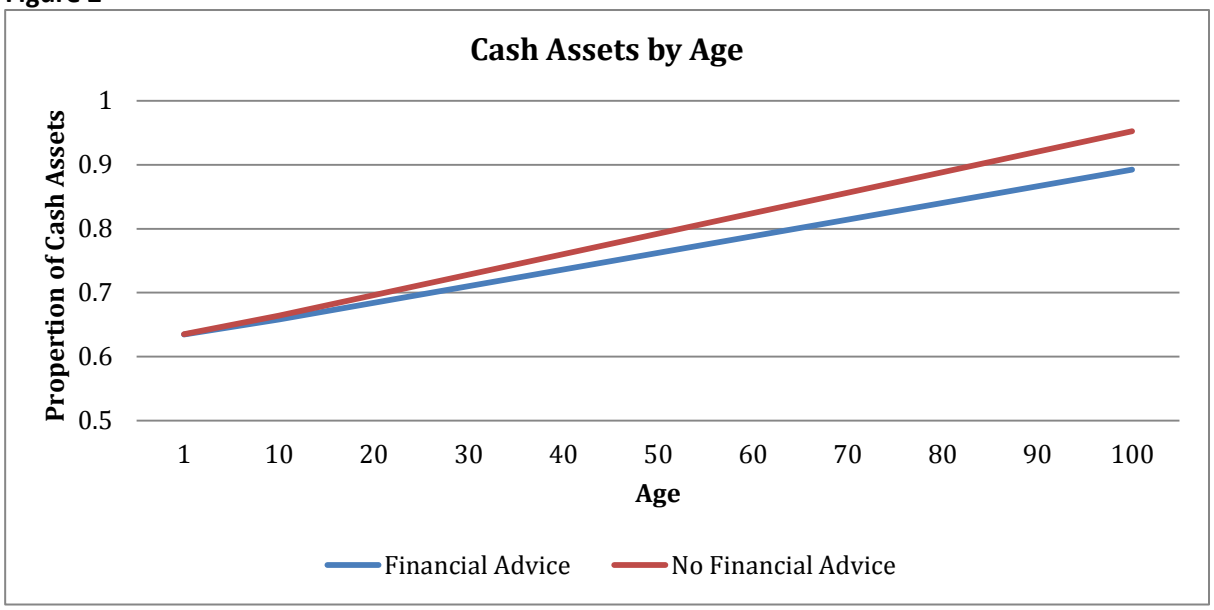

Figure 2 shows the relationship between the proportion of cash holdings relative to investor age for investors with and without advice.

Figure 3

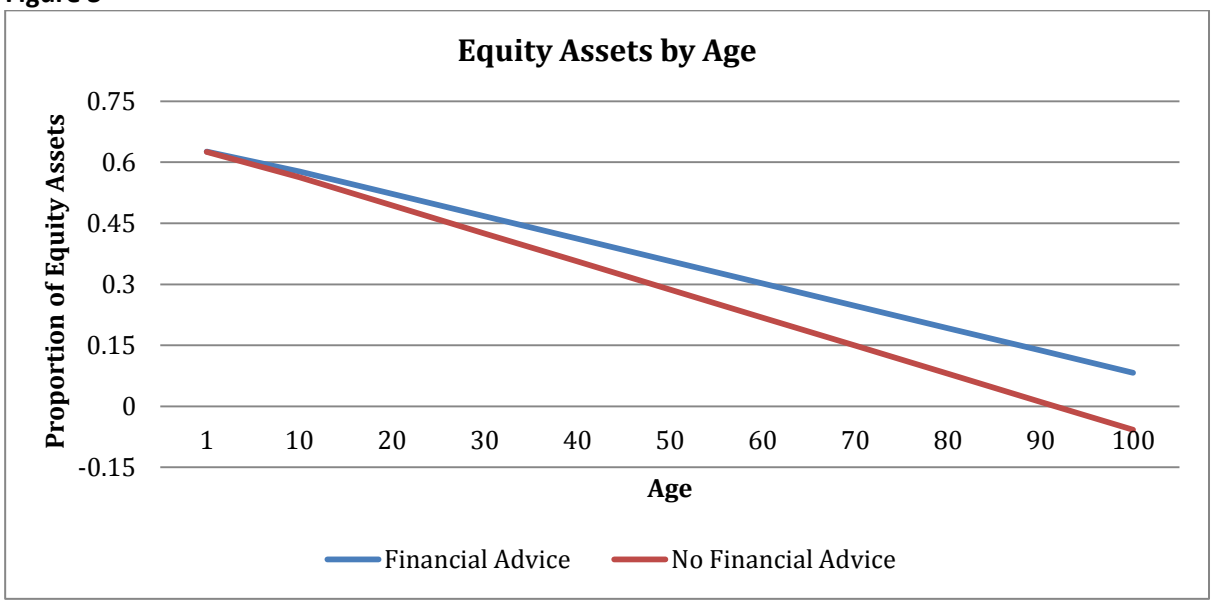

Figure 3 shows the relationship between the proportion of equity holdings relative to investor age for investors with and without advice.

If advisers are already adopting the life-cycle theory in their recommendations as our findings suggest, then why aren't default investment funds life-cycle based? Would this save time and costs and shift inert investors into funds suited to their age-based risk profile? An OECD study focussing on default investment strategies in defined contribution pension plans by Antolin, Payet and Yermo (2012, p20.) found that life-cycle fund strategies would have provided protection against market risk around the time of three major equity shocks in the US and similarly in Japan, demonstrating the potential value of life cycle strategies in protecting pension benefits against equity risk in the years prior to the retirement date. Basu and Drew (2006) investigate the appropriateness of various asset allocation strategies actually adopted by defined contribution plans as default options in Australia. They also find that asset allocation strategies with higher allocation to equities result in higher wealth outcomes for participants, controlling for periods of extreme equity market returns.

While there is support for life-cycle based funds as the default investment option for pension plans, the key issue of adopting a one-size-fits-all life-cycle strategy is that it may not be suitable for individuals who are less risk-tolerant. For instance, a highly risk averse investor, regardless of their age, may not want exposure to risky assets under any circumstance. In this instance, unless the investor is paying attention to the fund they have been placed by default, they may not know to switch to a less risky fund. A mitigating factor in this situation is that under the current KiwiSaver scheme in New Zealand, if people are uncomfortable with the default choices, they are free to switch to alternative options that better suit their risk profile needs. Changing the default fund option from the existing model to a life-cycle based strategy has the potential for inducing existing non-active investors to become more engaged and be aware of their investment fund choice.

What are the differences in returns?

In this section we compare the returns of investors who receive financial advice against investors who have not received advice. We find that investors who receive advice tend to earn higher returns in years where equity markets perform well. This is not surprising. As we find in early results, advised accounts tend to hold more equity assets than non-advised accounts. Table 6 shows the annual fund returns between investor groups.

Table 6. Returns Differences T-tests

Annual Return	Advice	No Advice	T-stat
Return2008	-12.90	-10.38	46.2
Return2009	13.28	11.72	-60.9
Return2010	6.93	6.65	-43.4
Return2011	2.41	2.96	43.3
Return2012	14.58	13.10	-60.1

This table reports the T-statistics and means annual returns from 2008-2012 for investors who have received financial advice compared to investors without financial advice. The returns used are KiwiSaver investment fund returns from Morningstar, calculated net of fees.

What makes the question of 'do advised accounts outperform non-advise accounts?' difficult to answer lies in that the return series for KiwiSaver investment funds is extremely short and saving for retirement typically occurs over long term periods, sometimes up to 45 years. It is hard to say with absolute certainty that financial advice generates higher returns than non-advised accounts until the end of the investment period. In a retirement savings context, this means that only when investors retire, they can finally see their returns of the total investment horizon. For instance, a 20-year old joining the workforce today, enrolling in KiwiSaver, who seeks financial advice and then selects an investment fund, may not realise their return until 45 years later when they retire at the age of 65. At which point does this individual realise the benefit of paying for financial advice? Since the national retirement savings scheme started only just in 2007 there is a limit to how much we can say in regards to how advised accounts track against non-advised accounts with a short returns series. Hackethal et al. (2012) point to a puzzle that exists in terms of why investors continue to purchase funds under advice that appear to perform no better yet cost substantially more. They suggest that the answer to this puzzle lies in that researchers may fail to measure intangible benefits of the brokerage relationship. In general, however, we can see that financial advice is transformative. It promotes investing into equity asset categories than otherwise and depending on the risk tolerance of an investor, which may have been an option otherwise overlooked if the advice was not there. In accordance with the life-cycle theory, the earlier someone invests for their retirement, the more they are able to invest in instruments that provide long-term growth. Similarly, if one does not begin planning for retirement until later, they may choose to invest assets with greater short term stability. Numerous studies have focussed on the importance of asset allocation on portfolio returns. For example, past studies have shown that 90% of the variability of returns over time can be explained by asset allocation (Brinson, Hood & Beebower, 1986, 1991 & 1995) and 40% variation of returns across funds (Ibbotson & Kaplan, 2000).

Since we are limited in our study by a short-returns series on KiwiSaver fund returns, we generate hypothetical returns using the average weights for advised and non-advised accounts and market indices returns from 2000-2012 to extend the time period and check for robustness. Figure 4 shows the results.

Figure 4. Differences in portfolio returns

	N	Female	T-Value	Male	T-Value	All	T-Value
Month	240	0.010	0.62	0.015	0.69	0.012	0.65
Quarter	49	0.037	0.57	0.051	0.64	0.044	0.6
Annual	12	0.244	0.68	0.324	0.72	0.281	0.7

This table shows the T-values for differences in portfolio returns between female investors who attain advice with female investors without advice, male investors with advice compared with male investors without advice and investors who receive advice compared with investors without advice. The returns used were calculated based on hypothetical asset allocation fund holdings and market return indices.

We find that the hypothetical portfolio returns derived from advised-client asset allocations do not differ strongly or statistically from non-advised clients over monthly, quarterly or annual periods from 2000 to 2012. The hypothetical returns calculated based on average asset allocation holdings of the two subgroups shown in Table 4 are unrelated to the investment fund returns that we actually received by the investors in our sample. We are not surprised that differences in average asset allocation lead to insignificant differences in hypothetical returns between subgroups because the difference in fund choice and asset allocation is marginal when the average is used. We hope to use actual KiwiSaver fund returns which are longer in time frame in the future. In the short term, asset allocation may not have a large effect on returns but over a 40-year investment period the result may be much different.

We now discuss the function of financial advice from a policy perspective rather than a financial one. According to van Rooij, Lusardi and Alessie (2011), there is a shift to greater responsibility for financial decisions on the individual investor and their ability to make sound investment decisions has never been more important because increasingly more complex financial products and markets are being created. Perhaps then, the role of financial advice ought to be more focused on education, enhancing better financial decision making and helping promote a macro-cultural shift within households to improve their levels of financial literacy. The emphasis on financial advice should predominately be placed on its educational role, instead of higher returns. This is the type of cultural shift required in order to push New Zealand towards higher financial literacy and advice-seeking patterns similar to countries such as Germany, which has 80% of their population seeking advice. Yaniv (2004) argues that receiving advice (of any type) improves the accuracy of decision-making because it serves a special function that enables people to overcome their self-confirmation tendencies and biases. Frijns, Gilbert and Tourani-Rad (2012) find that there is a positive and causal effect of financial experience on financial knowledge. This means that financial knowledge can be obtained not only through education, but also experience. Therefore, regardless of the financial gains from receiving advice, the experience of receiving advice in itself through discussing with an adviser and making investment fund choices adds to improving financial literacy and knowledge of individuals and households.

Conclusion

The introduction of KiwiSaver was aimed to increase the level of household savings for retirement in New Zealand. A natural result of the investment scheme implementation has seen KiwiSaver to make material contributions to the injection of funds to the mutual fund industry and provide more capital for New Zealand financial markets. In this paper we consider the asset allocation choices made by KiwiSaver investors. We explore differences in portfolio composition between investors who receive financial advice and those who do not. We find that financial advice is transformative and changes the way investors allocate their assets in investments. We arrive at several interesting findings: (1) older, wealthier and female investors are among the population that is more likely to receive financial advice; (2) financial advice is negatively related to cash and bond asset holdings and positively related to property and equity asset classes. Receiving financial advice

reduces cash and bond holdings by 5% and 4%, respectively, while increases property and equity class investment by 2% and 6%; (3) age, gender and wealth are also related to asset allocation. Men tend to take more risks than women. In addition, as investors increase in age, they tend to hold relatively safer assets than riskier assets. Furthermore, as the balances of accounts increase investors will hold more equity and property assets and less cash and fixed interest assets; (4) advisers tend to tailor their recommendations based on the life-cycle theory when providing advice and; (5) investors who received advice tend to earn higher returns in years when equity markets perform well.

This paper makes two key contributions to the existing literature. First, we exploit the use of a new proprietary dataset to understand the relationship between financial advice and individual investor decisions in a different setting. Previous studies have not investigated the relation between financial advice in an auto-enrolment retirement investment setting before. To our best knowledge, this is the largest sample of individual investor accounts nationwide that also includes information on financial advice which allows us to address the role of financial advice and asset allocation with more precision. Second, we distinctly measure who has received independent financial advice in our population across a nationwide sample, where previous studies focussed on brokerage information within one Investment Company.

Our findings raise a number of questions. We show that 10% of the population involved in KiwiSaver receive financial advice. Why do New Zealanders shy away from getting financial advice? Does financial advice need to be more targeted to specific groups who need it the most? How could advice be provided to households that have lower levels of financial literacy in order to improve their investment knowledge? Furthermore, if financial advisers recommend clients to select investment products in line with Bodie, Merton and Samuelson's (1992) life-cycle theory, then should life-cycle related investment products be more abundant? Or perhaps be considered more seriously as a default option? We look forward to more research in this area to be developed.

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From cents to half-cents and its impact on liquidity

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Abstract
In 2011 the New Zealand Exchange (NZX) reduced the minimum tick size from $0.01 to $0.005 for a selection of dual-listed and property stocks with the stated goal of boosting NZX liquidity. We examine this goal by measuring its impact on quoted and effective spread, volume, depth, and binding-constraint percentage. After controlling for firms matched on similar liquidity characteristics, both spread and depth significantly decline. Further, small firms do not enjoy the same liquidity benefits as large firms. While firms with high binding-constraints probability experience greater declines in spread, the negative impact on depth is even greater for these firms.

JEL Classification: G10, G12
Keywords: Tick size, Liquidity, Spread, Depth, Trading volume, New Zealand

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Purpose – We examine the impact on stock liquidity following the reduction of minimum tick size from $0.01 to $0.005 for a selection of dual-listed and property stocks on the New Zealand Exchange (NZX) during 2011.

Design/methodology/approach – We examine various liquidity measures six months either side of the change in minimum tick size for the eligible stocks and compare these to a sample of stocks matched on similar liquidity characteristics. Liquidity measures examine in the paper include quoted and effective spread, volume, depth, and binding-constraint probability.

Findings - After controlling for firms matched on similar pre-period liquidity characteristics both spread and depth decline significantly. We also find evidence that small firms experience significant declines in trading activity, and while firms with higher binding-constraints probability have greater declines in spread, their decline in depth is greater still.

Implications - These findings have important implications for policy-makers as the hoped for benefits of smaller tick increments may only be fully realized by larger more active stocks.

Limitations – The small sample of 17 stocks eligible for the $0.005 minimum tick size potentially impacts on the strength of the statistical analysis. As such, it is harder to detect statistically significant changes in liquidity.

Originality/value – The paper examines the impact of a change in minimum tick size on eligible NZX stocks to determine whether it meet the stated NZX goal of boosting liquidity.

Keywords - Tick size, Liquidity, Spread, Depth, Trading volume, New Zealand

1. Introduction

The New Zealand Exchange (NZX) reduced the minimum tick size for selected stocks in 2011, with a pilot of five listed stocks eligible for trading in $0.005 increments from 10 March 2011, followed by a further 12 stocks from 7 November 2011. The NZX's stated aim of the move was to boost stock liquidity. The move to reduce the minimum price movement for the eligible stocks follows similar moves on other stock exchanges including the NYSE in 2000-2001, the ASX in 2005 and HKEx in 2006.

However, the reputed liquidity benefits of smaller tick sizes may not be bestowed on all stocks and market participants equally. Research shows large capitalization and higher trading volume stocks benefit more from narrowing spreads (Bessembinder, 2003; Hsieh, Chung and Lin, 2008). While Goldstein and Kavajecz (2000) and Jones and Lipson (2001) find increased transaction costs for large investors and institutional investors following tick size reduction on the NYSE. The liquidity benefits are also not universally accepted among US market participants[34] with many arguing that the 2001 change to decimalization adversely affected the liquidity of small and medium US listed companies in particular. This has prompted the SEC to announce a review in late 2012 to evaluate the impact of tick size on securities markets[35]. The belief is that in the US quote-driven markets, an increase in the minimum tick would likely widen spreads which could cause traders to increase the size of their quotes and thereby result in increased liquidity for smaller companies.

Aitken and Comerton-Forde (2005) argue that tick size is even more critical in order-driven markets as the limit orders themselves provide the only source of market liquidity. In order- driven markets the benefits of tick size reduction is also mixed. Aitken and Comerton-Forde (2005) find that tick size reduction on the ASX generally improved liquidity, although stocks with small tick sizes and low trading volume actually experienced reduced liquidity. Hsieh, Chung and Lin (2008) argue that the decline in both spread and probability that a trade will occur at the minimum tick size (binding-constraints probability) following a reduction in minimum tick size leads to increased market efficiency and lower trading costs on the Taiwanese Stock Market. While, Pan, Song and Tao (2012) find that overall liquidity declines significantly for liquid stocks in the order-driven HKEx.

To the best of our knowledge this is the first examination of tick size on the NZX and the first to examine tick size changes made by exchanges following the Global Financial Crisis (GFC) liquidity shock. The GFC's impact on the NZX's liquidity was severe, with the daily average value of shares traded being 46% lower for the 2010 calendar year compared to its peak in 2006, and by the end of 2012 it was still 18% down on its peak[36]. Therefore an examination of NZX tick size changes instigated after the liquidity shock on what is already considered a relatively small illiquid market is warranted.

We examine the NZX's aim of boosting liquidity by measuring the reduction in tick size impact on quoted and effective spread, volume, depth, and binding-constraint probability. Spread and depth narrows for the 17 eligible stocks as a whole and after comparing with a matched control sample. While there is only limited evidence of increases in trading activity (volume, turnover and daily trades) following the reduction in tick size we find that smaller eligible stocks tended to fare worse in the post-period compared to larger stocks. Smaller eligible stocks trading activity significantly declined compared to the large firms during the post-period. Further firms with a high proportion of trades bid-ask quotes occurring at the minimum pre-period tick size of $0.01, experienced the greatest decline spreads after the reduction in tick size. However, the decline in depth for these same firms outstripped their decline in spread and based on combined liquidity metric (Bollen and Whaley, 1998) these firms experienced a significant decline in liquidity.

[34] http://www.tradersmagazine.com/news/jobs-tick-size-schweikert-109953-1.html

[35] http://www.sec.gov/news/press/2012/2012-274.htm

[36] Extracted from NZX Limited - Full Year Metrics 2006-2012.

The remainder of this paper is structured as follows. Section 2 presents a brief description of the institutional details surrounding the reduction in tick size. Section 3 outlines the data, method and hypothesis development. Section 4 presents the empirical findings, while section 5 concludes.

2. Institutional Detail

On the 23rd February 2011 the NZX announced that the minimum tick size would reduce from $0.01 to $0.005 after the 10th March 2011 for Telecom, Kiwi Income Property Trust, Guinness Peat Group, Fisher & Paykel Appliances and Auckland International Airport. On the 23rd October 2011, the NZX extended the scheme to a further 12 stocks based on a cross section of dual-listed and property stocks valued under $2.50 with narrow bid/ask spreads. The added stocks included Air New Zealand, Infratil, New Zealand Oil & Gas, CDL Investments and the listed real estate investment vehicles AMP NZ Office, Argosy Property Trust, DNZ Property Fund, Goodman Property Trust, Kermadec Property Fund, National Property Trust, Property for Industry, and Vital Healthcare Property Trust. The half-cent minimum tick size became effective for the 12 additional stocks on the 7th November 2011. In discussing the extension of the scheme, CEO Mark Weldon stated:

> "*…the reduced price steps had a positive impact on liquidity in the selected stocks, which is good news for the companies, for investors and our wider markets. The success of the initiative ... has prompted us to introduce the $0.005 price steps for dual listed and New Zealand property sector stocks that trade under $2.50. We expect to see the same positive liquidity impact for these stocks too.*"

The NZX's reduction in tick size mirrors similar changes for ASX stocks under $2.00 on the 1st April 2005 which allowed stocks to trade at various sub-cent increments. In fact, this was seen as the original driver in NZX's decision who had been under increasing pressure regarding the illiquidity in general of the New Zealand market. The head dealer at Craigs Investment Partners was quoted as saying:

> "*The driving motivation is probably the arbitrage that goes on between the two markets. Having to leave half a cent in Australia (for dual-listed stocks) is detrimental to New Zealand liquidity."*

3. Hypothesis, Data and Research Design

This section develops the key hypotheses tested in the paper (Section 3.1), and outlines the variables and method used to test these hypotheses (Section 3.2). The sources of data and process for selecting the control sample are then discussed in Section 3.3.

3.1 Hypothesis Development

As tick size is the smallest stock price increment investors can place limit orders on the NZX a reduction in the minimum tick size allows stocks to trade at tighter spreads. The more frequently a stock trades at the minimum tick size prior to any reduction the greater the potential reduction in spreads. However, even those stocks not constrained by the minimum tick size may still experience a decline in spreads due to investors being able to place orders at previously unavailable prices (Aitken and Comerton-Forde, 2005). The empirical evidence for both quote driven markets (e.g., Goldstein and Kavajecz, 2000; Chung, Charoenwong, and Ding, 2004) and in pure limit order markets (e.g., Aitken and Comerton-Forde, 2005; Hsieh, Chung and Lin, 2008; Pan, Song and Tao, 2012) reveals a decline in bid-ask spreads following tick size reductions. Therefore we hypothesize:

H_1: A reduction in tick size to $0.005 will lead to a decline in the bid-ask spreads for eligible stocks.

Smaller tick size increments represent a reduction in the premium paid to investors who provide liquidity to the market through their limit orders. To protect their potential premium for providing liquidity, investors may now place some or all of their order further from the best bid or ask. In addition, time constrained investors may now place market instead of limit orders, as the cost of their demand for liquidity has fallen (Aitken and Comerton-Forde, 2005). Therefore a reduction in the minimum tick size may have conflicting effects on

different aspects of liquidity, with spreads narrowing but depth declining. Prior research supports this with lower depth found in both order-driven (e.g., Bourghelle, and Declerck, 2004 on the Paris Bourse; Hsieh, Chung and Lin, 2008 on the Taiwan Stock Exchange; and Pan, Song and Tao, 2012 in the Hong Kong Exchange) and quote-driven markets (Goldstein and Kavajecz, 2000). While most studies report declining depth, Ahn, Cao, and Choe, (1996) find no change in depth following tick size reductions for AMEX stocks in 1992. Based on the weight of evidence, we anticipate that depth will decline at the best bid and ask prices.

H_2: A reduction in tick size to $0.005 will reduce depth at best bid and ask price for the eligible stocks.

The binding constraint of tick size imposes increased trading costs through artificially inflating bid-ask spreads more than may be optimal which leads investors to trade less than they otherwise might (Ahn, Cao, and Choe, 1996). Therefore, consistent with Harris's (1997) prediction, when tick size is reduced, traders can place orders with lower associated costs leading to increased trading volumes. Further, as trading costs fall, this may encourage participation by investors in the market. Alternatively, Harris (1997) also notes that as tick size falls, liquidity providers may reduce the number of shares offered at a particular price or exit the market altogether which could lead to a decline in trading activity. There is no clear evidence in the prior literature with either no change in trading activity (Ahn, Cao, and Choe, 1996) or significant declines in trading activity (Hsieh, Chung and Lin, 2008). Given the conflict between the predictions and evidence in the literature we form two sub-hypothesis as follows:

H_{3a}: The tick size reduction increases trading activity including volume and trading value for eligible stocks.
H_{3b}: The tick size reduction decreases trading activity including volume and trading value for eligible stocks.

3.2 Variables & Method

To test *Hypothesis H_1* that spreads decrease for the eligible stocks when tick size is reduced from $0.01 to $0.005 we consider several different measures of spread. The most common measure is quoted spread, defined as the difference between the Askj.t and Bidj.t where Askj.t and Bidj.t represent the best ask and bid price for stock j at day t. Alternatively, the percentage quoted spread (quoted spread %) is calculated as:

$$\text{Quoted spread \%} = \frac{2(\text{Askj.t} - \text{Bidj.t})}{(\text{Askj.t} + \text{Bidj.t})} \quad (1)$$

Following Hsieh, Chung and Lin (2008) we measure effective spread as the difference between trade price and bid-ask price midpoint which defined as (Askj.t + Bidj.t)/2, and

$$\text{Effective spread \%} = \frac{2(\text{effective spread})}{\frac{\text{Ask}_{j.t} + \text{Bid}_{j.t}}{2}} \quad (2)$$

For *Hypothesis H_2* we measure depth as both the order volume and dollar values at the best bid and ask quotes available immediately prior to each trade. The depth measures are averaged across all trades on a daily basis during the sample period for each stock. As noted earlier, the empirical evidence shows that reducing the minimum tick size generally produces conflicting liquidity effects with spreads narrowing but depth declining. Therefore as a test of overall market liquidity we follow Bollen and Whaley (1998) and Hsieh, Chung and Lin (2008) by using a measure of combined market liquidity defined as the ratio of dollar depth to quoted spread.

We employ five variables to test *Hypothesis $H_{3a\ \&\ b}$* that volume is unaffected by the reduction in tick size. The variables are trading volumes, trading values, number of trades, trade size in shares, and trade size in dollars. Trade size in dollars (shares) is equal to average daily trade value (volumes) divided by the daily number of trades.

In addition to the above measures, we examine the following variables to gain further insight into the impact of the NZX's tick size reduction. These include the binding-constraints probability which is the proportion of

quoted spreads equal to a tick size during the pre- and post-periods (e.g. Chung, Charoenwong, and Ding, 2004; Bourghelle, and Declerck, 2004). As the New Zealand stock market is relatively illiquid by international standards we also use the Amihud (2002) stock illiquidity measure which is the ratio of the absolute daily return to the daily dollar volume. We use two stock return variability measures; where return volatility is the standard deviation of daily returns during the pre and post periods, and high-low refers the highest price minus lowest price on each day. Chung, Charoenwong, and Ding, (2004) find that low-risk, high-volume or low-priced stocks benefit the most from a reduction in tick size.

With the exception of return volatility, the above variables are daily average measures for each stock across the trading days during pre- and post-periods. Then, the final mean results are averaged across stocks. We use an event type methodology similar to Ahn, Cao, and Choe, (1996) and Aitken and Comerton-Forde (2005) where we compare pre and post tick size reduction periods. We use a paired *t*-test and the Wilcoxon signed rank to compare for a difference in the liquidity measure means between the pre- and post-periods for both the stocks eligible for tick reduction and a set of matched control stocks. We also then compare the difference of differences between the eligible and control stock samples using the two sample t-test and Wilcoxon-Mann-Whitney z-scores.

3.3 Data

We compare 120 trading days prior to the reduction in minimum tick size (pre-period) with 120 trading days after the stocks become eligible for the half-cent tick size (post-period). For the first five stocks included in the scheme, the combined period is from 16th September 2010 through 29th August 2011. While the second group of 12 eligible stocks have the sample period from 19th May 2011 through to 2nd May 2012. We obtain data from two sources. The daily trading data is obtained from the New Zealand Company Research Database from which we extract daily closing, high and low stock prices, market capitalisation, trading volume and value, number of trades, and closing bid and ask prices. We source depth data from Securities Industry Research Centre of Asia-Pacific (SIRCA) from which we extract the bid and ask depth immediately prior to each trade for each trading day in the two windows detailed above.

In order to separate the effect of tick size reduction on liquidity measures apart from any effect on these variables due to market wide liquidity changes, we select a control sample from all non-eligible NZSX stocks based on the stock characteristics of stock price, trading volume, trading value, number of daily trades and market capitalisation. First we rank all NZSX listed stocks (including the eligible stocks) based on stock price, trading volume, turnover (trading value), number of trades and market capitalisation and then calculate the average rank based on these characteristics for each NZSX stock. Using the average rank we then choose without replacement the closest ranked non-eligible stock to each of the first five eligible stocks. We repeat the selection process for the remaining 12 eligible stocks after excluding the first five eligible stocks and their respective matches.

For robustness we also match on individual stock characteristics, as well as, other combinations of these. With the exception of ranking solely on stock price, a high proportion of constituents appear in all the alternative control samples; which is partly due to the relatively small number of total stocks listed on the NZSX. When matched solely on stock price the control sample produced was significantly different to eligible stocks in terms of trading volume, trading value, market capitalisation and average number of daily trades and was therefore rejected. The choice of the final control sample used in this paper was chosen as it had the largest average p-value of 0.546 (i.e. most similar to the eligible stocks during the pre-period) when comparing across stock price, trading volume and value, number of trades, firm size and quoted spread[37] as shown in Table 1.

[37] For robustness we complete the analysis reported in the next Section using alternative control samples, but as expected given the relatively high proportion of common constituents with the control sample reported in this paper these produce similar results in terms of size, direction and statistical significance. These results are available from the authors on request.

Table 1.
Summary statistics between eligible stocks and matched sample stocks during the pre-period

	Stock Price	Trading Volume	Trading Value	Daily Trades	Market Capitalisation	Quoted Spread
Panel A: Eligible Stock Sample						
Mean	$1.03	1,327,700	$2,061,335	49.2	$917,136,996	1.63%
Median	$0.98	669,814	$580,383	39.6	$449,839,143	1.10%
Standard Deviation	$0.54	2,455,670	$5,326,822	48.9	$1,073,908,143	1.58%
Minimum	$0.31	26,234	$7,971	1.2	$50,660,616	0.46%
Maximum	$2.15	10,512,874	$22,552,592	193.2	$4,135,546,923	7.22%
Panel B: Matched Control Sample						
Mean	$3.24	429,049	$1,860,107	50.7	$1,135,872,231	1.25%
Median	$2.83	234,373	$643,430	45.7	$556,960,336	0.81%
Standard Deviation	$2.49	517,929	$3,721,593	46.4	$1,222,579,606	1.20%
Minimum	$0.45	12,312	$13,086	2.4	$46,140,010	0.15%
Maximum	$9.94	1,910,822	$15,609,321	177.2	$4,956,078,806	4.79%
p-value	0.002	0.149	0.895	0.930	0.512	0.546

This table contains pre-period summary statistics of the key stock characteristics employed to find the closest matches. Each control sample constituent used in this paper was selected without replacement after choosing the closest rank based on trading volume and value, number of trades per day and market capitalisation. All stock characteristics are calculated based on the average daily closing value. The p-values are based on the difference in eligible and matched sample means for each stock characteristic during the pre-period.

Based on the mean (median) stock prices reported in Table 1, the absolute minimum tick size in the pre-period is 0.97% (1.02%) for stocks eligible to trade in the post-period at the half-cent tick size compared to 0.31% (0.35%) for the control sample. Therefore a reduction to half-cent tick size should bring the eligible stocks bid-ask spread closer to the control sample in the post-period.

The final datasets are cleaned by removing any daily observations where a stock was placed under a trading halt for the entire day. We also remove any daily observations where the bid price is higher than ask price. This result in 16 observations being removed from the possible 4080 daily observations (i.e. the 240 trading days for the pre- and post-periods combined multiplied by 17 firms) for the eligible stock sample and 7 observations deleted from the control sample.

4. Empirical Results

4.1. Summary statistics for spread, volume and depth

Table 2 details the summary statistics for changes in quoted spread and effective spread during pre- and post-period for both samples. Consistent with *Hypothesis* H_1, both the quoted and percentage quoted spread decline significantly at the 1% level following the half-cent tick reduction for the eligible stocks. Quoted spreads decline by -30.8%, while the percentage quoted spread declines from an average of 1.62% in the pre-period to 1.15% in the post-period. For eligible stocks a similar significant narrowing of spreads is found in the effective spread metrics. The spread changes for eligible stocks contrasts to a widening of both quoted spread and effective spread metrics for the matched control stocks; although only the percentage quoted and effective spread increases are statistically significant. In the pre-period, as might be expected given the lower average stock price (as highlighted in Table 1), the percentage quoted spread is higher for the eligible stocks. In the post-period this reverses, with percentage quoted spreads rising from 1.26% to 1.43% for the control stocks. Therefore, the bid-ask spread cost of executing transactions is lower for the eligible stocks in the post-period than the higher priced control stocks.

When comparing the pre-and post-period differences, all spread metrics exhibit a significant narrowing for eligible stocks compared to the control stocks at the 1% level for both the parametric and non-parametric tests. Therefore the empirical results clearly demonstrate that the NZX's 2011 reduction in tick size reduction had a

significant negative effect on spread and confirms *Hypothesis H_1* and previous findings in order-driven markets (e.g. Aitken and Comerton-Forde, 2005; Hsieh, Chung and Lin, 2008; Pan, Song and Tao, 2012).

Table 2.
Change in Spread Surrounding Reduction in Tick Size

Panel A: Eligible Stocks	**Pre-period**	**Post-period**	**Difference**	**Percentage Difference**	**t-statistic**		**Signed Rank p-value**	
Quoted spread	0.013	0.009	-0.004	-30.8%	-10.44	***	0.000	***
Quoted spread %	1.62%	1.15%	-0.47%	-29.0%	-4.32	***	0.000	***
Effective spread	0.006	0.004	-0.002	-33.3%	-7.05	***	0.000	***
Effective spread %	1.60%	1.11%	-0.49%	-30.6%	-3.67	***	0.000	***

Panel B: Matched Control Stocks	**Pre-period**	**Post-period**	**Difference**	**Percentage Difference**	**t-statistic**		**Signed Rank p-value**	
Quoted spread	0.029	0.032	0.003	10.3%	1.54		0.141	
Quoted spread %	1.26%	1.43%	0.17%	13.5%	1.73		0.081	*
Effective spread	0.013	0.014	0.001	7.7%	0.92		0.208	
Effective spread %	1.16%	1.28%	0.12%	10.3%	1.90	*	0.083	*

Panel C: Difference of Eligible less Matched Control Stocks	**Eligible Stocks**	**Control Stocks**	**Difference**	**t-statistic**		**z-score**	
Quoted spread	-0.004	0.003	-0.007	-3.64	***	-4.04	***
Quoted spread %	-0.47%	0.17%	-0.64%	-4.57	***	-4.33	***
Effective spread	-0.002	0.001	-0.003	-3.46	***	-3.92	***
Effective spread %	-0.49%	0.12%	-0.61%	-4.26	***	-4.40	***

Table 2 provides the comparison of changes in spread for the tick reduction eligible stocks (Panel A) and matched control stocks (Panel B) during the pre- and post-periods. Quoted spread is the difference in the closing best bid and asks, while effective spread is the difference between trade price and the bid-ask midpoint. In Panels A and B the statistical significance of variables between the pre- and post-periods are measured using a paired t-test and Wilcoxon signed rank p-value. In Panel C the differences between the eligible and control stocks is presented. The two sample t-tests and Wilcoxon-Mann-Whitney z-scores are used to measure the difference of differences between the eligible and control stocks.
* and ** and*** indicate significant at 10%, 5% and 1% level, respectively.

Next we turn our attention to changes in depth after the introduction of the half-cent tick size. For eligible stocks we find that the daily average depth immediately prior to each transaction more than halves during the post-period. For eligible stocks the decrease of -50.4% for dollar depth and -52.9% for volume is significant at the 1% level for both the parametric and non-parametric tests reported. The control sample also experiences a post-period decline in dollar (-12.1%) and volume depth (-15.9%) which is only significant at the 5% and 10% level respectively for the signed rank test. However, Panel C shows that the decline in depth is significantly higher at the 1% level for eligible, compared to matched stocks. The depth findings support *Hypothesis H_2* that depth declines when the minimum tick size is reduced. However we cannot comment whether depth in the entire order book declined as a result of the reduction in tick size, as liquidity providers may now be more inclined to place orders further from the best bid and ask prices to protect their liquidity premium.

Table 3.
Change in Depth and Liquidity Metrics Surrounding Reduction in Tick Size

Panel A: Eligible Stocks

	Pre-period	Post-period	Difference	Percentage Difference	t-statistic		Signed Rank p-value	
Dollar depth	$141,893	$70,844	-$71,049	-50.4%	-3.96	***	0.000	***
Volume depth	153,537	72,989	-80,548	-52.9%	-3.93	***	0.000	***
Market liquidity	13,688,858	11,927,541	-1,761,317	-13.1%	-1.55		0.207	
Amihud	0.736	0.895	0.159	21.6%	0.89		0.235	

Panel B: Matched Control Stocks

	Pre-period	Post-period	Difference	Percentage Difference	t-statistic		Signed Rank p-value	
Dollar depth	$31,039	$27,996	-$3,043	-12.1%	-1.18		0.045	**
Volume depth	17,798	15,373	-2,425	-15.9%	-1.11		0.071	*
Market liquidity	2,206,589	1,828,962	-377,627	-18.0%	-1.78	*	0.080	*
Amihud	0.515	0.464	-0.051	-9.9%	-0.67		0.641	

Panel C: Difference of Eligible less Matched Control Stocks

	Eligible Stocks	Control Stocks	Difference	Percentage Difference	t-statistic		z-score	
Dollar depth	-$71,049	-$3,043	-$68,006		-3.75	***	-3.89	***
Volume depth	-80,548	-2,425	-$78,123		-3.79	***	-4.17	***
Market liquidity	-1,761,317	-377,627	-$1,383,690		-1.20		-0.10	
Amihud	0.159	-0.051	0.210		1.08		0.36	

Table 3 provides the comparison of changes in depth and other liquidity measures for the tick reduction eligible stocks (Panel A) and matched control stocks (Panel B) during the pre- and post-periods. Dollar and volume depth is the average daily depth based on the quoted depth available at the best bid and ask prices immediately prior to each trade. Market liquidity is the ratio that dollar depth divided by quoted spread and we use also report Amihud's (2002) illiquidity measure. In Panels A and B the statistical significance of variables between the pre- and post-periods are measured using a paired t-test and Wilcoxon signed rank p-value. In Panel C the differences between the eligible and control stocks is presented. The two sample t-tests and Wilcoxon-Mann-Whitney z-scores are used to measure the difference of differences between the eligible and control stocks. * and ** and*** indicate significant at 10%, 5% and 1% level, respectively.

Given that narrower spreads and smaller depths have the opposite impact on overall market liquidity, the net effect of tick size reduction on market liquidity is ambiguous. As a result, we use two additional measures to examine the change in liquidity; the first combines both spread and depth changes (combined market liquidity) and the second (Amihud) is an alternative measure of a stock's illiquidity. Bollen and Whaley (1998) use a combined market liquidity metric which is defined as the ratio of quoted spread to the dollar depth. This ratio computes whether the relative change in spread is larger or smaller than the change in depth. Panels A and B of Table 3 shows that the combined market liquidity metric declined by -13.1% for eligible stocks during the post-period. However, the matched control stocks also experienced a decline for the same metric and while the decline in the combined market liquidity metric is greater for eligible stocks the eligible-matched difference is insignificant. When examining Amihud's (2002) illiquidity measure in Panel C, we find the measure becomes larger on average in the post-period, which suggests that eligible stocks on average experience greater illiquidity during the post-period (in fact for 12 of the 17 eligible stocks the Amihud metric was larger in the post-period indicating greater illiquidity). In contrast, the matched stocks experience liquidity improvements on average. However the eligible-matched difference is insignificant. So while overall liquidity appears to deteriorate more for eligible stocks when measured by both of these metrics, the change is not statistically

significant. In section 4.3 we explore this issue in more detail to see whether the change in liquidity is uniform across the eligible stocks.

Table 4 details the summary trading statistics surrounding tick size change during the pre- and post-periods. Panel A shows that daily trading volumes and value increase by 13.2% and 29.4% respectively for eligible stocks in the post-period, although the increase is only significant under the Wilcoxon signed rank test at 10%. However, the control stocks also experience increases in both volumes and value during the same period. The difference in post-period increases between the eligible and control stocks is insignificant for trading value, while volume is only marginally significant under the non-parametric test. The average number of daily trades increases from 49 to 65 trades for eligible stocks but again the control stocks also experience a similar rise is daily trades, resulting in no significant increase for eligible compared to control stocks. In general, while eligible stocks experience greater increases in trading volume, value and number of trades in the post-period compared to the control stocks, the larger increase is not statistically significant. Therefore we do not find sufficient evidence to confirm *Hypothesis* H_{3a} that trading activity increased or *Hypothesis* H_{3b} that it decreased in the post-period after controlling for trading activity changes in the matched stocks.

Table 4.
Change in Key Trading Statistics Surrounding Reduction in Tick Size

Panel A: Eligible Stocks

	Pre-period	Post-period	Difference	Percentage Difference	t-statistic		Signed Rank p-value	
Trading volumes	1,327,700	1,503,511	175,811	13.2%	0.73		0.064	*
Trading value	$2,061,335	$2,667,746	$606,411	29.4%	0.92		0.089	*
Number of trades	49.2	65.1	15.9	32.3%	1.72		0.020	**
Trade size in dollars	$26,861	$21,892	-$4,969	-18.5%	-2.36	**	0.015	**
Trade size in shares	24,728	20,013	-4,715	-19.1%	-2.80	**	0.005	***

Panel B: Matched Control Stocks

	Pre-period	Post-period	Difference	Percentage Difference	t-statistic	Signed Rank p-value
Trading volumes	430,129	460,303	30,174	7.0%	0.79	0.854
Trading value	$1,872,075	$2,171,774	$299,699	16.0%	1.00	0.644
Number of trades	50.7	63.5	12.8	25.2%	1.58	0.263
Trade size in dollars	$24,372	$33,001	$8,629	35.4%	1.02	0.963
Trade size in shares	8,583	13,729	5,146	60.0%	1.17	0.747

Panel C: Difference of Eligible less Matched Control Stocks

	Eligible Stocks	Control Stocks	Difference	t-statistic		z-score	
Trading volumes	175,811	30,174	145,637	0.59		2.00	*
Trading value	$606,411	$299,699	$306,712	0.42		1.38	
Number of trades	15.9	12.8	3.1	0.25		0.72	
Trade size in dollars	-$4,969	$8,629	-$13,599	-2.09	*	-2.89	**
Trade size in shares	-4,715	5,146	-9,861	-1.56		-1.38	

Table 4 provides the comparison of changes in key trading metrics for the tick reduction eligible stocks (Panel A) and matched control stocks (Panel B) during the pre- and post-periods. The average trading volume, value and number of trades are based on the daily average for the eligible and control stocks. Trade size in dollars is equal to trade value divided by number of trades and trade size in share is trade volumes divided by number of trades. In Panels A and B the statistical significance of variables between the pre- and post-periods are measured using a paired t-test and Wilcoxon signed rank p-value. In Panel C the differences between the eligible and control stocks is presented. The two sample t-tests and Wilcoxon-Mann-Whitney z-scores are used to measure the difference of differences between the eligible and control stocks.
* and ** and*** indicate significant at 10%, 5% and 1% level, respectively.

For eligible stocks there is a significant decline in the average trade size of -18.5% in dollars and -19.1% in shares. In contrast, the average daily trade size for both value and volume increase for the matched control stocks (see Table 4, Panel B). After controlling for the differences between eligible and matched stocks, daily trade value is significantly lower following the reduction in tick size as shown in Panel C. There may be several reasons for the decline in average trade size. As noted by Goldstein and Kavajecz (2000), while smaller orders may benefit from a reduction in tick size, trades larger than the quoted depth may actually become more expensive as they are forced to fill the trade deeper into the order book. If depth declines at the best bid and ask prices as per *Hypothesis* H_2, average trades size may need to be reduced to avoid these higher execution costs. Or alternatively, traders may now place smaller trades to take advantage of the lower execution costs now available at the narrower spreads of the best bid or ask as per *Hypothesis* H_1.

In Table 5 we present summary statistics for stock price, market capitalisation, binding-constraints probability and firm risk. Prior studies find that low priced, low risk, high trading activity and larger market capitalisation stocks experience larger declines in spread and depth following a reduction in minimum tick size (Goldstein and Kavajecz, 2000; Chung, Charoenwong, and Ding, 2004; Hsieh, Chung and Lin, 2008). This is commonly attributed to a reduction in the artificial constraint placed by the minimum tick size. The probability that the minimum price variation for a trade is a binding constraint on the spread width declines when tick size is reduced. In Table 5 over 83% of eligible stocks' closing quoted spreads are equal to the minimum tick size prior to the tick size change, whereas this binding constraint reduces to 56% in the post-period. As expected, the control stocks which trade at higher prices on average have a lower binding-constraint probability of 42% in the pre-period which declines marginally by 2% in the post-period. The eligible-matched control samples change in the binding-constraints probability is significant at the 1% level. Therefore the probability that a trade will occur at the artificially imposed minimum tick is significantly lower in the post-period.

Table 5.
Change in Stock Characteristics Surrounding Reduction in Tick Size

Panel A: Eligible Stocks

	Pre-period	Post-period	Difference	Percentage Difference	t-statistic		Signed Rank p-value	
Average stock price	$1.03	$1.05	$0.02	1.9%	1.24		0.365	
Market capitalization	$917,136,996	$946,015,541	$28,878,545	3.1%	1.10		0.287	
Binding-constraints probability	0.834	0.561	-0.274	-32.8%	-9.26	***	0.000	***
Return volatility	1.49%	1.23%	-0.26%	-17.4%	-2.69	**	0.008	***
High-Low	0.33%	0.26%	-0.07%	-21.2%	-2.86	**	0.018	**

Panel B: Matched Control Stocks

	Pre-period	Post-period	Difference	Percentage Difference	t-statistic	Signed Rank p-value
Average stock price	$3.24	$3.17	-$0.07	-2.2%	-0.94	0.503
Market capitalization	$1,138,716,798	$1,189,181,829	$50,465,031	4.4%	0.95	0.712
Binding-constraints probability	0.422	0.398	-0.024	-5.7%	-1.14	0.335
Return volatility	1.56%	1.70%	0.14%	9.0%	0.96	0.709
High-Low	0.360%	0.38%	0.02%	5.6%	0.72	0.464

Panel C: Difference of Eligible less Matched Control Stocks

	Eligible Stocks	Control Stocks	Difference	t-statistic		z-score	
Average stock price	$0.02	-$0.07	$0.09	0.91		0.62	
Market capitalization	$28,878,545	$50,465,031	-$21,586,486	-0.36		0.55	
Binding probability percentage	-0.274	-0.024	-0.250	-6.86	***	-4.64	***
Return volatility	-0.26%	0.14%	-0.40%	-2.13	**	-1.53	
High-Low	-0.07%	0.02%	-0.09%	-2.79	**	-2.44	**

Table 5 provides the comparison of changes in key trading metrics for the tick reduction eligible stocks (Panel A) and matched control stocks (Panel B) during the pre- and post-periods. All stock characteristics are calculated based on the average daily closing value. Binding-constraints probability is the proportion of closing quoted spreads equal to a tick size. High-low is the difference between the highest and lowest price each day. In Panels A and B the statistical significance of variables between the pre- and post-periods are measured using a paired t-test and Wilcoxon signed rank p-value. In Panel C the differences between the eligible and control stocks is presented. The two sample t-tests and Wilcoxon-Mann-Whitney z-scores are used to measure the difference of differences between the eligible and control stocks.
* and ** and*** indicate significant at 10%, 5% and 1% level, respectively.

In Panel C of Table 5 we find that the post-period change in both risk measures are significantly lower for eligible compared to the control stocks. Return volatility (standard deviation) and the average daily price range (high-low) significantly decline on average for eligible stocks during the post-period, whereas the control stocks experience insignificant increases in both risk metrics.

4.2 Impact of minimum tick reduction on liquidity

First we reexamine whether the introduction of half-cent tick for the eligible stocks impacts on the various liquidity metrics by controlling for liquidity shifts in the control stocks using the following general regression model:

$$\text{Liquidity} = a + b\text{Control(Liquidity)} + c\text{Period} + \varepsilon \qquad (3)$$

where the dependent variable, Liquidity is the natural log on trading day *t* for a liquidity metric (as measured by quoted spread percentage[38], volume, depth, the combined market liquidity and Amihud) based on an equally-weighted portfolio for the 17 eligible stocks. Control(liquidity) controls for general shifts in market liquidity as experienced by the control stocks and is the natural log on trading day *t* of the respective liquidity metric for an equally-weighted portfolio of the 17 matched non-eligible control stocks. Period is equal to 0 if trading day t is during the pre-period and 1 during the post-period.

The results for equation (3) are reported in Table 6. Consistent with the univariate results, the reduction in tick size during the post-period is associated with a significant decline in spread and depth of around 37% and 61% respectively for the eligible stocks. This result provides further support for *Hypothesis* H_1 that spread narrows and H_2 that depth declines for eligible stocks when tick size is reduced. In contrast to the univariate results which find no significant change in the daily trading volume in dollars, Table 6 highlights that volumes increase by approximately 21% during the post-period providing some support for *Hypothesis* H_{3a}. While eligible stocks' combined market liquidity declines and also experience greater illiquidity during the post-period but these changes in liquidity are significant.

Table 6.
Impact of Tick Size Reduction on Liquidity

	Spread (%)		**Volume ($)**		**Depth ($)**		**Market Liquidity**		**Amihud**	
Constant	-3.84	***	9.70	***	4.50	***	9.48	***	-2.64	***
	(15.6)		(11.4)		(4.7)		(9.1)		(13.9)	
Control(Liquidity)	0.07	***	0.33	***	0.71	***	0.48	***	-0.01	
	(1.2)		(5.6)		(7.7)		(6.7)		(0.1)	
Period	-0.37	***	0.21	***	-0.61	***	-0.06		0.18	
	(14.4)		(3.7)		(17.8)		(1.6)		(1.0)	
Adjusted R^2	0.47		0.19		0.69		0.20		0.01	

For each regression model the dependent variable the natural log on trading day *t* for each liquidity measure (quoted spread percentage, volume, depth, and the combined market liquidity and Amihud measures) based on an equally-weighted portfolio for the 17 stocks eligible for tick reduction in tick size. Control(Liquidity) is the natural log on trading day *t* of the respective liquidity measures for an equally-weighted portfolio of the 17 matched non-eligible control stocks. Period is equal to 0 if trading day t is during the pre-period and 1 during the post-period. The t-statistics are shown in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively.

[38] We find similar results when effective spread percentage is the dependent variable, however for conciseness we only report results for quoted spread percentage in sections 4.2 and 4.3.

4.3 Determinants of changes in liquidity

This section explores the explanatory variables of liquidity changes following the reduction in the minimum tick size from $0.01 to $0.005 for the 17 eligible stocks. Due to the small sample size we use the following simple regression models.

$$\ln\left(\frac{\text{Liquidity}_{post}}{\text{Liquidity}_{pre}}\right) = a + b\ln(\text{Determinant}) + \varepsilon \qquad (4)$$

For each simple regression model, the dependent variable is the natural log of the post-period divided by pre-period liquidity measure (i.e. change in quoted spread percentage, volume, depth, and the combined market liquidity and Amihud) for each eligible stock. Determinant is the explanatory variable for every iteration of the simple regression model and includes the natural log of the average pre-period stock price (Price), market capitalisation (Size), the binding-constraints probability (BCP) and the standard deviation of daily returns (Volatility). Prior studies find that firms with higher pre-period BCP experience greater declines in both depth and spread, and similarly, lower priced stocks also experience greater depth and spread declines when tick size is reduced as these stocks may be more likely to be constrained by pre-period binding-constraints imposed by the minimum tick size (Chung, Charoenwong, and Ding, 2004; Hsieh, Chung and Lin, 2008). Prior studies also find changes in depth and spread following changes to the minimum tick size are negatively related to firm size and risk (Chung, Charoenwong, and Ding, 2004; Hsieh, Chung and Lin, 2008).

Table 7 reports the simple regression results. For the change in quoted spread percentage from the pre- to post-periods only the pre-period BCP is statistically significant. The negative relationship suggests that stocks with a higher probability of trades occurring at the minimum tick size have the greatest percentage decrease in the quoted bid-ask spread between the pre- and post-periods. In addition, the pre-period BCP has a statistically negative relation to the change in dollar value of depth and the combined market liquidity variable, suggesting that firms with a higher probability of quoted spreads occurring at $0.01 during the pre-period experience larger declines in both depth and the combined market liquidity metric. So while high BCP stocks experience the greatest decline in spread, it appears that overall liquidity declines for these stocks when proxied by the combined market liquidity metric. In Table 8 Panel A, the eight firms with a pre-period BCP greater than the mean pre-period BCP (0.834 as per Table 5, Panel A) are classified as High BCP firms; otherwise they are Low BCP firms. Spread decreases by approximately -35% for high BCP firms compared to an average -28% reduction in spread for low BCP firms. However, high BCP firms' dollar depth falls by approximately -54% compared to a fall of -27% for low BCP firms. Therefore the negative relationship between the market liquidity metric and BCP highlighted in the simple regression appears to be driven by high BCP firms who experience a decline in market liquidity of -17% compared a 9% increase for low BCP firms (Table 8, Panel A).

Table 7.
Determinants of the Changes in the Liquidity Metrics

	Constant	Price	Size	BCP	Volatility	R^2
ΔSpread	-0.36 ***	0.07				0.07
	(5.0)	(1.1)				
ΔSpread	0.06		-0.02			0.02
	(0.1)		(0.6)			
ΔSpread	0.04			-0.40 *		0.19
	(0.2)			(1.9)		
ΔSpread	-0.27 ***				-1.71	0.01
	(3.6)				(0.4)	
ΔValue	-0.32 *	0.18				0.08
	(1.8)	(1.2)				
ΔValue	-2.61 *		0.12 *			0.18
	(1.9)		(1.8)			
ΔValue	-0.37			0.29		0.02
	(0.7)			(0.5)		
ΔValue	-0.03				-7.35	0.03
	(0.1)				(0.7)	
ΔDepth Value	-0.48 ***	0.07				0.03
	(-4.3)	(0.7)				
ΔDepth Value	0.33		-0.04			0.04
	(0.4)		(0.8)			
ΔDepth Value	0.35			-0.92 ***		0.42
	(1.5)			(3.3)		
ΔDepth Value	-0.51 ***				6.54	0.06
	(4.6)				(1.0)	
ΔMarket Liquidity	-0.19	0.14				0.06
	(1.1)	(1.0)				
ΔMarket Liquidity	-0.09		0.00			0.00
	(0.1)		(0.0)			
ΔMarket Liquidity	0.63			-0.82 *		0.15
	(1.5)			(1.8)		
ΔMarket Liquidity	-0.13				2.60	0.02
	(0.8)				(0.6)	
ΔAmihud	0.26	0.03				0.01
	(0.7)	(0.1)				
ΔAmihud	0.42		0.01			0.00
	(0.2)		(0.1)			
ΔAmihud	0.71			-0.51		0.01
	(0.8)			(0.5)		
ΔAmihud	0.30				-0.86	0.00
	(0.86)				(0.1)	

For each simple regression model the dependent variable the percentage change in the liquidity measure (change in quoted spread percentage, volume, depth, the combined market liquidity and Amihud measures) between the pre- and post-periods for each stock eligible for a reduction in minimum tick size. The explanatory variables are the average pre-

period stock price (Price), Size which is the natural log of market capitalisation, the binding-constraints probability (BCP) and Volatility is the standard deviation of daily returns. The t-statistics are shown in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels respectively.

The percentage change in average daily trade value in dollars is significantly positively related to firm size. In fact, as highlighted in Table 8 Panel B, the eight largest firms (with a market capitalisation above $500 million) experience virtually no change in either trading volume (-3%) and trading value (+1%) between the pre- and post-periods. However, small stocks experience a substantial decline in both trading volume and value of -28% and -27% respectively. In addition, large firms capture almost all of the increase in trades per day with a 39% increase compared to a negligible increase of 2% for small firms. Overall, small firms are more adversely affected in terms of both trading volume and trading value, and in addition small firms do not enjoy the benefit of a significant increase in daily trades as experienced by the large firms following the reduction in tick size.

Table 8.
Liquidity Changes Based on Size and Binding-Constraints Probability Determinants.

Panel A: Portfolios based on Binding-Constraints Probability (BCP)

	High BCP	Low BCP	Low - High	t-statistic		z-score	
Quoted spread percentage	-34.6%	-23.6%	11.0%	1.89	*	1.93	*
Trade size in shares	-23.0%	-8.8%	14.2%	0.95		1.31	
Trade size in dollars	-21.2%	-4.9%	16.3%	0.98		1.3	
Number of trades	19.7%	19.4%	-0.3%	0.01		0.14	
Dollar depth	-54.4%	-27.1%	27.3%	3.38	***	2.74	**
Market liquidity	-17.4%	9.4%	26.8%	1.88	*	1.59	

Panel A: Portfolios based on market capitalisation

	Large Firm	Small Firm	Small - Large	t-statistic		z-score	
Quoted spread percentage	-30.5%	-28.4%	2.1%	0.33		0.53	
Trade size in shares	-2.8%	-28.3%	-25.5%	-1.86	*	-1.56	
Trade size in dollars	1.4%	-26.8%	-28.2%	-1.82	*	-1.62	
Number of trades	39.0%	2.3%	-36.7%	-2.03	*	-1.79	*
Dollar depth	-44.8%	-38.7%	6.1%	0.56		0.91	
Market liquidity	-3.7%	-5.8%	-2.1%	0.12		0.63	

Those firms with a BCP above the mean pre-period BCP are classified as high BCP firms, otherwise they low BCP firms. In total 8 firms are classified as high BCP and 9 low BCP firms. Firm size is based on the average market capitalisation of equity during the pre-period and 8 firms with a market capitalisation above $500 million are classified as large, while the 9 firms less than $500 million are classified as small. The average percentage change between the pre- and post-periods is calculated for each liquidity variable presented. Two sample t-tests and Wilcoxon-Mann-Whitney z-scores are used to measure the differences between the eligible and control stocks. * and ** and*** indicate significant at 10%, 5% and 1% level, respectively.

5. Conclusions

The NZX reduced the minimum tick size from one cent to half-a-cent for 17 stocks in 2011. This paper explores the NZX's stated aim of boosting liquidity through reducing the minimum tick size. While spread declines significantly for eligible stocks there is also a significant decline in depth in the post-period. These conflicting liquidity impacts make it difficult to conclusively conclude whether liquidity improved or declined overall for the eligible stocks. When examining two alternative measures of liquidity, one based on both spread and depth and Amihud's illiquidity ratio, eligible stocks' experience declines in market liquidity and become more illiquid in the post-period, although these changes are insignificant. However, the impact of tick size changes is not consistent across all firms, with small firms experiencing significant deterioration in trading volumes and values. While firms with a high pre-period BCP have larger declines in both spread and depth than low BCP firms,

however, the decline in depth for high BCP firms is greater than the decline in spreads resulting in a significantly lower market liquidity metric compared to low BCP firms.

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Light-handed Regulation in New Zealand Banking and Financial Services: Does it work?

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Abstract
This paper reviews banking regulation in New Zealand from the deregulation of the 1980s through to the present day. It focuses on the effects of light-handed regulation that was introduced as part of the deregulatory process and examines its effectiveness for protecting depositors and at preventing the (potential) looting of New Zealand banks by their foreign owners.

In this context, the paper also considers Reserve Bank (of New Zealand) plans for a system of open bank resolution, and identifies some of the challenges in New Zealand and elsewhere in developing systems for bank failure management, particularly where there is significant foreign ownership of the banking sector.

Keywords:
Banking regulation, New Zealand, bank failure management.

Introduction
This paper sets out to provide an overview of the recent history of banking and financial services regulation in New Zealand. This is of interest because, particularly during the latter part of the 1980s, the New Zealand banking and financial system was deregulated very swiftly, according to a completely different set of regulatory principles, to become one of the most lightly regulated financial systems in the world. Barth et al (2001) included New Zealand among a small group of countries that permitted the widest latitude in terms of the activities banks might undertake. This light-handed regulation persisted through the 1990s and subsequently, although since around 2000 there have been a few steps taken to put a bit more power into the hands of the regulators.

The regulatory structure that existed from the 1930s through to the 1980s for the New Zealand financial sector (including the banking sector) was particularly pervasive.[39] It was developed in the aftermath of the great depression of the 1930s, and generally reflected a preference for managing the economy to achieve broader objectives around economic growth and development: finance should be the servant of this process. Markets were not seen as important, with a feeling in some circles that it was markets that had engendered the great depression, and that markets should be prevented from repeating this process. With there being no particular role for markets, regulation also lead to a segmentation of the financial sector, with different classes of financial institutions specialising in different types of loans and other products.

In a broader context, Spong (2000) identifies four main strands to justify the regulation of financial services firms: protection of depositors, monetary and financial stability, an efficient and competitive financial system and consumer protection. Depositor protection (often addressed by deposit insurance) addresses depositors' inability to look after themselves. Monetary and financial stability is concerned with protection of the payments system and the avoidance of systemic banking crises, and costs that such disruptions or crises would impose on society more broadly. An efficient and competitive financial system will be able to support more financial intermediation at lower prices, and be able to respond better to changing economic conditions and

[39] See Quigley (1992) for a review of financial regulation in earlier periods.

technological advances. It also reduces the costs of trading goods and services. Consumer protection is concerned with preventing abusive practices and ensuring fair access to financial services for all.

Spong also argues that banking regulation should not be directed at preventing bank failures, at providing for governments to override bankers' decision-making, or favouring certain groups over others. Banking regulation as practised in New Zealand prior to 1984 was not consistent with Spong's good principles, and tended to favour the bad principles, even though these were not part of the original objective of that regulation.

Prior research also identifies negative consequences that may arise from banking regulation. Deposit insurance to protect depositors can give rise to moral hazard, as depositors are no longer incentivised to ascertain whether the bank they deal with acts prudently, so that it remains able to repay deposits as required. Another version of the moral hazard problem arises when large banks get to be classed as too big to fail: incentives for prudent behaviour are undermined. These can lead in turn to the potential problem of looting, which we discuss further below: managers may seek to enrich themselves at the expense of small shareholders and depositors.

The rest of this paper proceeds as follows. We next look at the process of deregulation that occurred in New Zealand, and then at some of the reregulation that occurred after around 2000. In the following section we look at the non-bank deposit takers, particularly the finance company sector which was subject to widespread failures after 2006. After that we come back to look at governance issues and their interaction with regulation. We conclude by asking whether New Zealand regulation has, in the end, been very effective.

The process of deregulation

New Zealand's regulatory framework from the 1930s began to be eased a little in the 1970s, with changes such as banks being given greater freedom to set their own interest rates on lending, and permission being given for new products to be offered. These were often in response to changes in the global economic environment which meant, for example, that there was a demand for foreign-exchange hedging, which had not been necessary previously while all exchange rates globally were fixed relative to each other.

Also in response to this environment, new institutions and new classes of institutions were established to offer new products and services, which existing institutions might have been barred from offering. Regulatory frameworks often struggled to keep up these new institutions, and when some of these institutions got into difficulty, some social disruption was experienced as these institutions were dealt with under standard insolvency legislation. An eventual response to this was the Securities Act 1978, with accompanying regulations, which set out the process for issuance of the prospectuses required for solicitation of funds by entities other than banks, savings banks, building societies and credit unions. This was intended to ensure that investors received some standard format information on what it was that they were investing in.

In an attempt to gain control of inflation, the Muldoon government that was re-elected in 1981 imposed wide-ranging wage and price controls. It moved in 1982 to extend these to the financial sector, on the basis that the financial sector should be seen as sharing the burden of restrictions in the battle against inflation. These were primarily effected through the setting of maximum interest rates on various classes of loans, although there were also restrictions on bank lending growth, with regulatory powers being continually extended as financial institutions found ways to circumvent them. By the time the Muldoon government lost office in July 1984, the mesh of regulation had become extensive, and the financial sector found itself quite constrained in how it could provide financial services. One aspect of this was that, in the regulated environment, access to borrowing from banks was something of a privilege, with the less privileged having to utilise the services of other classes of institutions.

The election of the fourth Labour Government in 1984 provided the opportunity for much of the previous regulatory structure to be unwound. Over the following few months interest rate restrictions, foreign exchange controls, the fixed exchange rates, mandatory liquid assets holdings (through the reserve asset ratio system)

were abolished, as were restrictions on private foreign borrowing.[40] Later in 1985, proposals were advanced for opening up banking by allowing new banks to enter the market; this and a number of other changes were codified in a 1986 amendment to the Reserve Bank Act. Opening up the market to new banks necessitated the development of a set of rules for the registration of banks, replacing a previous system which had required individual acts of parliament. The only quantitative requirement for registration was a minimum capital level of $15 million. This was all intended to promote a more efficient and competitive banking market.

Legislative requirements were codified further in the Reserve Bank of New Zealand Act 1989 (Dawe, 1990). Throughout this process, major changes were also made in respect of monetary policy analysis and implementation, including the adoption of inflation targeting, but consideration of those is outside the scope of this paper, which is focused on regulation.

One of the consequences of the deregulation was that the banking sector was no longer disadvantaged in the way it had been in offering financial services, and in competing with other financial institutions. Some previous classes of institutions, such as official short-term money market dealers,[41] disappeared, while there was a move by many other non-bank financial institutions to convert to bank status. This meant that the numbers of participants within some classes of financial institutions, such as building societies and finance companies, were considerably reduced, while the savings banks all converted to bank status and consequently looked to broaden the scope of the activities which they undertook.

The overarching principle that should be applied to the regulation of the banking sector was set out in an article in the May 1987 Reserve Bank of New Zealand Bulletin (Staff, 1987).[42] This proposed that the Reserve Bank should not be concerned about the failure of individual institutions, but only about the failure of multiple institutions through a systemic financial crisis, where the undermining of financial intermediation capacity would have negative effects on the economy as a whole. Another perspective was that the object of policy should be failure management, designed to limit the disruption caused by failures, rather than failure prevention, with occasional failures being perceived as desirable as a way of spreading the message about market discipline (Doughty, 1986). The scope of regulation was to be prudential: in other respects, the market was seen as being the most appropriate source of regulation for the New Zealand financial system (Grimes, 1998), although this could be supplemented by the broader legislative framework such as the Companies Act and Financial Reporting Standards. The concern for the financial system was subsequently affirmed by White (1990, 1991), who stressed the importance of protecting the payments system.

This view of regulation has generally regarded deposit insurance schemes, which would be a standard international response to individual bank failures and which protect the interest of small depositors, as something that should be avoided. The Reserve Bank (of New Zealand) has seen deposit insurance as undermining depositors' incentives to monitor banks, leaving banks to take greater risks than they might otherwise – a phenomenon described as moral hazard (White, 1990). In such a situation, it is possible that bank losses could be aggravated at the expense of taxpayers, who would be likely to be the ultimate underwriters of a deposit insurance scheme. The Reserve Bank continues to uphold this argument in 2013.

During the period following initial deregulation, there was an economic boom, reflected particularly in a booming stock market and property development activity, followed by a bust, a key element in which was the 1987 share market crash. The bust in property development impacted severely on the banks that had supported it, and this lead in due course to the failure of the (formerly government-owned) Development Finance Corporation (DFC) in 1989, and to two bail-outs of the formerly government-owned Bank of New Zealand. This lead the Reserve Bank of New Zealand to give further consideration to issues around the

[40] See Hodgetts (1992) for a more detailed chronology of some of the relevant events. Evans et al (1996) suggest that the financial sector was an area where deregulation proceeded most rapidly.

[41] See Nicholl & King (1985) for a more extensive discussion of the role of official short-term money market dealers.

[42] Although, as we are reminded by Grimes (1998), there had previously been no system for the prudential supervision of New Zealand banks.

prudential supervision of banks, a topic they had been able to overlook in former times when banks were much more restricted in the activities they undertook, and when competition between the banks was much more limited. The other consequence of the crash was that the banks collectively became much more cautious about property development financing, to the extent that they more or less ceased this line of business. We discuss this further in a later section of the paper that focuses on the finance company sector.
During the late 1980s and 1990s we also saw a substantial increase in the proportion of foreign ownership of the New Zealand banking sector, in some cases reflecting a lack of financial strength on the part of the New Zealand owners, but also in response to the deregulated market. We saw previously New Zealand-owned entities such as the Post Office Savings Bank, the Bank of New Zealand and most of the trustee savings banks become part of international (predominantly Australian) banking groups. This made it easier for international banks to participate in the New Zealand market, while it also became more important for them to do so as New Zealand became more integrated into the global financial system. In some cases we also saw firms coming to New Zealand because it was easier to gain access than to some other markets internationally. The extent of foreign ownership is also regarded as having facilitated the inflow of non-resident funding into New Zealand banks (which had previously, in any case, been constrained by regulation).

It was also within such a context that the Reserve Bank deemed it appropriate to conform to the Basel Committee's guidelines on bank capital adequacy. There was a view that adherence to the Basel Committee's capital adequacy guidelines was driven primarily by a desire to conform to the international norms (and to avoid the costs of not doing so), but stated views have generally been to the effect that more capital was better for promoting bank safety and soundness (and under the 1988 Basel I rules, New Zealand and Australia both imposed a capital requirement for holdings of government securities).

A further indication of the deregulation of the New Zealand banking market was the government's sale of its shareholding in the Bank of New Zealand in 1992.[43] The government was then not involved in owning a bank until Kiwibank (owned by New Zealand Post) began operations with the general public in 2002. Kiwibank's ability to influence the market may be regarded as limited, however, as after more than 10 years of operations it still has less than 5% of banking system assets.

A further development in the approach adopted to prudential supervision of banks was the introduction of a bank specific disclosure regime, which came into effect at the beginning of 1996.[44] This requires banks, every quarter, to publish a balance sheet and year–to-date income statement, along with a range of other financial and non-financial information[45]: on the basis of this, depositors are supposed to be able to assess the soundness of the bank with which they are placing their funds, and to be able to exercise market discipline by withdrawing their funds if they decide that the risk profile of the bank has changed adversely so that their deposits might be at risk. A further principle enunciated was that the Reserve Bank would get the same information as was made available to the general public. They would therefore be not be privy to any better information than the general public: if a bank failed, they could not then be said to be in a position to have acted to prevent that failure, and they could not then be responsible for any losses incurred by depositors (Brash, 1997a).

There was also a view that the need for banks to report publicly every quarter would make them more cautious about the risks to which they exposed themselves (Brash, 1997b; 1998). In this respect, the role of a bank's board of directors was seen as particularly important, in terms of their responsibilities to individually sign off on the disclosure statements, which would make them liable to a range of penalties if there was anything

[43] Barth et al (2004) note that government ownership is usually associated with a more restrictive regulatory environment.

[44] Banks had been required to issue Securities Act-type prospectuses if they wished to accept retail deposits following the passage of the 1986 amendment to the Reserve Bank Act, but the disclosure requirements under the new regime were more specifically directed at the risks banks faced, and were required to be produced quarterly (rather than 6-monthly, as previously) by all banks (and not just those which sought retail deposits).

[45] More information on the data required to be disclosed under the disclosure regime, and the principles that underpinned it, are provided in Mortlock (1996a). There have been a number of changes to the detail of what is required to be disclosed since the scheme was introduced, but the principles remain the same.

misleading or untrue in the disclosure statements.[46] It was also envisaged that the disclosure statements would be reviewed and commented on by journalists and banking experts, who would highlight problems, for the public benefit.

Foreign ownership of the New Zealand banking system was also relevant, with the argument being advanced in some circles that New Zealand did not need to regulate its banks as they were almost all subject to the oversight of foreign regulators.[47]

The protection provided to the public under the disclosure regime provided a justification for the Reserve Bank to remove some of the quantitative restrictions previously applied, with the exposure limits replaced by requirements to report large exposures to individual counterparties and open foreign exchange positions. A similar approach was applied to the reporting of market risk exposures, as per Harrison (1996), although the Reserve Bank chose not to follow the Basel Committee's guidelines, and did not require capital against market risk.[48]

Reliance on disclosure was a most unorthodox approach internationally, with most countries around the world preferring to apply specific prudential regulation on exposures, and to have some sort of programme for specific examination of banks.[49] Consistent with Spong's principles, it is common to adopt deposit insurance schemes of some type to protect unsophisticated retail depositors, who could not be expected to read a set of bank financial statements to assess a bank's soundness. By contrast, the Reserve Bank of New Zealand has no specific objective to protect bank depositors per se.[50] Despite the disclosure regime having been publicised by the Reserve Bank, such research as has been undertaken has found relatively limited public awareness of how it operates, with many people believing that the government or the Reserve Bank would ultimately protect their deposits.[51] At least in the case of retail deposits, there is no obvious indication that interest rates are sensitive to (agency-provided) credit ratings. Even in 2012, the Reserve Bank continued to identify the disclosure regime as the basis for prudential supervision (Fiennes & O'Connor-Close, 2012), although they now require significant amounts of information to be reported directly to them by the banks, other than via their quarterly disclosures, which means that they can no longer claim to be no better informed than the general public.

Another distinctive feature of the New Zealand approach to banking regulation is the absence of any process for on-site visits to banks by the monetary or supervisory authorities, such as commonly occurs in other jurisdictions. The Reserve Bank will from time to time meet with a bank's management, but verification of a bank's condition is otherwise undertaken only by external auditors.

The attempts at reregulation

Towards the end of the 1990s, it had started to become apparent that the approach of light-handed regulation of banks, with limited objectives, as outlined above, might not provide the best outcomes for New Zealand and bank depositors, particularly with the extent of foreign ownership of the banks that were operating in New Zealand. The Reserve Bank started to take some initiatives to allow it to take greater control over what banks were doing, although these were by no means easy to implement. Among a series of changes made were the

[46] This is discussed at greater depth by Mortlock (1996b, 2002)

[47] See, for example, Heffernan (2005), p 178 (footnote 7) and Turner (2000), although Brash (1997a) specifically argued against this proposition.

[48] This changed with the adoption of Basel II in 2008, following which banks are now required to hold capital against market risk.

[49] By contrast, Reserve Bank monitoring is focused on making sure that banks comply with the disclosure rules.

[50] See Bollard (2003) for further discussion of these issues.

[51] See, for example, McIntyre et al (2009). Wilson et al (2012) could not find evidence for the effect of market discipline, although they did find evidence for banks exercising self-discipline in response to the disclosure regime.

promulgation of some revised rules on corporate governance, to provide for more genuinely independent directors, including New Zealand resident directors.[52]

Obtaining and reporting of ratings from a credit rating agency approved by the Reserve Bank was also made mandatory. For foreign-owned banks, the rating has generally been the same as for the parent bank, and the desire to maintain credit ratings and keep funding costs down accordingly is likely to have caused banks to act in a more conservative fashion.

Rules were also adopted to control banks' outsourcing activities, with the objective being that the Reserve Bank (or statutory managers) should be able to have access to banks' computer systems,[53] in New Zealand, if parent banks got into difficulty, while the Reserve Bank also got the power to regulate payment systems (which had previously been wholly under the control of the banks themselves).

We also saw steps being taken to try and get the Australian-owned Westpac Banking Corporation (Westpac), in particular, to establish a New Zealand incorporated subsidiary, which was seen as being of particular importance because, as a branch, there was a concern that Australian depositors might be given priority in terms of the repayment of New Zealand deposits (reflecting the priority given under the Australian Banking Act).[54] This was part of a local incorporation policy, designed to ensure that larger and systemically significant banks had local boards of directors, which should be more responsive to New Zealand needs than the directors of a foreign bank operating a New Zealand branch (Chetwin, 2006). It was also argued that having a New Zealand-incorporated entity made matters clearer for creditors (the most important category of which is depositors), particularly in cases where statutory managers might be appointed to a failing bank.[55]

In response to concerns about the risk profile of New Zealand bank funding, which were exacerbated during the depths of the global financial crisis in September and October 2008, we have also see the reintroduction of specific rules on bank liquidity. The mismatch and core funding ratios apply to short and long term liquidity and funding risks respectively, and came into effect on 1 April 2010 (Hoskin et al, 2009). This approach is broadly consistent with one that has since been mandated internationally as part of the Basel III process, and it is also consistent with what the banks appeared to be doing anyway as they sought to reduce the riskiness of their funding portfolios (Tripe & Shi, 2012).

A more problematic area of reregulation has been in developing a process for dealing with banks in financial distress. The current proposal, which has been under discussion at the Reserve Bank since at least the beginning of the present century, is for a system of open bank resolution (OBR), which would see bank deposits having a haircut applied to them, to provide funds to recapitalise a failing bank. Following the haircuts, funds remaining in the accounts at the failing bank would then be guaranteed (Hoskin & Woolford, 2011). A key feature of the OBR proposals is that they aim to reduce the social costs of financial institution failure by getting a bank re-opened promptly after the hair-cut has been applied, so that the payment system can resume operations (something which would be unlikely to be feasible under standard legal insolvency practices).

Although the banks are being required to establish systems to allow OBR to be implemented within their computer systems, debate over whether this is the most sensible approach to resolving failing banks has been limited. OBR relies on an assumption that depositors should have been able to protect themselves through the

[52] See, for example Bollard (2004). A further set of rules following a review were announced in December 2010.

[53] See Ng (2007) for more detail on this.

[54] The other major banks already conducted the majority of their New Zealand business through New Zealand incorporated subsidiaries. The Reserve Bank had been going through a process of setting conditions under which banks would not be allowed to operate as branches, but only as subsidiaries (see Mortlock, 2003). These conditions implied change only for Westpac (although they may have discouraged other banks from taking retail deposits). The policy would also have been likely to have impacted on Australian-owned AMP Banking, but they chose to sell their business and withdraw from the New Zealand market.

[55] See Evans & Quigley (2002) for a more extensive discussion of the relevant issues.

knowledge that deposits were not guaranteed, and that they could review disclosure statements to identify banks at risk.

We are now seeing approaches being proposed internationally where, if banks are failing, bond-holders and other wholesale depositors may be bailed in and required to contribute to losses. There are some suggestions that the OBR is similar to this, but there are some key differences. The OBR proposals treat all creditors equally (although there may be scope to exempt some small depositors) rather than imposing the costs of failure on those counterparties who might be better positioned to bear them. Moreover, other countries provide some form of deposit insurance or guarantee for retail depositors, a protection which is absent in New Zealand.

OBR might have been reasonable in a simpler environment such as existed in the 1980s, and is certainly consistent with the philosophy of light-handed regulation. There is an expectation that depositors should bear some of the cost of a failure because of their own failure to monitor the bank with which they do business. It is, however, less clear as to how effective OBR can be in the more complex banking environment that exists in 2013.

Non-bank Deposit Takers

The other outcome of the crash at the end of the 1980s was much greater aversion to risk by the banks when it came to property development financing, to the extent where they almost ceased financing development projects at all. In this case, however, the would-be property developers found a solution to the impasse by developing activities in a relatively lightly regulated class of financial institutions, the finance company sector. Regulation in the finance company sector was based on the Securities Act 1978, which had an emphasis on form, rather than substance: as long as the finance company had a trust deed with one of the small number of corporate trustees (generally with relatively limited powers), and as long as prospectuses (intended to provide market disclosure) were issued at requisite six-monthly intervals, finance companies could raise funds from the public, with potentially only relatively limited constraints on how these could be lent or otherwise allocated.

In a significant number of cases we thus found people associated with the property investments and development businesses getting involved in owning and managing finance companies, with funds being lent to associates (although not necessarily defined as such), and a number of other practices which might be perceived as “looting” (in the sense of Akerlof & Romer, 1993). In many cases, there was nothing illegal about the transactions that were entered into: it is arguable that the regulatory structures applying around such activities did not provide sufficient constraints to prevent the owners and managers of finance companies applying the funds invested with them towards their own enrichment.

The ineffectiveness of the regulatory environment for non-bank deposit takers, finance companies in particular, was highlighted by the wave of failures that began in 2006. For some of the earlier failures, problems appeared to be in weaknesses in management, and losses to depositors were not particularly severe, but as the plague of failures persisted, it became evident that there were significant gaps in the regulatory architecture, which appeared to have exacerbated losses for investors. In a number of cases, directors of failed finance companies have faced prosecutions for fraud or breaches of the Securities Act, but there has been a general acknowledgement that regulatory weakness was a major contributor to losses.

A further issue here was that the liquidation of the failed finance companies has been undertaken using the standard approaches of insolvency law, which can entail extensive delays. Many investors in finance companies have thus faced significant delays in recovering the remaining portions of the funds invested that are due to them, as the liquidation process has lingered on. In some cases this has been further complicated by various schemes of arrangement.

In response to this we have seen reregulation in the non-bank sector as well, with non-bank deposit takers having now become subject to prudential oversight by both their trustees and the Reserve Bank of New Zealand (Barker & Javier, 2010). As of 2013, however, the non-bank deposit taking sector is much smaller than it was in 2006, with there having been particular shrinkage in the finance company sector, and with three large institutions having converted to bank status. It is probable that future losses in the non-bank deposit taking

sector will be relatively much less than they were in the 2006-2009 period, but this may be as much a consequence of the sector's shrinkage rather than of the new regulatory framework.

There is a view that losses for retail investors were further compounded by financial advisors encouraging their clients into finance company investments because of higher levels of commission paid to advisors (with these commissions not necessarily being effectively disclosed to investors). There were also limited provisions to ensure the competence of financial advisors. This area of potential regulatory deficiency has also been subsequently addressed through new legislation governing financial advice.

The effect of regulation

An additional key rationale for regulation in the financial services sector, further to those outlined by Spong, is the corporate governance problem, as set out by Shleifer & Vishny (1997):

> *"How do suppliers of finance get managers to return some of the profits to them? How do they make sure that managers do not steal the capital they supply or invest it in bad projects?"* (p 737).

This is even more of a challenge in financial services than in other areas where assets are invested, in that electronic money is hard to trace, while it can also be diverted to a wide range of other uses. Where financial services firms are managed by owners, such as with foreign-owned banks or closely held finance companies, this can be even more of a challenge, as scope for independent oversight may be limited to periodic external audits.

Against this background, regulation, which should be part of broader corporate regulation, has to ensure that financial institutions are run consistent with their supposed purposes, and that the funds are not looted (again, in the sense of Akerlof & Romer, 1993). In the financial sector, regulation is of particular importance because of the sorts of roles that financial institutions play in a modern society, and the privileged position that they hold in terms of the means of payment that society uses. In the New Zealand environment, the rather narrower focus of regulation has otherwise been to try and reduce the likelihood of a systemic banking crisis that might otherwise damage the operation of the economy.

What then are the constraints that apply to the management and owners of financial institutions to discourage them from looting the resources, in terms of deposits, with which they have been entrusted? As the Reserve Bank of New Zealand and others have noted, this is more complex in the New Zealand environment because the banks are predominantly foreign-owned: if the owners seek to appropriate resources to other uses, it is difficult to recover them. We have seen how complicated this has been for the finance company sector in New Zealand since 2006: to take action, the authorities needed to establish that there was some sort of criminal culpability, and then try to find any money that might still be available to repay the depositors who entrusted it to the institutions in the first place. It is presumed that, for the non-bank deposit taking sector, the transfer of regulation to the Reserve Bank of New Zealand will reduce the scope for such misappropriation or mere carelessness with depositors' funds.

In the banking environment, the sums involved are relatively much larger than for the non-bank sector, reflecting the much greater significance of banks in New Zealand financial intermediation. The issue of concern from a regulatory perspective would be that resources at the New Zealand banks might be transferred to a foreign parent and that the New Zealand bank might act in the interest of the foreign parent, rather than in the interests of the bank's business in the New Zealand market.

Much of the regulatory effort that has been applied since the late 1990s has been directed at this issue. There was a view that, with Westpac incorporating a subsidiary in New Zealand, the New Zealand system was somehow protected, in that any transfer of funds from a New Zealand bank that rendered the New Zealand bank insolvent would mean that the directors, particularly those that were New Zealand resident, could be prosecuted. This was also a rationale to justify a stronger role for independent directors.

It is doubtful that this would really afford much protection to New Zealand if the Australian parent bank was in difficulty. Would the managers on secondment (from Australia) and Australian-based directors and owners really care that much about the New Zealand directors? Moreover, one needs to be mindful of the typical structure of the New Zealand subsidiary balance sheets, which usually have significant ordinary borrowings from parent banks. If the foreign owner was looking for resources that could be repatriated, the most obvious resources to seize on would be to repay those borrowings (which would be quite legal), but which might well have the effect of depriving the New Zealand bank of the liquidity needed to maintain operations.[56]

The question then arises that, if the looting of a New Zealand bank is simple, why it has not been done already. Why have the Australian banks not already ripped out the resources from their New Zealand business and supplied these to their Australian parents? There are two main reasons why this has not happened, and one might note that essentially the same issues apply in respect of the finance companies. The first factor is the governance regime applying at parent company level: this is clearly much more robust for the major Australian banks, reflecting the influences of APRA and the ASX, than it was for New Zealand finance companies.

The second and more important factor is a desire to preserve a profitable business to receive an ongoing stream of returns into the future. In that context, owners would only be incentivised to loot a bank if they regarded its future prospects as poor. Moreover, we know from the goodwill that is paid for acquisitions that the market value of New Zealand banks is generally substantially in excess of book values (of equity): any looting of banks would cause that surplus market value to be rapidly dissipated.

Related to this is the general reluctance by banks to abandon their foreign subsidiaries, because of the effect it would be likely to have on their perceived creditworthiness, and thus their agency credit ratings. The desire to maintain credit ratings is a factor which is likely to have contributed to more conservative bank behaviour, such as banks holding capital in excess of regulatory minima.

Concluding thoughts

We have, then, reached an interesting position. New Zealand financial markets have, since the deregulation of the 1980s, been relatively lightly regulated, consistent with an approach that has required regulation to be justified, rather than the alternative view that might have required the argument to be presented to remove regulation. In such an environment, the more domestically focused parts of the New Zealand financial system have not fared particularly well, an effect which can be seen with the New Zealand Stock Exchange, which has a much smaller capitalisation relative to GDP than for example, Australia (although this difference cannot be attributed solely to regulatory effects).

The part of the financial system that seems to function best is the banking system, which is largely foreign-owned, and which is thus significantly governed by foreign regulators. Even here, however, the ability of the Reserve Bank to prevent the looting of New Zealand banks by foreign owners is not especially strong. That this has not happened is, in the author's view, more a matter of good luck and the constraints applied in banks' home countries than anything else. Would we be drawing too long a straw to ask if the New Zealand approach to financial system regulation was not especially effective? We should not rely solely on Australian regulators because, as Kane (2006) notes, they are responsible to Australian rather than New Zealand taxpayers.

The disclosure regime is becoming less effective as a vehicle for protecting depositors' interests. A key reason for this is that bank financial statements have become increasingly complex, reflecting both the increasing complexity of banks' business and the adoption of the International Financial Reporting Standards (IFRS). Development of a consistent view on how banks are performing has not always been helped by changes to required disclosures, made in response to changes in regulation and to assist the banks by reducing the burden (and hence cost) of disclosure. Very little effort is now being directed at trying to comment on what is reported in banks' disclosures.

[56] Kaufman (2004) questions whether it makes any difference if a local bank operates as a branch or as a subsidiary of a holding company.

At the same time, the process of bank liquidation has become more complex, with the value of the banks as per the financial statements showing an increasing difference with what might be available to repay depositors. As Bertram & Tripe (2012) have noted, categories of assets that might disappear could include cash borrowed from a parent bank, assets that were subject to repurchase agreements (potentially including residential mortgage backed securities), loans in covered bond pools, intangibles and deferred tax. It would be easy to see 40% of a bank's assets disappearing by the time a statutory manager got to intervene!

Looking at matters from a longer term perspective, the 1980s were characterised by a rush to remove previous regulation, and a regulatory structure was developed which was directed at the not especially globalised world of the 1980s. Since that time globalisation and new financial products have made financial markets and financial institutions a lot more complex, and the simple approaches to the resolution of failing institutions that might have worked in the 1980s would be likely to be overwhelmed by the much more complex financial institutions that exist in the 2010s. The proposals for open bank resolution are a reflection of a 1980s view, rather than something that can work in the 2010s. Against this background we would seem to need a review of banking regulation in New Zealand, with serious consideration needing to be given as to how to manage the failure of one or more banks.

The New Zealand experience is of international relevance as well, particularly with the greater frequency of significant foreign ownership of banking systems. Foreign ownership poses challenges for host country regulators, and in some environments, such as the European Union, regulators' roles in overseeing the local operations of foreign-owned banks can be quite limited. Gaining control of a banking system to encourage it to operate consistent with a national interest, but also within the confines of the invisible hand, can be a challenging process.

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Crossing the Tasman: Determinants of Price Discovery for Australia-New Zealand Cross-listed shares

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ABSTRACT
Price discovery is the process by which markets incorporate new information. In this study, we investigate the price discovery for 19 stocks cross-listed on the NZX and the ASX between 1998 and 2012. We observe strong downward trends in the contribution to price discovery of the NZX, both for New Zealand firms cross-listing on the ASX, and Australian firms cross-listing on the NZX. This suggests that the competitiveness of the NZX relative to the ASX is decreasing. Towards the end of the sample period, 50% of the price discovery for New Zealand firms takes place on the ASX, and the NZX acts as a satellite market for Australian firms. We further examine the driving factors behind this decline, such as spreads, and trading and quoting activity.

Key Words: Price Discovery; Market Microstructure.

1. Introduction

Recent advances in information technology and globalisation have given companies the opportunity to list their shares on multiple exchanges. Generally, companies choose those exchanges that will provide better listing conditions, greater access to capital, improved analyst following and that will broaden their investor base. However, at the same time, investors are gaining increasing access to multiple exchanges, and are no longer restricted to trading only in their home market. Because of this possibility for firms to choose where to list their shares, and because of the possibility for investors to choose where to trade shares, the competition between exchanges for order flow has increased, and exchanges need to be competitive and remain liquid and efficient to remain attractive for both companies and investors.[57]

One way of measuring the relative competitiveness of exchanges is through price discovery. Price discovery is the process by which new information gets impounded into stock prices and forms a crucial function of an exchange. When a security is listed on multiple exchanges, price discovery addresses the question of where information gets impounded most efficiently. When an exchange dominates in terms of price discovery, it suggests that this is the exchange where traders prefer to execute their trade. The importance of price discovery can be highlighted by a quote by the TSX Board of Governors: "The TSE cannot afford to have the U.S. markets become the price discovery mechanism for Canadian inter-listed stocks" (Eun and Sabherwahl, 2003 pg 550). Given the importance of price discovery for the competitiveness of exchanges, an important question becomes what drives price discovery. Harris et al. (2002) argues that informed traders, whose trading activity impounds new information into prices, are attracted to exchanges based on market factors like the depth, immediacy and quoted spreads that they can offer to traders. Therefore, the location in which new information gets incorporated into prices should be driven by the relative efficiency of the exchanges in question.

In this study, we examine the contribution to price discovery for two highly integrated markets, the Australian Stock Exchange (ASX) and the New Zealand Stock Exchange (NZX). We collect data for 11 New Zealand firms cross-listed on the ASX and 8 Australian firms cross-listed on the NZX, for a period of 14 years, 1998-2012. To examine price discovery, we estimate both the Gonzalo and Granger (1995) Component Share (CS), and the

[57] An example of the increased openness of global capital markets it the recent move of Cavotech from the NZX to the OMX Stockholm. The CEO argued it was to "help see it raise capital, improve liquidity and increase the share price." (Wood, 2011).

Hasbrouck (1995) Information Share (IS) for each year of our sample. Over all firm-years, we find that the home market dominates in terms of price discovery, which is consistent with prior literature. However, when we examine price discovery year-by-year, we observe a clear downward trend in the NZX's contribution to price discovery. For New Zealand firms this decline goes from about 90% in 1998 to about 50% in 2012. For Australian firms the decline goes from about 35% to 15%, suggesting that for Australian firms the NZX is almost a pure satellite market. When we examine the determinants of price discovery, we find a strong relationship between relative trades, volume and spread for New Zealand firms. For Australian firms, relative spread and volume seem to be important determinants.

This paper extends the work of Frijns et al. (2010), by considering a substantially longer period from 1998 to 2012, and the work of Eun and Sabherwal (2003) by considering bi-directional cross-listing (i.e. listing of New Zealand firms on the ASX and vice versa). The combination of these two extensions allows us to determine whether there are differences in the factors driving price discovery. Very few studies have considered such bi-directional settings.

The rest of the paper set out as follows. Section 2 discusses the extant literature on price discovery. Section 3 discusses the methodologies employed in this paper. Section 4 outlines the data employed and provides a summary of the data. Section 5 presents our empirical findings and Section 6 provides conclusions.

2. Literature Review

Price discovery is a key function of a financial market (Eun and Sabherwal, 2003). A general observation is that price discovery should mostly occur in the home market (Bacidore and Sofianos, 2002), as this is the market in which information about the company is mostly created. This notion assumes investors will trade on that information in the home market, but as investors in highly integrated markets have the ability to trade in what they consider to be the best exchange, where information gets impounded into prices becomes uncertain. If investors prefer to trade in the more "efficient" market, then a cheaper and more liquid foreign market could also become the informationally dominant market.

There is a growing literature examining the issue of price discovery in a number of settings, particularly looking at the price discovery of stocks listed on multiple exchanges. Initially, studies examined the relative importance of exchanges within the US, particularly between the NYSE and regional exchanges (Harris et al., 2002; Hasbrouck, 1995). An interesting extension is Harris et al. (2002), who looked at the relative contributions to price discovery for the NYSE and regional exchanges at three points in time; 1988, 1992 and 1995. They find that price discovery contributions change over time, particularly in relation to changes in the competitive position of the various exchanges against each other. They note that as the NYSE became relatively more expensive with regards to transaction costs in around 1992, price discovery migrated to the regional exchanges. In 1995, once NYSE spreads had reduced, the NYSE regained some of its contribution to price discovery.

A number of studies also examine the location of price discovery for internationally cross-listed firms, addressing the question of which is the informationally dominant market, the home or the foreign market. Despite the assertions of Bacidore and Sofianos (2002) that the home market should dominate the price discovery, empirical evidence is mixed. For instance, Lieberman et al. (1999) examine price discovery for six Israeli firms cross-listed on the NYSE and find only a limited informational role for the NYSE for five of the firms. Su and Chong (2007) look at eight Chinese firms listed on both the Hong Kong Stock Exchange and the NYSE and also find a limited informational role for the US exchange. Likewise, Ding et al. (1999) examine a Malaysian firm cross-listed on the Singapore Exchange and find that the Malaysian market is largely the dominant one. Lok and Kalev (2006) and Frijns et al. (2010), both study bi-directional listings between the Australian and New Zealand Stock Exchanges, and find that the home market dominates but that the foreign market has a small but significant role in price discovery.

However, several studies have found that the foreign market plays an important role in price discovery. Kadapakkam et al. (2003) in a study of Indian companies listed on the London Stock Exchange, find that both markets contribute equally to price discovery. Hupperts and Menkveld (2002), looking at Dutch firms cross-

listed on the NYSE, find wide variations on a per company basis, with some finds being dominated by price discovery in the home market, some by the foreign market, and others by both markets.

Eun and Sabherwal (2003) examine price discovery for Toronto Stock Exchange stocks cross-listed on US exchanges for a six-month period in 1998. As with the findings in Hupperts and Menkveld (2002), Eun and Sabherwal (2003) show wide variation in the contribution to price discovery of the US exchanges, averaging 38.1% but ranging from 0.2% to 98.2%. They note that while the home market dominates in many cases, there are a number of companies for which price discovery is dominated by the US exchange, making the TSX a mere satellite. They further examine the determinants of price discovery and find that price discovery is driven by the proportion of information-based trades occurring in the US. Lieberman et al. (1999) and Hasbrouck (1995) also show that the bid-ask spread ratio affects the level of price discovery.

One weakness of the studies on price discovery to date, particularly in relation to measuring the effects of exchange competition on the future of smaller exchanges, is that most of the studies are snapshots in time, focusing on measuring price discovery in one relatively short period of time, typically less than a year. As such, changes over time in price discovery, and what may cause these shifts, have not really been examined in the literature. One study that does look at the development of price discovery over time is Frijns et al. (2010). They examine both New Zealand firms listed on the ASX and Australian firms listed on the NZX for the period 2002-2007. Frijns et al. (2010) show that while the home market is dominant for both New Zealand firms listed on the ASX and Australian firms listed on the NZX, the ASX was increasing its share of price discovery over time for both groups. This suggests that the NZX is increasingly becoming less relevant for Australia-New Zealand cross-listed firms.

3. Methodology

To study the informational role of the NZX and ASX markets for New Zealand and Australian cross-listed firms, we investigate the contribution to price discovery of each market. To assess this, we follow the literature by estimating vector error correction model (VECM) and computing price discovery measures from these model estimates.

Consider a single security that is listed on two exchanges (NZX and ASX). Let p_{jt}^{NZX} be the log NZ dollar price of security *j* traded on the NZX, and let p_{jt}^{ASX} be the log New Zealand dollar price of the asset traded on the ASX. If the two assets are identical and completely fungible, then arbitrage implies that the price difference $(p_{jt}^{NZX} - p_{jt}^{ASX})$ is bounded with probability 1. Stated differently, if the prices ($p_{jt} = (p_{jt}^{NZX} \quad p_{jt}^{ASX})'$) in the NZX and ASX are for the same asset then prices will be cointegrated, with cointegrating vector $\beta_j' = (1 \quad -1)$. Cointegration of these assets implies that price changes can be expressed as a VECM of the form,

$$\Delta p_{jt} = c_j + \alpha_j \beta_j' p_{jt} + \sum_{i=1}^{I} \Gamma_{ij} \Delta p_{jt-i} + \varepsilon_{jt}, \qquad (1)$$

where α_j is the (2 × 1) vector of containing the speed of adjustment coefficients for NZ prices and Australian prices and Γ_{ij} are (2 × 2) matrices containing coefficients on lagged price changes. Note that the specification of the cointegrating vector β' implies that we expect the first element of α, $\alpha^{NZX} \leq 0$ and the second element of α, $\alpha^{ASX} \geq 0$.

We obtain our price discovery measure using the VECM stated in Equation (1) in two ways. The first method is the permanent-transitory (PT) decomposition of Gonzalo and Granger (1995), which is commonly referred to as the Component Shares (CS). The second method is commonly referred to as the Information Shares (IS) due to Hasbrouck (1995).

3.1 Gonzalo and Granger (1995) Component Shares

The Gonzalo and Granger (1995) PT decomposition compares the speed of adjustment coefficients of the two markets. The lower the speed of adjustment coefficient, the more informative that market is. For example, if the NZX is completely dominant in terms for price discovery and the ASX is a pure satellite market, then $\alpha^{NZX} = 0$ and $\alpha^{ASX} > 0$. Vice versa, if the ASX is completely dominant and the NZX is a pure satellite, then $|\alpha^{NZX}| > 0$ and $\alpha^{ASX} = 0$. If neither market is completely dominant $|\alpha^{NZX}|$ and α^{ASX} will both be positive, but their relative magnitudes will give us an indication of the degree of dominance over the other market. The CS can therefore be defined as

$$CS_j^{ASX} = \frac{\left|\alpha_j^{NZX}\right|}{\left|\alpha_j^{NZX}\right| + \alpha_j^{ASX}}, \qquad (2)$$

where CS_j^{ASX} is the component share for a security on the ASX. Likewise, $CS_j^{NZX} = 1 - CS_j^{ASX}$ is the component share for a security on the NZX.

3.2 Hasbrouck (1995) Information Shares

Whereas the CS only considers the speed of adjustment coefficient, the IS makes a different decomposition of the VECM. Hasbrouck's (1995) measure builds on the fact that if prices are cointegrated, they share a single common trend often referred to as the efficient price or underlying price of the assets. This efficient price is assumed to follow a random walk and the innovations in the efficient price are due to the arrival of new information. The total variance of the random walk is therefore a measure of the amount of information arriving to the market. The IS decomposes this variance and computes the percentage contribution of each market to the total variance of the common trend (efficient price). The higher the IS, the more informative the market is about the true price process.

4. Data

In this study, we consider the relative level of price discovery for both New Zealand firms cross-listed on the ASX and Australian firms cross-listed on the NZX. We examine price discovery for both types of firms over the period 1998-2012. However, we restrict our analysis to those firms that were cross-listed between the two exchanges prior to 2006have reliable results on possible movements of price discovery across the two markets. This restriction also ensures that there will be sufficient per year observations for each firm. We also require that intra-day data to be available for each firm from Thompson Reuters Tick History. As a result, our sample contains 11 New Zealand companies that are cross-listed on the ASX, and 8 Australian firms listed on the NZX. Appendix A provides an overview of the 19 firms used in this study.

We collect intra-day data on trade, bid and ask price, and number of trades, quotes and traded volume at a one minute frequency for the period 1 January 1998 to 31 December 2012. We also collect one-minute data bid and ask quotes on the NZD/AUD exchange rate. As price discovery is examined when both markets are open, we only utilise data for the overlapping trading hours of the two exchanges. The NZX opens at 10am and closes at 5pm NZ Time while the ASX opens at 10am and closes at 4pm AEST. For most days in the year there is a two hour time difference between NZ and AEST resulting in 5 hours of overlapping operations, although this can vary between 4 and 6 hours depending on the start and end dates for daylight savings between the two countries. We also restrict our analysis to days when both markets are open.

5. Results

5.1 Summary Statistics

Table 1 presents summary statistics for our sample for the NZX and ASX. Panel A and B report summary statistics for New Zealand and Australian firms, respectively. From Panel A, we observe that for most firms the majority of the trading and quoting activity occurs on the NZX, but there is considerable variation per firm. For instance, the ratio of NZX/ASX daily trades is on average close to 5, but varies from 12 (AIA and WHS) to 0.5 (FBU and TEL). For quoting activity, we observe an 8 times greater quoting activity on the NZX than the ASX, with again wide variation from 15.33 (AIA) to 1.16 (TEL). Likewise, 83.5% of the volume traded per day occurs

on the NZX. Finally, spreads are also considerably lower on the NZX, on average 0.95% compared with 3.49% on the ASX.

Panel B, which looks at the Australian companies cross-listed on the NZX, also shows that most trading and quoting activity takes place in the home market. On average, we observe more than 2000 trades per day on the ASX, but just 287 on the NZX, and 92% of the volume traded occurs on the ASX. Spreads are also considerably lower, 0.97% for the ASX compared with 2.99% on the NZX. Overall, the results suggest that the home market remains the most important market for cross-listed firms in terms of trading and quoting activity.

Table 2 presents summary statistics for each year for New Zealand (Panel A) and Australian (Panel B) firms. For New Zealand firms, we observe that over time more trade is occurring on the ASX, especially from 2009 onwards (in terms of *Daily Trades* and *Daily Volume*). This suggests that the ASX is increasingly becoming a more important market for New Zealand firms in terms of trades. However, relative quoting activity and relative bid-ask spreads remain relatively stable over time. The results for the Australian firms (Panel B) also suggest the NZX is becoming less important. This holds for relative *Daily Trades*, *Daily Volume* and *Bid-Ask Spread*. Only relative *Daily Quotes* do not change over time.

5.2 Price Discovery

One confounding factor in these summary statistics is the issue that firms enter the sample at irregular periods which may affect the statistics reported. Also, trading and quoting location are only some factors that affect competition between exchanges. As such, we next compute our two measures of price discovery, the Gonzalo Granger CS and the Hasbrouck (1995) IS.

In Table 3, we present the average price discovery measures per firm for New Zealand (Panel A) and Australian firms (Panel B). Overall, our results show that the home market is the informationally dominant market, which is consistent with most prior literature. For New Zealand firms, we observe that the NZX provides about 69% of price discovery for the 11 firms over our sample period, using both the CS and IS measures. We observe that price discovery ranges from around 55%-57% (TEL) to 84%-85% (WHS)[58], showing that there is some variation in price discovery across the sample of New Zealand firms.

Panel B shows the price discovery measures for the Australian firms. On average, the ASX has between 78.6% (CS) and 81% (IS) of the price discovery of the Australian firms, suggesting that the ASX is informationally dominant over the NZX on average. As with the New Zealand firms there is some variation across firms. Lion Nathan has about 37-48% of price discovery occurring in the NZX. This may be explained by the fact that it was formed as an amalgamation of both Australian and New Zealand breweries and retains a significant manufacturing presence in New Zealand, which may explain the substantial price discovery occurring on the NZX, before its eventual delisting from both markets as a result of a takeover.

Comparing the respective roles of the foreign markets in Panels A and B supports the earlier summary statistics findings reported in Table 1. For New Zealand firms, we observe that the ASX plays a relatively greater role (around 30%) in the price discovery than the NZX plays for Australian firms (around 20%). However, both foreign markets contribute to price discovery of these dually listed firms.

We next examine the price discovery over time. Figures 1 presents the average NZX price discovery contribution for New Zealand and Australian firms per year. Panel A presents the average Information Share per year, while Panel B presents the average Component Shares per year. Although we observe some fluctuations in price discovery on a year-by-year basis, there is also a very clear trend in price discovery. For New Zealand firms (right scale) we observe a decrease in price discovery from over 90% to around 50% in both graphs. This indicates a marked decline in the contribution of the NZX to the price discovery of cross-listed New

[58]The Warehouse Group de-listed from the ASX in 2012, suggesting that they saw little value in a continued listing.

Zealand firms, and a marked increase in the importance of the ASX. The graphs demonstrate a similar pattern for the Australian firms (left scale). Australian firms demonstrate a marked decline in price discovery occurring on the NZX going from around 35% to around 15%. This indicates that the NZX has become less important for Australian firms.

It is possible that the trends in Figure 1 are driven by the inclusion and removal of firms. In Table 4, we therefore present the New Zealand CS values by firm for each year. While there is some variation between years, the declining importance of the NZX remains apparent. For the New Zealand firms (Panel A), we observe a reduction in the contribution of the NZX to the price discovery for all firms but one firm (AIR). In seven of these cases, the decline is at least 10% over the 15 year period of our study. Furthermore, by 2012 we observe that for three firms (AIA, FBU, and TEL) the ASX is the informationally dominant market. In the case of TEL, less than 10% of the price discovery is occurring on the NZX.

We observe a similar pattern in the New Zealand CS values for the Australian firms (Panel B). With the exception of PPP, all firms experience a reduction in the contribution of the NZX to price discovery, and only PPP has a component share exceeding 10%. This indicates that for Australian firms cross-listed on the NZX, the NZX has lost its relevance for in terms of price discovery.

The apparent decline in the relevance of the NZX is concerning. As discussed above, price discovery offers a relatively robust measure to examine the relative competitiveness between exchanges. Harris et al. (2002) points out that exchanges compete to attract informed traders based on the liquidity and efficiency of the market. The relative contribution to price discovery, in essence, offers a simple way of measuring the relative competiveness of the ASX and NZX. Our findings show that the NZX is losing ground to the ASX for firms that are cross-listed between the two exchanges. The long-term concern is that if this trend continues, it raises questions about the value of the listing on the NZX, not only for Australian but also for New Zealand firms.

5.3 Determinants of Price Discovery

The next question we address is what factors affect the relative contributions of price discovery. Understanding these factors may offer guidance to the areas in which exchanges should seek to improve their competitiveness. We examine the determinants of price discovery by employing pooled OLS regressions. We follow Eun and Sabherwal (2003) and take a logistic transformation of the NZX component share and information shares to ensure the values lie between 0 and 1. We employ a dynamic model, where we include a lag of the price discovery measure. The dynamic model controls for the potential that price discovery is persistent over time, where the current value is driven in part by the previous year's value.

The first set of determinants we employ relate to the location of trading and quoting activity. Eun and Sabherwal (2003) and Hasbrouck (1995) show that location of trading activity, especially volume traded, plays a significant role in determining price discovery. We consider three measures, relative trades, relative quotes and relative volume traded. All three measures are defined as the value for the ASX divided by the value for the NZX; for example relative trades is defined as the number of trades per day on the ASX divided by the number trades per day on the NZX. As such, a relative measure less than 1 would indicate that the NZX has the majority of the activity while greater than 1 would indicate otherwise.

In addition to the location of trading and quoting activity, we also consider the impact of transaction costs. Specifically, we consider the relative bid-ask spread, defined as the average percentage spread on the ASX divided by the average percentage spread on the NZX. For cross-listed securities, informed traders have a choice in which market they choose to exploit their information However, spreads, a cost for trading, imposes a cost on informed traders seeking to exploit their information. Given that the stocks in both markets are identical, an informed trader may choose to trade in the lowest cost market so as to maximise their profit. Harris et al. (2002) demonstrate that the NYSE's share of price discovery increased when its spreads relative to regional exchanges decline.

We further control for two other factors that are likely to influence the relative contributions of the NZX to price discovery. Specifically, we control for the log of the market value of the firm at the end of the year. It is

likely that larger firms would find a more active market in a foreign market and that may influence the relative contributions to price discovery. We also control for time effect by including time dummies to control for any time variation/trends in the price discovery measures.

Table 5 presents the regression results for New Zealand and Australian firms, where we compute robust standard errors by controlling for clustering at the firm level. For the sample of New Zealand firms (Panel A), we observe a strong degree of persistence in the level of price discovery, as shown by the significant positive coefficients for the lag measure in our model. We also find a significant negative relationship with the NZX price discovery measure and *Relative Trades*. This negative relationship indicates that as the NZX's share of the number of trades grows, and so the relative trade measure gets smaller, the NZX's price discovery increases. We further note that *Relative Spread* is positive and significant in three out of four regressions, suggesting that increased spreads on the ASX, or decreased spreads on the NZX lead to a greater level of price discovery on the NZX. Finally, we find that *Relative Volume* becomes significant once we drop *Relative Trades* from the regressions.

In Panel B of Table 5, we report the regression results for the Australian firms. As with the New Zealand firms, we observe strong persistence in the level of the price discovery. In terms of the determinants of price discovery, the results are a bit weaker than for the New Zealand firms. We observe a positive and significant relationship between *Relative Spread* and CS suggesting that higher spreads on the ASX, or lower spreads on the NZX lead to an increase in the price discovery measures for the NZX. We also observe a negative and significant relationship between *Relative Volume* and IS, suggesting that if traded volume increases in the ASX, or decreases in the NZX, the NZX's contribution to price discovery decreases.

6. Conclusion

In this paper, we examine the contributions to price discovery for Australia/New Zealand cross-listed stocks. Using a sample for 11 New Zealand firms cross-listed on the ASX and 8 Australian firms cross-listed on the NZX, we compute yearly Component Shares and Information Shares over the period 1998-2012. Our results show that over this period of time there has been a marked decrease in the NZX's contribution to price discovery both for New Zealand and Australian firms. For New Zealand firms this decline goes from about 90% in 1998 to about 50% in 2012. For Australian firms the decline goes from about 35% to 15%, suggesting that for Australian firms the NZX is almost a pure satellite market. When we examine the determinants of price discovery, we find a strong relationship between relative trades, volume and spread for New Zealand firms. For Australian firms, relative spread and volume seem to be important determinants.

Overall, our findings suggest that improving the NZX's share of the trading in New Zealand companies is necessary to improve the price discovery of these companies and so reverse the trend of declining price discovery. Likewise, efforts to reduce the relative spreads of Australian firms and increase the local share of trading and quoting activity may also allow the NZX to become more relevant to Australian firms and so attract more informed trading.

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APPENDIX A

Ticker	Name	Industry	Year Cross-Listed
Panel A: New Zealand Firms			
AIA	Auckland Airport	Industrial Transportation	1999
AIR	Air New Zealand	Travel and Leisure	1997
FBU	Fletcher Building	Construction and Materials	2001
FPH	Fisher and Paykel Healthcare	Health Care Equipment and Services	2001
NPX	Nuplex	Chemicals	2002
NZO	New Zealand Oil and Gas	Oil and Gas Producers	1991
SKC	Sky City Entertainment	Travel and Leisure	1999
SKT	Sky TV Network	Media	2000
TEL	Telecom	Fixed Line Telecommunications	1991
TWR	Tower	Life Insurance	1999
WHS	Warehouse Group	General Retailer	2000
Panel B: Australian Firms			
AMP	AMP	Life Insurance	1998
ANZ	ANZ Bank	Banks	2004
APN	APN News and Media	Media	1991
GFF	Goodman Fielder	Food Producers	2005
PPP	Pan Pacific Petroleum	Oil and Gas Producers	2002
TLS	Telstra Corporation	Fixed Line Telecommunications	1997
WBC	Westpac Bank	Banks	1997
LNN	Lion Nathan	Beverages	1986

Table 1: Summary Statistics

	Daily Trades			Daily Quotes			Daily Volume			Bid-Ask Spread		
	NZX	ASX	NZX/ASX	NZX	ASX	NZX/ASX	NZX	ASX	NZX/ASX	NZX	ASX	NZX/ASX
Panel A: New Zealand Firms												
AIA	102.94	8.63	11.93	785.48	51.25	15.33	1,283,835	43,289	29.66	0.5375	4.1345	0.13
AIR	50.05	15.86	3.16	358.79	37.11	9.67	954,768	146,223	6.53	1.3002	2.4901	0.52
FBU	146.70	293.10	0.50	1,346.88	972.52	1.38	1,430,482	282,854	5.06	0.3994	1.9247	0.21
FPH	74.74	15.10	4.95	654.68	63.59	10.30	820,405	45,338	18.10	0.6381	2.3929	0.27
NPX	45.25	10.19	4.44	498.68	39.37	12.67	245,233	35,043	7.00	0.8600	5.1975	0.17
NZO	27.69	10.05	2.76	285.80	33.57	8.51	274,368	50,330	5.45	3.5392	5.0985	0.69
SKC	95.50	28.39	3.36	711.25	124.17	5.73	966,278	70,581	13.69	0.5055	3.7607	0.13
SKT	46.67	4.73	9.87	517.80	50.64	10.23	406,663	31,985	12.71	0.8084	6.7679	0.12
TEL	227.80	414.99	0.55	1,373.01	1,184.54	1.16	8,171,828	2,091,375	3.91	0.3475	0.7699	0.45
TWR	47.34	57.45	0.82	305.91	149.56	2.05	487,647	236,470	2.06	0.9135	1.7517	0.52
WHS	63	5.09	12.38	3,11.511	26.22	11.88	404,602	11,001	36.78	0.6063	4.0977	0.15
Average	84.33	78.51	4.97	649.98	248.41	8.08	1,404,191	276,771	12.81	0.95	3.49	0.31
Panel B: Australian Firms												
AMP	57.98	1972.08	0.03	395.13	4,700.79	0.08	139,178	4,915,832	0.03	1.4558	0.4690	3.10
ANZ	2168.09	4077.89	0.53	6,347.43	1,1125.7	0.57	2,363,268	4,366,166	0.54	1.5019	0.2504	6.00
APN	2.32	632.46	0.00	248.62	2,064.95	0.12	95,007	1,070,037	0.09	7.9423	1.0425	7.62
GFF	11.08	1164.19	0.01	238.04	3,603.44	0.07	287,871	5,243,690	0.05	2.5251	0.6182	4.08
PPP	6.14	28.26	0.22	111.51	71.41	1.56	195,647	539,558	0.36	5.1579	3.5145	1.47
TLS	16.85	2597.92	0.01	229.26	5,568.73	0.04	403,923	24,964,134	0.02	1.4393	0.4995	2.88
WBC	18.92	6696.66	0.00	1,240.03	1,9674.5	0.06	188,637	5,536,412	0.03	1.7711	0.1834	9.66
LNN	15	408.82	0.04	312.79	1,191.82	0.26	448,735	732,680	0.61	2.1592	1.1948	1.81
Average	287.05	2197.29	0.10	1,140.35	6,000.17	0.35	515,283	5,921,063	0.22	2.99	0.97	4.58

This table reports summary statistics for the full sample period, January 1998 to December 2012. *Daily Trades* is the average number of trades per day, *Daily Quotes* is the average number of new quotes per day, *Daily Volume* is the average number of shares traded per day and *Bid-Ask Spread* is the average percentage bid ask spread measured as the difference between the bid and the ask price divided by the midpoint each minute while the respective market is open.

Table 2: Summary Statistics by Per Year Average

	Daily Trades			Daily Quotes			Daily Volume			Bid-Ask Spread		
	NZX	ASX	NZX/ASX	NZX	ASX	NZX/ASX	NZX	ASX	NZX/ASX	NZX	ASX	NZX/ASX
Panel A: New Zealand Firms												
1998	68.84	2.24	*30.73*	50.24	15.22	*3.30*	1,591,501	25,459	*62.51*	3.88	7.43	*0.52*
1999	111.93	31.39	*3.57*	58.01	49.43	*1.17*	1,626,778	110,587	*14.71*	2.30	3.49	*0.66*
2000	81.46	30.85	*2.64*	46.53	48.89	*0.95*	1,219,730	116,296	*10.49*	1.73	6.89	*0.25*
2001	84.16	27.59	*3.05*	53.77	50.85	*1.06*	981,253	134,473	*7.30*	1.17	4.32	*0.27*
2002	78.19	21.00	*3.72*	69.04	49.67	*1.39*	1,142,071	163,208	*7.00*	1.27	3.54	*0.36*
2003	81.35	23.56	*3.45*	87.77	58.74	*1.49*	1,194,510	216,109	*5.53*	1.21	3.11	*0.39*
2004	67.76	27.13	*2.50*	81.26	61.67	*1.32*	1,382,105	243,516	*5.68*	0.79	1.87	*0.42*
2005	79.86	35.90	*2.22*	771.07	101.69	*7.58*	1,355,959	236,570	*5.73*	0.78	2.01	*0.39*
2006	78.21	51.29	*1.52*	982.18	152.88	*6.42*	1,970,764	362,265	*5.44*	0.79	2.26	*0.35*
2007	83.14	70.07	*1.19*	711.31	219.91	*3.23*	1,827,356	318,412	*5.74*	0.73	3.22	*0.23*
2008	88.85	90.30	*0.98*	917.66	298.64	*3.07*	1,855,738	390,599	*4.75*	1.07	5.58	*0.19*
2009	84.31	133.36	*0.63*	935.06	440.37	*2.12*	1,872,944	395,701	*4.73*	0.95	4.07	*0.23*
2010	79.11	138.90	*0.57*	864.60	478.10	*1.81*	1,676,703	453,627	*3.70*	0.66	1.79	*0.37*
2011	128.86	226.77	*0.57*	1,385.32	731.62	*1.89*	2,030,003	631,104	*3.22*	0.72	2.05	*0.35*
2012	137.27	220.22	*0.62*	1,493.53	700.40	*2.13*	1,959,430	453,727	*4.32*	0.73	2.57	*0.28*
Panel B: Australian Firms												
1998	266.14	868.09	*0.31*	196.93	969.58	*0.20*	1,168,685	3,308,830	*0.35*	0.89	0.71	*1.25*
1999	145.45	702.08	*0.21*	142.85	764.80	*0.19*	604,047	2,335,937	*0.26*	0.95	0.63	*1.51*
2000	119.01	708.57	*0.17*	122.01	714.06	*0.17*	641,544	3,129,549	*0.20*	1.00	0.89	*1.12*
2001	130.81	888.14	*0.15*	162.07	860.71	*0.19*	636,053	4,917,110	*0.13*	0.97	0.56	*1.73*
2002	149.66	902.81	*0.17*	237.44	1,222.89	*0.19*	601,060	6,388,217	*0.09*	1.05	0.51	*2.06*
2003	152.29	867.34	*0.18*	252.47	1,229.75	*0.21*	531,397	5,634,382	*0.09*	2.64	2.08	*1.27*
2004	104.88	623.41	*0.17*	185.93	918.43	*0.20*	352,643	4,131,812	*0.09*	2.12	1.24	*1.71*
2005	117.08	864.19	*0.14*	1,178.84	1,363.64	*0.86*	746,110	8,571,842	*0.09*	2.24	0.99	*2.26*
2006	155.92	1057.14	*0.15*	1,880.98	1,852.57	*1.02*	347,381	6,034,475	*0.06*	2.24	0.86	*2.60*
2007	251.92	1590.99	*0.16*	707.60	3,589.86	*0.20*	425,187	5,535,464	*0.08*	2.88	0.73	*3.95*
2008	523.75	3268.12	*0.16*	1,869.24	8,289.97	*0.23*	718,405	8,119,263	*0.09*	5.07	1.16	*4.37*
2009	568.92	3539.64	*0.16*	1,704.07	10,271.27	*0.17*	766,810	9,124,730	*0.08*	4.23	0.89	*4.75*
2010	742.81	4202.09	*0.18*	2,597.85	13,386.47	*0.19*	723,314	9,890,798	*0.07*	3.46	0.59	*5.86*
2011	842.82	4840.53	*0.17*	3,178.07	16,409.22	*0.19*	801,083	10,607,005	*0.08*	3.66	0.76	*4.82*
2012	807.72	4510.94	*0.18*	2,605.41	13,307.73	*0.20*	660,371	8,564,564	*0.08*	2.99	0.85	*3.52*

This table reports summary statistics for the full sample period, January 1998 to December 2012, averaged by home country. *Daily Trades* is the average number of trades per day, *Daily Quotes* is the average number of new quotes per day, *Daily Volume* is the average number of shares traded per day and *Bid-Ask Spread* is the average percentage bid ask spread measured as the difference between the bid and the ask price divided by the midpoint each minute while the respective market is open.

Table 3: Price Discovery Measures per Firm

	NZX			ASX				
	IS Upper	IS Lower	IS Midpoint	IS Upper	IS Lower	IS Midpoint	CS^{NZX}	CS^{ASX}
Panel A: New Zealand Domiciled Firms								
AIA	72.60	68.52	*70.56*	31.48	27.40	*29.44*	68.55	31.45
AIR	65.23	60.33	*62.78*	39.67	34.77	*37.22*	59.80	40.20
FBU	66.64	60.97	*63.80*	39.03	33.36	*36.20*	66.34	33.66
FPH	73.86	63.45	*68.65*	36.55	26.14	*31.35*	69.50	30.50
NPX	76.89	61.47	*69.18*	38.53	23.11	*30.82*	72.32	27.68
NZO	77.95	77.10	*77.53*	22.90	22.05	*22.47*	74.61	25.39
SKC	76.74	64.09	*70.42*	35.91	23.26	*29.58*	72.21	27.79
SKT	82.90	66.60	*74.75*	33.40	17.10	*25.25*	77.03	22.97
TEL	61.00	52.88	*56.94*	47.12	39.00	*43.06*	55.10	44.90
TWR	65.85	61.15	*63.50*	38.85	34.15	*36.50*	67.04	32.96
WHS	89.63	79.88	*84.76*	20.12	10.37	*15.24*	83.33	16.67
Average	73.57	65.13	*69.35*	34.87	26.43	*30.65*	69.62	30.38
Panel B: Australian Domiciled Firms								
AMP	14.52	2.73	*8.62*	97.27	85.48	*91.38*	10.04	89.96
ANZ	35.39	3.08	*19.23*	96.92	64.61	*80.77*	15.00	85.00
APN	25.26	13.21	*19.24*	86.79	74.74	*80.76*	27.11	72.89
GFF	13.41	11.10	*12.26*	88.90	86.59	*87.74*	16.12	83.88
PPP	37.43	36.81	*37.12*	63.19	62.57	*62.88*	48.01	51.99
TLS	9.16	5.80	*7.48*	94.20	90.84	*92.52*	11.23	88.77
WBC	33.52	0.99	*17.25*	99.01	66.48	*82.75*	6.90	93.10
LNN	38.52	23.61	*31.07*	76.39	61.48	*68.93*	36.81	63.19
Average	25.90	12.17	*19.03*	87.83	74.10	*80.97*	21.40	78.60

We report the average of the per year estimates of the two price discovery measures.

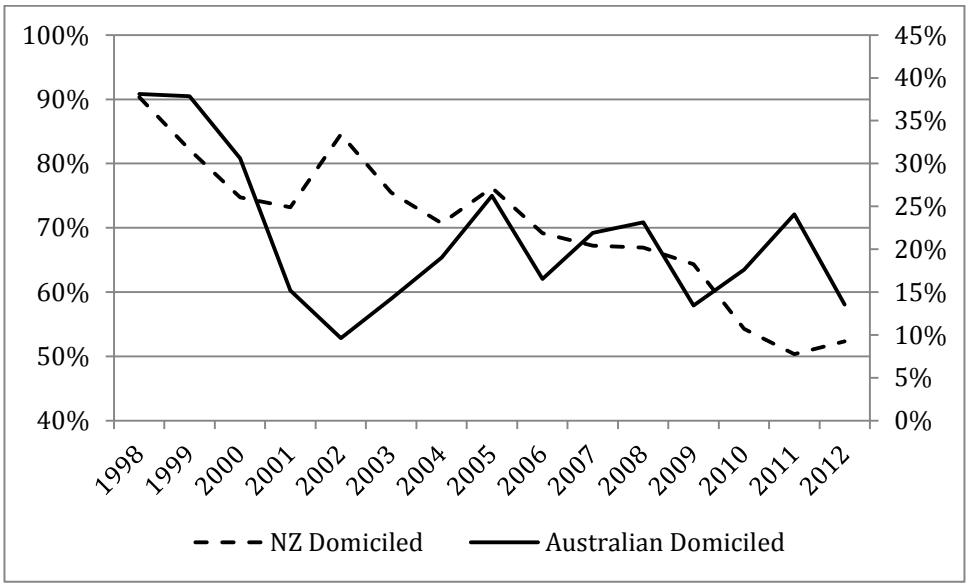
Table 4: Per Year New Zealand Component Share Estimates

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Panel A: New Zealand Domiciled Firms															
AIA			82.46	89.07	86.85	94.18	83.75	73.00	68.87	79.95	72.17	57.99	42.87	27.50	32.55
AIR				45.73	56.61	59.04	52.06	63.26	58.37	63.61	70.01	79.17	63.04	53.75	52.98
FBU				86.88	96.48	81.86	83.34	75.55	71.71	70.60	65.58	63.17	53.19	27.06	20.65
FPH				64.62	73.38	61.83	72.48	83.82	78.64	80.14	73.90	69.27	66.13	54.67	55.19
NPX							92.87	76.85	79.26	66.96	79.51	56.47	66.30	68.76	63.86
NZO	88.43	75.73	80.53	80.55	79.05	66.08	74.48	84.40	76.44	69.56	78.37	73.24	58.34	65.32	68.58
SKC			63.80	64.85	91.96	99.31	86.16	81.77	79.40	83.89	74.31	74.70	44.38	37.15	57.11
SKT									77.49	77.97	85.71	86.79	78.81	64.33	68.13
TEL	86.91	85.18	79.17	75.30	73.19	70.86	62.05	68.36	63.98	45.97	28.43	18.43	3.15	20.29	9.23
TWR		78.42	73.07	71.52	81.10	66.95	63.68	61.74	42.90	46.56	71.78	74.03	70.70	71.15	64.91
WHS				90.37	87.05	89.34	83.30	83.26	76.23	81.22	75.90				
Panel B: Australian Domiciled Firms															
AMP	37.64	19.01	22.13	19.20	16.67	3.71	11.11	2.31	4.83	1.18	7.53	0.28	0.98	4.29	2.70
ANZ	18.49	22.22	26.07	24.99	25.90	15.88	9.78	19.08	14.25	9.37	10.17	3.65	11.48	6.30	7.44
APN							31.22	27.93	26.58	54.43	51.83	14.82	13.60	19.20	4.34
GFF								79.67	15.48	11.44	5.75	15.75	22.44	11.17	9.29
PPP						48.34	56.39	50.44	51.26	46.06	41.22	37.46	33.04	55.72	60.18
TLS	11.97	4.97	4.96	1.68	9.35	9.16	22.53	12.17	11.21	4.57	1.75	0.27	44.31	43.14	5.08
WBC								13.62	11.39	15.83	0.16	3.73	2.66	0.88	6.94
LNN	74.76	80.48	67.48	44.03	31.99	22.28	11.98	13.58	23.15	18.12	19.43	34.40			

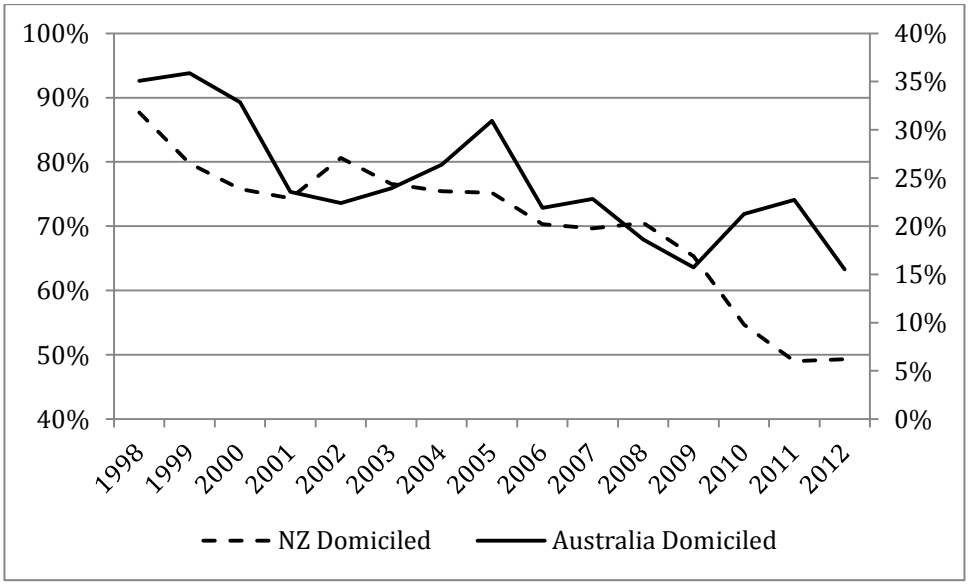
Table 5: Price Discovery Determinants Regressions

Panel A: New Zealand Firms				
	Component Share		Info Share	
Lag Dep.	0.485***	0.568***	0.458***	0.583***
	(7.13)	(5.78)	(5.57)	(5.95)
Rel Trades	-0.343**		-0.530**	
	(-2.37)		(-2.88)	
Rel Quotes	0.150	0.156	0.245	0.205
	(1.13)	(1.10)	(1.33)	(1.27)
Rel Volume	0.288	-1.01**	-0.070	-1.899**
	(0.61)	(-2.05)	(-0.15)	(-2.77)
Rel Spread	0.075**	0.078**	0.049	0.057*
	(2.75)	(2.90)	(1.67)	(1.81)
Market Value	-0.046	-0.141**	-0.001	-0.152
	(-0.60)	(-2.53)	(-0.01)	(-1.74)
Year Dummies	YES	YES	YES	YES
Observations	119	119	119	119
R-squared	0.785	0.761	0.694	0.661
Panel B: Australian Firms				
	Component Share		Info Share	
Lag Dep.	0.307**	0.307**	0.606***	0.621***
	(2.34)	(2.37)	(6.12)	(5.76)
Rel Trades	0.00		0.002	
	(0.00)		(0.89)	
Rel Quotes	-0.008	-0.008*	-0.017*	-0.010*
	(-1.01)	(-2.17)	(-1.94)	(-2.25)
Rel Volume	-0.005	-0.005	-0.008*	-0.005**
	(-0.71)	(-0.72)	(-2.00)	(-2.42)
Rel Spread	0.419***	0.419*	0.050	-0.082
	(3.85)	(2.01)	(0.37)	(-0.97)
Market Value	-0.172	-0.172*	-0.024	-0.047
	(-1.83)	(-2.23)	(-0.25)	(-0.59)
Year Dummies	YES	YES	YES	YES
Observations	84	84	84	84
R-squared	0.632	0.632	0.587	0.583

Figure 1: NZX Price Discover over Time



Panel A: Information Shares



Panel B: Component Shares

The Impact of Holdings Disclosure on Portfolio Performance: A New Perspective

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Abstract

Portfolio holdings disclosure has been a controversial issue for many years; SEC disclosure requirements in the US were relaxed from quarterly to semi-annual in 1985, then in 2004 returned to a quarterly mandate. Even today, some countries do not require holdings to be disclosed, and some are considering changing their laws to make it compulsory. Further, in the US, there are current discussions about whether hedge funds should come under increased scrutiny, and be subject to more disclosure.

Just in the last two years there have been at least a half-dozen papers examining various aspects of the impact of disclosure –front-running, copycat trading, and reporting lag, in addition to the simple return performance differential. Most of these studies have either examined the before and after 2004 SEC rule change, or compare SEC disclosure vs. another disclosure mechanism.

Our study examines two markets where disclosure is not required, but some funds choose to disclose. This affords us a natural experiment to compare funds that disclose with those that do not. We find, contrary to arguments against disclosure, the benefits of disclosure easily outweigh the costs.

Keywords: disclosure, voluntary disclosure, mandatory disclosure, portfolio disclosure, portfolio holdings, fund performance, fund flows, front-running, agency cost, Australia, New Zealand

This research supports the case for introducing mandatory portfolio holdings disclosure regimes in Australia and New Zealand. Of the 22 nations (constituents of the MSCI World Index) surveyed in the 2011 Morningstar Global Investors Report, these are the only two countries that do not require disclosure. Even without compulsory disclosure, some funds do choose to disclose. We examine the potential effects of mandated holdings disclosure on mutual fund returns by using the voluntary holdings disclosures as a proxy for mandatory disclosure.

We find that low-ranked (on abnormal returns) New Zealand funds following the Global Financial Crisis (GFC), and Australian low-rank funds both before and after the Crisis, would have improved performance with mandatory disclosure. In contrast, returns would drop for Australian high-rank funds. This suggests that disclosure may be costly for high-rank funds due to front-running, while it provides benefits for low-rank funds due to the enhanced monitoring abilities of investors.

We also examine whether investors care about disclosure, by measuring fund flows. We find evidence that following the GFC, the importance of transparency has increased for investors in high-rank New Zealand funds, while investors in Australian funds show no preference for disclosure after the Crisis. On balance, we believe the introduction of

mandatory disclosure schemes in Australia and New Zealand would represent a significant advance for the industry and bring benefits to investors.

1. Introduction

The costs and benefits of the disclosure of portfolio holdings have been the focus of longstanding debate among practitioners, regulators, researchers and academics. In unique markets lacking mandatory disclosure but some funds voluntarily disclose, we examine the potential effects of a mandatory portfolio disclosure regime. Disclosure of portfolio holdings refers to a public release of the specific stocks, bonds and other securities which constitute the portfolios of pooled investment vehicles.[59] Australia and New Zealand are the only two nations among the 22 countries surveyed in the Morningstar Global Investor Experience 2011[60] study that do not require mandatory portfolio holdings disclosure. In the Morningstar study, Australia and New Zealand both received the overall grade of D-, at least partly due to lack of disclosure. Our research focuses on the Australian and New Zealand markets and addresses the following three questions for each market:

What factors determine whether a fund voluntarily discloses their holdings?
How does disclosure affect fund returns?
How does disclosure affect net new money flows into mutual funds?

Investors have increasingly employed professional fund managers to administer their savings over the last 30 years, driven by the government-sponsored retirement savings schemes in both New Zealand and Australia. In 2010, the Ministry of Economic Development in New Zealand announced[61] that they would make changes to the governance of KiwiSaver[62] schemes, possibly including the introduction of a mandatory portfolio holdings disclosure regulation. By 11 March 2010 the Ministry had received 65 submissions from industry members, investor advocacy groups, consultants and academics. Interest in introducing disclosure laws has also been raised over the past decade in Australia. The Super System Review[63] (2010) recommends mandatory disclosure of portfolio holdings within 60 days after each six-month reporting period. There are two sides to the debate concerning mandated disclosure.

Arguments supporting mandatory disclosure include the following: first, it would provide more detailed information allowing investors, advisors and trustees to better monitor their investments delegated to professional fund managers. This would help with identification of overlaps in holdings and would improve investors' asset allocation and diversification of their overall portfolios. Second, the increased transparency would enable shareholders to better monitor the compliance of a fund with its stated investment objectives. Third, disclosure would enhance the ability to track whether funds are engaging in portfolio manipulation such as portfolio pumping.[64] Fourth, disclosure would have the side effect of providing more extensive information in support of academic enquiry.

A selection of market participants who are concerned about the potential negatives from a portfolio disclosure regime argue the following: Firstly, it would enable increased front-running[65] by professional investors and speculators. Secondly, it could increase free-riding,[66] thus restricting a fund's ability to fully benefit from its research. Thirdly, there would be direct costs associated with producing and distributing timely and accurate information.

[59] For the purposes of this study disclosure is defined as funds that disclose their portfolio holdings to the fund tracking firm, Morningstar Inc.
[60] The Global Fund Investor Experience Survey is an annual survey undertaking by Morningstar that analyses and contrasts mutual fund marketplaces, highlighting their strengths and weaknesses. The 22 countries surveyed are the constituents of the MSCI World Index at the time of the survey.
[61] This change to be made to KiwiSaver was officially announced by the Officer of the Ministry of Commerce in a cabinet paper entitled "Creating a financial markets authority and enhancing KiwiSaver governance and reporting."
[62] KiwiSaver is New Zealand's government-sponsored voluntary retirement savings scheme.
[63] The Super System Review was commissioned in May 2009 by the Australian Government to review the governance, efficiency, structure and operation of Australia's superannuation system.
[64] Portfolio pumping is the act of bidding up the value of a fund's holdings before the end of a reporting period in order to raise the fund's performance results.
[65] Front-running refers to the practice of outside investors buying (selling) securities in anticipation of buying (selling) trades by the fund.
[66] Free-riding occurs when outsiders are able to observe a fund's investment strategies, allowing them to either copy a fund's holdings or to adopt the investment strategies of the find.

Empirical research regarding the costs of disclosure regimes has investigated the free-riding of investors in the U.S. market by constructing copycat strategies. Frank, Poterba, Shackelford and Shoven (2004) find that disclosure is costly for funds, as copycat funds dilute the ability of the underlying fund to fully exploit their proprietary information. Verbeek and Wang (2010) find that the cost of disclosure is higher for increased disclosure frequency because copycat funds have more information on which to free-ride. Other research based on the U.S. market looks at the effect of disclosure on fund returns and finds that high-performing funds can have their performance impaired by disclosure (Ge and Zheng, 2006; Parida and Teo, 2010).

This study builds on the literature surrounding portfolio disclosure by considering the unique environment in Australia and New Zealand. As some funds provided voluntary disclosure of portfolio holdings during the sample period 2005 to 2010, this provides an opportunity to explore the choice of funds to voluntarily disclose and thereby the potential effects of mandatory disclosure. While this study focuses on the potential effects of mandatory disclosure, it does not examine other important facets of mandatory disclosure regulation such as the lag period allowed following the reporting period and the frequency of disclosure.[67]

2. Literature Review

The mutual fund industry provides a useful platform to examine the effects of disclosure, because the disclosure level and proprietary costs can be readily quantified. Academic interest in the area of disclosure of fund holdings has been prompted by an announcement by the U.S. Securities and Exchange Commission that they would review disclosure requirements for the semi-annual and annual reports provided by mutual funds to their shareholders.[68] In a move toward increased transparency, holdings disclosure regulations were reformed in 2004 after significant consultation. They required that funds report on a more frequent basis -- quarterly (within 60 days after the end of the reporting period) rather than the previous requirement of semi-annual reporting. Despite the heated debate around the disclosure requirements, little empirical evidence has been documented on this issue.

Frequency of Reporting Research

Wermers (2001) provides a well-documented exploration of the potential effects of more frequent portfolio disclosure on mutual fund performance, concluding that the costs of more frequent disclosure would outweigh the benefits. This study cites the largest potential cost as increased opportunities to exploit information on holdings data coupled with fund flow data to “front-run” a fund’s trades, as well as an increased ability for the practice of free-riding by copying a fund’s holdings.

The theory behind front-running is: investors examine changes in fund holdings to infer which securities the fund will purchase and then purchase those stocks before the fund does, thus driving up the price, and vice-versa for sales (Wermers, 2001). Furthermore, investors can couple a fund’s holdings information with fund flow data in order to speculate which holdings will be bought or sold in the event of flows of money into or out of the fund. Such practices would decrease fund returns and harm investors. Wermers claims that more frequent reporting will enable increased

[67] For example, U.S. regulations call for quarterly disclosure within 60 days of the end of the period.

[68] See Paul F Royce, Director, Division of Investment Management, U.S. securities and Exchange Commission, “Remarks Before the Securities Law Procedures Conference [of the] Investment Company Institute,” December 7, 1998, p. 3 (www.sec.gov/news/speech/speecharchive/1998/spch238.htm).

front-running. The length of time over which fund managers typically build or liquidate their positions is essential to evaluate this argument; however, Wermers (2001) fails to draw any conclusions about the timing of transactions.

Frank et al. (2004) argue that most positions can be accumulated or sold in 10 days. This would suggest that front-running would not be a serious issue for either semi-annual reporting or quarterly reporting, as managers would have ample opportunity to perform their trading before or after reporting periods. Wermers, Yao and Zhao (2010) argue that, due to a 60 day delay in reporting in the U.S., front-running is not likely to be an issue, except in cases in which funds take months to purchase or sell a position.

Wermers (2001) also discusses free-riding as a potentially significant cost of more frequent reporting requirements. Outsiders are able to either duplicate a fund's portfolio holdings or perform "reverse engineering" to identify and adopt the proprietary investment techniques and strategies of the fund. Reverse engineering is useful because funds often hold stocks for reasons other than stock selection. More recently, Wermers et al. (2010) developed a model using reported portfolio holdings to predict individual stock returns. They show that this strategy produced a better result than just copying a fund's holdings and is useful to investors when making stock selection decisions. With more frequent disclosure, the accuracy of both mimicking fund holdings and reverse engineering would be improved. This could harm funds by causing prices to move before a fund could fully implement its investment strategy and by encouraging less investment into the fund itself. On the other hand, Ge and Zheng (2006); Frank et al. (2004); and Verbeek and Wang (2010) suggest that funds can benefit from price movements caused by the front-running of their trades. A body of literature examines the so-called copycat funds, as discussed in the next section.

Elton, Gruber, Blake, Krasny and Ozelge (2010) takes a different perspective on the effect of an increased frequency of holdings reporting, examining the changes from an academic perspective rather than Wermers' (2001) examination from an investor's prospective. Elton et al. (2010) revisits four well-known hypotheses in finance to determine whether the results of previous tests remain valid when repeated with monthly rather than semi-annual holdings data. Using a sample of 215 U.S. mutual funds from 1994 to 2005, they examine momentum trading, tax-motivated trading, window dressing and tournament behaviour. The study finds that many of the results of the previous studies are changed and in some cases even reversed, with the use of more frequent holdings data. The study's results show that quarterly holdings data miss, on average, 18.5% of trades that are captured with monthly data. The main shortcoming of Elton et al.'s (2010) work is that the cross section of funds which voluntarily provide monthly disclosure is a non-random sample of the entire group of mutual funds.

Following the implementation in 2004 of the requirement in the U.S. to disclose portfolio holdings on a quarterly basis, Ge and Zheng (2006) and Parida and Teo (2010) extend Wermer's (2001) study by performing qualitative examinations of the effects of the change in reporting frequency. Ge and Zheng (2006) examine: first, which firms choose to report quarterly; second, the effect of the frequency of portfolio holdings reporting on returns; and third, the frequency of portfolio holdings disclosure on flows of money into and out of the funds. They take a sample of U.S. equity funds from 1985-1999 and compare the funds that choose to disclose quarterly with the funds that provide only the mandatory semi-annual reporting of holdings. They find that funds with higher turnover, higher expense ratios and a higher likelihood of committing fraud tend to disclose their holdings less frequently. They find that the skilled funds (measured as the top 20% of past performers) have lower returns when they report more frequently, supporting Wermers' (2001) hypotheses of increased front-running and free-riding. However, for the bottom 20% of funds, return is higher for funds that report quarterly, possibly because of opportunities for increased monitoring of management decisions. They also find more money flowing into poor-performance funds that choose to disclose more frequently, demonstrating investors' preference to monitor those low-performing funds. Like Elton et al. (2010), this study has the shortcoming that the funds which voluntarily disclose quarterly is a non-random sample, conceivably dominated by funds that potentially benefit the most (or suffer the least) from more frequent disclosure. However, it is likely that this bias only makes the results more conservative.

Parida and Teo (2010) addresses the key bias of Ge and Zheng (2006), by using U.S. data before and after the 2004 change in regulation. They also investigate the impact of more frequent mandated portfolio disclosure. Parida and Teo (2010) takes the performance of the funds which disclose semi-annually before 2004 and compare it to their performance after 2004 when they were required to disclose quarterly. They find that, for high performing funds, quarterly disclosure harms fund returns by 17 to 20 basis points a month. Looking further into the results, the reduction in performance is higher for funds with illiquid assets that increased their disclosure frequency after they were compelled to do so with the 2004 regulations. A new type of bias is introduced in this study. The funds that did not disclose quarterly before 2004 are likely to be the funds that would suffer the most from disclosure. By examining only the differences in returns of these funds, the cost of more frequent disclosure is conceivably higher than from a sample of the entire industry. Although the inherent bias of Parida and Teo (2010) and the bias of Ge and Zheng (2006) are in opposite directions, they still find similar results, namely that more frequent disclosure (quarterly) is costly.

Closely related to the frequency of reporting is the lag between the portfolio 'snapshot', and when that is reported. Choi and Chhabria (2012) examine several potential lags, 30, 60, 90 and 120 days. They find that with a lag of 30 days, a copycat portfolio can significantly outperform the underlying portfolio, but with 60 or longer they can not.

Copycat Studies

The theory underlying copycat funds suggests that if the research on an actively-managed fund is valuable in uncovering excess return opportunities, and the copycat fund is able to mimic the holdings of the underlying fund, then the copycat fund should earn equal returns before expenses. The copycat's potential disadvantage in timely access to research findings may be offset, however, by its lower research expenses. Frank et al. (2004) use semi-annually reported holdings of 20 high-expense actively-managed U.S. mutual funds between 1992 and 1999 to construct hypothetical copycat portfolios, mimicking holdings of the underlying funds. Their study took into account fees by estimating the fees of expenses incurred for actively-managed funds and estimating fees for the passive copycat funds. Their work reveals that the returns of the copycat funds were not statistically different, and possibly higher, than those of the underlying disclosing funds. In examining the effects of less frequent disclosure, they find that copycat funds outperform actively-managed funds by more at the 12-month horizon than at the 6-month horizon, probably due to larger cumulative expense charges for the underlying funds. In other words, there appears to be some evidence that investors can profit by free-riding on active funds operating in the market; however, the relatively small sample size of this study should be noted.

Verbeek and Wang (2010) use a larger sample, and examining how the frequency of reporting has affected free-riding. They investigate the performance of free-riding strategies before and after the 2004 regulations for quarterly reporting. They analyse disclosed holdings of 3,046 active U.S. equity funds from 1985-2008, and construct hypothetical copycat funds by duplicating the active funds' disclosed portfolio holdings. They find that the average relative performance of copycat funds increases significantly by 5 basis points per month, after the new regulations. This implies that since 2004 it is easier for outside investors to free-ride on disclosed fund holdings, which might contradict the commission's interest in protecting fund shareholders' welfare.

There are several limitations to copycat studies. The returns of underlying funds could be understated because security purchases by actual copycat funds may drive up the prices of securities held by the underlying fund. Moreover, if active managers know that their funds are being tracked by copycats, they might act to reduce the information content of the disclosure filings. Such actions could raise the standard deviation of the differential between the return on the underlying fund and the return on the copycat. If active managers could earn positive returns as a result of their analysis and could conceal some holdings with window dressing, such trading could increase the return differential between the copycat fund and the underlying fund, although it could also increase the expenses of the underlying fund.

Front-running studies

If an investor can accurately anticipate a fund's trades, and trades ahead of the fund – expecting some price impact when the fund trades – then the 'front-running' trader can earn abnormal profits. If a fund is required to disclose their holdings very close to their actual trades, investors who analyse those holdings might be able to infer the underlying strategy, and then anticipate future trades.

Schwarz and Potter (2012) study fund holdings disclose to the SEC disclosed vs those disclosed thru Thomson. They find front-running unprofitable, and that window-dressing has little impact on returns.

Brown and Schwarz (2011) find abnormal trading volume around, and abnormal positive returns after disclosure dates. They also find suggestive evidence of short-term profits to front-running, but find no evidence of return benefit to long-term investors.

Hedge Fund Industry

Hedge funds offer another platform to determine the value of disclosing portfolio holdings. Brown and Schwartz (2011) and Shi (2010) examine free-riding by focusing on hedge funds. When the assets of a hedge fund exceed $100 million, the fund is required by the SEC to file 13F forms reporting some of their quarterly holdings within 45 days after the end of each quarter (Shi, 2010). The study uses a sample of 4,024 U.S. hedge managers reporting over the period 1977 to 2010, during which 414 managers have filed form 13F at least once. The performance of the funds in the periods they disclose is compared with their performance in the periods in which they did not disclose. Shi (2010) provides evidence that disclosure harms hedge fund performance by about 4% per annum. These findings are supported by Argon, Hertzel and Shi (2011) and by Agarwal, Jiang, Tang and Yang (2011) who demonstrate that hedge funds request confidential treatment to delay 13F disclosure of their profitable ideas.

In contrast, Brown and Schwartz (2011) finds that 13F filings are, if anything, positive for hedge funds. Using the filing events of U.S. hedge funds from 1999 to 2006, they are one of the only studies to investigate whether market participants use mandatory portfolio holdings to make investment decisions. They find evidence of unusual trading behaviour around the filing day, in particular that the excess returns of the disclosed securities spike on the day of filing and immediately after the filing date, indicating that investors do in fact implement a copycat strategy. However, they find that investors cannot profit from copying strategies in the long term.

Australasia Research

Research from Australia and New Zealand in the field of portfolio holdings disclosure is limited. Folwer, Grieves and Singleton (2010) take a different approach and look at the accuracy of information currently provided to investors in New Zealand. They find some evidence that mandatory disclosure may benefit investors. They study the styles of active New Zealand fund managers using fund returns from 1999 to 2006. They examine characteristics of the funds' returns to determine whether managers are investing in securities that accurately represent their stated investment objectives. Fowler, Grieves and Singleton (2010) find evidence that New Zealand fund managers deviate from their stated investment objectives, with equity-orientated funds providing returns that are significantly different from equity returns. This in turn suggests that opportunities for investors to appropriately diversify are impaired, because of a lack of information about the asset allocation of the fund. The study's findings offer support for a mandatory requirement for New Zealand funds to disclose their holdings and thus better serve the needs of investors.

Gallagher (2007) examines the case for requiring mandatory portfolio holdings disclosure in Australia in a qualitative study. In line with Fowler et al. (2010), he also offers support for the case of mandatory disclosure of portfolio holdings, and determines that holdings data would enable suitable performance measurement by researchers and industry analysts by allowing them to analyse trading activity. Gallagher (2007) outlines the potential benefits and costs of portfolio disclosure, and focuses on encouraging a more transparent system in Australia. Although Gallagher acknowledges the costs of more frequent disclosure, as noted by Wermers (2001), he nevertheless argues that more rigorous standards are required to better serve the needs of investors.

Literature Review Conclusion

On the whole, disclosure has received much attention and encompasses a wide-ranging spectrum of various industries. Mandatory disclosure has important socially beneficial outcomes, particularly in the areas of health and safety. However, if not well-designed and implemented, the rules can be gamed, resulting in negative outcomes. Voluntary disclosure models centre mainly on the field of accounting; they identify key factors that drive management's disclosure decisions, in particular that costs are an important variable in such decisions.

Disclosure in a mutual fund setting is especially related to our research. Studies generally show that mandated requirements for more frequent disclosure (quarterly instead of semi-annually) can decrease high-performing funds' returns, but increase low-performing funds. The few studies in New Zealand and Australia offer support for some type of disclosure regime. Researchers argue that investors would be better informed and that academic enquiry would be improved.

Despite the debate in Australasia over what disclosure regulations are needed, little empirical research has been documented around the issue. While Ge and Zheng (2006) and Parida and Teo (2010) look at the U.S. case of voluntary disclosure decisions regarding funds, it appears that no similar research has been performed in New Zealand or Australia. The market in Australasia, particularly in New Zealand, is smaller and less liquid than the U.S. market, meaning costs of front-running could potentially be higher.

The fact that during the sample period some funds provide portfolio holdings on a voluntary basis and others do not, provides a unique setting to examine the effects of disclosure. To the best of our knowledge, this is the first paper to examine the potential effects of mandatory disclosure in the New Zealand and Australia markets. This research is designed to give policy makers additional information when considering regulatory decisions about the disclosure of portfolio holdings. It also addresses a gap in front-running research. The front-running literature has focused on the agents who front-run or on profits accruing from hypothetical front-running strategies. Our study complements these models by providing some empirical evidence on the impact of front-running on mutual funds.

3. Potential Effects of Mandatory Disclosure

This study investigates the potential effects of mandatory disclosure. We conjecture that if a fund is required to disclose its portfolio holdings, it will be more exposed to activities such as front-running. This cost will lead to inferior performance compared to a fund that does not disclose. On the other hand, agency costs might decrease in funds that disclose their holdings because fund shareholders will be better able to monitor fund activities.

Ge and Zheng (2006) and Parida and Teo (2010) identify one of the potential costs of disclosure as the "information effect". Disclosure of the securities which a fund holds exposes a fund's proprietary information to the public, as it exposes the identity of securities held by a fund. Disclosure limits the time frame over which fund managers are able to reap the benefits of their research, because other investors may use the disclosed holdings to anticipate future trades by the fund and trade on this information. Such front-running on the research of funds can potentially lower fund returns by moving security prices before a fund can fully implement its strategy. On the other hand, free-riding activities may drive up the prices of securities the fund holds due to investors copying their holdings, thus increasing demand for the securities. This could have a positive effect on fund returns. On balance, we expect the information effect will have a negative impact on fund returns.

Another potential effect of disclosure is the "agency effect" (Ge & Zheng, 2006; Parida & Teo, 2010). More transparency could lessen agency costs by allowing regulators and investors to have more insight into fund activities; this would thus deter funds from engaging in activities that are not in the best interest of investors. In sum, the higher the costs are to the agency, the more potential benefits that will be derived from disclosure.

The effect of free-riding on fund returns, identified as the "price-effect" (Ge & Zeng, 2006), is not obvious. Free-riding will be costly if it causes the price to move before the fund can fully benefit from its research. On the other hand, disclosure may increase demand for the securities the fund holds, driving up prices and thereby raising fund returns.

4. Hypothesis Development

The purpose of this research is to assess the potential impact of a mandatory disclosure regulation by addressing three key questions:

What factors determine whether a fund discloses their holdings?
How does disclosure affect mutual fund performance?
How does disclosure affect net new money into mutual funds?

In this section, hypotheses are outlined for each of the key research questions.

Characteristics of Funds that Disclose

Given that the funds which choose to disclose are likely to be the funds which suffer least from disclosure, we can make some predictions about the characteristics of funds that voluntarily disclose. With regard to a fund's net assets having an effect on its disclosure choice, there are two theories. Funds with higher net assets could cause larger price movements when they buy and sell shares due to the larger scale of their trades. Investors engaged in front-running will therefore be more interested in funds with larger net assets, leaving large funds more exposed to front-running. This would create a disincentive for funds with higher net assets to disclose. On the other hand, the economies of scale experienced by large funds may mean that on a percentage basis the direct costs of disclosure, such as the systems as dissemination costs, may be less of a burden for larger funds. This in turn suggests that larger funds would be more likely to disclose.

For the characteristic of standard deviation, if a fund's return patterns show a high standard deviation, the fund could be investing in assets outside of their stated objective and therefore would not choose to disclose holdings. The findings of Fowler et al. (2010) offer evidence that New Zealand equity funds make investments outside of their investment objectives. They show funds which advertise that they invest in equities perform as if 16 to 33 percent of their funds were instead invested in fixed interest instruments. We expect a negative relationship between expense ratio and voluntary disclosure. Prior research indicates that expense ratio is a measure of agency costs. Del Guercio, Dann and Partch (2002) and Tufano and Sevick (1997) provide evidence that effective boards are associated with lower fund expenses. Consistent with the agency effect, funds that have higher expenses would be less likely to disclose. These proposed effects lead to the following hypotheses:

Hypothesis 1: Funds with higher net assets are less likely to voluntarily disclose.
Hypothesis 2: Funds that are older are less likely to choose to disclose.
Hypothesis 3: Funds that have returns with higher standard deviation are less likely to disclose.
Hypothesis 4: Funds with higher expense ratios are less likely to disclose.

Effect of Disclosure on Fund Returns

The information effect suggests that disclosure is negatively related to fund performance, while the agency hypothesis is just the opposite, having the effect of increasing returns. To investigate which effect is the most powerful, the funds are categorised into high-rank, mid-rank and low-rank funds. High-rank funds are the 20 percent of funds with the highest adjusted performance over the previous six months, while low-rank funds are the 20 percent of funds with the lowest performance over the same period. Mid-rank funds are the 60 percent of the funds with middle performance over the previous six months. In line with Ge and Zheng (2006), we propose that high-rank funds have more proprietary information than the low-rank funds, therefore they will be harmed more by disclosure.

The same may not be true for low-rank funds. Less monitoring by the investors owing to the lack of disclosure might lead the managers in poorly managed funds to indulge in value-destroying activities. The agency cost might outweigh some or all of the benefits accrued from less exposure to activities such as front-running. For mid-rank funds, we suggest that both the information effect and the agency effect take place, with neither dominating. In light of these considerations, we make the following hypotheses:

Hypothesis 5: Disclosure will have a detrimental effect on the performance of successful funds.
Hypothesis 6: Disclosure will have a neutral effect on the performance of mid-rank funds.
Hypothesis 7: Disclosure will have a positive effect on the performance of unsuccessful funds.

Effect of Disclosure on Fund Flows

Timely disclosure of portfolio information may help investors to make better investment decisions and to monitor funds more closely. As a result, some investors might attach substantial value to frequent disclosure. Since investors vote with their money, we believe that funds which voluntarily disclose will experience more inflows of money as outlined in hypothesis 8:

Hypothesis 8: Funds which disclose will attract higher flows than funds that do not disclose.

5. Data and Methodology

Data

The data were obtained from the Morningstar database. To the best of our knowledge, this is the only database that records disclosed holdings of Australian and New Zealand funds. The Morningstar database records holdings that have been voluntarily disclosed proactively by the fund. Additionally, on an ad-hoc basis, Morningstar makes holdings requests directly to selected funds. This introduces a potential bias, because we do not have information regarding for which funds holdings data was requested by Morningstar, and therefore, we do not know for which funds holdings were requested but declined. Despite this bias, the disclosed holdings reported by Morningstar is the most comprehensive record that is available in New Zealand and Australia to measure holdings disclosed to the public.

The final sample spans the period February 2005 to December 2010. Prior to 2005, Morningstar did not record portfolio holdings. In total, the samples (of funds having at least 1 holdings disclosure) encompass 1,920 Australian funds and 72 New Zealand funds. Survivorship bias is eliminated by using data from both alive and dead funds.

The sample uses equity funds by excluding funds that have the following category codes in the Morningstar database: bond funds, hedge funds, and balanced funds. The sample also excludes any index funds because they should not be exposed to the same extent by free-riding or front-running. The New Zealand sample excludes any funds that are not portfolio investment entities.[69] Finally, any fund in which there are less than two consecutive years of returns data is excluded. Funds that invest in international shares are included to maintain a reasonable sample size.

Methodology

This section explains the methodology adopted in this research report and how it was implemented. The methodology is based on Ge and Zheng's (2006) approach. The study addresses three important questions:

What factors determine whether a fund discloses their holdings?
How does disclosure affect mutual fund performance?
How does disclosure affect net new money into mutual funds?

[69] A portfolio investment entity is a fund that is eligible to pay tax on investment income based on the prescribed investor rate of their investors, rather than at the entity's tax rate.

The key methodology used in this research is a multiple regression analysis based on one sample from Australia and one sample from New Zealand. The primary reason for using a regression analysis is that it is a relatively straightforward and effective method of testing for relationships between the explanatory variables and the dependant variables. Each regression is performed separately for Australian and New Zealand samples. Regressions included panel regressions in order to encompass both firm effects and time effects. Petersen (2009) warns that panel data is frequently mistreated. In the presence of both firm effects and time effects, we follow the study's advice and address each effect separately. The time effect is dealt with by including time dummies. The firm effect is mitigated by using clustered standard errors, which are White standard errors adjusted for possible correlation within a cluster. Petersen (2009) finds that White standard errors are unbiased, as they account for the residual dependence created by the firm effect. As a robustness check, the panel data regression results are checked against the regression results of 2010 data.

Our regression analysis method is aligned with the method employed by Ge and Zheng (2006). The output will loosely take the form of the following function:

Dependant Variable (e.g., Fund Return) = Constant + Independent Variables

The specifications for the regressions for each key research question will be discussed in the following sections.

Characteristics of Funds that Voluntarily Disclose

A logit regression is used to analyse the characteristics of funds that voluntarily disclose, in line with Ge and Zheng (2006). A logit regression was employed instead of an OLS regression to deal with the binary nature of the dependant variable. The regression equation employed is as follows:

$$Prob(Voluntary\ Disclosure_{it}) = \beta_0 + \beta_1 Logtna_{i,t-1} + \beta_2 Logage_{i,t-1} + \beta_3 Stddev + \beta_4 Expense_{i,t-1}$$

The dependant variable, voluntary disclosure, is defined as a dummy variable, taking the value of one if the fund provides at least one voluntary disclosure during each semi-annual time period[70] and zero if it provides no holdings disclosure during the same period. Logtna is the natural logarithm of the total net assets at the end of each semi-annual period. Logage is taken as the natural logarithm of the number of days since inception. Stddev is measured as the standard deviation of the previous 12 monthly adjusted fund returns. A minimum of six previous monthly market-adjusted fund returns is required for the calculation. It is prudent to use adjusted fund returns rather than raw fund returns to ensure that a like-to-like comparison is being drawn. Adjusted returns are calculated as follows:

Adjusted fund return = monthly fund return – Morningstar benchmark return

The Morningstar Benchmark was selected for use because it is the least subjective measurement available. Morningstar assigns a benchmark to a fund when it is added to the database by reviewing the fund's holdings (if available) along with its investment objective. The benchmarks are reviewed on an intermittent basis by Morningstar and are updated if the benchmark has changed due to a modification in approach by the fund manager. The database does not provide a record showing which funds have had benchmark changes over time. However, the use of the most recent Morningstar benchmark is not considered a significant bias, as this study only spans five years, and thus not a significant length of time to have changes in investment policies. Using the NZX50 as a blanket benchmark across all funds was considered; however, this approach could introduce significant bias because many funds invest in markets other than New Zealand. Ge and Zheng (2006) offer no insight into the choice of benchmark from which to calculate adjusted returns.

[70] A semi-annual time period was selected because according to the Morningstar submission to the New Zealand Ministry of Economic Development for the Periodic Reporting Regulations for Retail KiwiSaver Schemes, semi-annual disclosure is the minimum standard for global best practice disclosure regimes

Expense is defined as the management expense ratio, including all operating expenses such as recordkeeping; custodial services; taxes; legal expenses; and accounting fees. A fund's trading expenses are not included in the management expense ratio. This data was only available from Morningstar for 2010. A separate regression was performed using only data from 2010 so that the expense variable could be examined.

All explanatory variables were lagged by one six-month time period. Ge and Zheng (2006) considered two additional independent variables that we could not include: turnover ratios and whether the fund was being investigated for fraud. Turnover ratios indicate how often a fund trades, and can be used as a proxy for the amount of private information possessed by a fund, assuming that trades are based on information. It would be interesting to use turnover ratios as a proxy to measure whether funds with more private information are less likely to voluntarily disclose their holdings. This study does not use turnover ratios as an explanatory variable due to a lack of available data. Given that many funds do not disclose portfolio holdings, the turnover ratio is unable to be estimated.

Ge and Zheng (2006) also looked at the likelihood of committing fraud, measured as whether a fund is currently under investigation for fraud by the SEC. Unfortunately, the securities commissions in both Australia and New Zealand were unwilling to provide information about which funds are under investigation, so fraud could not be examined in this study.

A potential bias in the pooled-logit estimate is found in the possibility that funds may follow the same disclosure policy over time, which may be due to the costs of changing policy. In one regression, we include a lagged disclosure variable to control for the stickiness of the disclosure policy.

Effect of Disclosure on Fund Returns

An OLS regression is used to analyse the characteristics of funds that voluntarily disclose, in line with Ge and Zheng (2006). Time dummies were used for all regressions to control for time-series trends. The regression equation is specified as follows:

$$Excess\ Return_{i,t} = \beta_0 + \beta_1 Lowrank_{i,t-1} + \beta_2 Highrank_{i,t-1} + \beta_3 Disc * lowrank_{i,t-1} + \beta_4 Disc * midrankK_{i,t-1} + \beta_5 Disc * highrank_{i,t-1} + \beta_6 Expense_{i,t-1} + \beta_7 Stddev_{i,t-1} + \beta_8 Logtna_{i,t-1} + \beta_9 Logage_{i,t-1}$$

The dependant variable, excess return, measures the average monthly excess return, defined as the return less the benchmark return during each semi-annual period. The benchmark is the Morningstar Benchmark (discussed in the previous section). We do not use the Fama and French (1992) three-factor model or the Cahart (1997) four-factor model measures of return, in line with Ge and Zheng (2006) and Parida and Teo (2010) because these measures are only applicable to the U.S. market with factors not available for Australia and New Zealand.

Disc is defined as a dummy variable, taking on the value of one if a fund provides quarterly disclosure during the semi-annual period and zero otherwise. Lowrank, Midrank and Highrank are dummy variables, each equal to one if a fund's adjusted performance for the semi-annual period belongs to the bottom quintile, the 2nd to the 4th quintiles, and the top quintile respectively. It otherwise takes a value of zero. Past performance is calculated for each semi-annual period based on the monthly excess return (as defined above) over the past 12 months. Ge and Zheng (2006) and Parida and Teo (2010) use alternative measures of adjusted performance, such as Fama and French's (1993) three-factor abnormal returns and the Carhart (1997) four-factor abnormal returns. These market-adjusted returns are not applicable to our sample because we include funds that invest in both domestic and international securities. For example, it would not make sense to compare a benchmark return of all Australian funds with the returns of a fund that invests in international, e.g., U.S., securities. The Fama and French (1993) and Carhart (1997) models cannot be used in our study, as factors are not available for New Zealand and Australia.

The control variables are Expense, Std dev, Logtna and Logage and have the same definition as in the previously-described logit model. The coefficients of interest are Disc*lowrank, Disc*midrank and Disc*highrank. All independent variables are lagged by one time period and we use White's panel-corrected standard errors, which adjust for heteroskedasticity and auto correlation.

If disclosure frequency is determined by regulatory requirements exogenous to the fund, then a causal link between regulation and disclosure of could be expected. However, in this study the absence of regulation means that disclosure decisions are determined internally by the fund. Despite this, a statistical association between the two can still be expected (Ge & Zheng, 2006; Parida & Teo, 2006). In either case, the performance difference between the funds of different investment skills would provide empirical support for the potential effects of frequent disclosure.

Effect of Disclosure on Fund Flows

An OLS regression is used to analyse the fund flows of funds that voluntarily disclose, in line with Ge and Zheng (2006). Time dummies were used for all regressions to control for time-series trends. The regression equation is specified as follows:

$$Fund\ Flow_{i,t} = \beta_0 + \beta_1 \text{Lowrank} + \beta_2 Highrank_{i,t-1} + \beta_3 Disc * lowrank_{i,t-1} + \beta_4 Disc * midrank_{i,t-1} + \beta_5 Disc * highrank_{i,t-1} + + \beta_6 Stddev_{i,t-1} + \beta_7 Logtna_{i,t-1} + \beta_8 Logage_{i,t-1}$$

Fund flow measures the amount of money being put into a fund over a six-month horizon. Following Gruber (1996) and Zheng (1999), we calculate fund flows as a percentage of the beginning-of-period total net assets (TNA).

$$Fund\ flow = \frac{TNA_{i,t} - TNA_{i,t-1}\ (R+1)}{TNA_{i,t-1}}$$

Each of the independent variables is explained in section 3.1.1 and 3.1.2, including Lowrank and Highrank in the regression acts as a control for the well-documented non-linear relationship between performance and fund flows (Chavalier & Ellison, 1997; Surri & Tufano, 1998). We include the control variables: short term volatility of a fund; fund size; age; and total expenses as independent variables, as in Barber, Odean and Zheng (2005). The primary variable of interest is the disclosure indicator (Disc). If investors value disclosure, we should find a positive coefficient on Disc.

6. Results

Determinants of Disclosure Decisions

In this section, we examine the relationship between fund characteristics and disclosure patterns to determine which fund characteristics are associated with voluntary disclosure. The determinants of a fund's disclosure choice provide insight into the potential effects of a mandated portfolio disclosure regime.

Descriptive Statistics

To examine the determinants of disclosure frequency, we begin by presenting basic descriptive statistics for the data apportioned as to whether the fund provides voluntary disclosure. Tables 1 and 2 provide a statistical comparison of funds that disclose with funds that do not disclose. In Table 2, Panels A and B represent the Australian sample, while Panels C and D represent the New Zealand sample. We report the following fund characteristics: standard deviation; total net assets; fund age; and expense ratios, and compare each of these characteristics based on a fund's disclosure choice. We report t-test results to indicate whether the differences in group means are statistically significant. Given that the expense ratio variable is only available for 2010, Panels B and D show results of regressions on 2010 data so that the expense coefficient can also be examined.

Our results for the Australian sample for the 2010 period in Panel B show a positive relationship between a fund's expense ratio and its choice to disclose portfolio holdings, significant at less than one percent level. New Zealand funds show no significant results for expenses for the 2010 period, as seen in Panel D; this is probably due to the small sample size.

From here we will only refer to the 2005 to 2010 data set for the descriptive statistics, as it provides more reliable results with a longer time horizon than the results from the 2010 data set. Panel A shows that for Australian funds for the 2005 to 2010 dataset, funds that disclose have significantly lower standard deviation than funds that do not disclose. Results from New Zealand, as seen in Panel C, are in line with Australian findings and show that funds with lower short term variance tend to be more likely to voluntarily disclose.

The descriptive evidence shows that funds that voluntary disclose are significantly larger than funds that do not disclose. This is the case in both Australia, as seen in Panel A, and in New Zealand, as seen in Panel C.

Lastly, Panel A shows that Australian funds which voluntarily disclose are older than funds that choose not to disclose. Panel C shows the opposite effect occurring in New Zealand, where funds that voluntarily disclose tend to be younger than funds that do not disclose.

Logistic Analysis

The descriptive statistics are interesting, but are insufficient to draw strong conclusions about the determinants of voluntary disclosure and to evaluate the relative importance of the various factors. Our results for the logistics analysis shown in Table 3 provide further evidence of the effect of a fund's size, age, standard deviation and expense ratio on the fund's disclosure choice.

Our evidence suggests that hypothesis 1, which states that funds with higher net assets are less likely to voluntarily disclose, cannot be accepted. On the contrary, both descriptive evidence and logit regression results in Table 3, Panel A for Australia and Panels D and F for New Zealand indicate that fund size is positively related to voluntary disclosure. The results in Panel F, using 2010 data from New Zealand, show no significant results for fund size, which is probably due to the small sample size of only 66 observations. Parida and Teo (2010) and Ge and Zheng (2006) find opposing evidence from the U.S. that larger funds voluntarily disclose less frequently. The difference in our results may stem from the differences in the regulatory environments, while as the U.S. requires mandatory quarterly disclosure New Zealand and Australia lack any portfolio disclosure regulations. Gallagher (2007) points out that fund managers complain about the implementation and compliance costs associated with portfolio disclosure. This suggests that funds in New Zealand and Australia may be faced with higher costs, for example system set-up costs, if they choose to disclose. The economies of scale enjoyed by larger funds could mean that it makes more economic sense for larger funds to disclose.

Evidence from the logistic analysis supports the acceptance of hypothesis 2, that funds that are older are less likely to choose to disclose. In Table 3, Panels A and B for the Australian sample and Panels D and E for the New Zealand sample show that the age of a fund, measured by days since inception, has a negative association with its decision to voluntarily disclose. Descriptive evidence offers further support for this hypothesis. Relationships between fund age and disclosure for 2010 samples, as seen in Panels C and F, show no impact, probably due to the much smaller sample size.

Our results also show some support for hypothesis 3, that funds that have returns with higher standard deviation could be less likely to disclose. Panel D shows that for the Australian sample, the higher the standard deviation of returns, the less likely it is for a fund to disclose. Funds may have incentives not to disclose if they have high standard deviation. Standard deviation is a measure of the difference between a fund's benchmark (based on the investment objective) and its actual returns, therefore high standard deviation may indicate that a fund's underlying holdings do not reflect their stated investment objectives. For this reason, fund managers with higher standard deviation have

incentives not to disclose their portfolio holdings, as is reflected in our results. However, the 2010 Australian sample in Panel C and evidence from New Zealand in Panels D, E and F contain no significant standard deviation coefficients.

The Australian market offers some evidence that hypothesis 4, stating that funds with higher expense ratios are less likely to disclose, cannot be accepted. In Table 3, Panel C, the expense ratio is showing as positive and significant for Australian funds in 2010. Unfortunately, data prior to 2010 is not available to be analysed. The evidence from Australia appears to be in contrast to the results from Ge and Zheng (2006) and Parida and Teo (2010), who find that funds which disclose more frequently than required have lower expense ratios. One reason this could be the case is the differences in regulatory environments between the U.S. and New Zealand and Australia. Because all funds in the U.S. must periodically provide holdings disclosures, every fund must have the systems in place to produce this disclosure. On the other hand, funds in Australia are not legally obliged to disclose; therefore, the funds that voluntarily disclose may be faced with higher expenses to cover the dissemination and systems costs of disclosure, which otherwise would not be imposed. The results for the New Zealand sample using 2010 data, as seen in Panel F, show no impact.

The possibility that funds may follow the same disclosure policy over time can potentially create a bias in the panel logit estimates. As a robustness check, we include the lagged disclosure variable in the logit regression, which is reported in Panel B for the Australia sample and Panel E for the New Zealand sample, in order to control for the stickiness of the disclosure policy. The positive coefficient of the disclosure variable for the Australian sample in Panel B provides evidence that the disclosure policy is likely to stay the same. For New Zealand, the coefficient of the lagged dependant variable in Panel E indicates a significant correlation between past and current disclosure policy. The results for both countries include the following: total net assets remain positive and significant, while reducing in magnitude; age retains the same sign although becoming significant; and standard deviation also retains the same sign but becomes insignificant. This indicates that the effects documented earlier are not entirely driven by the persistence in the disclosure policy; however, results for fund age and standard deviation for Australia should be treated with some scepticism.

Overall, we find that that our results differ from those of Ge and Zheng (2006) and Parida and Teo (2010). This is most likely due to the unique regulatory environment in Australia and New Zealand, where there are no mandatory disclosure requirements. We find that in Australia and New Zealand, funds with larger net assets as well as funds that are younger are more likely to voluntarily disclose. Funds that disclose are conceivably the funds that suffer least from disclosure. If mandatory disclosure rules were applied, it could be the smaller and older funds that are most detrimentally affected. In Australia there is some evidence that funds with higher risk levels and higher expenses also have an increased likelihood of disclosing.

Impact of Disclosure on Fund Returns

Risk-adjusted returns are important to investors, and the results from this section offer some insight into possible outcomes for returns if regulators were to establish a mandatory disclosure regime. The relationship between voluntary disclosure and fund performance broken down by return-rank in the previous period allows more information for differentiating between the information and agency effects in fund disclosure. Table 4 provides a summary of the regression estimate.

The results from Australia offer support for hypothesis 5, that voluntary disclosure has a detrimental effect on the performance of successful funds. In Panel A, we find a clear association between voluntary disclosure and fund performance. For the top 20 percent of funds, voluntary holdings disclosure is associated with significantly worse future fund performance. Among past winners, funds with voluntary disclosure underperform funds with no disclosure by 0.68 percent market-adjusted return per semi-annual period, or 1.36 percent per year. This finding offers support for the information effect, which is most relevant for funds with superior performance. As explained in section 3, the information effect is the cost of revealing a fund's proprietary information.

Our findings from the Australian sample suggest that hypothesis 6, that disclosure will have a neutral effect on the performance of mid-rank funds, cannot be rejected. Panel A shows that, for mid-rank Australian funds, we find no significant relationship between voluntary disclosure and fund returns. This result is consistent with the hypothesis that both the information effect and the agency effect take place for these funds and that neither of the two effects dominates.

Our evidence from Australian funds is consistent with hypothesis 7, that disclosure will have a positive effect on the performance of unsuccessful funds. For the bottom 20 percent of funds, our results show that voluntary disclosure is associated with significantly better fund performance. Among past losers, funds that disclose outperform funds that do not disclose by 0.25% per month, or 0.50% per year. This finding yields support for the agency effect as discussed in section 3.

The results from New Zealand in Table 4, Panel B, show no significant effect of disclosure on returns. The reasons for this could be the small sample size of 607 observations and/or an indication that less front-running and monitoring of investments occurs in New Zealand.

The relationships between disclosure and return documented for the Australian sample are robust to the inclusion of control variables, as seen in Table 4, Panel A. As expected, greater net assets are related to higher net return. Higher standard deviation is also related to increased net return. On the other hand, all coefficients for the New Zealand sample are insignificant.

A sub-period analysis was performed as a robustness check and revealed some interesting results. It is conceivable that the Global Financial Crisis, beginning in the second half of 2008, could have triggered a change in investors' attitudes towards disclosure. Around the same time, in December 2008, Bernie Madoff admitted to running one of the largest known Ponzi schemes in U.S. history.[71] The sub-period analysis segregates the data into two samples, from January 2005 to June 2008 and from January 2009 to December 2009. Results from the sub-period analysis are documented in Table 5. The sub-period analysis of Australian funds, as seen in Panel A, shows that the variable of interest, namely disclosure, did not have any significant effect on return in either period. This is surprising, as the results from the 2005 to 2010 sample showed significant effects from disclosure. The New Zealand sample shows that following the Global Financial Crisis, disclosure for low-rank funds had a positive effect on returns, significant at the 1 percent level. For the period prior to the 2008 events, we could not find significant results for disclosures' effect on returns, which is similar to the results for the entire period. This suggests that the agency effect is relatively more important after 2008, which could mean that after that time investors began to monitor funds more closely.

The two different relationships between voluntary disclosure and fund return for variously-ranked funds provide strong support for both the agency and information effect in Australia. Consistent with the agency effect, funds with poor past returns that do not disclose tend to underperform past losers who voluntarily disclose. These findings are robust to various performance measures. Findings for New Zealand in the 2005 to 2010 period show that disclosure has no impact on returns; however, the sub-period analysis suggests that disclosure has a positive association with returns following the GFC and Madoff events in late 2008.

Effect of Disclosure on Money Flows

The results from this section offer insight into whether investors care about the disclosure of portfolio holdings, and therefore whether investors want regulation for mandatory disclosure. Ge and Zheng's (2006) research shows that the effect of disclosure on fund returns varies according to the rank of fund performance. We therefore break down the relationship between voluntary disclosure and fund money flows by return-rank, as investors may peruse and act on past performance. Table 6 provides a summary of the regression results.

[71] Prosecutors estimated the size of Madoff's fraud to be $64.8 billion, affecting 4,800 clients.

The results from the Australian and New Zealand data samples provide mixed evidence for hypothesis 8, that funds which disclose will attract higher flows than funds that do not disclose. Panel A shows that, overall, voluntary disclosure for Australian funds has a negative impact on money flows into the fund. On the other hand, money flows into funds are significantly higher for New Zealand funds that voluntarily disclose, as can be seen in Panel B. Further analysis reveals disparities between flows into high-rank funds and those into low-rank funds.

The evidence from Australian funds in Panel B shows a negative relationship between money flows into funds and disclosure for mid-rank funds. Coefficients for low-rank and high-rank funds are not significant, which may be due to a smaller sample size. While these two rankings cover only 20 percent of funds each, mid-rank funds account for 60 percent of funds. The negative relationship for mid-rank funds suggests that investors in Australian funds are concerned about opportunities for front-running, which portfolio disclosure provides, and is consistent with the information hypothesis. This would seem to be consistent with the return results, but only for high-rank funds, where return is negatively affected for funds that disclose.

Panel D shows that New Zealand funds which disclose attract higher money inflows if they are high ranking. This is the opposite effect to that observed by Ge and Zheng (2006), who find that high-rank funds that disclose more frequently experience greater fund outflows. Considering the return results which indicate that fund returns are not affected by disclosure, the results begin to make sense. It is conceivable that investors in high-ranking funds are more active and/or more sophisticated; therefore, it is these investors who would be most interested in underlying holdings information. These investors would reward the disclosure by investing their money into the fund. For mid-rank and low-rank New Zealand funds, the results in Panel D show no impact on fund returns.

Results from the Australia sample are consistent with the previous research in the U.S. market that the mutual fund flow-performance relation is highly convex (Brown, Harlow & Starks, 1996; Chevalier & Ellison, 1997; Del Guercio & Tkac, 2002). Table 6, Panel A shows that investors in Australian mutual funds flock to funds with superior past performance, yet do not punish poor performers by withdrawing assets. The coefficient for low rank is negative but not significant, while the coefficient for high rank is positive and significant. Evidence from New Zealand in Panel B shows the opposite effect, with money being taken out of both underperforming and high-performing funds and put into mid-rank funds. This shows a significant disparity between investors' behaviour in the two countries.

The coefficient estimates on control variables in Table 6, Panels A, B, C and D are largely consistent with those documented in the literature. Total net assets, fund age and short-term fund volatility all show negative effects on fund performance, but the only statistically significant variable is fund age. The signs of the coefficients agree with Ge and Zheng's (2006) findings.

A sub-period analysis was performed as a robustness check and revealed some interesting results. Table 7, Panels A and B show that for the Australian 2005 to 2008 sample, disclosure had a negative relationship with money flows into mid-rank funds. For 2009 to 2010, the disclosure variable shows no impact for Australian funds, as seen in Panel B.

Table 7, Panel D shows that for the New Zealand sample, disclosure is more important to investors following the Global Financial Crisis (GFC) in late 2008, at least for investors into high-rank funds. Prior to the GFC, from 2005 to 2008, disclosure had a significantly negative effect on money flows into funds for low-rank and high-rank funds, as seen in Panel C. From 2009 to 2010, investors put significantly more money into funds that disclose and are defined as high-rank when compared to high-rank funds that did not disclose.

7. Summary and Conclusion

Our research adds to the body of literature on the balance between portfolio disclosure to allow investors to monitor their hired professional fund manager, and that disclosure hindering the managers' ability to generate good performance without competitors taking advantage of that knowledge.

We examine a special case with Australia and New Zealand, where fund managers are not required to disclose holdings, but, at least in New Zealand, the government is considering a rule change which would require such disclosure. As such, this study can also be viewed as an examination of the potential effects of a mandatory disclosure regime in New Zealand and Australia. For those countries, and other considering either a change to such a rule, or an increase in requirements, such as hedge funds in the US, the results have implications for: regulators for determining the potential effects of mandatory disclosure; investors, when making investment decisions into funds; and fund managers when making transparency choices.

We analyse a sample of New Zealand and Australian equity funds from 2005 – 2010, during which there is no requirement for mandatory disclosure of portfolio holdings but some funds choose to voluntarily disclose. We examine the effect of voluntary disclosure to make predictions about the effect of a mandatory disclosure regime.

We find that for both New Zealand and Australian funds, those with larger net assets, and funds that are younger, are more likely to voluntarily disclose. In Australia there is some evidence that funds with higher standard deviation and higher expenses also have an increased likelihood of disclosing. These results are robust to the impact of the stickiness of a fund's disclosure policy.

This study highlights the potential implications for performance if holdings disclosure were to become mandatory. Empirical evidence from the Australian sample demonstrates that high-rank funds (the top 20 percent of past performers) which do not disclose outperform funds that do. This indicates that the information effect dominates, as high-rank funds may hold superior information which is exploited by front-running when holdings are released to the market. Therefore, investors in the top 20% of past performing funds may suffer from lower returns if disclosure was legally required.

In contrast, for low-rank funds (bottom 20 percent of past performing funds), the agency effect seems to dominate the information effect in Australia. We find that the low-rank funds that do not disclose significantly underperform funds that disclose. These results suggest that for investors who invest in the bottom 20% of performing funds, mandatory disclosure would boost returns and benefit the investors. In New Zealand funds, we find no disclosure impact on returns, most likely due to the small sample size of that market.

A sub-period analysis offers further insight into the potential effects of mandated disclosure. Each sample is divided into two groups: 1) before the Global Financial Crisis of late 2008; and 2) after the crisis. We find no difference for Australia, but we find some interesting results for New Zealand -- after the Global Financial Crisis, disclosure has a positive effect on fund returns, while prior to the crisis there is no impact.

Finally, we examine whether investors care about mandatory disclosure by examining the effect of disclosure on fund flows. Our evidence for Australian funds demonstrates a negative relationship between money flows into funds and disclosure for mid-rank funds, showing that Australian investors punish mid-rank funds that disclose by removing their assets from the fund. However, we find no fund flow impact for low- or high-rank funds, perhaps due to smaller sample sizes (60% of funds in the mid-rank). This finding suggests that investors in Australian funds are concerned about potential losses, such as those caused by front-running. For this reason they may not support a mandatory disclosure regime. However, concerns regarding the mid-rank funds appear to be misplaced, as our results show that it is only the top 20 percent of performing funds and not the mid-rank funds whose returns are harmed by disclosure. Results from the New Zealand sample show that high-rank funds that choose to disclose attract higher inflows. This shows that investors in the top 20 percent of New Zealand funds care about disclosure and reward it by investing more money into the funds.

A second sub-period analysis reveals differences in the way that disclosure influences investors' money flows following the Global Financial Crisis. The Australian sample shows that after the crisis, disclosure has had no impact

on fund returns, while prior to it investors withdrew their money from mid-rank funds that chose to disclose. These findings suggest that investors in Australian funds may have not previously supported mandatory disclosure, while more recently the investors are ambivalent in this regard. Results from New Zealand offer evidence that investors in New Zealand funds support mandatory disclosure, at least for high-rank funds. Prior to the crisis, investors removed funds from low-rank and high-rank funds that disclosed. In contrast, after the crisis, investors rewarded disclosure by high-rank funds by increasing money flows into the fund. This evidence clearly establishes that disclosure has become more important for New Zealand investors following the Global Financial Crisis.

To the best of our knowledge, this is the first paper that examines voluntary holdings disclosure in Australia and New Zealand. We believe that our results have implications for any introduction of portfolio holdings disclosure regulations. Policy makers will have to strike a balance between the potential advantages of disclosure, primarily stemming from the agency effect, with possible harmful side-effects coming from the information effect, which encourages activities such as front-running. If mandatory disclosure is introduced, the results of past studies suggest that the frequency will have to be selected carefully, as quarterly disclosure can significantly increase costs. If mandatory disclosure is introduced, the results of this study are important to investors because it is likely that the funds which voluntarily disclose are the funds that will be the least harmed. For New Zealand, the funds that have chosen to disclose are younger and have larger net assets. In Australia the funds choosing to disclose are also younger and larger; however, there is some evidence to suggest that Australian disclosing funds have higher risk levels and greater expenses.

While our research is limited by the relatively short time frame that these data are available, as time elapses and a larger recorded window becomes available, the accuracy of this research could potentially be enhanced by increasing the time period examined, thus extending the sample size.

This research is also constrained in that the decision to disclose is endogenous, due to the voluntary nature of a fund's disclosure decision. It is conceivable that the funds which choose to disclose are the ones that will be the least affected by their decision. However, we still expect a statistical association between an endogenous decision to disclose and an exogenous decision to disclose, particularly if there are costs associated with switching between disclosure and non-disclosure.

On balance, we believe that the introduction of a mandatory disclosure regime in Australia and New Zealand would represent a significant advancement for the industry and would benefit investors. Our study shows that mandatory disclosure may create return benefits by allowing better monitoring of fund managers. Other important benefits are the enhanced ability for investors to improve asset allocation, monitor compliance with objectives, and track whether funds engage in portfolio manipulation. While there are obvious challenges and concerns such as front-running and free-riding, the potential benefits to investors outweigh these considerations. Regulators can rely on the experience of other countries such as the U.S. as well as academic studies when considering the requirements for frequency of disclosure, lag period, and dissemination.

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Table 1. Summary Statistics

The descriptive statistics are presented for Australian funds in Panels A and B and for New Zealand funds in Panel C and D. Panel A and C present results for the 2005 to 2010 period and Panels B and D present results for the 2010 sample. Expense is the fund's management expense ratio. Stddev is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns. Tna is the net assets of the fund, calculated at the end of each six-month time period. Age is the age of the fund.

Panel A: Australian Fund Characteristics 2005-2010

Australia 2005 - 2010					
	Mean	Median	Std. Dev.	25%	75%
Expense (in %)					
Std Dev	1.58	1.20	1.37	0.72	1.94
TNA (millions)	116.18	13.26	401.99	2.96	65.7
AGE(yrs)	6.78	5.31	5.28	2.92	8.67

Panel B: Australian Fund Characteristics 2010

Australia 2010					
	Mean	Median	Std. Dev.	25%	75%
Expense (in %)	1.65	1.75	0.79	1.05	2.15
Stddev	1.19	0.85	1.03	0.54	1.41
TNA (millions)	108.65	14.65	389.58	3.61	65.7
AGE(yrs)	9.16	7.61	5.51	3.25	13.47

Panel C: New Zealand Fund Characteristics 2005 – 2010

New Zealand 2005 - 2010					
	Mean	Median	Std. Dev.	25%	75%
Stddev	2.23	1.96	1.40	1.25	2.93
TNA (in millions)	44.36	19.78	61.31	5.39	59.4
AGE (in years)	8.37	8.25	5.65	2.89	11.94

Panel D: New Zealand Fund Characteristics 2010

New Zealand 2010					
	Mean	Median	Std. Dev.	25%	75%
Expense (in %)	1.25	1.28	0.62	0.97	1.51
Std Dev	1.88	1.74	1.01	1.14	2.24
TNA (in millions)	50.31	21.86	84.15	6.76	58.0
AGE (in years)	9.25	6.46	6.11	3.25	13.57

Table 2. Voluntary Disclosure Versus No Disclosure

The descriptive statistics are presented for Australian funds in Panels A and B and for New Zealand funds in Panels C and D. Panels A and C present results for the 2005 to 2010 period. Panels B and D present results for the 2010 sample. Expense is the fund's management expense ratio. Stddev is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns. Tna is the net assets of the fund, calculated at the end of each six-month time period. Age is the age of the fund.

Panel A: Descriptive Statistics for Australia Equity Funds 2005-2010

Australia 2005 - 2010				
	Disclosure (Mean)	No Disclosure (Mean)	Difference (Disclosure - no	Two-sided p-value test
Expense (in %)				
Std Dev	1.54	1.63	-0.09	0.0000
TNA (millions)	147.80	81.26	66.53	0.0000
AGE(yrs)	6.23	6.98	-0.75	0.0000

Panel B: Descriptive Statistics for Australia Equity Funds 2010

Australia 2010				
	Disclosure (Mean)	No Disclosure (Mean)	(Disclosure - no disclosure)	Two-sided p-value test
Expense (in %)	1.77	1.66	0.11	0.0075
Std Dev	1.11	1.29	-0.18	0.0015
TNA (millions)	144.23	59.31	84.92	0.0001
AGE(yrs)	8.61	9.16	-0.55	0.0711

Panel C: Descriptive Statistics for New Zealand Equity Funds 2005-2010

New Zealand 2005 - 2010				
	Disclosure (Mean)	No Disclosure (Mean)	(Disclosure - no disclosure)	value for two-sample t test*
Expense (in %)				
Std Dev	2.14	2.47	-0.33	0.0062
TNA (millions)	67.98	36.27	31.71	0.0000
AGE(yrs)	7.05	8.51	-1.46	0.0016

Panel D: Descriptive Statistics for New Zealand Equity Funds 2010

New Zealand 2010				
	Disclosure (Mean)	No Disclosure (Mean)	Difference (Disclosure - no disclosure)	Two-sided p-value test
Expense (in %)	1.07	1.38	-0.31	0.1825
Std Dev	1.62	2.03	-0.41	0.1153
TNA (millions)	84.61	30.71	53.90	0.0118
AGE(yrs)	8.43	9.37	-0.94	0.5569

Table 3. Determinants of the Decision to Provide Voluntary Disclosure

$$Prob(Voluntary\ Disclosure_{it}) = \beta_0 + \beta_1 Logtna_{i,t-1} + \beta_2 Logage_{i,t-1} + \beta_3 Stddev + \beta_4 Expense_{i,t-1}$$

This logit regression models the probability of an equity fund providing voluntary disclosure within a 6 month period. The sample consists of equity mutual funds from 2005 to 2010 and logit regression results are presented for Australian funds and New Zealand funds in Panels A and B and Panels C and D respectively. The dependant variable, *Voluntary Disclosure,* is a dummy variable and takes the value of one if a fund provides disclosure during each semi-annual time period and zero if they do not provide disclosure. *Expense* is the fund's operating expense ratio. *Logtna* is the natural logarithm of a fund's total net assets at inception. *Logage* is the natural logarithm of the age of a fund. *Standard deviation* is calculated over the previous 12 monthly market-adjusted returns. All of the independent variables are lagged by a semi-annual time period. Time dummies are included in the regression.

	Panel A: Australia 2005-2010		Panel B: Australia 2005-2010		Panel C: Australia 2010	
	Coefficient	P value	Coefficient	P value	Coefficient	P value
Lagged disclosure			3.991***	0.000		
Logtna	0.073***	0.000	0.052***	0.000	0.12***	0.000
Logage	-.008	0.767	-0.054***	0.000	-0.02	0.862
Std Dev	-0.115***	0.000	-0.059	0.156	-0.14***	0.009
Expense					0.20**	0.024
Intercept	-1.198***	0.000	-2.850***	0.000	-1.72**	0.031
Observations	14,299		14,299		1162	
R^2	0.021		0.472		0.019	

***1 significance; **5% significance; *10% signifiance

	Panel D: New Zealand 2005 - 2010		Panel E: New Zealand 2005-2010		Panel F: New Zealand 2010	
	Coefficient	P value	Coefficient	P value	Coefficient	P value
Lagged disclosure			3.937***	0.000		
Logtna	0.393***	0.000	0.284***	0.005	0.687*	0.056
Logage	-0.855***	0.000	-0.732***	0.000	-0.803	0.366
Std Dev	-0.101	0.149	-0.131	0.160	-0.57	0.132
Expense					-0.381	0.663
Intercept	-3.265*	0.058	-2.284	0.250	-3.915	0.562
Observations	607		607		66	
R^2	0.156		0.48		0.177	

***1 significance; **5% significance; *10% signifiance

Table 4. The Impact of Voluntary Disclosure on Fund Returns

$$Excess\ Return_{i,t} = \beta_0 + \beta_1 Lowrank_{i,t-1} + \beta_2 Highrank_{i,t-1} + \beta_3 Disc * lowrank_{i,t-1} + \beta_4 Disc * midrank_{i,t-1} + \beta_5 Disc * highrank_{i,t-1} + \beta_7 Stddev_{i,t-1} + \beta_8 Logtna_{i,t-1} + \beta_9 Logage_{i,t-1}$$

This table reports the results of the panel regressions at the fund level. The sample consists of equity mutual funds from 2005 to 2010 and regression results are presented for the Australian funds dataset and the New Zealand funds dataset in Panels A and B and Panels C and D respectively. *Excess Return* measures the average monthly excess returns during the semi-annual period t using benchmark-adjusted return. *Disc* is a dummy variable, equal to one if the fund provides voluntary disclosure over the semi-annual time period and zero otherwise. *Expense* is the fund's management expense ratio. *Lowrank* is a dummy variable, equal to one if fund performance belongs to the bottom quintile and zero otherwise. *Midrank* is a dummy variable, equal to one if fund performance belongs to the 2nd to 4th quintiles and zero otherwise. *Highrank* is a dummy variable, equal to one if fund performance belongs to the highest quintile and zero otherwise. *Stddev* is the standard deviation of the past 12 monthly benchmark-adjusted returns. *Logtna* is the natural logarithm of total net assets. *Logage* is the natural logarithm of days since inception. All of the independent variables are lagged by a semi-annual time period. Time dummies are included in the regression and White's panel-corrected standard errors are used.

	Panel A: Australia		Panel B: New Zealand	
	Coefficient	P value	Coefficient	P value
Disc* lowrank	0.250***	0.003	2.260	0.147
Disc* midrank	0.050	0.585	0.510	0.500
Disc* highrank	-0.677***	0.003	-0.97	0.570
Lowrank	-0.689***	0.007	-1.35***	0.044
Midrank				
Highrank	0.643***	0.003	-0.97*	0.066
Logtna	0.044**	0.038	-0.17	0.362
Logage	0.118	0.170	-0.29	0.513
Std dev	0.289***	0.009	0.070	0.848
Intercept	-1.995***	0.001	3.680	0.417
Observations	14,282		607	
R^2	0.018		0.104	

***1 significance; **5% significance; *10% signifiance

Table 5. Sub-Period Analysis: The Impact of Voluntary Disclosure on Fund Returns

$$Excess\ Return_{i,t} = \beta_0 + \beta_1 Lowrank_{i,t-1} + \beta_2 Highrank_{i,t-1} + \beta_3 Disc * lowrank_{i,t-1} + \beta_4 Disc * midrank_{i,t-1} + \beta_5 Disc * highrank_{i,t-1} + \beta_6 Stddev_{i,t-1} + \beta_7 Logtna_{i,t-1} + \beta_8 Logage_{i,t-1}$$

This table reports the results of the panel regressions at fund level. The sub-period analysis provides regressions for two samples from New Zealand and two samples from Australia, covering the periods January 2005 to June 2008 and January 2009 to December 2010. Excess Return measures the average monthly excess returns during the semi-annual period t using benchmark-adjusted return. *Disc* is a dummy variable, equal to one if the fund provides voluntary disclosure over the semi-annual time period and zero otherwise. *Expense* is the fund's operating expense ratio. *Lowrank* is a dummy variable, equal to one if fund performance belongs to the bottom quintile and zero otherwise. *Midrank* is a dummy variable, equal to one if fund performance belongs to the 2nd to 4th quintiles and zero otherwise. *Highrank* is a dummy variable, equal to one if fund performance belongs to the highest quintile and zero otherwise. *Stddev* is the standard deviation of the past 12 monthly benchmark-adjusted returns. *Logtna* is the natural logarithm of total net assets. *Logage* is the natural logarithm of days since inception. All of the independent variables are lagged by a semi-annual time period. Time dummies are included in the regression. White's panel-corrected standard errors are used.

	Panel A: Australia 2005 - 2008		Panel B: Australia 2009-2010		Panel C: New Zealand 2005-2008		Panel D: New Zealand 2009-2010	
	Coefficient	P value	Coefficient	P value	Coefficient	P value	Coefficient	P value
Disc*lowrank	-0.117	0.390	-0.518	0.130	-0.925	0.707	3.809***	0.001
Disc*midrank	0.071	0.460	-0.318	0.104	-1.296	0.225	1.084	0.213
Disc*highrank	0.051	0.774	-0.250	0.469	-0.714	0.826	-0.167	0.949
Lowrank	-7.148***	0.000	0.342	0.265	-1.673**	0.045	-1.435	0.215
Midrank								
Highrank	-1.144***	0.002	-2.018***	0.000	-0.714	0.826	-0.222	0.905
Logtna	-0.014	0.475	0.066*	0.079	-0.266	0.283	0.385	0.216
Logage	0.085	0.141	0.279**	0.014	-0.76	0.327	-1.247*	0.054
Std dev	1.107**	0.000	0.836***	0.000	0.358	0.365	0.138	0.812
Intercept	-.374	0.369	0.080***	0.000	8.525	0.210	7.250	0.298
Observations	7,147		5,099		280		261	
R^2	0.458		0.080***	0.000	0.113		0.146	

***1 significance; **5% significance; *10% signifiance

Table 6. The Impact of Voluntary Disclosure on Money Flows

$$Fund\ Flow_{i,t} = \beta_0 + \beta_1 \text{Lowrank} + \beta_2 Highrank_{i,t-1} + \beta_3 Disc * lowrank_{i,t-1} + \beta_4 Disc * midrank_{i,t-1} + \beta_5 Disc * highrank_{i,t-1} + + \beta_6 Stddev_{i,t-1} + \beta_7 Logtna_{i,t-1} + \beta_8 Logage_{i,t-1}$$

This table reports the results of the panel regressions at the fund level. The sample consists of equity mutual funds from 2005 to 2010 and regression results are presented for Australian funds and New Zealand funds in Panels A and B and Panels C and D respectively. *Fund flow* is calculated as a percentage of the beginning-of-period total net assets. *Disc* is a dummy variable, equal to one if the fund provides voluntary disclosure over the semi-annual time period and zero otherwise. *Lowrank* is a dummy variable, equal to one if fund performance belongs to the bottom quintile and zero otherwise. *Midrank* is a dummy variable, equal to one if the fund performance belongs to the 2nd to 4th quintiles and zero otherwise. *Highrank* is an indicator variable, equal to one if fund performance belongs to the highest quintile and zero otherwise. *Logtna* is the natural logarithm of total net assets. *Logage* is the natural logarithm of the age of a fund. *Stddev* is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns. All regressions using pooled data include time dummies and panel-corrected standard errors.

	Panel A: Australia		Panel B: Australia		Panel C: New Zealand		Panel D: New Zealand	
	Coefficient	P value	Coefficient	P value	Coefficient	P value	Coefficient	P value
Disc*lowrank			0.019	0.992			0.091	0.434
Disc*midrank			-2.569**	0.034			0.072	0.396
Disc*highrank			-1.529	0.507			0.585**	0.019
Disclosure	-1.72*	0.088			0.159*	0.075		
Lowrank			-0.254	0.781			-0.155*	0.065
Midrank								
Highrank			3.568*	0.087			-0.086	0.351
Logtna	-0.486	0.121	-0.504	0.038	-0.098**	0.033	-0.102**	0.026
Logage	-3.017***	0.000	-2.952***	0.170	-0.045	0.538	-0.048	0.482
Std dev	0.096	0.780	-0.356	0.417	-0.013	0.471	-.016	0.363
Intercept	33.26**	0.000	33.349***	0.000	2.034***	0.000	2.216***	0.000
Observations	8,628		8,628		369		369	
R^2	0.011		0.010		0.071		0.090	

***1 significance; **5% significance; *10% signifiance

Table 7. Sub-Period Analysis: The Impact of Voluntary Disclosure on Fund Money Flows

$$Fund\ Flow_{i,t} = \beta_0 + \beta_1 \text{Lowrank} + \beta_2 Highrank_{i,t-1} + \beta_3 Disc * lowrank_{i,t-1} + \beta_4 Disc * midrank_{i,t-1} + \beta_5 Disc * highrank_{i,t-1} + + \beta_6 Stddev_{i,t-1} + \beta_7 Logtna_{i,t-1} + \beta_8 Logage_{i,t-1}$$

This table reports the results of the panel regressions at fund level. The sub-period analysis provides regressions for two samples from New Zealand and two samples from Australia, covering the periods January 2005 to June 2008 and January 2009 to December 2010. Fund flow is calculated as a percentage of the beginning-of-period total net assets. *Lowrank* is a dummy variable, equal to one if fund performance belongs to the bottom quintile and zero otherwise. *Midrank* is a dummy variable, equal to one if the fund performance belongs to the 2nd to 4th quintiles and zero otherwise. *Highrank* is an indicator variable, equal to one if fund performance belongs to the highest quintile and zero otherwise. *Disc* is defined as an indicator variable, equal to one if the fund provides quarterly disclosure during the semi-annual period and zero otherwise. Expense is the funds indirect cost ratio. *Logtna* is the natural logarithm of total net assets. *Logage* is the natural logarithm of the age of a fund. *Stddev* is defined as the standard deviation of the previous 12 monthly market-adjusted fund returns. All regressions using panel data include time dummies and White's panel-corrected standard errors.

	Panel A: Australia 2005-2008		Panel B: Australia 2009-2010		Panel C: New Zealand 2005-2008		Panel D: New Zealand 2009-2010	
	Coefficient	P value	Coefficient	P value	Coefficient	P value	Coefficient	P value
Disc*lowrank	0.116	0.969	-.078	0.976	-0.119*	0.099	0.192	0.213
Disc*midrank	-3.363*	0.052	-1.668	0.269	-0.041	0.524	0.132	0.154
Disc*highrank	0.681	0.820	0.210	0.936	-0.301**	0.048	.652***	0.005
Lowrank	-0.654	0.794	-0.334	0.886	0.014	0.869	-0.103*	0.063
Midrank								
Highrank	.681***	0.006	-0.333	0.890	0.072	0.617	-0.024	0.681
Logtna	0.268	0.419	-0.819***	0.006	0.000	0.986	0.106**	0.025
Logage	-4.627	0.000	-2.614***	0.000	-0.136***	0.002	-0.084**	0.012
Std dev	-0.722	0.424	-0.185	0.652	-0.038	0.160	-0.027	0.122
Intercept	31.160***	0.000	33.658***	0.000	1.133***	0.000	2.556***	0.001
Observations	3,876		3,708		93		226	
R^2	0.018		0.009		0.150		0.265	

***1 significance; **5% significance; *10% signifiance

New Zealand Venture Capital Funds and Access to New Financing: An Exploratory Study

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Abstract

Purpose - This paper explores the challenges the Venture Capital (VC) funds industry in NZ faces when sourcing new capital. In New Zealand there is a significant gap currently for companies seeking VC funding of between $2 million and $10 million to commercialise new products and ideas. Also, the estimated financing needs of the next generation of early stage NZ enterprises are around 2 billion dollars of investment over the next 10 years (NZVIF, 2011).

Design / methodology / approach - A qualitative research design is applied, given the exploratory nature of this research. We undertook 15 face-to-face semi-structured interviews with VC fund managers, investors and intermediaries.

Findings - Our findings suggest that the lack of observable proven historical returns from NZ domiciled VC funds is a significant impediment to raising new equity capital. Fund managers and intermediaries also note that there is a lack of domestic entities in NZ that have the capacity and current appetite to invest in VC. In part, this may indicate that VC investors are unwilling to invest further capital in NZ VC funds until the current funds exit their existing investments.

Originality / value - Overall our findings support recent initiatives by the NZ VC funds industry to track and monitor the performance of NZ VC funds.

Paper type – Research paper

Introduction

This paper investigates the current challenges Venture Capital (VC) funds in the New Zealand (NZ) market face when attempting to raise new equity capital. We define VC funds as '*independently managed, dedicated pools of capital sourced from multiple parties, aggregated in a fund, which is invested in exchange for equity in privately*

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held early stage high-growth companies".[73] VC backed enterprises are typically reliant on intangible assets, such as intellectual property or marketing concepts, to bring products or services to the market. The failure rate of such potentially high growth enterprises is high. The products and services offered are based on unproven technologies or concepts and often target poorly defined and dynamic markets (Landström, 2009). Further, these enterprises typically require several years of development before revenues and/or profits are generated from their operations.

In NZ, capital or new equity for growth of early stage enterprises can come from a variety of sources including friends and family, angel investors, family trusts, government schemes, VC funds and private equity. However, when the sums required for growth exceed two million NZ dollars, VC funds are typically the only local source of capital until enterprises have established themselves sufficiently to qualify for finance from traditional sources such as equity markets and debt (New Zealand Venture Capital Association, hereafter "NZVCA", 2011).

The first true VC firm, American Research and Development,[74] was established in 1946 to make investments in early stage companies that were based on technology developed for World War II (Lerner & Gompers, 2004). The success of early stage investments in enterprises such as Digital Equipment Corporation™, Genentech™, Apple computers™, Federal Express™ and Intel™ gave rise to a major proliferation of VC firms in the following decades. By the late 1980s, the VC industry had developed as an important source of finance for innovative early stage enterprises seeking capital for rapid growth (Caselli, Stefano, & Perrini, 2009; Engel & Keilbach, 2007; Gompers & Lerner, 1999). Numerous reports and academic studies indicate how innovation and its successful commercialisation contributes to economic growth in developed economies (Audretsch, Falck, & Heblich, 2011; Butler, Lockett, & Ucbasaran, 2006; Cumming, 2007; Romain & von Pottelsberghe de la Potterie, 2004).

The NZ VC industry formally began in 2002 with the establishment of the New Zealand Venture Investment Fund (NZVIF), and it has developed over the last 10 years. Despite its young age, as of November 2011, NZ VC funds have invested in excess of 500 million NZD in early stage enterprises (NZVCA, 2011). However, the industry faces considerable forward-looking challenges. The NZVIF (2011) estimates that the financing needs of the next generation of early stage enterprises will require about 2 billion dollars of investment over the next 10 years (approximately $200 million a year). Springall (2011) also observes that a pronounced funding chasm has emerged in the NZ capital market for early stage enterprises of over two million dollars. Despite the high expected need for funds from early growth phase companies, fundraising efforts over the last 4–5 years have been largely unsuccessful, creating considerable challenges to the NZ VC industry (Capital Market Development Taskforce, 2009; Springall, 2011).

Apart from a few institutions that are dominated by the Accident Compensation Corporation, most entities in NZ have nil or a very small level of investment in VC funds (NZVCA, 2011). The global financial crisis and continuing economic uncertainty have also stalled fundraising progress worldwide by: (1) reducing the occurrence and value of prospective realisations, thereby weakening the track record of fund managers embarking on fundraising; and (2) increasing risk aversion among investors worldwide, many of whom are constrained by financial crises within their own organisations (Block & Sandner, 2009; Cumming, 2012; Klein, 2011; Urban, 2012). This means that a large number of early stage NZ companies are likely to be currently underfunded due to the lack of access to capital from venture capital funds (NZVCA, 2011; Cusumano, 2009).

In this paper we seek to explore in more detail the challenges faced by the VC funds industry in NZ when raising funds and sourcing new capital. We also provide some insights into the decision making process and the criteria used by investors when they are considering investing in VC funds. A qualitative research design is applied, given the exploratory nature of this research, whereby data was gathered through a total of 15 face-to-face, semi-

[73] Captive VC is excluded from this definition because it is not independently managed. Similarly, informal VC is excluded from this definition as it is not independently managed. Angel investors, friends, and family predominantly provide informal VC. Interestingly, in NZ approximately 19 'angel networks' and 'angel funds' exist that also invest in equity in early stage enterprises (New Zealand Venture Investment Fund, 2011a).

[74] American Research and Development was founded by MIT President Karl Compton and General Georges Doriot, who are regarded as the fathers of venture capital.

structured interviews with VC fund managers, investors and intermediaries, which were recorded and subsequently transcribed. The motivation for our study is as follows. First, given the importance of the NZ VC industry and the considerable challenge it faces when raising new capital, there is substantial corporate, Government, regulatory, industry and investor interest in understanding the VC industry's options and potential solutions to sourcing new funds. Second, most prior VC research has been heavily biased toward the US context. NZ is a much smaller capital market with the VC industry still in an emergent state. Most NZ high growth start-up and VC companies face additional risks from the need to undertake international expansion at an earlier stage of their lifecycle compared to similar companies resident in larger domestic markets. This poses unique issues in raising new capital funds.

Our findings suggest that a key issue faced by the VC industry in New Zealand is the lack of proven historical returns from existing VC investments. Fund managers and intermediaries also note that there is a lack of domestic entities in NZ that have the capacity and current appetite to invest in VC to support the industry, and existing local VC investors are unwilling to invest further capital until their current capital invested in VC funds is returned. Investors' inability to tolerate lack of liquidity prevents a number of entities from investing. There were also concerns expressed about the volume and quality of deal flow for VC investment in the NZ market, the lack of scale, and the difficulty for investors to diversify across several funds. Also, potential investors do not fully understand the nature of VC investment. VC fund and remuneration structure was found to be of lesser importance relative to the lack of evidence of observable returns when investors are considering investing in a VC fund. Overall, our findings support recent initiatives by the NZVCA to track the performance of NZ VC funds through benchmarking and quarterly data monitoring. The announcement in October 2012 of the NZVIF $200 million co-investment partnership with Taiwan's National Development Fund and the announcement in March 2013 by the CEO of the New Zealand Exchange (NZX) that it is investigating a new market or exchange for small growth orientated companies that require expansion capital[75] may also encourage further local investment into NZ VC funds.

The remainder of this paper is organised as follows. Section 2 provides an overview of VC funds. Section 3 reviews relevant prior literature. Section 4 discusses the VC industry in NZ. Section 5 outlines the study's methodology and sample of industry participants interviewed. Section 6 presents the findings of the study. Section 7 concludes.

1.0 Overview of the VC funds

1.1 The venture capital cycle

The operation of a VC fund is cyclical, consisting of three phases: (1) fundraising, (2) investment, and (3) realisation. The 'fundraising' phase consists of 'fund managers'[76] raising capital from multiple parties, termed 'investors', and pooling it to form a 'VC fund'. The 'investment phase' consists of fund managers identifying enterprises with high growth potential; investing capital for equity; and 'adding value' to the firm through provision of further cash, access to resources, and guidance. The 'realisation phase' refers to the liquidation of the equity interests held in enterprises in order to provide a 'return on investment' for investors. Figure 1 provides an overview of the VC cycle and how it relates to the operation of VC funds.

[75] See http://www.stuff.co.nz/business/8490693/NZX-prepares-to-launch-new-markets - dated 31 March 2013.

[76] The term 'fund manager' technically refers to a 'management company' that is employed by VC funds to identify, invest, add value, and realise investments.

Figure 1

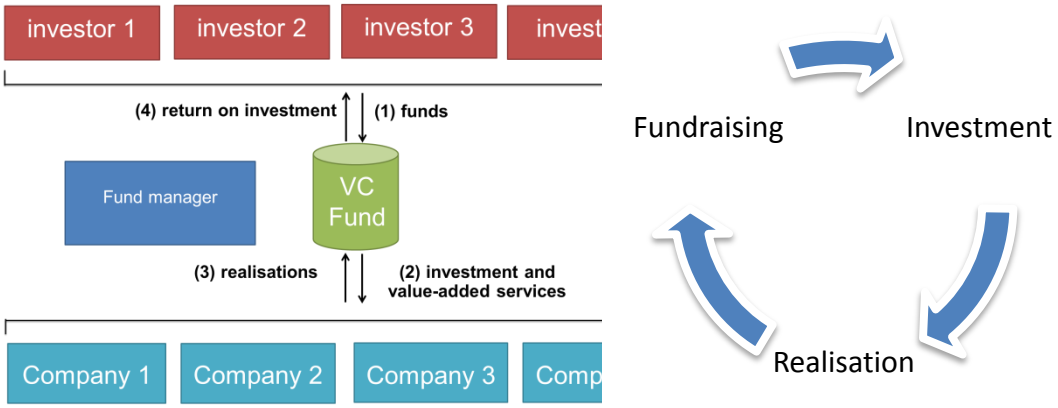

Figure 1. Overview of how funds operate and the VC cycle. (1) Fund managers pool capital raised from multiple parties termed 'investors' to form a VC fund. (2) Fund managers' invest capital in enterprises with high growth potential for equity and over several years provide value-added services, primarily through provision of further capital, access to resources, and guidance. (3) Fund managers aim to realise equity held in companies through liquidity events such as an initial public offering or trade sale. Ideally, realisations produce a capital gain which provides a (4) return on investment for investors in the fund.

Cyclical nature and fundraising

VC funds are typically structured with a 10-year term, whereby and fund managers must return all raised capital back to investors within this period of 10 years. To achieve this, fund managers typically aim to make all new investments before the fifth year, as several years are required for 'adding value' and realising investments (Kandel, Leshchinskii, & Yuklea, 2011). The fundraising process can take fund managers between one month and several years (Lerner & Gompers, 2004). Once completed, the fund is said to be closed and the 10-year lifetime starts. 'Vintage' refers to the year a fund began its 10-year term. Fund managers specify a target 'fund size',[77] which is used to set a minimum investment amount for potential investors (Lerner, Hardymon, & Leamon, 2012). Investment is usually notional at an early stage, and highly dependent on the ability of fund managers to raise additional capital from other potential investors. Thus, over a 10-year term fund managers are often required to raise new funds periodically, typically after the prevailing fund reaches its fourth or fifth year.

Investment phase

Most fund managers follow a set of principles that determine the type of enterprises in which investments are made. This is referred to as an 'investment strategy' and can vary along three dimensions: company stage, sector, and geography (Caselli, 2010). The investment strategy is set before fundraising commences.

Some funds may concentrate on investment in companies at a particular stage of development: seed, start-up, early expansion, and expansion.[78] Generally, in the context of VC, the seed and start-up stages are referred to collectively as 'early stage'. Similarly, the early expansion and expansion stages are referred to collectively as 'late stage'.

In some cases, VC funds only invest in companies in a particular sector (such as software) or a few related sectors (such as pharmaceuticals, medical devices, and healthcare), and these types of funds are referred to as 'specialists'. However, VC funds typically invest in companies across several unrelated sectors, which are referred to as 'generalist funds'. Lastly, VC funds may restrict investments into companies that either

[77] The amount of capital available for investment in a VC fund.

[78] See the website of the NZVIF for more comprehensive definitions for each stage of investment.

originate or operate in specific geographies. Selection of geographies is often based on where the VC fund operates from. Several studies indicate that fund managers prefer to be in close proximity to their investments as they prefer face-to-face communication (Gompers & Lerner, 1999; Macmillan, Siegel, & Narasimha, 1985) and need to enable managers to leverage their networks within their local area (Rin et al. (2011)).

Fund managers typically cease making investments in new companies after the fifth year of the fund's life. At this time they cease making new investments and become 'fully invested'. The number of individual companies invested in by a fund manager depends on several factors including fund size, investment strategy, and the size of their management team (Lerner et al., 2012). Typically, fund managers invest in several companies, thereby diversifying risk. [79]

Realisation phase

The return on investment that investors receive depends on the size of the capital gains resulting from the realisation of equity in portfolio companies. There are several types of realisation methods: initial public offerings (IPOs), trade sales, secondary sales, buybacks, and liquidations. Secondary sales, buybacks, and liquidations usually result in capital loss. They tend to occur mid-way through a VC fund's life when it becomes clear that a company's future prospects are poor (Lerner et al., 2012). Overall, investors expect to receive a high return on investment to compensate for the high risk and illiquidity associated with investments in VC funds.

Venture capital fund structure

The most common VC structure is the 'institutional' or 'traditional structure', as it emerged at a time where institutional investors accounted for more than half of the capital raised by fund managers (Gompers & Lerner, 2001). The NZ VC industry is said to have adopted the 'institutional fund structure' (Lerner & Shepard, 2009), with most VC funds being 'closed-ended'[80] and with a 10 year life. Fund managers are remunerated by way of management fees, and a portion of the return on investment generated by a fund which is referred to as 'carried interest'[81] (Litvak, 2009).

2.0 VC Fund Raising: Literature Review

2.1 Introduction

The factors that affect the ability of VC fund managers to raise new capital can be split into three strands: (1) investor specific factors that predispose the decision and/or extent of investment in VC funds, (2) macro-environmental conditions that indicate regions or sectors where VC funds are expected to generate an attractive return on investment, and (3) factors specific to fund managers which impact on their ability to raise funds, the decision making process and the criteria used by investors to select particular VC funds. Studies that focus on the first and third strand are limited (Groh, von Liechtenstein, & Canela, 2010). This is surprising, as investor specific factors and the selection criteria they apply may play an important role in determining the aggregate capital available to fund managers.

[79] Teten and Farmer (2010) find that on average, for every investment made by a fund manager, they examine over 80 potential investment opportunities (investment opportunities are typically referred to as 'deals').

[80] This means that once a fund commences its 10-year life, it is closed to new investors (Braendel & Chertok, 2010). Typically, VC funds are 'blind' or referred to as 'blind pools of capital'. This is because investors entrust fund managers to invest and divest capital as they see fit.

[81] The carried interest component of fund manager remuneration is normally calculated as a percentage of the return on investment generated by a fund. The percentage applied is typically 20%, but can vary between 12.5 and 30% (Cumming & Johan, 2009; Robinson & Sensoy, 2011, 2012). Typically, fund managers receive their carried interest after investors are provided a pre-determined minimum rate of return, for example 7–8% (Litvak, 2009).

2.2 Investor specific factors

The asset-liability structure determines an entities' illiquidity tolerance, length of their investment horizon, and ability to rely on dated valuations rather than market prices of their investments in VC (Jegadeesh, Kräussl, & Pollet, 2009). International evidence suggests entities with long-term, intergenerational asset pools such as sovereign funds, endowments, and pension funds invest a high proportion of their capital in VC funds. For instance, Fried and Hisrich (1994) note that the scale of an entities' assets, its longevity, and the nature of its liabilities—i.e., their duration, predictability, and controllability largely determine investors' appetite to invest in VC funds.

2.3 Macro-environmental determinants

A large amount of literature has investigated the role macro-environmental factors play in determining supply and demand for VC investment. Macro environmental factors can be grouped into several 'key drivers': economic activity, depth of the capital market, investor protection and governance, entrepreneurial culture and abundance of investment opportunities (also known as 'deal flow'), taxation and other macroeconomic and environmental factors.[82]

Economic Activity

Gompers and Lerner (1998) indicate that there are more attractive opportunities for entrepreneurs if the economy is growing quickly. Wilken (1979) argues that economic development facilitates entrepreneurship as it provides a greater accumulation of capital for investment. Romain and van Pottelsberghe de la Potterie (2004) find that VC activity is cyclical and significantly related to GDP growth. Bonini and Alkan (2011) indicate that societal wealth is linked to the number of investment opportunities that exist. It is suggested that this is not solely due to better access to finance but also higher income among potential customers in the domestic market and ease of starting a business.

Depth of the capital markets

The development of a national capital market influences VC markets (Michelacci & Suarez, 2004). Black and Gilson (1998) and Kaplan and Schoar (2005) show that well-developed stock markets allow fund managers to realise investments via IPOs, which is crucial for the establishment of a vibrant VC market. Gompers (1996) suggests that investors benefit from potentially higher returns on investment and have the ability to select top performing fund managers by examining the number of successful IPOs. Bonini and Alkan (2011) consider the merger and acquisition (M&A) market within a country to be as important as the IPO market because M&As also provide an exit mechanism for VC investments. Jeng & Wells (2000) suggest that well-developed capital markets increase the effect of VC markets on innovation and growth because holding periods are shortened and greater numbers of innovative enterprises are able to benefit from the skills and capital that fund managers provide.

Investor protection and governance

La Porta et al. (1998) note that the legal environment and protection of property rights determines the size of a country's capital market and the ability of local companies to source outside financing. López de Silanes et al. (2002) and Lerner and Schoar (2005) find a lower cost of capital for companies in countries with better investor protection.

Cumming, Fleming and Schwienbacher, (2006) find that the quality of a country's legal system is more closely related to facilitating realisations than the size of a country's stock market. Cumming, Schmidt and Walz (2010) also report that cross-country differences in legality, including legal origin and accounting standards, have a significant impact on the governance of investments in the VC industry, which clearly has implications for the emergence of new enterprises.

[82] The Oxford Handbook of Venture Capital (2012, Chapter 28) provides a comprehensive review of the legal, macro-economic and political factors that may impact on the level of VC investment.

Abundance of investment opportunities and entrepreneurial culture

Access to viable investments is an important factor for the activity of regional VC markets. Megginson (2004) argues that R&D culture, especially in universities or national laboratories, plays an important role in determining the number of VC investments. Gompers and Lerner (1998) report that both industrial and academic research and development (R&D) expenditure correlates with VC activity. Schertler (2003) shows that R&D expenditure and volume of patent filings correlate with VC activity. Kortum and Lerner (2000) state that the growth in VC fundraising in the mid-1990s may have been due to a surge of patents in the late 1980s and 1990s. Further, Romain and von Pottelsberghe de la Potterie (2004) find that enterprise start-up activity interacts with R&D expenditure, technological opportunities, and the number of patents filed.

Taxation and other macro-environmental factors

The taxation of returns on VC investment (particularly versus other asset classes) can be an important factor in the allocation of funds for VC investment. In the US, the tax code differentiates between income and capital gains, with the latter being tax-advantaged. Gompers and Lerner (1998) argue that the capital gains tax rate influences VC activity. Decreases in capital gain taxes were shown to correlate with increases in allocation of capital into VC funds, based on their supply and demand model.

Overall, however, the empirical studies that have tested a number of macro-environmental factors (as independent variables) against historical fundraising show mixed results, particularly when trying to explain cross-country fundraising variance (Black & Gilson, 1998; Bottazzi, Marco Da Rin, & Thomas Hellmann, 2009; Bottazzi, Marco Da Rin, & Thomas Hellmann 2009; Cumming, Fleming, & Suchard, 2005; Cumming, 2007, 2012; Cumming, Schmidt, & Walz, 2010; Jeng & Wells, 2000). This lack of consensus between studies may stem from geographical bias in data and the unreliability of historical cross-country data.

2.4 Factors specific to VC fund managers and the investor criteria used to select VC funds

Once investors decide to allocate a portion of their portfolio to VC investment, a second level of decision making then follows that involves a structured process where prospective VC funds are identified, screened, evaluated, and selected for investment (Barnes and Menzies, 2005). The four key criteria[83] in order of importance that were reported during the evaluation and selection stage were: (1) reputation and quality of the wider fund manager management team, (2) the return on investment of historic funds, (3) investment strategy, and (4) terms and remuneration structure for investing in the VC fund.

An important measure of fund manager reputation is the historical performance of fund managers (Bowden, 1994; Humphery-Jenner, 2011; Kaplan & Schoar, 2005; Freiburg & Grichnik, 2012). The extant literature also suggests that a VC fund's reputation is the aggregate culmination of many small factors that include social ties, procedures and conduct, historical performance, the wider management team and the opinion of others, which includes entrepreneurs, other investors and other fund managers (Busse, Goyal, & Wahal, 2010; Kaplan & Schoar, 2005; Nahata, 2008; Robinson & Sensoy, 2011; Van Osnabrugge & Robinson, 2001). Kaplan and Schoar (2005) show that successful VC funds that outperform peers of the same vintage attract larger capital commitments and perform better in the future. Also, 'bad' performing funds continue to deliver poor returns.

[83] Groh & von Liechtenstein (2011) also report that important selection criteria for investors to invest in VC funds are flow of investment opportunities, access to transactions, fund manager historical track-record, local market experience, match of management team with the proposed investment strategy, reputation of fund managers and alignment of fund and managers' interests.

3.0 New Zealand venture capital industry overview

3.1 History and development of the NZ VC industry

The NZ VC industry began in 2002 when the NZ government established the NZVIF program.[84] The NZVIF program was launched with the following four objectives (Lerner & Shepard, 2009, p 64):

- *"To accelerate development of the venture capital industry by increasing the level of early stage investment activity in the New Zealand market;*
- *To develop a larger pool of people in New Zealand's venture capital market with skills and expertise in early stage investment;*
- *To facilitate commercialisation of innovation from the Crown Research Institutes (CRIs), universities and the private sector; and*
- *To get more New Zealand businesses on paths to global success by increasing their access to international experts, networks and market knowledge"*

The NZVIF co-invests alongside private investors in independently managed VC funds that invest in 'NZ based innovative companies with high growth potential' (NZVIF, 2012). The NZVIF invests into VC funds on a pre-determined investment ratio,[85] alongside private investors, up to a maximum of $25m in any one single fund. NZVIF's investment criterion specifies that the amount of capital committed (including the ratio) is determined by: (1) the investment strategy of the VC fund, and (2) the amount of capital committed by private investors.

The NZVIF criterion limits investment into funds that intend to invest in 'NZ based companies'. This is defined as 'a company that has the majority of its assets and employees in NZ at the time that initial investments are made'. Furthermore, NZVIF's criterion specifies that investments can only be made in the seed, start-up, early expansion, and expansion stage of a firm. [86]

Table 1 provides an overview of the NZ VC funds that are noted on the website of NZVIF (2012). The publicised fund size varies between $20 million and $100 million, with funds split between generalist and sector specific funds. Since 2007, only two new VC funds (MOVAC III, and Valar ventures) have been established. Most of the pre-2007 VC funds are fully invested or have limited capacity to make new investment until further new equity capital is raised.

[84] Prior to 2002, Lerner & Shepard, 2009, report that early stage companies were typically financed by corporates (usually internally), by government grant schemes, or institutions such as the Development Finance Corporation (DFC) and the Greenstone Fund, or, by wealthy individuals or family offices.

[85] The highest potential investment ratio of NZVIF matching private capital is 1:1, where a venture capital fund intends to invest entirely in early stage companies. The lowest possible investment ratio is 1:5, for VC funds that intend to invest only in late stage companies. For VC funds that intend to invest in companies at a range of different stages, a blended ratio is determined.

[86] The NZVIF's criterion precludes fund managers making investments in companies in sectors including property development, retailing, mining, and hospitality-industry business.

Table 2.
Summary of VC funds in NZ as of November 2012.

Firm or fund name	Vintage year	Publicised fund size (millions of NZDs)	Sector(s)	Stage	Geography
MOVAC I	Not clear	20	No stated preference	Early stage	NZ
MOVAC II	Not clear	41	No stated preference	Expansion stage	NZ
MOVAC III	2012	42	No stated preference	Expansion stage	NZ
Pioneer Capital	2007	70	No stated preference	Expansion stage	NZ
BioPacific Ventures	2005	100	Food, agriculture, and consumer health	No stated preference	NZ/AU
iGlobe Treasury	2003	30	No stated preference	No stated preference	NZ
Endeavour Capital	Not clear	40	Energy, information technology (IT) and advanced manufacturing	No stated preference	NZ
No 8 Ventures No 1 and 2	1999 and 2002	N/A	IT, energy, and other specialised technologies	Early stage	NZ
TMT ventures	2001	100	Telecommunications and media technologies	Early and expansion stage	NZ
Valar Ventures	2012	40	No stated preference	Early stage	No stated preference

Sources: NZVCA website, Websites of each company MOVAC, (2012); Pioneer Capital, (2012); Bio Pacific Ventures,(2012); iGlobe Treasury, (2012); Endeavour Capital, (2012); No 8 Ventures, (2012); TMT Ventures, (2012); Valar Ventures, (2012) and own analysis.

3.2 Investors in NZ VC Funds

Compared to the major economies such as the US, Denmark, Canada, and the United Kingdom, institutional investment in NZ venture capital funds is relatively small.[87] While a few large institutions such as New Zealand Super and Accident Compensation Corporation have an exposure to local venture capital funds, the majority of the NZ institutional investors have little or only a small allocation to VC investment (NZVCA, 2011). Consequently, family trusts, corporations, and high net worth investors have historically been an important local source of private capital for the NZ VC industry.

3.3 Investment activity by sector and stage

In the period between 2002 and 2011, NZ domiciled VC funds have invested in excess of 550m NZD in ventures. These enterprises earn 250 million in annual revenues (mostly from exports), employ over 1000 people, and have revenues of $250,000 per employee. The majority of funds were invested in early stage companies, with 33% and 53% in seed and start-up stage companies respectively. A total of 57% of

[87] See Lerner & Tåg (2012). In Australia, approximately 30% of private equity and venture capital funding also comes from domestic pension funds and professionally managed investment funds (Capital Market Development Taskforce, 2009; Cumming, Fleming and Suchard., 2011).

companies originated from the private sector and 23% emerged from either crown research institutes or universities. Investments were made across a broad range of sectors, with 'software & services', and 'pharmaceuticals, biotechnology & life sciences' accounting for 35% and 22% of investments, respectively (NZVCA, 2011).

Investment and realisations

Figure 2 shows investments and realisations in NZD and the number of deals by NZ VC funds and seed funds supported by the NZVIF Seed Co-investment Fund over the period from 2003–2011. VC fund returns typically follow a 'J-curve', where periods of negative returns are replaced by positive ones (Jegadeesh, Kräussl, & Pollet, 2009; Kaplan & Schoar, 2005; Xu, 2008). This trend reflects liquidity events associated with 'poor' investments in the early years and the realisation of 'good' investments over time. The data indicates that the NZ early stage start-up and VC industry has invested in 525 deals, with an average deal size of 1.0m NZD.

Figure 2

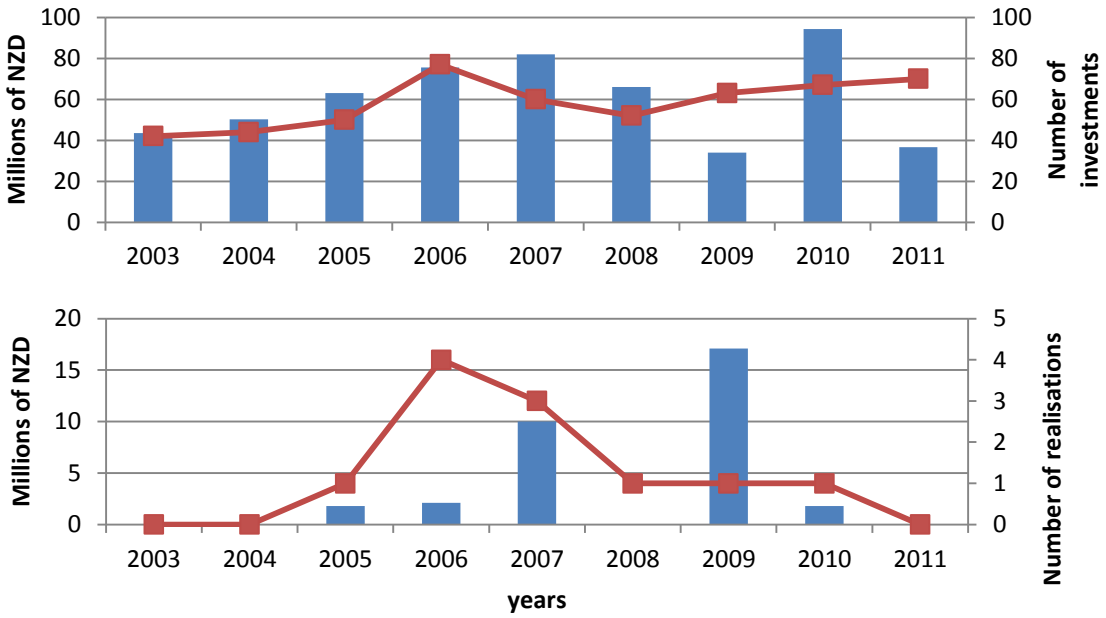

Figure 2. Investment and divestment activity of the NZ VC industry from 2003 to 2011. Data sourced from New Zealand Private Equity & Venture Capital Association and Ernst and Young, 2011.

Over this period the industry has successfully returned 32.8 million NZD through 11 realisations, with an average deal size of 3.0 million NZD. The low number of realisations indicates that many early stage (seed) and VC fund managers in NZ are yet to fully demonstrate their ability to exit their investments and provide an 'attractive' return on investment for investors. The NZVIF (2011a) also notes that the NZ market lacks observable data for early stage companies on company failure rates, investment returns, the amount of capital required to fund early stage companies through to realisations, and the holding period of early stage investments.[88]

[88] However, data on valuation of early stage companies indicates that value-uplift is occurring at various stages of investment. Pre-money valuations are 3.5 times higher at start-up stage than in seed stage, 3.5 times higher in early expansion than start-up and 4.3 times higher in expansion over early expansion (NZVIF, 2011a).

3.4 Methodology

Sample

To investigate impediments to attracting new VC investment capital, a qualitative research strategy was applied. Data was collected through 15 face-to-face, semi-structured interviews with fund managers, investor representatives, and industry intermediaries.[89] Each group consisted of five individuals who held senior positions within their respective organisations.[90] We classified fund managers as independent professionals that manage dedicated pools of capital (sourced from multiple parties) aggregated in a fund, which is invested in exchange for equity in privately held early stage high growth companies (Gompers & Lerner, 1998). Investor representatives were the personnel responsible for undertaking and managing the investments made by their respective organisations. The extant literature also suggests that corporate advisors can strongly influence the perspectives of investor representatives (Freiburg & Grichnik, 2012; Schertler, 2005). These participants provided an overview of the industry, which would not have been otherwise accessible, as well as perspectives on fund structure.

The categories for fund managers, investor representatives and industry intermediaries are outlined in Table 2. Fund managers invest mainly in companies based in NZ. Investors invited to partake in the study were typical VC investors in the NZ market. The investors' representatives were drawn from four organisations that had invested in VC funds and one institutional investor representative that had not invested in VC. Industry intermediaries included two individuals who work for different corporate advisory firms and three representatives from institutions that are affiliated or work with the NZ VC industry. The sample is not described in greater detail to maintain anonymity, which is a condition of ethics approval by the University of Auckland Human Participants Ethics Committee.[91]

Table 3

Panel A: Diversity of investment strategies implemented by fund managers that participated in the study. Aggregated investment strategies are categorised by sector, company stage and geography.

	Sectors	**Company stage**	**Geographies**
Fund managers	Energy, food/beverage, healthcare, biotechnology, pharmaceuticals/medical devices, IT/software, manufacturing, multi-media/communications, technology and agriculture	Seed, start-up, early expansion and expansion	Australia and New Zealand

[89] This sample size is broadly consistent with other exploratory qualitative research on VC conducted by Badino, Hu, & Hung, 2006; Bas & Bustamante, 2011; Hassan, 2010; Ness & Lameira, (2006).

[90] For example, fund managers and investor representatives were general partners and the head of investments.

[91] This study was granted ethics approval by The University of Auckland Human Participants Ethics Committee on 21st August 2012.

Panel B: Overview of the types of investor representatives that participated in the study.

	Types	Prior investment in VC fund
Investor representatives	Investment funds, corporates and institutions	Representatives from four organisations that had invested in VC, one representative had no VC investments.

Panel C: Overview of the type of participants in the industry intermediary group.

	Types
Industry intermediaries	Two corporate advisors and three representatives from institutions that are closely affiliated or work with the NZ VC industry

3.5 Interview questions

Interview questions were structured around what factors determine the ability or willingness of institutions to invest in VC funds, the general impediments or barriers fund investors face in allocating capital to VC funds and the prevailing VC fund structures. The fifteen participants were interviewed face-to-face at their premises or at a location of their preference in Auckland, NZ. The average duration of the interviews was 45 minutes and the aggregate duration of all interviews was 11.4 hours (685 minutes). Each interview was recorded using a digital device (Apple™ iPhone 4s) and transcribed using Intelligent Verbatim Transcription into a Microsoft™ 2010 Word document by the researcher. Intelligent Verbatim Transcription was used to increase the readability of the transcripts i.e., removal of repeats, filler words, and other irrelevant material (Bryman & Bell, 2011).

All edited transcripts were made anonymous and subsequently analysed using thematic analysis according to the principals set out by Gibbs (2008). NVivo™ 9 software package was used to analyse and visualise the individual transcripts line-by-line and broken down into individual 'meaning units' (chunks of text), referred to as codes.

4.0 Results

Lack of returns and fund manager reputation

Importance of historical track record

Participants from each group clearly indicated that the 'lack of returns' from NZ incumbent VC funds to date is the primary hindrance in raising either domestic or international capital. A historical record of producing returns is required to create a 'track record', which illustrates the competence and quality of a fund manager to potential investors. The importance placed on 'track record' as a quality indicator is consistent with prior studies that show investors use the historical track record of returns as the primary measure of reputation and a predictor of future fund manager performance (Barnes & Menzies, 2005; Fried & Hisrich, 1989).

The following quotes highlight this view:

"Lack of returns and that's the biggest, if you don't have a track record you'll never attract capital"

"I guess the problem in the industry here is, there is no track record to go off… until there is a track record developed, funds will be difficult to raise"

"The biggest threat, the biggest one is difficulty in raising funds and it is driven by lack of returns from existing funds… the chicken and the egg… until existing fund managers prove they can make an economic return for investors' money is going to be constrained… managers must demonstrate capabilities with their current portfolios"

Investors and corporate advisors differentiated 'lack of returns' from 'lack of observable returns'. The latter was referred to as '*high profile realisations, block buster success stories [internationally recognised success] of VC backed companies and lucrative returns [Internal rate of return of 20% or greater]".* Corporate advisors explained that observable returns are required to demonstrate that NZ VC funds represent lucrative investment opportunities, thereby fostering interest from potential investors.

Participants also mentioned that in order to attract investment from institutions (domestic or international) returns need to be demonstrated by several incumbent funds. These participants explained that institutions need the ability to build a diversified portfolio of investments in VC funds, otherwise it would simply not be considered. A contrasting view emerged from some fund managers and industry intermediaries, who mentioned that overall 20% or greater IRR and blockbuster success stories are unrealistic for first generation funds, especially given the timing of the global financial crisis (GFC). These participants indicated that a reasonable return demonstrates fund manager competence, as the industry is still immature.

Interestingly, fund managers in this study indicated that despite some VC funds demonstrating good performance, investors (offshore and domestic) still questioned their track record. A number of industry reports support this view, indicating that many NZ institutional investors do not consider VC funds as credible investment opportunities, or that these funds require Governmental support unless the fund managers have a track record (Lerner & Shepard, 2009; Springall, 2011). Barnes & Menzies (2005) also report that investors put a lot of emphasis on determining whether realisations can be assigned to 'luck' i.e., that they are isolated liquidity events at unpredictable market peaks, rather than the fund manager is genuinely and consistently adding value to investments. Most VC funds in NZ, however, are still in their first generation or fund lifecycle[92], and investments in partnership with NZVIF have generally been more directed towards "early stage" VC investments. These early stage VC investments take longer to develop to the next phase of the company lifecycle. In addition, many NZ VC investments were made prior to the onset of the global credit crisis, which has significantly impacted on subsequent returns and the ability for NZ VC funds to realise their investments.

Fund Manager Reputation

Prior empirical studies have demonstrated the importance of reputation as a determinant of the fundraising ability of fund managers (Gompers & Lerner, 1998; Gupta & Sapienza, 1992; Litvak, 2009; Walske & Zacharakis, 2009). They show that more reputable fund managers have a higher probability of raising funds, are more successful in raising larger funds, and attract larger capital commitments. Investors explicitly mentioned fund manager quality as an important consideration in any investment. The quotes below illustrate this:

"The single largest attribute is who the [fund] manager is and their track record"

"Deal flow, investment strategy is built into [fund] manager quality… the best managers have a handle on these and that's what produces returns"

"Investors would not mind paying a higher fee if they had some certainty of a good performance or if the fund manager being backed has a track record of executing"

[92] One exception is No 8 Ventures which has established No 8 Ventures Fund No. 2.

"We don't see the expertise of fund managers to identify the promising companies in general"

"It [investment strategy] seems to be built into fund manager reputation and quality"

Immaturity of the industry

Most participants shared the view that the industry is still maturing and that the lack of visible returns is partly due to incumbent funds not having progressed to completion. Thus, the perceived level of returns is not representative of 'true' performance. For example, one fund manager explained, "*we have only been through 75% of a cycle, [so] it's hard to tell [performance].*" Some investors noted that until there are observable returns produced by incumbent VC funds, most of the investor community will not care to familiarise themselves with VC. The intermediary participants agreed, adding that there is not enough accurate information about performance in the market place or coverage by corporate advisors.

VC versus other Asset Returns

Investors and corporate advisors indicated that other types of investments have to date provided superior risk adjusted returns compared with returns to NZ VC funds. It was considered not rational to invest in VC funds where: "*there are better returns elsewhere for less risk and it simply does not stack up.*" Some investors were of the view that VC investments are extremely volatile and the level of illiquidity and risk did not justify the investment decision. The following quotes illustrate these sentiments:

"It's more about the return; we can invest in illiquid assets as we have elongated assets. For example, infrastructure takes 5–10 years, but the returns are very very certain but single digit [IRR percentage] in which case we have been willing to invest despite illiquidity… but with VC the situation is there is a good chance you will see none of the money back"

"Investors are less concerned about the extent of a return... you know 10, 12–15% [IRR] whatever, but more concerned about just getting their money back"

4.1 Capital Constraints

The lack of capable domestic investors

Fund managers and intermediaries noted that there is a lack of domestic private capital available and questioned whether there are enough domestic entities in NZ that have the capacity to invest in NZ VC funds. The lack of domestic capital is a severe hindrance for fundraising offshore, with offshore investors very reluctant to invest in NZ VC funds unless a local private investor with a material contribution and the NZVIF also invest. The following quotes illustrate this:

"[is the lack of NZ institutional investors a 'put-off' for international investors?] Oh it's huge, huge! If the local market is not investing then you're in trouble… we used to have a rule that you never invest in a country without a local investor and I know many others stick to this"

"If the NZVIF was not in it they would walk away very quickly…"

Participants from the two groups mentioned that the severity of this hindrance is likely to increase in the future. Several fund managers also noted that the pool of domestic private capital was inadequate to support fundraising efforts, as residual investor types (high net worth individuals, family trusts, and corporates) are relatively small investors. These types of investors are an important supplementary source of funds once a 'critical mass of capital' has been raised from larger capital suppliers—namely institutional investors. The following quote illustrates this:

"they [high net worth individuals] are relatively small contributors [which] prefer to be well under 10% of a fund, so the critical mass of capital must be there before they come in."

Capital Exhaustion

Most VC fund managers were of the view that capital from domestic investors was exhausted or severely fatigued. Those domestic investors willing to invest in VC funds were already fully invested in prevailing funds and were seeking a return of their capital before they were in a position to invest in future funds. On the other hand some intermediaries indicated that the growing presence of Asian high net worth investors may expand the pool of domestic capital.

Illiquidity and Investor Time Horizon

Some participants mentioned that inability to tolerate illiquidity and the time horizon of VC investments (typically 10 years) prevents a number of entities from investing. Corporate advisors explained that the ability to invest in VC depends on the entity's asset liability structure. The ability to tolerate illiquidity was explained to be directly related to the predictability of investors' liabilities and the amount of discretion they have in meeting them. The length of time an entity can also wait until investments yield returns depends on the entity's longevity and purpose. Participants from all three groups indicated that illiquidity and investment time horizon are large barriers for investor types such as high net worth individuals, corporates and family trusts.

"We don't feel that the returns of VC justify taking on that illiquidity. An illiquid asset requires a premium as you can't extract the cash out for over 10 years. I think that the time horizon requires returns to be very large, it's also very risky. I think it's a very big barrier, as for an institution you have to have a lot of capital that you're willing to put a small portion away for 10–20 years and hope it's worth a heck of a lot more"

"It requires large returns and a track record of them, given the illiquidity. So managers need to be very good, and that takes time and experience"

"Illiquidity is the nature of the game so it's priced into the investment, so comfort around the risk-adjusted return is rational"

Some participants from each of the three groups also indicated that there are entities in NZ who are capable of investing in illiquid assets such as VC, but unfamiliarity with illiquid assets and misconceptions have limited their participation. The following quotes illustrate these views:

"There are a lot of entities who are in an ideal position to invest [in VC funds]… VC does not really feature or is not considered, there is a general lack of familiarity and understanding of the asset class [VC]… investors don't appreciate the difference between angel investing, VC and PE and where each fits"

"The length of the investment becomes less relevant for institutions, as we have elongated assets, so we do have the capacity to put a portion of our funds into illiquid assets"

"it is too easy for a lot of institutions to use that [illiquidity] as an excuse not to invest… a serious analysis of their cash flow position would indicate that their liquidity needs are probably not as high as thought of"

Fund managers and some investors also spoke of incongruence between the 10-year fund term and the time required: (1) to grow portfolio companies to a sufficient scale, and (2) to maximise realisable value.

"In terms of new funds… we really now question whether 10 years is long enough… I think others in the industry feel a bit the same way about that… in [the country] where our other fund operates our balance sheet shows hold times of over 10 years… I just think that some investors would not have gone into those types of investments knowing this now"

"There is a sense that the standard 10-year life does not sit comfortably with the development of companies and the time taken to bring products to the market, things like companies changing strategic direction after you've invested in them… you [have] got to remember while its 10 years, the investment

period is 5 or less and so the average hold can be as little as 5–6 years until the fund runs out of management fees or expectations of the investors increase that they will get distributions…"

"For a lot of life sciences, the 10 year time frame is a short time frame"

4.2 Volume and quality of deal flow

Interestingly, investors and intermediaries were of the view that insufficient volume and quality of deal flow (number of investment opportunities) in NZ is an impediment to the industry's viability. There was an overall appreciation from participants that VC fund managers screen thousands of deals to find 15–20 'good' opportunities, and eventually invest in 8–10. However, investors questioned the viability of the industry, because in their view there is not enough deal flow volume to support this approach in NZ. Some participants with this view linked inadequate deal volume to the small size of New Zealand's economy. Interestingly, this is despite research by Groh & von Liechtenstein (2012), who rank NZ in the top quartile[93] for abundance of investment opportunities and entrepreneurial culture. The following quotes summaries this sentiment:

"Out of the big basket [of deals] fund managers need to sift through and find the one good opportunity, well there isn't a hundred opportunities here in NZ, we are a tiny island"

"[What are your thoughts on deal flow in the NZ market?] Well whether there are enough deals in NZ for funds to be truly viable…it's the question"

Some investors and fund managers were also critical of the quality of deals in terms of human capital, corporate governance, the lack of experienced management teams, and the frequent mismatches between the types of expertise that enterprises require. The following quotes illustrate these views:

"Lack of governance is often an issue, usually there's just the founder and that's it… easily investable deals, with good teams and boards are few and far between"

"Lack of experienced management teams, poor human capital, ridiculous valuations… plenty of good ideas, but no execution I mean we have a full time head hunter to find the human capital we require… we often have to build teams first and then investment in them, we are investors not venture creators"

"Human capital is lacking to be honest, it's a big limiting factor… but this is a big real time debate actually, and perhaps generously I would suggest that our bigger issue may be governance not management, because good governance ensures that the right resources are in place to execute"

4.3 Other Challenges

Unfamiliarity

There was a clear view from VC fund managers and intermediaries that potential investors do not fully understand VC. One view was that NZ institutions (and the investor community in general) are generally unfamiliar with alternative assets such as private equity and VC. For example:

"The comment that I hear is that people don't really understand the asset class… very unsophisticated on alternative assets in general"

[93] Drivers that determined ranking for 'deal flow' include: Innovativeness Indices, R&D expenditure (public and private) as a percentage of GDP, number of early stage enterprises, ease of starting a business (time, cost, procedures required) and number of scientific and technical journal articles. See Groh & von Liechtenstein (2012) for a comprehensive summary of methodology, data sources, and technical descriptions.

"I think a lot of investors don't appreciate the difference between angel investing, VC and PE and where each fits… and there is a fundamental lack of understanding about how VC is different in NZ"

Corporate advisors indicated that there is a lack of investment expertise on the boards of potential investors (entities that have the capacity to invest), which may explain the lack of investment in alternative assets such as VC. However, corporate advisors also indicated that most NZ corporate advisory firms provide only scant coverage of illiquid assets. Moreover, there is no incentive to research and provide clients with information about alternative assets such as VC funds, and this lack of coverage is likely to contribute to limited investment by capable investors. The following quotes illustrate these views:

"Well it's a lack of coverage for illiquid assets that is a real barrier in getting VC in front of decision makers… Very few domestic asset consultants make the effort to research funds, they don't really understand them, so that's an issue"

"The other thing I suppose is advisor's, in some cases, complete lack of [knowledge of] what's actually happening in the market place, and that's a pretty big issue"

Misconceptions about the timeline of venture capital investment

A related view that emerged was that misconceptions exist concerning the timeline around investment in VC funds and when returns materialise (investment horizon). For example, intermediaries noted:

"There is an anecdotal issue around investors thinking it happens fast. For example, Instagram™ and 42 Below™ [and others] are commonly quoted by clients… I think there is a perception that investors think in 2–3 year life spans for investments… then you have fund managers saying these are 7–10 year life spans, well there's a mismatch of expectation there"

"I do come back to asset management consultants, well it's a lack of coverage for illiquid asset classes that is a real barrier in getting VC in front of decision makers… its often put in the too hard basket and others [corporate advisors] find lots of reasons to say no or distract clients from looking at it. I think there are issues around lack of gate keeping… private assets are not researched, very few domestic asset consultants make the effort to research funds and they don't really understand them and are not paid too…"

Scale and diversification

Fund managers and intermediaries indicated that the lack of scale and inability to diversify across several funds is a further impediment faced by domestic and international institutional investors. It was noted that a number of institutional investors (international and domestic) prefer to invest between $100–200m across several funds (scale), without placing for more than 20% of the total capital in any one fund (diversification). This creates a significant incongruence with respect to NZ, given the perception that there are not enough 'capable funds' (referring to quality fund managers) in NZ to deploy and diversify that amount of capital. Corporate advisors indicated that the investment mandates of institutions require diversification, without which asset classes are simply not considered. The following quote illustrates this sentiment:

"Well I think it's [lack of scale] a hindrance… Investors will say he [fund manager] wants 5 million dollars of investment, but I can't be bothered because I have got 25 million [to commit to the asset class], and I know 5 million is only going to get me an exposure of 2.5 million [capital draw-downs] and then it will start coming back [distributions], so it's not worth the hassle… So unless you are a big fund [that requires large commitments] it doesn't help you very much… their [investors] decisions are driven by scale and certainty of returns"

The requirement to enter international markets

Fund managers mentioned that because the NZ market is small, it is essential that portfolio companies enter international markets if they are aiming to reach their growth potential. For NZ companies, this requires a 'double growth phase' by first establishing business operations domestically, and second, by entering offshore markets to fulfil growth potential. The following quotes describe this view:

"In NZ you're looking from day 1 how quickly you're going to get that technology into a major market. Whereas if you're starting that company in the US you're looking at domestic markets that are big enough for you to grow a major company. So that's the different paradigm of the NZ market where you're looking from day one as to how you get them international"

"The biggest single challenge every one of our investments in NZ will face is the cost of going global… the first market won't be NZ, it will be offshore, NZ is clearly not a big enough market… so time, risk, money, language barriers etc., all gets a lot more complicated… you require a 'double growth phase', I mean the Aussies complain that they don't have a decent home market"

"We are one-step removed from international markets; you know distance to market, management and follow on capital… the 3 together means it takes longer and more expensive to do things… I mean some of our investments are 14 years in the making"

"NZ portfolio companies need to hit the borders very quickly, which is risky, requires more capital and more time"

Prevailing fund structure

Fund structure and manager's remuneration appeared to be a lesser consideration relative to other factors that investors consider when deciding to invest in a VC fund. The following quotes illustrate this view:

"[What are the drivers of the investment decision?] We generally centre our discussion on track record and what they [fund managers] have done. Typically, the fund structure only comes in once we are comfortable with track record"

"At the end of the day [fund structure] is a secondary issue, I mean at the end of the day you have to be happy with the fund manager"

This finding is consistent with several studies which investigate the criteria applied by investors when selecting funds (Barnes & Menzies, 2005; Fried & Hisrich, 1989; Groh & von Liechtenstein, 2011).

5.0 Conclusions and Implications

5.1 Overall conclusions

The importance of a well-developed national capital market has long been recognised by the NZVIF and the NZ government. However, the NZ VC industry currently faces considerable challenges to source new capital, with a large number of NZ institutions at present having little or no appetite to invest in VC funds. The global financial crisis and the continuing economic uncertainty have also reduced access to new capital by increasing investor risk aversion and making realisation of the existing investments held by VC funds more difficult. At the same time, NZVIF (2011) estimates that the financing needs of the next generation of early stage enterprises will require about 2 billion dollars of investment over the next 10 years (approximately $200 million a year). A pronounced funding chasm has also emerged for early stage NZ enterprises that require between two and ten million dollars of funding.

In this exploratory study we examine the challenges the VC funds industry faces in NZ to raise funds and source new capital. Data was gathered through 15 face-to-face interviews with fund managers, investors, and industry intermediaries. Our findings suggest that a key issue faced by

the VC industry in NZ is the lack of observable proven historical returns. Proven returns provide evidence of a VC funds' track record, which will incentivise new VC investment and enable NZ VC funds to raise new equity capital. However, as one fund manager noted, '*it's a chicken and egg situation'*, in that reputation is required to raise capital, but capital is required to build reputation. Demonstration of a 'track record' is further hindered by the relative immaturity of the VC industry, as most NZ VC funds have only progressed through 75% of their investment life cycle and a number of investments have yet to be exited. Thus, the lack of observable returns is partly due to incumbent funds not having progressed to completion.

Fund managers and intermediaries also noted that there is a lack of domestic entities in NZ that have the capacity and current appetite to invest in VC to support the industry. Those domestic investors who had invested in VC funds were seeking a return of their capital before they are in a position to invest in future funds. This also reflects the relative immaturity of the NZ VC fund industry. Some participants noted that investors' inability to tolerate illiquidity and the time horizon of VC investments (typically 10 years) prevents a number of entities from investing. There were also concerns expressed about the volume and quality of deal flow for VC investment in the NZ market, the lack of scale, and the inability for investors to diversify across several funds, as well as the fact that potential investors do not fully understand the nature of VC investment.

5.2 Implications for the industry and recommendations

The NZ VC industry is taking steps to mitigate a number of the challenges that we have identified in this study to raise new equity capital. For instance, NZVIF has indirectly (through VC funds), invested in 125 companies, and it aims to see 10% (12 companies) of these listed on the NZX over the next few years. The CEO of the NZX also announced in March 2013 that it is investigating a new market to replace the existing NZAX alternative exchange with a view to making listing easier for small growth orientated companies that require expansion capital.[94] NZVIF (2012a) indicates that the benefit of this will be two-fold. Firstly, New Zealand's capital markets will be stronger if there is a viable path from private investment through to the public market. Secondly, it is suggested that establishing a viable path to the listed market will open up new, deeper pools of capital for companies to develop while providing investors with another path to liquidity.[95] The announcement in October 2012 of a $200 million co-investment partnership with Taiwan's National Development Fund will also likely improve the ability of VC funds to access new capital in the NZ market.

To address concerns about the lack of observable historical return data, the NZVCA is taking steps in conjunction with Cambridge Associates to track the performance of NZ VC funds through benchmarking and quarterly data monitoring (NZVCA, 2012). This recognises the importance of robust performance data to assist investors in their decision to invest in VC funds. Also, The NZVCA (2011) recommends that the Government should consider further initiatives to encourage high net worth migrants into NZ. It should also encourage Scheme providers for KiwiSaver to invest in VC funds, and consider providing guidance to the NZ Superannuation Fund to invest a greater portion of its funds in VC capital. Policy initiatives could further be directed to improve investors' understanding of the VC market in NZ.

[94] See: http://www.stuff.co.nz/business/8490693/NZX-prepares-to-launch-new-markets - dated 31 March 2013.

[95] Given the importance of capital markets the industry may consider options to enhance the ability of young companies to raise further growth capital from public markets and in doing so provide liquidity for investors. For example, the Australian Securities Exchange (ASX) listing rules allow young companies (with the characteristics of venture backed companies; typically unprofitable, not a going concern, no accounts history for previous three years), termed Commitments Test Entities, to become quoted on the ASX, based on commitments to spend the funds raised under an IPO and provision of quarterly cash flow reports to the ASX (Murgulov, Marsden, Ghon Rhee, & Veeraraghavan, 2011).

However, despite these positive initiatives by the NZ VC industry, we conclude that the VC industry still faces considerable challenges in the current market when attempting to raise new equity capital. The situation has been made even more challenging because access to credit and investor risk aversion remains high following the global credit crisis. Successful realisations or other mechanisms to provide liquidity and price transparency with existing investments held by NZ VC funds would represent a significant milestone for the industry and demonstrate a record of observable and (hopefully) high levels of returns to investors.

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Identifying Extreme Performers Stocks in New Zealand

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Abstract
The purpose of this study is to determine both common factors and differencing factors that can assist in identifying extremely good performance stocks and extremely poor performance stocks on New Zealand Stock Exchange market (NZX). Adopting the two-stage approach of Beneish, Lee, and Tarpley (2001), the study firstly estimates a model that is able to identify extreme performers relative to a control group within the fourth quarter each year starting from 1994 to 2010. In the second stage, this study contrasts extreme winners and extreme losers within the subset of predicted extreme performers. Findings of the study show that extreme samples are found to have lower market capitalization, lower price before portfolio formation date, and less number of available estimates. In addition, stocks belong to Winners' sample is expected to have lower closing price before the portfolio formation date than Losers' stocks. Extreme samples are also found to have higher standard deviation of return in the prior 6 months before the formation date, and higher ratio between highest closing price and lowest closing price in prior 30 days before the portfolio formation date. Findings of this study are beneficial to fund managers and investment analysts in portfolio construction and stock picking strategies.

JEL Classification - G15 - International Financial Markets

Key Words: Extreme stocks; firm characteristics, trading characteristics; market multiples, fundamental variables.

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1. Introduction

According to Beneish et al. (2001), in a typical quarter, there is great disparity between the performances of stocks listed on the United States Stock Exchange. In addition, they also found several sufficient indicators for distinguish performance of stock prices (in term of size adjusted return). These extreme stocks are of particular interest to professional fund managers and investors. The purpose of this study is similar to Beneish et al (2001) study. However, instead of digging into the US stock markets, which was investigated by number of previous studies, this study totally focuses on New Zealand Stock Exchange market (NZX) by analysing both common factors and differencing factors that can assist in identifying extremely good performance stocks and extremely poor performance stocks.

In this study, the two-stage approach of Beneish, Lee, and Tarpley (2001) is the main foundation techniques with additional modifications on variables use such as dropping NASVOL and slightly differences in calculating size adjusted return. The modification of some variables is mainly due to the differences between the US stock markets and the NZX. In the first stage, the study estimates a model that is able to identify extreme performers relative to a control group within the fourth quarter each year starting from 1994 to 2010. In the second stage, this study then contrasts extreme winners and extreme losers within the subset of predicted extreme performers.

The dependent variable is size adjusted return (RNTQ4), which is calculated for all public-listed stocks on New Zealand Stock Exchange. The sample extends from 1994 to 2010 and consists of 1368 observations. The size adjusted return represents the difference between the firm's buy-and-hold returns and the buy-and-hold return on a value-weighted portfolio of firms in the same CRSP size decile.

The analysis methods are used in this study for prediction of extreme stock returns. Even if gains and losses from holding them can be dramatic, little is known about the characteristics of these stocks (Beneish, Lee, & Tarpley, 2001). It will then be examined to which existing market anomalies, such as the price-to-book effect and the price momentum effect are attributable to the extreme performers in the top and bottom 10% of all stocks. Also, accounting-based variables (such as R&D, profit margins, and capital expenditures) are tested to find whether they have any influence in returns prediction across extreme and non-extreme firms within New Zealand Exchange markets.

There are three areas of research relevant to the subject matter that is addressed in this study. First, it sits in that stream of literature that has been described as contextual studies in that it addresses a particular sub-group of stocks, the extreme performers. Second it relates to the general area of predictability in that we aim to identify in advance these extreme performers where our success will undoubtedly lead to the construction of outperforming portfolios. Third, it can be regarded as part of a stream research that address the question of the relevance of accounting information, especially from the context of making investment decisions.

Reingamun (1988) was the first study that sought to identify extreme winners. He used a combination of technical and fundamental factors and identified that extreme winners were most likely to come from value stocks that were enjoying strong price and earnings momentum. We expand the context beyond extreme winners to extreme performers as we first seek to identify both extreme winner and extreme losers and then differentiate between the two. Other contextual studies have been conducted in the areas such as bankruptcies (Altman et a., 1977), and mergers (Palepu, 1986).

Using cross-sectional analysis to produce factors models that forecast future returns has been the subject of many academic papers. Perhaps the most well-known academic papers in this are Fama and French (1993) and Carhart (1997) that both drew from the market anomalies literature to develop models based on value, size and momentum to explain stock returns. Other factors that researchers have found to be correlated with future markets performance include accruals (Sloan, 1996), financial health, (Bird and Casavecchia, 2007) and several macroeconomic variables (Petkova, 2006). Almost all quantitative fund managers have their own factor models which are the basis of their investment strategy.

Finally our work covers much of the territory previously canvassed by papers that have attempted to assess the usefulness of accounting information in identifying the better performing stocks. Ou and Penman (1989) was the foundation paper in this area with these authors testing numerous accounting ratios and identifying some that were useful in identifying future stock returns. Several subsequent papers have confirmed the usefulness of accounting data to various degrees (Abaranell and Bushee 1998; Bird and Casavecchia 2007).

2.0 Literature Review

The predictability of stocks returns has occupied the minds of market participants ever since markets were established. The interests of academics in this exercise dates back more than a century but was given a fillip by the work of Fama and French (1992) who categorised the Efficient Markets Hypothesis (EMH) in the 60s (1970). Since that time hundreds of empirical studies using a range of methods have identified instances where stocks returns seemed to be predictable, at lease to the extent that they provide insights that can be used as the basis for strategies that can when implemented outperform the market (e.g. Lakonishok, Shleifer, and Vishny (1994); Jegadeesh and Titman (1993)).

Further, these instances of predictability are frequently referred to as market anomalies in that they are at variance with the Efficient Market Hypothesis. Many would argue that this is not the case citing explanations

such as the strategies do not generate excess returns once one takes account of implementation costs (Rubinstein, 2001) or that the analysis has identified spurious predictive relations (Ferson, Sarkissian, and Simin, 2003).

One answer to the second of these criticisms is to show that similar models suggest predictability across different markets at different points in time. It is this that provides a particular motivation for this paper with another equally important examining a particular instance of predictability which has previously not been examined in the context of the New Zealand Stock Exchange market. Beneish, Lee, and Tarpley (2001) examined the extent to which extreme performing stocks could be identified in advance in the US equity market.

They found that both extreme winners and extreme losers share some certain characteristics that differentiate than more normal performing stocks and in turn there are a number of accounting variables which enable the extreme winners to be distinguished from extreme losers. Glickman, DiRienzo, and Ochman (2001) extended the analysis to US small cap stocks and also demonstrated the importance of the first two moment of recent performance (momentum and volatility) in first identifying, and then differentiating between, extreme performers. Becker and Ochman (2004) largely extend the Glickman, DiRienzo, and Ochman (2001) analysis to European markets pointing out that differing company characteristics and reporting practices may lead to variations between the models appropriate for European stocks as compare to those identified for the US stocks.

Again, they find that a two stage process works best first identifying extreme performers using variables such as short-term volatility, age and recent sales history and then differentiating between those identified using several variables including momentum and fundamental accounting variables.

3.0 Variable Definition

The research objective is to detect a descriptive profile of the firms that subsequently experience a sharp price movement. Following the study of Beneish (2001), there are total of 11 market based variables and 8 fundamental signals. Comparing to Beneish's (2001) study, the only abandon variable is NASVOL (equal AVGVOL of firms is traded on NASDAG, zero otherwise, which is not consistent with this study which investigates toward New Zealand Stock Exchange). To ensure of having sufficient number of sample the stocks, securities have close price of less than $1 on portfolio formation date which are also included (this help to explain the negative figures for PRICE variables). These 19 variables are listed in Table 1, including data expression from Thomson One Banker.

Dependent Variable

Panel A of Table 1 presents the dependent variable: size adjusted returns in a last subsequent quarter each year (RTNQ4). This variable is the buy-hold return for a given firm in a future quarter; minus the average return for firms in the same size decile over that fiscal quarter. To ensure the accounting information is available by the portfolio formation date, the RTNQ4 is computed as over the first calendar quarter from October 01 to December 31, which is 3 months after the fiscal quarter end on September 30 each year (time t).

Independent Variables

The independent variables derive from two main streams of research (First, from the literature on market volatility, and second, from prior literature on market pricing anomalies). These variables are grouped as either market-based signals, or fundamental signals. These two groups are intended to highlight the incremental contribution of accounting variables to the two tasks at hand.

Market-based Signals

The purpose of these market-based signals is to control for general firm characteristics and recent trading patterns that could be early ideal indicators of large imminent price movement.
The panel B of Table 1 presents four general firm characteristics including SIZE, PRICE, NUMEST, and AGE. SIZE is the decile ranking of a firm's market capitalization based on the New Zealand Stock Exchange cut-offs, as of September 30 of the prior year. PRICE is the natural log of close price just one day before portfolio formation date. NUMEST is the number of analysts supplying a one year ahead earnings forecast (assumed to be zero if firm is not available in the Thomson One Banker database). AGE is defined as the number of months from the first listing data on CRSP to the fiscal quarter end on September 30.

The panel C presents four variables associated with recent trading activities in each stock including FRTN6, AVGVOL, STDRET, and MINMAX. FRTN6 is the size adjusted buy and hold return in the six months prior to portfolio formation ended on September 30 each year. AVGVOL is the average daily turnover ratio over the prior six months ended on September 30 each year. STDRET is the standard deviation of daily returns in the 250 trading days prior to portfolio formation. MINMAX is the ratio of the highest daily closing price to the lowest closing price over the past 30 trading days ended on September 30 each year. Panel D describes three market based valuation multiples including D/P is the debt to market ratio; B/P represents the book to price ration and S/P is the sales to price ratio.

Fundamental Signals

There are total eight fundamental signals which are presented in the panel E of table 1 including: SGI, GMG, CHGEPS, ACCRUAL, R&D, CAPX, LSY, and SLDY. SGI is the rates of sales growth over the past year. GMG is the percentage change in sales minus percentage change in gross margin. CHGEPS is a measure of the earnings surprise from the most recent year. ACCRUAL is the total accrual scaled by average total assets. R&D is a measure of research and development expenditure intensity, calculated as total research and development expenditures divided by total assets. CAPX is measured as total capital expenditures divided by average total assets.

There are two extra indicator variables (LSY and SLDY) to capture possible asymmetry in the case of loss firms, or firms that have experienced sales declines. LSY is defined as value of 1 if a total earnings before interest and tax is negative over the past year and 0 otherwise. SLDY takes on the value of 1 if sales declined over the past year, and 0 otherwise.

<See Table 1 here>

4.0 Data and Methodology

Data is mainly collected from Thomson One Banker. The sample consists of all firms in the CRSP and merged Compusat (PST, Full Coverage, and Research) universe. Following the study of Beneish et al. (2001), to ensure sample firms have sufficient market liquidity, the stock samples are required to have a stock price of at least $1 on the portfolio formation date. However, due to limited number of available stock each year, samples with stock closing price of less than $1 on the portfolio formation date are included in the estimated samples.

After data collection and calculation, all stocks samples are re-ranked based on the size adjusted returns for each year. In the previous study of Beneish et al. (2001), based on the stock's performance, the top 2% and bottom 2% were pull-out from total estimated sample. To ensure of having sufficient number of samples for extreme winner and loser, the top 10% and bottom 10% were pulled from total sample each year with the time period covered is from January 1994 to December 2010. After excluding inactive stocks, the total number of samples is 1683 which includes 170 samples each for extreme winners and extreme losers group, and 1343 samples for control group.

Due to small scale of New Zealand exchange market, this study is trying to increase the number of estimated samples which lead to a trade-off limitation between insufficient numbers of estimated total samples or extreme samples and insufficient market liquidity requirement of securities having stock price under $1. The least square regression with and without dummy variables, and multivariate probit estimation regression are primarily conducted for detecting stock performance.

5.0 Empirical Results

Univariate Statistics

Results of univariate statistics are presented in table 2. The total samples for all variables are 1,638 estimated samples. In the table 2, while the extreme winners (loser) are set as Winners (Losers), the rest of unfitted firms in Winners' samples or Losers' group are named as Control.

<Insert Table 2 here>

Between each sample group, the T-Statistic results are conducted by two-tailed statistic test of difference in mean; and the Z-Statistic results are considered the two-tailed statistic test of difference in median. At first the Control group are selectively tested with both Winners' and Loser' group, the third column is the statistical tests for comparison of Winners' and Losers' themselves. The number of both positive sign (+) and negative sign (-) expresses the direction of relationship and statistical confident level at 90% or 95%. N is the number of available observations in each estimated group.

The Panel A shows the total sample of each group. The sample number of both Winners' and Losers group is 170, and the Control's group is 1343 samples. Within 3 months of the fourth quarter each year, the extreme winners' size adjusted return averagely increases by 38.42%; the extreme losers' size adjusted return averagely decreases by 31.70%. Lastly, the size adjusted return of Control sample has the mean of -0.87%. The confident level of statistic test between each groups are all more than 95%. While Control vs. Winner statistical test shows positive direction, Loser vs. other two groups with negative direction.

The Panels B compares the firm characteristics of each estimated sample group. There is more than 95% confidence level showing the significant difference between extreme groups (Winners and Losers) and Control groups in term of firm SIZE, PRICE and NUMEST. All of three variables shows the negative direction (-- sign) of extreme samples with control group. These negative signals indicate that, comparing to Control samples; extreme samples tend to have lower market capitalization (SIZE), lower price before portfolio formation date (PRICE), and less number of available estimates toward the specific firm (NUMEST). Between Winners' sample and Losers' sample, there only PRICE variable signals the statistical difference with a positive relationship direction (+). In addition with the mean of PRICE variable of Winners is equal -0.6784 which smaller than Losers' PRICE mean of -0.3377 indicating that Winners tend to have lower closing price just before the portfolio formation date than Losers.

In the Panel C, there are four trading characteristics' variables which were used for detecting the statistical differences between each estimated sample group. Despite of non-existing statistical differences in mean and median of FRTN6 and AVGVOL, there is more than 95% statistical confident level of difference between extreme sample and Control sample in term of STDRET and MINMAX which both signal the ++ value. Both STDRET of Winners' mean and Losers' mean are higher than Control samples' mean, which implies that extreme sample tend to have high standard deviation of return in the prior 6 months toward the portfolio formation date. The higher mean value of extreme's MINMAX, comparing to Control's MINMAX, indicating that the ratio between of highest closing price over the lowest closing price prior 30 days before the portfolio formation date of extreme sample is likely to be higher than the Control sample.

In the Panel D, it contains three market multiples variables including B/P, S/P, and D/P. There is more than 90% confidence level of difference between Winners and Controls in term of B/P. With B/P mean of 3.3966 comparing to control B/P mean of 2.2571, the Winners B/P values are found to have higher book to price ratio than Control sample. In addition there is more than 95% confidence level of different between both Control sample and Loser sample toward Winner sample in term of S/P. With higher S/P mean value of 1.5314 comparing to Control's S/P mean value of 1.3791, Winners stocks are expected to have higher sales to price ratio than Control sample. On the other hand, the Losers' S/P mean value is 2.5361, indicating that, comparing to Losers sample, Winners samples are expected of having lower sales to price ratio.

In the Panel E, there are 6 fundamentals variables including SGI, GMG, R&D, CHGEPS, ACCRUAL, and CAPX. There only SGI variable signal the + sign between Winners and Losers. It indicates more than 90% significant confidence level of difference in both mean and median between Winners and Losers. With the lower SGI mean value of 1.2458 comparing to Losers SGI mean value of 2.8972, Winners samples would normally have lower sales growth than Losers sample.

Estimated Returns for Extreme and Non-Extreme Firms

During this contextual analysis, it contains the differential role played by number of variables for the purpose of predicting return performance of extreme and non-extreme firms. The table 3 presents the results of pooled regression of total sample of 1683 New Zealand Exchange stocks in the estimated sample from 1994 to 2010. The independent variables are including market ratio (B/P), measure of price momentum (FRTN6), measure of firm market capitalization (SIZE), and in addition with total 8 fundamentals variables as listed in table 1.

<Insert Table 3 here>

Model A and B apply simple least square regression of the some or all discussed independent variable listed in Table 1. These two models are followed to number of previous studies, especially Beneish et al. (2001) paper. The model C and D also choose the same independent variables with model A and B respectively, in addition with the set of interaction terms (*I * y*). Within the model C and D, each independent variable (*y*) is multiplied by an indicator variable (*I*), which is set as 1 if the firms are an extreme performer in the last end quarter each year, and zero otherwise. Moreover, in model C and D, the non-interactive terms express the predictive power of the variables in the non-extreme group. In a contradiction, the interactive terms signal the incremental effect of these variables for the prediction of extreme performance return.

Model A Equation

RTNQ4 = 0.024 + (-0.06)R&D + (-0.024)LSY + (-0.048)ACCRUAL

The regression Model A has the adjusted r-square of 2.40%, which explains that the movement of size adjusted return is 2.40% explained by the total 8 variables in model A. Along with the intercept there are 6 out of 8 variables that statistically significantly affect toward size adjusted return. There are 5 variables that negatively statistically impact toward the overall stock performance, which include SGI, R&D, LSY, ACCRUAL, and CAPX. There only GMG variable has positive affect toward stock return with more than 90% confidence level. The coefficient values of SGI, GMG, and CAPX are relatively small, which are cancelled out from the Model A equation.

Model B Equation

RTNQ4 = (-0.104)R&D + (-0.019)LSY + (-0.05)ACCRUAL + (0.033)FRTN6

The regression of Model B has the adjusted r-square of 4.37%, which explain that the stock return is 4.37% explained by total 11 variables in Model B. There are 8 out of 11 variables that have the statistical significant level of 90% or more. There are 5 variables that negatively affect toward stock performance including SGI, R&D, LSY, ACCRUAL, and CAPX; and 3 variables that have the positive impact including GMG, B/P, and FRTN6. The coefficient values of SGI, GMG, CAPX, and B/P are close to zero, which are cancelled from the Model B equation.

Model C Equation

RTNQ4 = 0.0258 + (-0.024)LSY + (-0.04)ACCRUAL + (-0.17)I*R&D

In the model C, the adjusted r-square is 3.20% which expresses that stock return behaviour is 3.20% explained by listed variables in model C. There 4 non-interactive variables (LSY, CHGEPS, ACCRUAL, and CAPX) and two interactive variables (I*R&D and I*CHGEPS) are statistically significant of more than 90% affect toward the size adjusted return. All of the 4 non-interactive significant variables have the negative impact to size adjusted return of Control sample. For the extreme sample, while interactive variable of LSY has the negative impact toward stock return, the interactive variable of CHGEPS has the positive effect toward extreme performers. The coefficient values of CHGEPS, CAPX, and dummy variable of CHGEPS are relatively small. Thus they are left out from the Model C equation.

Model D Equation

RTNQ4 = 0.0242 + (-0.024)LSY + (-0.04)ACCRUAL + (-0.21)I*R&D +
(-0.11)I*ACCRUAL + (0.014)I*BP + (0.08)I*FRTN6

The model D has the adjusted r-square of 7.58%, which highlights that stock return behaviour is 7.58% explained by listed variable in model D. There 4 non-interactive variables (LSY, CHGEPS, ACCRUAL, and CAPX) and 7 interactive variables (I*SGI, I*R&D, I*CHGEPS, I*ACCRUAL, I*B/P, I*FRTN6, and I*SIZE) have statistically impact toward the estimated sample size adjusted return with confidence level of more than 90%. Similarity with Model C, in Model D all of 4 non-interactive significant variables have negative impact toward non-extreme samples' stock performance. For the extreme sample, while SGI, R&D, SIZE and ACCRUAL, have the negative effects toward stock return; there only CHGEPS, B/P, and FRTN6 has the positive effect toward extreme performers' stock return. However, the coefficient values of CHGEPS, CAPX, and dummy variables of SGI, CHGEPS are relatively small. Thus their coefficient values are assumed as zero and abandoned from overall Model D regression equation.

Multivariate Estimation Results

In the table 4, there three sets of multivariate Probit regression is used for the purpose of detecting the signal of each of sample group. Independent variables are chose following Beneish et al (2001) study which includes all listed independent variables in Table 2, excepting NUMEST, and B/P.

<Insert Table 4 here>

In the first column, the extreme samples (Winners and Losers) are compared with Control samples. During this comparison, the dependent variable is set as 0 if sample belong to Control group, and 1 for extreme samples. The pseudo r-square in the first column is 26.75%, which explain that stock return movement between extreme samples and control samples is 26.75% explained by chosen variables. There are 10 variables with P-value less than 0.1, which indicates the significant confidence level of more than 90%. These 9 variables would help to identify the stock performance of extreme samples. The positive indicators are including SIZE, AGE, STDRET, SGI, LSY, and CHGEPS; and negative indicators including FRTN6, AVGVOL, SLDY, and R&D.

In the second column, using the total of 1368 sample Losers and Winners samples are re-defined for the purpose of analysis. As dependent of firm with negative size adjusted return is coded as 1 (defined as Losers) and 0 if its size adjusted return is positive (defined as Winners). The founded pseudo r-square is 8.5% indicating 8.5% stock return between Loser and Winners is explained by listed variables. There are 6 variables with P-value less than 0.1, which indicates they have more than 90% significant confidence level. There signalling variables are identified as signalling positive or negative stock return. There are 5 variables predict the positive stock return including PRICE, S/P, D/P, SGI, and R&D. SLDY and ACCRUAL is the only two founded variable which predict the stock loss.

In the third column, there only total of 340 extreme samples are used including 170 samples from Losers group and 170 samples from Winners group. During the third test, dependent variable of firms who belong to Losers sample is defined as 1 and 0 if firms belong to Winners samples. The pseudo r-square is 36.75%, which explains the difference in stock return between Loser and Winner is 36.75% explained by chosen independent variables. Due to small number of sample size, there are only 4 founded variables with P-value less than 0.1 or more than 90% significant level of confidence that help to specify the extreme Losers and extreme Winners. Two variables are useful for predicting extreme Losers are SIZE and ACCRUAL. Two variables should be used for identifying extreme Winners stocks are MINMAX and CAPX.

Conclusions

In the univariate statistics, there numerous found variables could help to distinguish the stock performance of each sample groups (Winners, Losers, and Control):

- Extreme samples are found to have lower market capitalization, lower price before portfolio formation date, and less number of available estimates. In addition, stocks belong to Winners' sample are expected to have lower closing price before the portfolio formation date than Losers' stocks;

- In the trading characteristics' variables, extreme samples are found to have higher standard deviation of return in the prior 6 months before the formation date, and higher ratio between highest closing price and lowest closing price in prior 30 days before the portfolio formation date;

- For the market multiples, the higher book to price ratio might be useful for identifying extreme Winners stocks. In addition, Winners sample tend to have lower sales to price ratio toward Losers but higher sales to price ratio comparing with Control samples; and

- The sales performance cannot be used to separate extreme performers from Control samples. However, it can be used to distinguish the performance of Winners and Losers stocks, as the Winners sales growth level is expected to be lower than Losers' sales growth level.

In the regression model, there is evidence to support the forecast of variation in future returns when it is estimated on the whole sample:

- Both the concluded equation model A and B agrees that the level of research and development, accrual, and EBIT growth help to indicate the stock price downward movement. The model B is different from model A in term of FRTN6. As model B suggest that 6 months prior size adjusted return might help to forecast the stock price upward movement; and

- Both equations of model C and D indicate that EBIT performance and accrual might identify control sample; and research and development help to detect extreme stock performers. The model D is different from model C in term of dummy variables of ACCRUAL, B/P, and FRTN6. As the model D suggests that variables of accrual, book to price ratio, and prior 6 months size adjusted return might be useful for separating extremely stocks from the whole samples.

In the probit estimation regression, there evidences explain a much larger proportion of the variation in future return whether it is estimated on whole sample or extreme sample only:

- For the purpose of identifying extreme sample within New Zealand stock markets, the suggested indicator are firm market capitalization, age, prior six month price adjusted return, average trading volume, standard deviation of prior 250 days return, sales growth performance, research and development, and EBIT growth;

- For the purpose of predicting negative stock return from within New Zealand stock markets, the useful indicators are its price before portfolio formation date, sales to price ratio, debt to price ratio, sales performance comparing from its prior year, and research and development expenditure; and

- For the purpose of separating extremely poor performance stock from extreme sample, the ideal indicators are market capitalization, and the ratio between highest and lowest closing price prior 30 days before the portfolio formation date.

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Table 1 Variable definitions

Panel A: Dependent Variable	
RTNQ4	3-month size-adjusted buy-hold returns over the calendar quarter from October 01 to December 31, 3 months after the fiscal quarter end on September 30 each year (time t). Data expression is "*TF.PriceClose*"
Panel B: Firm Characteristics	
SIZE	Decile Ranking of Market Cap as of September 30 of the year prior to portfolio formation date
PRICE	Natural log of price just before portfolio formation date
AGE	Age of firm computed as number of months from 'BEGDAT' on CRSP to fiscal quarter end on September 30. Age data expression is "*DateofIncorporation*"
NUMEST	Number of analysts supplying FY1 forecasts (equal 1 if found from database, or 0 if firm not in IBES database)
Panel C: Trading Characteristics	
FRTN6	Prior 6-month size-adjusted buy-hold returns ended on September 30 each year
AVGVOL	Prior 6-month Average Daily Turnover ended on September 30 each year. Data expression is "TF.MarketCapMonthly"
STDRET	Standard deviation of daily returns over the 250 trading days prior to portfolio formation
MINMAX	The ratio of the highest price to the lowest price over the past 30 trading days ended on September 30 each year
Panel D: Market Multiples	
B/P	The book-to-price ratio computed as total SE/MVE as of the portfolio formation date. Data expression is "TF.PricetoBookratioClose"
S/P	The sales-to-price ratio computed as Net sales divided by market capitalization
D/P	The debt-to-price ratio computed as (current liabilities + Long-term debt)/market capitalization
Panel E: Fundamental Variables	
SGI	Current period sales are divided by last year period sales ($Sales_t$ / $Sales_{t-1}$).
GMG	Percentage changes in sales – Percentage changes in gross margin (Δ% Sales - Δ% Gross Margin)
R&D	R&D expense deflated by total assets, deemed zero if missing
CHGEPS	Earnings surprise ((EPS_t – EPS_{t-1})/$Price_{t-1}$)
ACCRUAL	Total accruals/Average total asset
CAPX	Capital Exp./Average total asset ($CAPX_t$ / (Total $Asset_t$ + Total $Asset_{t-1}$)/2))
SLDY	Indicator (= 1) if sales decline in most recent year ($Sales_t$ – $Sales_{t-1}$)
LSY	Indicator (= 1) if loss (EBIT) occurs in most recent year ($EBIT_t$ – $EBIT_{t-1}$)

Note: Year t refers to data from the most recent year to September 30. All %'s calculated as follows: $[X_t - ((X_{t-1} + X_{t-2})/2)]/((X_{t-1} + X_{t-2})/2)$.

Table 2. This table presents summary statistics for firms in the extreme winner portfolio (Winners), extreme loser portfolio (Losers), and a control group (Control). Extreme winners and losers are defined as firm ranked in the top and bottom 10 per-cents in terms of size adjusted.

										Statistical Tests					
	Winner			Control			Loser			Winner vs. Control		Loser vs. Control		Winner vs. Loser	
	N	Mean	Median	N	Mean	Median	N	Mean	Median	T-stat	Z-stat	T-stat	Z-stat	T-stat	Z-stat
Panel A. Dependent variable															
RNTG	170	0.3842	0.3092	1343	-0.0087	-0.0105	170	-0.3170	-0.2718	++	++	--	--	--	--
Panel B. Firm Characteristics															
SIZE	170	196.6659	21.4900	1343	431.3676	89.5500	170	186.8549	19.2100	--	--	--	--		
PRICE	170	-0.6784	-0.6897	1343	0.2265	0.2553	170	-0.3377	-0.5025	--	--	--	--	+	+
AGE	170	212.70	121.50	1343	264.0881	176.0	170	239.6500	152.50						
NUMEST	170	0.1941	0.0000	1343	0.4847	0.0000	170	0.2647	0.0000	--	--	--	--		
Panel C. Trading Characteristics															
FRTN6	170	0.0368	0.0029	1343	-0.0059	-0.0218	170	0.0085	-0.0508						
AVGVOL	170	7.1876	0.9340	1343	12.7710	1.1139	170	7.3059	0.9539						
STDRET	170	0.0464	0.0362	1343	0.0267	0.0180	170	0.0471	0.0389	++	++	++	++		
MINMAX	170	1.2407	1.1429	1343	1.1304	1.0870	170	1.2689	1.1544	++	++	++	++		
Panel D. Market Multiples															
B/P	170	3.3966	1.4303	1343	2.2571	1.3935	170	-5.9887	1.2373	+	+				
S/P	170	1.5314	0.6749	1343	1.3791	0.6046	170	2.5361	0.8400			++	++	++	++
D/P	170	0.6111	0.2800	1343	0.7055	0.3658	170	2.7718	0.4576						
Panel E. Fundamental Variables															
SGI	170	1.2458	1.0625	1343	2.2479	1.0643	170	2.8972	1.0496					+	+
GMG	170	11.1459	0.0977	1343	1.1727	0.0767	170	3.3513	0.1240						
R&D	170	0.5025	0.2536	1343	0.4310	0.3054	170	0.4611	0.2937						
CHGEPS	170	45.6201	0.0077	1343	-0.2193	0.0029	170	44.4749	-0.0045						
ACCRUAL	170	0.1998	0.1450	1343	0.1880	0.1052	170	0.2157	0.1042						
CAPX	170	6.9617	3.0862	1343	8.3074	3.9097	170	11.9389	3.2901						

Table 3: Future returns to individual signals for all sample firms.

*The table 3 presents the results of a pooled regression of 1683 New Zealand stocks in the estimated sample from 1994 to 2010. The dependent variable is the one quarter lag size adjusted returns (RTNQ1). The independent variables are the eight fundamental variables as listed in table 1, in addition of book to market ratio (B/P), a measure of price momentum (FRTN6), and a measure of firm market capitalization (SIZE). The model C and D included the interaction terms (I*y), in which each variable (y) is multiplied by an indicator variable (I). I is equal 1 if the firm is an extreme performer (winner and loser), and zero otherwise.*

*Table values represent estimated coefficients ***, **, *, represents statistical significance level of confidence at 99%, 95%, and 10% respectively, based on two-tailed tests.*

Variable	Model A	Model B	Model C	Model D
Intercept	**0.02412*** **	0.008525	**0.025816*** **	**0.024168** **
Primary Explanatory Variables				
SLDY	-0.0042	0.0005	-0.0067	-0.0054
SGI	**-0.0006** **	**-0.0006** **	-0.0013	-0.0010
GMG	**0.0003***	**0.0003***	0.0010	0.0007
R&D	**-0.0612***	**-0.1039*** **	-0.0354	-0.0265
LSY	**-0.0235** **	**-0.0186***	**-0.0241** **	**-0.0212***
CHGEPS	6.41E-06	6.85E-06	**-0.003698** **	**-0.0037** **
ACCRUAL	**-0.0475***	**-0.0504***	**-0.0421***	**-0.0363***
CAPX	**-0.0008*** **	**-0.0007** **	**-0.0007***	**-0.0006***
B/P		**0.0062*** **		-0.0012
FRTN6		**0.0325***		0.0146
SIZE		-2.95E-06		-1.22E-07
Interaction Variables				
I*SLDY			0.0172	0.0184
I*SGI			-0.0016	**-0.0038***
I*GMG			-0.0007	-0.0005
I*R&D			**-0.1673***	**-0.2115** **
I*LSY			-0.0026	-0.0003
I*CHGEPS			**0.0037** **	**0.0037** **
I*ACCRUAL			-0.0265	**-0.1117** **
I*CAPX			-9.54E-05	0.0004
I*B/P				**0.0136*** **
I*FRTN6				**0.0813** **
I*SIZE				**-8.91E-06***
Adjusted r-square	2.40%	4.37%	3.20%	7.58%

Table 4: Probit estimation results over the full sample period (1994 – 2010)

The table 4 presents the regression results of three Probit estimations. The first column is the comparison between extreme firms and control firms, the dependent variable (RTNQ4) is equal 1 if the firm belong to extreme winners' or loser's groups, and zero otherwise. In the second column, the comparison is between winners and losers, the dependent variable is equal 1 if the firm is a loser (if RTNQ4 < 0), and zero otherwise. In the third column, instead of full sample in the second column, the third comparison of regression estimation between losers and winners only considers extreme sample only.

Variables	Extreme Firms vs. Control Firms	Losers vs. Winners (Full Sample)	Loser vs. Winner (Extreme Sample)
Constant	**-2.6011**	0.0184	-3.1992
	(0.006)	(0.492)	(0.163)
General Firm Characteristics			
SIZE	**0.0003**	0.0000	**-0.0013**
	(0.029)	(0.453)	**(0.067)**
PRICE	0.0629	**0.1909**	0.1140
	(0.304)	**(0.023)**	(0.377)
AGE	**0.0006**	0.0001	0.0004
	(0.094)	(0.407)	(0.429)
Recent Trading Characteristics			
FRTN6	**-1.6682**	-0.0430	0.2972
	(0.003)	(0.460)	(0.420)
AVGVOL	**-0.0061**	-0.0002	0.0450
	(0.052)	(0.455)	(0.052)
STDRET	**48.8250**	9.3653	-0.3592
	(0.000)	(0.191)	(0.496)
MINMAX	0.0744	-0.4748	**2.7621**
	(0.470)	(0.299)	**(0.095)**
Market Multiples			
S/P	-0.0011	**0.0825**	0.4873
	(0.495)	**(0.076)**	(0.150)
D/P	0.0216	**0.2750**	0.1247
	(0.435)	**(0.058)**	(0.389)
Fundamental Variables			
SLDY	**-0.3315**	**-0.2275**	0.1731
	(0.025)	**(0.074)**	(0.416)
SGI	**0.0127**	**0.0343**	0.0881
	(0.088)	**(0.054)**	(0.323)
GMG	0.0002	-0.0039	-0.0408
	(0.493)	(0.421)	(0.403)
R&D	**-3.0968**	**2.0885**	-6.0133
	(0.007)	**(0.095)**	(0.203)
LSY	**0.2810**	-0.0058	-0.3795
	(0.032)	(0.488)	(0.306)
CHGEPS	**-0.0027**	-0.0017	-0.0430
	(0.025)	(0.349)	(0.256)
ACCRUAL	-1.4725	**-1.5979**	**-10.6647**
	(0.172)	**(0.048)**	**(0.073)**
CAPX	0.0125	0.0104	**0.1150**
	(0.324)	(0.318)	**(0.024)**
pseudo r-square	26.75%	8.50%	36.75%

The bold values indicates the confident level is 90% or higher, and the values in the bracket is P-value

Appendices

SIZE Statistics

	winner	*control*	*loser*
Mean	196.67	431.37	186.85
Standard Error	93.96	32.99	87.31
Median	21.49	89.55	19.21
Mode	6.63	36.73	183.39
Standard Deviation	1225.10	1208.94	1138.40
Sample Variance	1500879.11	1461546.64	1295946.93
Kurtosis	157.40	63.03	148.38
Skewness	12.34	7.08	11.88
Range	15777.26	15774.74	14454.07
Minimum	0.90	0.47	0.12
Maximum	15778.16	15775.21	14454.19
Sum	33433.21	579326.71	31765.33
Count	170.00	1343.00	170.00

t-Test: Two-Sample Assuming Unequal Variances

	winner	*control*
Mean	196.67	431.37
Variance	1500879.11	1461546.64
Observations	170.00	1343.00
Hypothesized Mean Difference	0.00	
df	213.00	
t Stat	-2.36	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*control*
Mean	186.85	431.37
Variance	1295946.93	1461546.64
Observations	170.00	1343.00
Hypothesized Mean Difference	0.00	
df	220.00	
t Stat	-2.62	

RTNG Statistics

	winner	*control*	*loser*
Mean	0.3842	-0.0087	-0.3170
Standard Error	0.0196	0.0027	0.0116
Median	0.3092	-0.0105	-0.2718
Mode	#N/A	0.2232	#N/A
Standard Deviation	0.2555	0.0981	0.1515
Sample Variance	0.0653	0.0096	0.0230
Kurtosis	6.3113	-0.1487	3.8330
Skewness	2.2792	0.0365	-1.7021
Range	1.4986	0.6562	0.8703
Minimum	0.1076	-0.3631	-1.0010
Maximum	1.6063	0.2931	-0.1308
Sum	65.3210	-11.6303	-53.8879
Count	170	1343	170
Confidence Level(95.0%)	0.0387	0.0053	0.0229

t-Test: Two-Sample Assuming Unequal Variances

	winner	*control*
Mean	0.384241	-0.00866
Variance	0.065266	0.009622
Observations	170	1343
Hypothesized Mean Difference	0	
df	175	
t Stat	19.86776	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*control*
Mean	-0.31699	-0.00866
Variance	0.022953	0.009622
Observations	170	1343
Hypothesized Mean Difference	0	
df	187	
t Stat	-25.8575	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*winner*
Mean	-0.31699	0.384241
Variance	0.022953	0.065266
Observations	170	170
Hypothesized Mean Difference	0	
df	275	
t Stat	-30.7824	

AGE Statistics

winner		*control*		*loser*	
Mean	212.7	Mean	264.0881	Mean	239.65
Standard Error	47.19249	Standard Error	18.10641	Standard Error	45.29708
Median	121.5	Median	176	Median	152.5
Mode	26	Mode	123	Mode	217
Standard Deviation	258.4839	Standard Deviation	292.518	Standard Deviation	286.4839
Sample Variance	66813.94	Sample Variance	85566.78	Sample Variance	82073
Kurtosis	3.2596	Kurtosis	1.914695	Kurtosis	3.822849
Skewness	2.017981	Skewness	1.697467	Skewness	2.182557
Range	1002	Range	1240	Range	1097
Minimum	7	Minimum	-51	Minimum	8
Maximum	1009	Maximum	1189	Maximum	1105
Sum	6381	Sum	68927	Sum	9586
Count	170	Count	1343	Count	170

PRICE Statistics

	winner	*control*	*loser*
Mean	-0.67844	0.226537418	-0.33766
Standard Error	0.135046	0.038285902	0.139728
Median	-0.68967	0.255302465	-0.50252
Mode	-2.30259	0	-1.96611
Standard Deviation	1.760787	1.399924415	1.821829
Sample Variance	3.10037	1.959788369	3.319061
Kurtosis	4.456676	4.803727923	2.14761
Skewness	1.16129	0.350410052	0.533443
Range	11.61471	14.70876812	12.59848
Minimum	-4.2687	-6.907755279	-6.0474
Maximum	7.34601	7.80101284	6.55108
Sum	-115.336	302.8805279	-57.4014
Count	170	1343	170
Confidence Level(95.0%)	0.266595	0.075107032	0.275837

t-Test: Two-Sample Assuming Unequal Variances

	winner	*control*
Mean	-0.67844	0.226537418
Variance	3.10037	1.959788369
Observations	170	1343
Hypothesized Mean Difference	0	
df	197	
t Stat	-6.44719	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*control*
Mean	-0.33766	0.226537
Variance	3.319061	1.959788
Observations	170	1343
Hypothesized Mean Difference	0	
df	195	
t Stat	-3.89425	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*winner*
Mean	-0.33766	-0.67844
Variance	3.319061	3.10037
Observations	170	170
Hypothesized Mean Difference	0	
df	338	
t Stat	1.753728	

NUMEST Statistics

	winner	*control*	*loser*
Mean	0.194118	0.484736	0.264706
Standard Error	0.030425	0.013642	0.033937
Median	0	0	0
Mode	0	0	0
Standard Deviation	0.396688	0.499953	0.44248
Sample Variance	0.157362	0.249953	0.195788
Kurtosis	0.440323	-1.99924	-0.85199
Skewness	1.560539	0.061154	1.076186
Range	1	1	1
Minimum	0	0	0
Maximum	1	1	1
Sum	33	651	45
Count	170	1343	170
Confidence Level(95.0%)	0.060061	0.026763	0.066994

t-Test: Two-Sample Assuming Unequal Variances

	winner	*control*
Mean	0.194118	0.484736
Variance	0.157362	0.249953
Observations	170	1343
Hypothesized Mean Difference	0	
df	243	
t Stat	-8.71595	

t-Test: Two-Sample Assuming Unequal Variances

	loser	control
Mean	0.264706	0.484736
Variance	0.195788	0.249953
Observations	170	1343
Hypothesized Mean Difference	0	
df	227	
t Stat	-6.01567	

FRTN6 Statistics

	winner	*control*	*loser*
Mean	0.036804	-0.0059	0.008536
Standard Error	0.043277	0.010448	0.03773
Median	0.002928	-0.02184	-0.05078
Mode	#N/A	0.130903	#N/A
Standard Deviation	0.564265	0.382901	0.491944
Sample Variance	0.318395	0.146613	0.242009
Kurtosis	17.78322	103.4391	21.27575
Skewness	3.190059	7.12622	3.04425
Range	5.136161	8.162823	4.973187
Minimum	-1.37596	-2.12985	-1.14362
Maximum	3.7602	6.032968	3.829563
Sum	6.25668	-7.92317	1.451048
Count	170	1343	170
Confidence Level(95.0%)	0.085433	0.020497	0.074484

AVGVOL Statistics

	winner	*control*	*loser*
Mean	7.18756	12.77102	7.305879
Standard Error	3.870687	1.575991	3.699624
Median	0.933963	1.113918	0.953906
Mode	1.023673	12.20245	0.417031
Standard Deviation	42.22421	52.93079	41.19726
Sample Variance	1782.884	2801.669	1697.215
Kurtosis	108.7435	61.62292	114.9203
Skewness	10.24606	7.747993	10.55656

Range	453.973	453.973	453.8376
Minimum	0.000367	0.000367	0.135751
Maximum	453.9733	453.9733	453.9733
Sum	855.3196	14405.71	905.929
Count	170	1343	170
Confidence Level(95.0%)	7.665014	3.092207	7.323178

STDRET Statistics

	winner	*control*	*loser*
Mean	0.046355	0.026724	0.047061
Standard Error	0.002851	0.00109	0.002697
Median	0.036215	0.018021	0.038923
Mode	#N/A	0	0
Standard Deviation	0.037066	0.039856	0.035057
Sample Variance	0.001374	0.001589	0.001229
Kurtosis	5.661332	203.2398	1.761613
Skewness	2.134767	12.35724	1.373187
Range	0.213901	0.762938	0.1667
Minimum	0	0	0
Maximum	0.213901	0.762938	0.1667
Sum	7.834031	35.73026	7.953341
Count	170	1343	170
Confidence Level(95.0%)	0.005629	0.002138	0.005324

t-Test: Two-Sample Assuming Unequal Variances

	winner	*control*
Mean	0.046355	0.026724
Variance	0.001374	0.001589
Observations	170	1343
Hypothesized Mean Difference	0	
df	220	
t Stat	6.431148	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*control*
Mean	0.047061	0.026724
Variance	0.001229	0.001589
Observations	170	1343
Hypothesized Mean Difference	0	
df	227	
t Stat	6.991905	

MINMAX Statistics

	winner	*control*	*loser*
Mean	1.240736	1.130447	1.268869
Standard Error	0.023415	0.004623	0.03078
Median	1.142854	1.086957	1.154396
Mode	1	1	1
Standard Deviation	0.305296	0.169414	0.401322
Sample Variance	0.093206	0.028701	0.161059
Kurtosis	9.685888	41.67733	59.79554
Skewness	2.776662	5.230243	6.503851
Range	2	2.250002	4.27778
Minimum	1	1	1
Maximum	3	3.250002	5.27778
Sum	210.9251	1518.191	215.7078
Count	170	1343	170
Confidence Level(95.0%)	0.046224	0.009069	0.060763

t-Test: Two-Sample Assuming Unequal Variances

	winner	*control*
Mean	1.240736	1.130447
Variance	0.093206	0.028701
Observations	170	1343
Hypothesized Mean Difference	0	
df	182	
t Stat	4.620937	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*control*
Mean	1.268869	1.130447
Variance	0.161059	0.028701
Observations	170	1343
Hypothesized Mean Difference	0	
df	177	
t Stat	4.447258	

B/P Statistics

	winner	*control*	*loser*
Mean	3.396616	2.257122	-5.98868
Standard Error	0.591037	0.17499	7.440273
Median	1.43034	1.39349	1.23727
Mode	#N/A	1.15695	#N/A
Standard Deviation	6.867225	5.806403	86.44816
Sample Variance	47.15878	33.71431	7473.285
Kurtosis	14.43738	172.6852	133.3546
Skewness	3.251817	0.993718	-11.5152
Range	58.0107	197.561	1022.968
Minimum	-14.4153	-100	-1000
Maximum	43.59545	97.56098	22.96809
Sum	458.5432	2485.092	-808.471
Count	170	1343	170
Confidence Level(95.0%)	1.168967	0.343352	14.71556

t-Test: Two-Sample Assuming Unequal Variances

	winner	*control*
Mean	3.396616	2.257122
Variance	47.15878	33.71431
Observations	170	1343
Hypothesized Mean Difference	0	
df	158	
t Stat	1.848635	

S/P Statistics

	winner	*control*	*loser*
Mean	1.531358	1.379085	2.536083
Standard Error	0.20261	0.07248	0.410015
Median	0.6749	0.604596	0.840038
Mode	0	0	0
Standard Deviation	2.36282	2.432131	4.763944
Sample Variance	5.582917	5.915263	22.69517
Kurtosis	14.69541	28.46568	15.43318
Skewness	3.242257	4.595844	3.630412
Range	16.99723	25.18362	30.05068
Minimum	0	-0.41808	0
Maximum	16.99723	24.76555	30.05068
Sum	208.2647	1552.85	342.3712
Count	170	1343	170
Confidence Level(95.0%)	0.4007	0.142211	0.810938

	loser	*control*
Mean	2.536083	1.379085
Variance	22.69517	5.915263
Observations	170	1343
Hypothesized Mean Difference	0	
df	142	
t Stat	2.77876	

t-Test: Two-Sample Assuming Unequal Variances

	loser	*winner*
Mean	2.536083	1.531358
Variance	22.69517	5.582917
Observations	170	170
Hypothesized Mean Difference	0	
df	196	
t Stat	2.196872	

D/P Statistics

	winner	*control*	*loser*
Mean	0.611094	0.705535	2.771761
Standard Error	0.091151	0.05063	1.621193
Median	0.280037	0.36582	0.45762
Mode	#N/A	#N/A	#N/A
Standard Deviation	1.006801	1.554759	18.12549
Sample Variance	1.013648	2.417276	328.5332
Kurtosis	20.33308	174.6049	119.7144
Skewness	4.079089	10.88608	10.84693
Range	7.025064	30.95102	201.6809
Minimum	0.000766	0.000548	0.002678
Maximum	7.02583	30.95157	201.6836
Sum	74.55349	665.3199	346.4701
Count	170	1343	170
Confidence Level(95.0%)	0.180458	0.09936	3.208795

SGI Statistics

	winner	*control*	*loser*
Mean	1.245848	2.247928	2.897216
Standard Error	0.140017	0.70913	0.806471
Median	1.062466	1.064261	1.049581
Mode	0	0	#N/A
Standard Deviation	1.448349	22.24455	8.496701
Sample Variance	2.097714	494.8199	72.19392
Kurtosis	81.35087	826.8858	65.11181
Skewness	8.482008	27.92789	7.537698
Range	15.13126	673.9713	82.78237
Minimum	0	-4.77128	-2.36074
Maximum	15.13126	669.2	80.42163
Sum	133.3057	2211.961	321.591
Count	170	1343	170
Confidence Level(95.0%)	0.277598	1.391583	1.598237

t-Test: Two-Sample Assuming Unequal Variances

	loser	*winner*
Mean	2.897216	1.245848
Variance	72.19392	2.097714
Observations	170	170
Hypothesized Mean Difference	0	
df	117	
t Stat	2.017466	

GMG Statistics

	winner	*control*	*loser*
Mean	11.14591	1.172723	3.351319
Standard Error	11.43326	0.8876	1.611347
Median	0.097745	0.076744	0.124036
Mode	#N/A	-0.00888	#N/A
Standard Deviation	99.67287	24.9635	14.59137
Sample Variance	9934.681	623.1763	212.9079
Kurtosis	75.77883	653.2136	30.81508
Skewness	8.6989	24.68042	5.399677
Range	888.3835	712.4346	106.7505
Minimum	-20.3434	-43.2409	-8.9825
Maximum	868.0402	669.1937	97.76797
Sum	847.0895	927.6242	274.8082
Count	170	1343	170
Confidence Level(95.0%)	22.77623	1.742333	3.206075

R&D Statistics

	winner	*control*	*loser*
Mean	0.502489	0.431012	0.46113
Standard Error	0.133497	0.031415	0.068717
Median	0.25358	0.305362	0.293651
Mode	#N/A	#N/A	#N/A
Standard Deviation	0.597017	0.379586	0.400684
Sample Variance	0.356429	0.144086	0.160548
Kurtosis	12.07934	17.9834	9.155977
Skewness	3.231247	3.341943	2.558501
Range	2.666303	2.99504	2.052449
Minimum	0.121235	0.116533	0.1167
Maximum	2.787538	3.111573	2.169148
Sum	10.04978	62.9277	15.67842
Count	170	1343	170
Confidence Level(95.0%)	0.279412	0.06209	0.139805

CHGEPS Statistics

	winner	*control*	*loser*
Mean	45.62011	-0.2193	44.47493
Standard Error	32.65202	1.142006	44.8995
Median	0.007708	0.002933	-0.00453
Mode	#N/A	0	0
Standard Deviation	357.685	36.59768	503.9956
Sample Variance	127938.5	1339.39	254011.6
Kurtosis	103.9984	402.0279	121.3032
Skewness	9.965579	-9.55973	10.89302
Range	3802.343	1481.908	6270.652
Minimum	-6.14744	-876.154	-665.884
Maximum	3796.196	605.7542	5604.768
Sum	5474.413	-225.223	5603.841
Count	170	1343	170
Confidence Level(95.0%)	64.65426	2.240934	88.86168

ACCRUAL Statistics

	winner	*control*	*loser*
Mean	0.199763	0.188022	0.215661
Standard Error	0.018092	0.030582	0.024014
Median	0.145026	0.105225	0.104231
Mode	0	0	0
Standard Deviation	0.199832	0.939133	0.26849
Sample Variance	0.039933	0.881971	0.072087
Kurtosis	5.778794	862.7723	7.064785
Skewness	2.048192	28.7907	2.394205
Range	1.22728	28.36364	1.578623
Minimum	0	0	0
Maximum	1.22728	28.36364	1.578623
Sum	24.37114	177.3043	26.95763
Count	170	1343	170
Confidence Level(95.0%)	0.035818	0.060017	0.047531

CAPX Statistics

	winner	*control*	*loser*
Mean	6.961718	8.307412	11.9389
Standard Error	1.139234	1.164163	4.239219
Median	3.086175	3.90972	3.2901
Mode	0	0	0
Standard Deviation	12.47968	36.97937	46.0497
Sample Variance	155.7424	1367.474	2120.575
Kurtosis	12.75149	735.223	96.17337
Skewness	3.427287	25.4995	9.443087
Range	70.67884	1091.917	483.6634
Minimum	0	0	0
Maximum	70.67884	1091.917	483.6634
Sum	835.4062	8382.178	1408.791
Count	170	1343	170
Confidence Level(95.0%)	2.255796	2.284461	8.39555