

RESEARCH PAPER

**PRODUCTS  
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## Know your style: capacity in the Australian equity market

By Simon Elimelakh, Head of Quantitative Analysis, BT Investment Management

*In a small, concentrated market like Australian equities, fund capacity is an important consideration for investors. Portfolios should be closed at the level of FUM at which the manager's ability to deliver results, according to the fund's stated strategy and objectives is not compromised. The exact level of full capacity is difficult to determine. Size should be a concern, however "large" is not necessarily "bad". Many external and internal factors affect how large a manager can grow before its ability to generate alpha is jeopardised. However, research is limited and often based on simulated, generalised data. This paper discusses why the most important factor is the manager's style and the best representation of style is actual performance and trading history.*

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Capacity plays an important role in the investment process. Various research studies have shown that as capacity approaches maximum, portfolio management is affected in many ways. These include the ability to buy and sell preferred stocks, the price of the stock, implementation of changes to model portfolios, visibility of positions as substantial shareholdings must be declared to the market, ability to adhere to a stated investment style, and ability to generate return (alpha). As Perold and Salomon (1991) point out: "There are diseconomies of scale in active management, which stem from the relation between market impact and transaction size. Large trades are more difficult to execute than small trades. Performance thus erodes with size."<sup>1</sup>

### Existing research on capacity

Compared to other aspects of investment management, capacity does not appear regularly as the subject of research articles, even when compared with some closely associated issues such as transaction costs or optimal trading. The main reason for this scarcity is that most research articles published in the investment journals originate in the US and so are concerned with issues relevant to US-based investors and portfolio managers. The size and depth of the US equity market and the fact that US investors traditionally invest the bulk of their funds in domestic asset classes (the conventional US balanced fund is a combination of 60% US equity and 40% US bonds) means capacity is not a popular topic.

The most well-known capacity article – by Perold and Salomon (1991) – was published some 15 years ago. More recently, Beckers and Vaughan (2001) analysed the Australian market and portfolios. Vangelisti (2006) was concerned with emerging markets.<sup>2</sup>

In Australia, several investment management consulting firms have published capacity-related research papers. Interestingly, even locally, the issue of large FUM as a potential problem is a relatively recent phenomenon. As recently as 2001, Beckers and Vaughan claimed that "So far, little attention has been paid to the natural depth of individual investment strategies. The industry at large and asset consultants

and pension trustees in particular have actually tended to see large amounts of assets under management as a positive, especially when size has been combined with recent good."<sup>3</sup>

The situation has changed rather dramatically in recent years. Van Eyk (2004) highlighted that capacity is style specific and, ultimately, manager specific, but it acknowledged that "...it is not reasonable to undertake a tailored FUM analysis for each of the strategies".<sup>4</sup> Nevertheless, van Eyk concluded it is possible to mitigate the shortcomings of a general capacity analysis by applying detailed knowledge of a manager.

Mercer Investment Consulting (2002) effectively supported that view, but also presented several business-level arguments for and against large size managers.<sup>5</sup> The negative factors associated with ever growing FUM included distractions caused by client service duties, loss of initial drive by successful portfolio managers, and systems and administration being driven to their limits. It concluded that these aspects are partly mitigated by the ability to hire and retain better people (in the author's view, a questionable argument given the ownership structure of the majority of boutique firms), better access to the market (broker research, execution, better access to company management), and better resources and infrastructure (systems, compliance, risk management). On this argument, not only is it true to say that too big can be bad, but clearly too small is not always beautiful either.

### Defining capacity

Following on from Vangelisti (2006), we can consider three alternative definitions of capacity.

**Threshold capacity** is the amount of FUM at which the investment strategy can no longer achieve the stated (or mandated) investment objectives. This normally includes return objectives (for example, outperform the benchmark by 5% per annum after fees), risk objectives (for example, tracking error between 2% and 6%) and universe/style positioning (for example, large-cap, Australian value). When a successful strategy is open and starts accumulating FUM, threshold capacity is the first to be reached. At this point, the manager



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can continue to generate alpha but has to refine the investment process – for example, introducing a bias away from low liquidity stocks, reducing turnover, adjusting or not implementing otherwise optimal (or at least desirable) investment decisions.

**Wealth-maximising capacity** as proposed by Perold and Salomon (1991) is the next capacity level to be reached. It is the FUM that maximises the total value (in after-costs dollars) generated by the strategy. The manager can still generate alpha but any increase of FUM causes a disproportionate increase in transaction costs and, as a result, the total generated dollar value (after costs, alpha times FUM) is reduced.

**Terminal capacity** is the level of FUM at which no positive alpha can be generated after transaction and other costs. At terminal capacity, net alpha is zero.

Clearly, it is threshold capacity that is the most important for fund managers and clients. A strategy (portfolio or fund) should be closed at the level of FUM at which the ability to deliver results (such as alpha, risk-adjusted returns, value), according to the stated objectives and style, is not compromised. The remainder of this paper focuses on threshold capacity.

### Market conditions affecting capacity

Research conducted by BT shows that the market in which a manager operates is the single most important external factor defining fund capacity. Considering this, it is important to distinguish between long-term permanent or slowly-evolving characteristics, and time-dependant or seasonal conditions. The Australian equity market is used to illustrate the major factors at play.

The two most obvious parameters affecting capacity are liquidity and capitalisation. In this respect, it can be shown that the Australian equity market has more in common with emerging markets than the US market.

Liquidity defines a manager's ability to trade a particular stock, group of stocks, or portfolio. It can be measured using stock-level daily trading volumes or dollar values. It is closely linked to capitalisation but is also affected by other factors including the volatility of a stock, its popularity and ownership distribution, and market sentiment and sector-specific market mood.

Capitalisation is closely linked to liquidity but, in a relatively small market like Australia, also directly affects capacity through substantial shareholding restrictions. As FUM grows and all positions are scaled upwards, a manager potentially reaches the point where it owns 5% or more of the total capitalisation of a particular stock. At this level, the manager is obliged to report changes to its position to the market, which can affect its competitive positioning. If FUM levels continue to grow, the manager may approach 20% stock ownership levels, implying an unwanted take-over bid.

Not only is the Australian equity market relatively small in capitalisation and number of stocks available but it is also very concentrated (or skewed). The 10 largest stocks represent about 85% of the S&P/ASX 200 Index capitalisation, while the largest 20 represent 90%.

Further exacerbating the situation is that the skewed

distribution of capitalisation among stocks is mirrored by a similar distribution of FUM among institutional managers. As shown in Figure 1, there are a dozen large institutions each managing more than 1% (\$10 billion) of the Australian equity market.

On the positive side, long-term factors have been improving in the local market. As capitalisation has grown, average trading volumes have grown even faster (Figure 2). For the selection of 24 large S&P/ASX 100 Index stocks, average daily turnover has grown, on average, by 18.9% over 18 years. These trends reflect (among other factors) a rise in short selling activity, increasing numbers of new players (boutiques, hedge funds), and growing interest in the local market from overseas players.

Along with these long-term and slowly evolving factors, many short-term market conditions can also affect capacity. These include time-series volatility and cross-sectional dispersion of returns, flow of IPOs, and style currently dominating the market. In BT's view, capacity is best defined by applying the worst possible combination of these conditions. For example, during periods of high volatility, daily trading volumes normally increase, making it easier to turn a large portfolio around. However, a manager will need to continue managing the same FUM when volatility is low and liquidity is negatively affected (as was the case in Australia during 2003 to 2005).

### Style and manager-specific factors

For each individual market, there is obviously some level of FUM (for example, \$100 billion for the Australian market) that is well above the capacity level for all managers. At the same time, there is clearly no magic level applicable to all individual managers (or even a group of similar managers) that represents the exact level corresponding to full capacity. Every manager and product has its own capacity linked to a region and that fluctuates with size and other market conditions.

Given this, it is relatively easy to list the major manager-specific factors affecting capacity. They include the universe of stocks and the benchmark, the typical number of stocks held in the portfolio, stock, sector and risk factor exposure allowances (both absolute and active – that is, relative to the benchmark), total volatility and tracking error ranges, cash inflows and outflows, timing and efficiency of trading, and portfolio turnover.

One of the most important factors defining many of the parameters above is a manager's style.

Value managers base portfolios on value factors (P/E, P/Book, etc) and these tend to have a relatively long life-span. As a result, value funds have a relatively low turnover, as the underlying signals do not change markedly in a short space of time. Growth and in particular momentum managers normally generate a much higher turnover as they are based on faster-moving information sources. All else being equal (universe, benchmark, tracking error, etc), a value manager can grow larger relative to a growth manager before it needs to sacrifice style and the ability to generate alpha.

Two different views can be considered for style-neutral managers. On the one hand, style-neutral managers are not limited to any particular subset of the universe and therefore an argument can be made that they are in the best shape from a capacity view, even compared to value managers. On the other hand, style-neutral managers need to invest in growth stocks and therefore capacity may arguably be lower than that of value managers. This group is also much more diverse relative to the style-specific managers (that is, truly style-neutral, core, style-rotators, etc), making the capacity issue even more manager specific.

A manager's investment style is a good starting point when assessing its capacity. However, as capacity levels are very manager specific, further insights can be gained by looking at fund managers' own portfolio analysis.

### How a fund manager assesses capacity

To assess capacity, BT has developed a methodology that combines both transaction and substantial shareholding approaches. The process is very manager-specific and not directly applicable to a group of managers (even if similar style, size and trading policies). The methodology relies on historical data but does not include any portfolio or market/environment simulations. As discussed, all else being equal, style and trading strategy are the most important factors affecting capacity limits. A manager needs to consider these factors, relative to its competitors operating in the market, benchmarked to the same indices, mandated to the same risk/return objectives, and affected by the same external/market conditions. As much as the manager's style can be summarised in terms of definitions, stock selection methodologies or models, and portfolio construction rules and constraints, the best (and most objective) representation of the manager or product as a whole is the product's historical record – not its performance record, but historical portfolio holdings (and implicitly, the trades that caused the portfolio to evolve as it did).

If you accept a manager's investment style and its ability to successfully manage product(s) with its current FUM and performance record, it can be demonstrated whether it could have achieved the same (or very similar) performance over the same time period, by applying the same style with a higher FUM. Specifically, it can be shown whether there has been adequate liquidity in the market to trade proportionally more within the same period, without breaching the prohibitive levels of substantial shareholdings. Importantly, the analysis will show whether the manager can get through all the bottle-necks associated with large positions, trades and holdings, and it does not just use a particular snapshot of the product. The procedure is as follows:

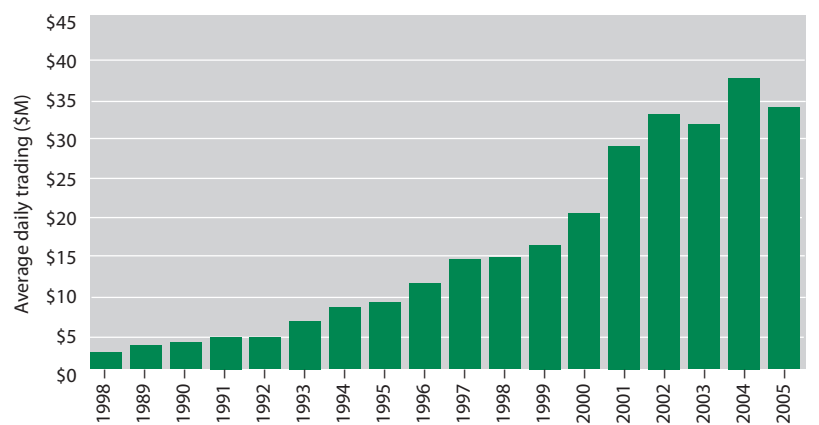
- **Data is collected** – all portfolio holdings (from front/back office systems), substantial shareholdings data, and liquidity data (stock-level daily trading volumes and values) are gathered for the relevant

Figure 1: Largest Australian equity managers

FUND MANAGER	31 MAR 2006 (\$M)
COLONIAL FIRST STATE	28,149
AMP CAPITAL INVESTORS	25,232
PERPETUAL INVESTMENTS	22,257
MLC INVESTMENT MGMT	20,292
BARCLAYS GLOBAL INV	16,175
MAPLE-BROWN ABBOT	14,975
QUEENSLAND INVESTMENT CORP	13,703
ING AUSTRALIA	13,344
PERENNIAL INVESTMENT PARTNERS	12,315
BT FINANCIAL GROUP	10,481
SCHRODER INVESTMENT MANAGEMENT	10,007
UBS GLOBAL ASSET MANAGEMENT	9,080
STATE STREET GLOBAL ADVISORS	8,551
BALANCED EQUITY MANAGEMENT	8,295
VANGUARD INVESTMENTS	8,138
GMO AUSTRALIA	7,513
MACQUARIE BANKING	6,630
DEUTSCHE ASSET MANAGEMENT	6,121
INVESTORS MUTUAL	5,708
CONCORD CAPITAL	5,463

Source: BT Financial Group

Figure 2: Average daily trading value (based on 24 S&P/ASX 100 stocks)



Source: ASX

period (this should ideally be associated with the term of the current management style and management team, but also long enough to be truly representative). Figures 3, 4 and 5 (overpage) show sample liquidity, portfolio holdings and substantial shareholding data.

- **Data is linked together** – internal (holdings/trading, substantial shareholdings) and external

(liquidity) data links into a research platform allowing the history of the product to be traced.

- **Testing** – the platform is used to conduct three tests against increasing FUM, looking for the maximum portfolio size at which it is possible to still replicate the trading history of the fund and pass all trading

and substantial shareholdings bottle-necks.

Figures 6, 7 and 8 show the daily trading volumes for three stocks – BHP, PaperlinX and Ventracor – which at 31 December 2005 were respectively the first, 100th and 200th largest stocks in the market. For large stocks like BHP, the distribution can be considered approximately normal and therefore average trading value is a good representation of liquidity available to a manager. For smaller stocks (like PaperlinX and Ventracor), the situation is very different. Several trading days saw volumes as high as ten or twenty times average, being the days when sizeable institutional managers moved their portfolios. To ensure these patterns are reflected, all the capacity tests outlined below use not just average liquidity but also maximum and average of top 10 trading days.

Figure 3: Sample liquidity data

STOCK	AVERAGE (\$)	MEDIAN (\$)	AVG OF 10 (\$)	MAX (\$)
AAC	410,277	256,632	4,581,645	10,086,792
AAT	36,532	10,210	392,587	538,662
BBG	7,250,456	5,621,092	40,754,900	69,549,560
BBI	1,539,698	954,642	9,842,724	14,892,062
BBW	4,426,711	1,314,592	15,743,236	62,701,096
BCA	1,937,516	1,019,425	26,307,673	60,755,416
BCL	222,737	109,027	3,085,818	6,339,864
BDG	574,464	249,382	8,342,338	34,563,509
BEI	42,979	637	1,004,860	2,115,091
BEN	1,419,076	1,163,194	8,336,780	25,140,370
BGF	446,960	200,639	4,227,323	7,004,391
BHP	214,634,220	171,802,712	754,366,595	940,790,951
ZFX	14,849,601	11,339,254	68,891,235	153,822,480
ZIM	142,482	18,180	4,180,344	12,351,335

Source: BT Financial Group

### Test 1: New mandate/redemption

This test applies to the transitioning of a new institutional mandate or liquidation of an existing mandate. Importantly, the process uses the largest holding for every stock ever held in the portfolio. These are stacked together and analysed using the liquidity data. For this test, as well as for Test 2, it is assumed the manager can use up to 25% of daily stock turnover (a rather conservative assumption). Typically, a sizable mandate is considered (say, \$200 million), and the number of trading days it would take to settle all positions is calculated (the same as the largest number of days required to settle all the individual positions).

Figure 9 (overpage) shows a typical Test 1 result.

Figure 4: Sample portfolio holdings

STOCK	POSITION		CHANGE	
	CURRENT (%)	MAX (%)	AVG (%)	MAX (%)
ABS	0.00	0.13	0.01	0.12
AGL	0.00	0.39	0.02	0.38
BBG	0.00	0.00	0.00	0.00
BBI	0.00	0.00	0.00	0.00
BBW	0.00	0.00	0.00	0.00
BCMCA	0.00	0.00	0.00	0.00
BDG	0.00	0.00	0.00	0.00
BHP	12.01	12.01	0.68	1.86
BIL	2.46	2.46	0.25	1.30
BLD	0.00	0.00	0.00	0.00
BNB	0.00	0.21	0.01	0.16
BSL	0.10	1.09	0.16	0.71
WSF	0.00	1.64	0.05	0.84
ZFX	0.00	0.50	0.03	0.38

Source: BT Financial Group

Figure 5: Sample substantial shareholdings data

STOCK	POSITION		CHANGE	
	CURRENT (%)	MAX (%)	AVG (%)	MAX (%)
ABS	0.00	0.13	0.01	0.12
AGL	0.00	0.39	0.02	0.38
BBG	0.00	0.00	0.00	0.00
BBI	0.00	0.00	0.00	0.00
BBW	0.00	0.00	0.00	0.00
BCMCA	0.00	0.00	0.00	0.00
BDG	0.00	0.00	0.00	0.00
BHP	12.01	12.01	0.68	1.86
BIL	2.46	2.46	0.25	1.30
BLD	0.00	0.00	0.00	0.00
BNB	0.00	0.21	0.01	0.16
BSL	0.10	1.09	0.16	0.71
WSF	0.00	1.64	0.05	0.84
ZFX	0.00	0.50	0.03	0.38

Source: BT Financial Group

Using stock-level liquidity data and the fund’s historical positions, the number of days to settle each individual position is calculated using the average, maximum, and the top 10 days daily trading data. The results are summarised at the portfolio level. As with the other tests, the toughest individual stock numbers represent bottle-necks applicable to the portfolio. In the example, the new mandate can be settled within 20 trading days based on average liquidity, with 80% of positions ready after two days. Using top 10 (maximum) liquidity, the whole mandate can be settled within two trading days.

**Test 2: Position/portfolio movement analysis**

This test traces the actual changes to portfolio holdings over time, effectively repeating all trades undertaken by the manager. Full capacity is reached when it becomes impossible to apply any of the historical position changes using the liquidity (trading values volumes) available to a large institutional investor. It is important to distinguish between the liquidity available to “mums and dads” (who normally can only rely on average daily trading volumes) and the liquidity available to institutional investors (who can use higher volumes). A typical Test 2 result is shown in Figure 10. The approach is similar to Test 1, but the projected portfolio size is \$5 billion. The number of days to replicate all historical movements using average liquidity is 80 days, which is clearly excessive. However, 80% is settled after just 20 trading days (within one trading month) and the remainder can be moved using top 10 liquidity, as referred to above. This is more relevant and generally available to institutional investors (seven days would only be required in the worst case scenario). The result shows that \$5 billion FUM is below full capacity.

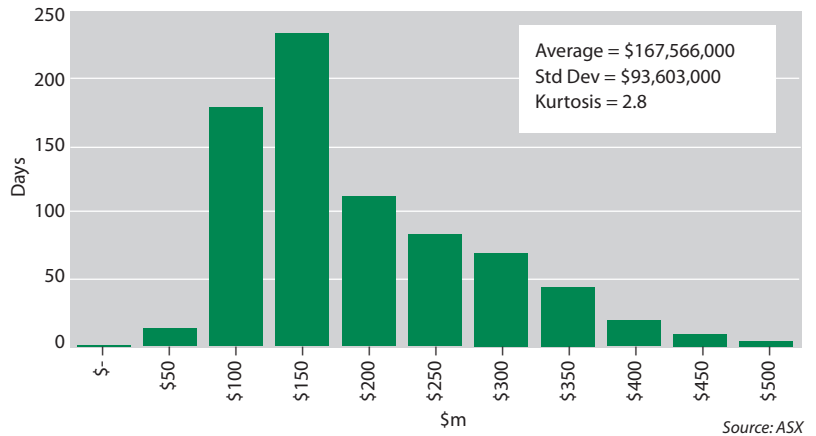
**Test 3: Substantial shareholdings analysis**

Using the same historical holdings as in Test 2, Test 3 is used to check whether history can be replicated with a higher FUM without crossing “dangerous” levels of stock ownership. It is assumed that 15% ownership (total simultaneous holding across all portfolios) should never be exceeded. Figure 11 presents the results. It is assumed there are four funds with different existing and projected FUM. The historical shareholdings are attributed to the underlying funds and scaled proportionately to the projected FUMs. In the example, the projected numbers are probably at or above full capacity as the scaled holdings reach 13% to 15% levels. Applied together, Tests 2 and 3 put a limit on FUM. The analysis is carried out in dollar values, however, given ever-changing market conditions, it makes sense to present results as a percentage of total market capitalisation.

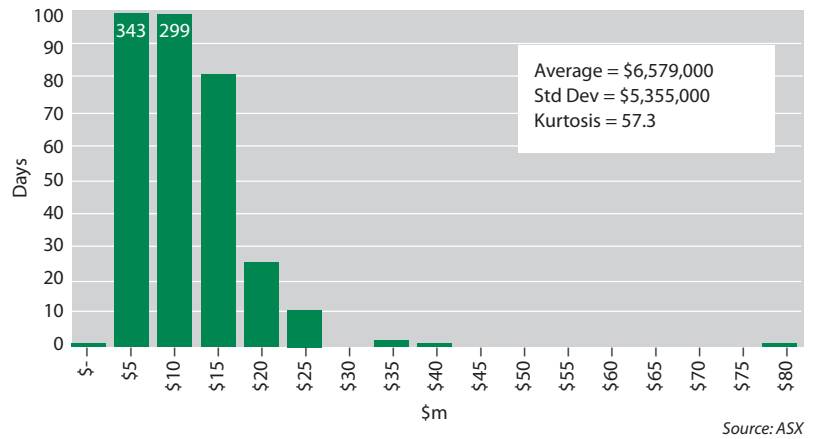
**Conclusion**

In a small, concentrated market like the Australian equities market, capacity is a highly relevant issue for the funds management industry and investors. It is important that managers perform the necessary research and analysis to ensure portfolio performance is

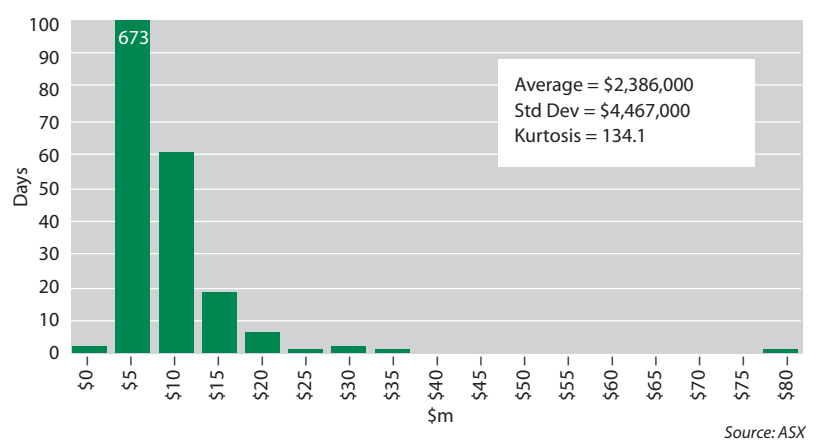
**Figure 6: BHP – daily trading volumes (Jan 2003 – Dec 2005)**



**Figure 7: PaperlinX – daily trading volumes**



**Figure 8: Ventracor – daily trading volumes (Jan 2003 – Dec 2005)**



not compromised. Exact full capacity levels are difficult to determine for any group of managers. Full capacity is defined by a variety of external and internal factors, with a manager’s style being the most important. It is important to take into account the style and particular characteristics of each manager, keeping in mind that big is not necessarily a negative. At the same time, in the author’s view, it is possible to conduct a very thorough analysis of an individual manager’s capacity

constraints based on its trading/holding record. The manager itself is in the best position to run this analysis. BT Financial Group has developed and implemented a comprehensive methodology based on both trading and substantial shareholding capacity-related limits. ■

ENDNOTES

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ABOUT THE AUTHOR



As Head of Quantitative Analysis with BT Investment Management, Simon Elimelakh manages the Quantitative Analysis Team and is responsible for quantitative research and market risk modeling across all asset classes and asset allocation. He is also a Portfolio Manager for the BT Market Neutral Fund (part of the BT Total Return Fund), and manages the BT Institutional Eco Share Fund and the BT Institutional Australian Sustainability Share Fund. Prior to BT, Simon was a research consultant for BARRA International, a senior analyst for NZI Insurance Australia, and a research consultant and head of the laboratory at the USSR Academy of Sciences. He holds a Masters in Applied Mathematics, a Bachelor of Science, and is a Fellow of the Financial Services Institute of Australasia, a CFA charterholder, and a member of The Q-Group Australia.

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Figure 9: Test 1 results summary – \$200,000,000 mandate, 25% daily value

ASX CODE	MAX FUND HIST WEIGHT (%)	AVERAGE LIQUIDITY (\$)	MAXIMUM LIQUIDITY (\$)	TOP 10 LIQUIDITY (\$)	DAYS TO SETTLE (AVG LIQUIDITY)	DAYS TO SETTLE (MAX LIQUIDITY)	DAYS TO SETTLE (TOP 10 LIQUIDITY)
RUPDP	1.07	433,335	49,068,737	12,444,349	20	1	1
ANN	7.00	4,366,111	93,043,576	36,229,004	13	1	2
MTS	4.24	6,445,603	99,176,379	67,567,339	6	1	1
VRLPA	0.66	1,204,137	75,178,112	30,603,333	5	1	1
GRD	0.37	625,172	18,816,975	6,102,112	5	1	1
HIG	0.21	411,232	7,873,883	3,644,596	5	1	1
RMD	2.06	4,552,198	28,501,490	21,673,354	4	1	1
MCG	1.60	3,415,949	99,941,407	37,571,333	4	1	1
WOR	0.71	1,754,280	21,048,180	14,601,480	4	1	1
FBU	0.55	1,140,095	21,403,624	11,486,634	4	1	1
SIP	0.13	290,723	19,681,872	6,545,316	4	1	1
SGT	2.42	7,086,646	235,532,240	93,395,818	3	1	1
AVG DAYS					2	1	1
MAX DAYS					20	1	2
80% READY					2	1	1

Source: BT Financial Group

Figure 10: Test 2 results summary – \$5,000,000,000 FUM, 25% daily value

ASX CODE	MAX POSITION CHANGE (%)	AVERAGE LIQUIDITY (\$)	MAXIMUM LIQUIDITY (\$)	TOP 10 LIQUIDITY (\$)	DAYS TO SETTLE (AVG LIQUIDITY)	DAYS TO SETTLE (MAX LIQUIDITY)	DAYS TO SETTLE (TOP 10 LIQUIDITY)
SIP	0.12	290,723	19,681,872	6,545,316	80	2	4
GRD	0.16	625,172	18,816,975	6,102,112	52	2	6
FBU	0.28	1,140,095	21,403,624		49	3	5
MTS	1.53	6,445,603	99,176,379	67,567,339	48	4	5
MCG	0.79	3,415,949	99,941,407	37,571,333	47	2	5
UGL	0.40	1,930,675	29,584,886	13,393,485	42	3	7
MCQCA	0.22	1,177,817	15,925,439	8,930,152	37	3	5
VRLPA	0.22	1,204,137	75,178,112	30,603,333	36	1	2
SEV	0.54	3,116,198	26,293,918	17,224,143	35	5	7
OGD	0.08	481,085	7,382,446	3,095,808	35	3	6
SBC	0.30	1,769,964	17,129,378	11,013,156	34	4	6
AWB	0.50	3,076,536	35,956,052	21,652,587	33	3	5
AVG DAYS					14	2	2
MAX DAYS					80	5	7
80% READY					20	2	3

Source: BT Financial Group

Figure 11: Test 3 – results summary

	HISTORICAL FUM (\$)	PROJECTED FUM (\$)	SUMMARY	HISTORICAL (%)	PROJECTED (%)
TOTAL	9,720,000,000	13,500,000,000	MAX	10.22	14.95
FUND 1	5,000,000,000	7,500,000,000	## > 5%	18	35
FUND 2	4,000,000,000	4,000,000,000	## > 15%	0	0
FUND 3	20,000,000	1,000,000,000			
FUND 4	700,000,000	1,000,000,000			

ASX CODE	% SHARE HELD IN FUND 1	% SHARE HELD IN FUND 2	% SHARE HELD IN FUND 3	% SHARE HELD IN FUND 4	HISTORICAL TOTAL (%)	PROJECTED TOTAL (%)
PBG	6.03	3.08	0.06	0.00	9.17	14.95
VGH	0.00	3.11	0.00	7.12	10.22	13.20
RUPDP	8.96	0.00	0.00	0.00	8.96	12.60
MAP	5.43	0.00	0.00	2.96	8.38	11.80
VSL	0.00	0.00	0.08	4.82	4.89	11.28
GRD	3.32	0.00	0.00	4.50	7.82	11.01
MCG	3.72	3.65	0.00	1.19	8.56	10.63
MCQCA	3.57	1.31	0.07	0.00	4.95	10.24
MYP	3.95	2.27	0.03	0.00	6.25	9.46
RMD	5.62	1.28	0.00	0.00	6.90	9.21
HGI	3.82	1.53	0.03	0.09	5.47	8.82
CDR	0.41	0.00	0.00	5.70	6.12	8.62

Source: BT Financial Group