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“Unit Pricing – I thought we’d done that?”

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The views expressed in the paper are the Author’s alone and do not necessarily accord with those of his employer – Kiwibank Limited

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1. Introduction

1.1. I thought we'd done that?

When I first suggested to an actuary that I was thinking about writing a paper on unit pricing they replied "I thought we'd done that". Well we had and there are many actuarial papers on the subject. However, given the attention KiwiSaver has brought to unitised products, I thought it was timely to draw Society members' attention to some of what is being aired in the regulatory space. This is a short paper to raise awareness that, because of KiwiSaver, unit pricing is topical again.

Actuaries have a lot of history with unit pricing and much experience to bring to the table. There has been some criticism (who can forget the "Actuarial Snakepit" etc?¹) but in my experience actuaries often have a clarity of thought about unit pricing that is not so evident with others operating in the financial services space. For those reasons I believe we should be involved in the debate.

I always say to people unit pricing sounds easy if you say it quickly but if you have ever been involved at the coalface you'll know what a minefield it can be. At the detail level it is not usually straightforward at all. Errors occur. Hence the paper concludes with some of my ideas about fixing unit pricing errors – derived I should add from reading, discussing and thinking about others work. Lastly any errors in this paper are of course mine and mine alone.

1.2. Rearing its head again

So where is unit pricing rearing its head again? The Report of "Capital Market Development Taskforce"² raised the issue of unit pricing. It recommended regulation. Then the MED "Review of Securities Law" discussion paper³ picked up the issue of regulation of unit pricing practices and of addressing unit pricing errors. These references are further explored in the next section.

Why is unit pricing rearing its head? I think it is primarily because of KiwiSaver and earlier negative publicity about unit pricing. As at 30 September 2010 there are over 1.5m KiwiSaver members⁴.

1.3. Materiality and NZSA Involvement?

With unit pricing there are bound to be "errors". What constitutes an error and when is a unit pricing error material? Should the NZSA be involved in that discussion? Should we have a standard for our members covering some of the issues they may well face in the future? Perhaps only guidance is possible?

1.4. Fixing unit pricing errors

The paper finishes with some of my thoughts about fixing unit pricing errors and I'm interested to hear peoples thoughts on the methodology proposed.

¹ <http://www.gmi.co.nz/Pages/News/Archive.aspx?pid=218>

² http://www.med.govt.nz/upload/71047/MDV6220_CMD_TombStone_04c.pdf

³ <http://www.med.govt.nz/upload/73375/discussion-document.pdf>

⁴ <http://www.kiwisaver.govt.nz/statistics/ks-stats-10-09-30.html>

2. Contemporary References

2.1. Capital Market Development Taskforce

As noted in the introduction the report of “Capital Market Development Taskforce” raised the issue of unit pricing and recommended in the summary of recommendations:

“Require funds to establish entry, exit and unit pricing rules that are fair to all investors, and disclose these to investors. This could be achieved through self-regulation by industry bodies.”⁵

and went further in the body of the report to recommend:

“We believe that regulation should require the implementation of a unit pricing process that ensures equity among investors, and is carried out at a minimum frequency, possibly monthly. This process should be documented and made available to scheme members. Industry bodies can help to develop and promote best practice standards in this area.”⁶

These recommendations have a number of aspects to them that are of interest. Entry and exit unit prices raises the topic of the “buy/sell margin”. Actuaries are familiar with that concept and the associated issues that surround them. If a fund is growing does it only need a “buy price”?

Self-regulation by industry bodies. Which ones?

The recommended minimum frequency of monthly for unit pricing doesn’t install me with confidence that that recommendation came from a source with much unit pricing experience.

2.2. Review of Securities Law

The MED “Review of Securities Law” discussion paper, which came 6 months after Capital Market Development Taskforce report, further extends the issue of regulation of unit pricing practices and specifically mentions addressing unit pricing errors. Some quotes from that discussion paper:

“Fund managers have few incentives to invest in accurate pricing, and to adequately review pricing procedures.”

“There is very limited monitoring of pricing practices and usually no mechanism for pricing to be independently reviewed.”

“There are a number of issues regarding the treatment of pricing errors. There is no agreed industry wide policy as to how to deal with pricing errors. There is no regulatory oversight as to how these errors are treated by schemes or trustees and pricing error policies are not usually disclosed by schemes.”⁷

Based on those quotes I think it is fair to conclude previous high profile negative publicity about unit pricing has found a receptive audience.

⁵ Capital Market Development Taskforce, “Capital Markets Matter”, December 2009, page 16

⁶ Capital Market Development Taskforce, “Capital Markets Matter”, December 2009, page 45

⁷ Ministry of Economic Development, “Review of Securities Law”, discussion paper June 2010, page 126

The discussion paper in later sections canvasses whether unit pricing should be mandated to be done externally of the fund manager because *“it reduces the risk of a manager manipulating the unit price to serve their own purposes.”*⁸ Two paragraphs later the paper acknowledges that the New Zealand market may not have the required expertise and capability in this area to meet the likely demand. The MED was seeking submissions as to whether external administration (pricing) should be mandated. I wonder how many organisations that carry out unit pricing were aware of that.

Further on in the discussion paper unit pricing errors are specifically mentioned:

“The Ministry proposes that, in addition to the requirement to have a pricing methodology in constitutional documents, fund managers will be required to put policies in place on how they deal with pricing errors.”

and

*“Supervisors will be required to report to the Authority on breaches above a threshold set by legislation.”*⁹

So organisations will potentially be required to have:

1. a documented unit pricing methodology in their constitutional documents
2. policies on how to handle pricing errors with the materiality level set by legislation

This is a substantially different environment than exists today.

2.3. Statutory references

Given the discussion paper references above there are two statutory areas I can see where actuaries will need to keep abreast of developments in this space.

The first is covered in the “Review of Securities Law” discussion paper. I quote from that paper:

*“The Superannuation Schemes Act currently contains a whistle-blowing provision (section 18A) requiring any administration manager, investment manager, actuary or auditor of a scheme to disclose information to the regulator where they form the opinion there is a serious problem with the scheme.”*¹⁰

Will unit price issues be a “serious problem” if other legislation requires remedial action?

The second statutory implication arises from the Insurance (Prudential Supervision) Act 2010 and actuaries increased responsibilities under that Act. For example will unit pricing issues within life insurance companies be the responsibility of the actuary through a responsibility for risk management within those companies?

⁸ Ministry of Economic Development, “Review of Securities Law”, discussion paper June 2010, page 140

⁹ Ministry of Economic Development, “Review of Securities Law”, discussion paper June 2010, page 144

¹⁰ Ministry of Economic Development, “Review of Securities Law”, discussion paper June 2010, page 149

3. When does a unit pricing error become material?

3.1. What is an error?

An area of focus in future may be unit pricing errors. What is an error may sound obvious but it is not straightforward in all cases.

“Some unit pricing errors have arisen because the calculation methodology did not match statements in the product’s governing documents, rather than because the unit pricing methodology was intrinsically faulty.”¹¹

Furthermore unit pricing may rely on assumptions or estimates where the values become known over time.

“For example, where estimates included in a unit price need adjustment as the actual amounts become known, or where a reasonable policy is nonetheless reviewed from time to time and updated, neither the unit price before the change, nor the unit price after the change, is incorrect for the purpose of deciding whether compensation is required.”¹²

An area where I believe there is particular complexity that is not generally well understood is the treatment of transaction costs. The Guide describes possible scenarios well:

“There are a number of ways that transaction costs have been allocated – for example, using:

- a. the mid-price as a single price for both sales and purchases. Transaction costs for unit holders entering and leaving the fund are paid by the fund and so subsidised by all existing unit holders. The impact on the fund becomes greater as more units are bought and sold*
- b. a buy-sell spread, where two prices are applied, calculated from the mid-price plus or minus an allowance for transaction costs. The higher price is paid by people entering the fund. The lower price is received by people exiting the fund*
- c. the net buyer/seller method, where a single price is used for both applications and redemptions. Whether the price is above or below the mid-price depends on whether there are more buyers or sellers:
 - i. when the overall size of the fund is increasing – a net buyer position – transaction costs are added to the unit price. In effect the underlying assets associated with the units of exiting unit holders are sold to the new unit holders*
 - ii. when the overall size of the fund is decreasing – a net seller position – transaction costs are subtracted from the unit price.”¹³**

If method *b.* is adopted and the buy/sell is too large the excess fees fall into the fund and benefit all fund members. Method *a.* is effectively the opposite of this (a zero buy/sell).

¹¹ ASIC and APRA, “Unit pricing – guide to good practice”, August 2008, page 14
http://www.apra.gov.au/Superannuation/upload/UP_GGP_082008_ex_final.pdf

¹² ASIC and APRA, “Unit pricing – guide to good practice”, August 2008, page 15

¹³ ASIC and APRA, “Unit pricing – guide to good practice”, August 2008, page 31

For a KiwiSaver fund that is growing is it best to use *c.i?* Is it fair that exiting members in that circumstance pay no or reduced transaction costs? How do you set the margin above the mid price – do you do that daily based upon the amount of the transactions either way? Is that really feasible in practice? Part of the reason for unitised funds is that there is a benefit in being part of a group. There can also be some downsides – is an approximate handling of transaction costs one of those?

3.2. What is material?

We accept we have an error. What is a material error that warrants remediation? In this part of the world (Australasia) there tends to be two sources of “guidance”; Financial Services Council standards (formerly IFSA) and the ASIC and APRA “Unit pricing – guide to good practice”. Financial Services Council standards are mandatory for full members.

3.3. Financial Services Council standards (formerly IFSA)

IFSA Guidance Note No 4.00¹⁴, which is now repealed, was issued in 1999 and, as far as I can tell, introduced the concept that “*materiality is defined as 0.3% of the price of a unit*”¹⁵.

It included in commentary that “*Where an application or redemption has taken place at a price, which is incorrect by less than 0.3% of the price of a unit, compensation to or from the Scheme will not normally be required.*”¹⁶

It further added “*In cases where compensation is otherwise required, amounts due to reimburse Investors for individual sums under \$20 will not normally need to be paid.*”¹⁷

These concepts persist today although the guidance note has been superseded by IFSA Standard No 17.00¹⁸ “Incorrect Pricing Of Scheme Units - Correction and Compensation”. This standard was issued in October 2006 with an operative date of 1 July 2007. That was after the first edition of the APRA/ASIC “Unit pricing – Guide to good practice was issued in November 2005.

The materiality threshold is still 0.3% of the unit price but that is now a maximum:

*“materiality used for such an assessment must be no more than 0.3% of the price of a unit.”*¹⁹

The commentary also introduces the concept of assessing the impact on an investor’s value of their benefits:

*“The Scheme Operator must also consider whether it is appropriate to apply a materiality test to the effect of the error on individual Investor benefits”*²⁰

¹⁴ <http://www.ifsa.com.au/standards-guidance/financial-services-council-guidance-notes.aspx>

¹⁵ IFSA Guidance Note No 4.00, “Incorrect Pricing Of Scheme Units - Correction and Compensation”, July 1999, page 4, paragraph 7.1

¹⁶ IFSA Guidance Note No 4.00, “Incorrect Pricing Of Scheme Units - Correction and Compensation”, July 1999, page 4, paragraph 11.2.1

¹⁷ IFSA Guidance Note No 4.00, “Incorrect Pricing Of Scheme Units - Correction and Compensation”, July 1999, page 4, paragraph 11.4

¹⁸ <http://www.ifsa.com.au/standards-guidance/financial-services-council-standards.aspx>

¹⁹ IFSA Standard No 17.00, “Incorrect Pricing Of Scheme Units - Correction and Compensation”, October 2006, page 4, paragraph 7.1

Further changes include the requirement to pay compensation (or remediate as I prefer to call it) if the Scheme Operator has benefited from an error and the \$20 has become a maximum threshold if adopted. The next section discusses APRA's views of materiality.

3.4. APRA/ASIC "Unit pricing – Guide to good practice"

The APRA guide was updated in 2008. It has the following to say about when compensation is payable and the 30 basis points found here is often quoted as a required materiality level:

"When determining whether compensation is payable, you need to consider the impact on each individual unit holder of one or more unresolved errors. You need to:

- a. compare the value that would have accumulated if the unresolved error(s) had not arisen with the value that accumulated in the presence of the error(s), from the date the error(s) started to the date the effect of the error(s) ceased. You can regard an error as resolved if it was appropriately identified and addressed within the terms of reasonable error management policy and reasonable compensation policy in effect at that time;*
- b. if the difference is equal to or greater than 0.3% (30 basis points) of the value that would have accumulated without the error, pay compensation; and*
- c. if the difference is less than 0.3%, consider whether compensation should be paid. For example:
 - i. this may depend on the type of asset. It may be appropriate to compensate smaller errors for some products, for example, cash management trusts;*
 - ii. where an error arises due to miscalculation of fees, it must be compensated in all cases; and*
 - iii. there may be other circumstances when it is appropriate to compensate when the difference is less than 0.3%. You need to consider the circumstances and your obligations in each case."²¹**

Interestingly the 2008 update was "amended so that scheme operators can elect not to make payments to exited members for unit pricing errors where the compensation due is less than \$20."²²

It continues:

"The \$20 minimum would only apply to payments made to exited members; those members still in the fund should expect to be compensated regardless of the amount involved. The aim of the rectification process is to restore all parties to the position they would have been in had the unit pricing error not occurred."

²⁰ IFSA Standard No 17.00, "Incorrect Pricing Of Scheme Units - Correction and Compensation", October 2006, page 4, paragraph 7.1.2

²¹ ASIC and APRA, "Unit pricing – guide to good practice", August 2008, page 97

²² APRA Media Release, 28 August 2008 http://www.apra.gov.au/media-releases/08_24.cfm

3.5. But what does the 0.3% in the “Guide” actually mean?

Depending on whom you ask you may get a variety of answers. Some interpret that to mean if the unit price is out by 0.3% you have a material error (consistent with IFSA above). Could it mean if the return per annum produced by the unit prices is more than 0.3% out?

In response to the question: “0.3%, what does that mean exactly?” I have seen the reply:

“Very simply, you need to compare:

A: What their benefit (if they left) or current balance (if still a unit holder) would have been had the “error” not occurred.

B: What benefit they did receive (if they left) or what their current balance actually is (if still a unit holder).

If $(A - B) / A$ is greater than 0.3% then there is prima facie evidence of a problem requiring rectification with compensation being offered.”

That all seems pretty reasonable to me and is value based. However to clarify a further question:

“The answer is that we are considering the unit holders’ value. We are not concerned with a unit price error per se but the effect of that error on the unit holders’ value received.

Further the value received is measured in total for the unit holder and is not applied to any individual transaction in isolation.

A very superficial example. The numbers are not “right” as it is the concept I’m after. Assume we have two unit holders, one with \$1m in the fund and the other with \$100. They both buy a unit the next day for \$1 when the price should have been 50c. It is not relevant that the unit price error is 100% of the correct price. Furthermore the \$1m holder is possibly not due compensation because his “value error” is less than 0.3% whereas the \$100 holder will possibly be due compensation because his error is 0.5% (50c of \$100).”

A response:

“The Good Practice Guide is not entirely clear on this point - and there is scope for judgement. However, I think it would be reasonable, when assessing the impact of the error on the benefits received, to only consider the part of the benefit arising from affected transactions. Taking that line, in the case of your example, the opening balances of the investors are not relevant in assessing the significance of the error as they are not affected by the error. All that would matter is the impact on the benefit arising from the \$1 subsequent investment made by each unit holder.

The 0.3% test is used to determine whether there is a compensatable error, which arises when the impact of the error on any individual exceeds 0.3%. Having determined that, compensation is then payable to ALL affected unit holders, even if the individual impact is less than 0.3%. In the case of your example (and notwithstanding the point above, that the opening balances may not

be relevant in any case), the fact that the \$100 unit holder is materially affected is sufficient to say that there is a compensatable event, even if the \$1m unit holder isn't."

That raises two aspects. The first is that the measure is very much value based. The second is that the 0.3% in the Guide is not much of a guide at all. Further, as many readers will be aware, to determine a value error requires a large amount of effort after which you may conclude there is no remedial action required. Thus how practicable is a value based approach? (no matter how intrinsically appealing)

A 30 basis point error in the unit price itself is certainly more practicable but may not lead to a 0.3% value error. In fact it could lead to a very minor value error.

So how should we define a material error? The discussion above shows the answer is non-trivial.

4. Should the NZSA have a standard for a material error?

4.1. A standard?

The previous section of the paper demonstrated the definition of a material error is not a trivial exercise. The intuitively appealing (at least to me) “value error” definition unfortunately is not much use in the real world. Why? Because you have to complete all the calculations in order to determine whether you are required to do them!

An error as a percentage of the unit price is not very informative of what the impacts to members of that error will be.

Thus the questions in my mind are:

- Should the NZSA have a standard?
- Will regulators require one?
- Who will develop it?

The answer to should the NZSA have a standard is probably no but that leads to the next question.

4.2. Should we be involved in the discussion?

Yes.

I believe actuaries have lots to offer and we shouldn't under value the understanding plus experience members have. We may need to resurrect those old text books but the issues have been pretty well canvassed by the profession and we are undoubtedly capable of grasping and hopefully explaining those issues. Understanding the maintaining of equity between unit holders is a familiar concept.

We need to be at the forefront of the debate. An opportunity to climb out of the snakepit?

An interesting question is could the Society get a consensus on what constitutes a material error?

Is each situation unique such that a principles based approach is the only possible solution in contrast to a hard and fast tangible rule?

5. A generalised approach to fixing unit pricing errors

5.1. Introduction

This section of the paper sets out some of my thinking about a methodology for approaching unit pricing errors.

A unit price is determined by dividing the net asset value (NAV) by the number of units. An incorrect valuation incorporated in the NAV leads to incorrect ownership (a proportionate share of the NAV) because unit holders transact at incorrect unit prices. This leads to an exchange of value between unit holders. For example consider a transaction when the NAV was too low and thus the unit prices were too low. A unit holder entering receives too many units; this depresses the existing unit holders' proportionate share of the NAV and transfers value from the existing holders to the new entrant when the error is fixed. Conversely if a unit holder left they would not receive enough cash for their units meaning when the valuation error was fixed the value would be passed to the remaining unit holders. Hence when you fix a valuation error an ownership error remains. The following sets out a methodology to correct that ownership error.

5.2. General methodology

1. Identify the reason for the unit pricing error(s).
2. Remedy the unit pricing process (and calculate prices on the current information).
3. The date the unit pricing commences correctly ends the period of error(s).
4. The first unit price correctly calculated at the end of the period becomes the accepted go forward unit price.
5. Accepting the unit price at end of the period means there is no error from then on.
6. Go back and recalculate unit prices as they should have been for the period (this can be completed without undue time pressure because the problem is now capped).
7. Clients during the period of the erroneous unit pricing require individual assessment. The approach is to determine the value their holding would have had at the end of the period if the unit pricing error had not occurred (based on recast corrected unit prices) against the value determined from the unit price in use at the end of the period (which is now in use as the go forward unit price).
8. Any difference in value for an in-force unit holder is measured in the number of units based on the unit price in use at the end of the period (the "go forward" unit price).
9. For in-force unit holders any compensation due is effected by purchasing that number of units (from 8.) at the now current unit price when the remediation is effected.
10. For unit holders who have left during the period any value owed can be rolled forward at an appropriate rate (could be the fund earning rate)
11. Consideration can also be given to cancelling units if a client has benefited from the errors (Banks routinely retrieve any overpayments).

5.3. Consequences of methodology

1. All incorrect unit prices need to be recalculated correctly.
2. Require all in force unit holder data at the end of period as well as all the movements data during the period. (this should be reconciled against that used in the unit price calculations)

3. Any performance reporting will require adjustment of the unit prices for the disjoint in the pricing process. This can be achieved by using recast unit prices to date of the date of the fix then substituting go forward prices from then on ie a two step process.

In summary the solution is based around fixing no. units as opposed to the unit price i.e. concentrate on the value to a customer (measured by units) not the unit price.

This is an efficient approach because increasing the unit price to remediate unit holders' worse off makes those already better off even better off. The proposed approach reduces remediation costs.

5.4. Recasting Unit Prices

The remediation process above relies on a series of recast corrected unit prices. A methodology for recasting unit prices is set out in the following paragraphs.

First off, in reality I do not think you can recast unit prices perfectly as they would have been. This is because different actions may have occurred if unit prices had been calculated and declared correctly. For example if more money should have left a fund (unit prices should have been higher) it might have come from a specific investment sector. In hindsight we cannot know exactly what would have happened. This methodology assumes we take (or add) evenly from (to) the fund as a whole ie each sector is reduced according to its proportion of the fund. Entering into a pooled fund has benefits as well disadvantages. By entering you accept that. One of the disadvantages is that you accept, in exchange for the benefits of mutuality, that some things may not occur as they would in a perfect world where you were a sole investor.

The methodology corrects for an error in the NAV. Recasting of the unit prices is completed by recalculating for the error period what the NAV should have been on each day of pricing and then dividing this by the number of units on issue that day. The unchanged number of units can be used because of the method used to recalculate the NAV.

Recalculating the NAV can be summarised as rolling forward a cumulative error adjusted for per period returns and unit movements and then using this error value to adjust subsequent NAVs.

A novel feature is that per period returns are first approximated from the existing unit price series. This assumes the incorrect unit prices are a reasonable approximation of the correct ones. This is probably fair in that if they weren't similar you'd expect the error to have been picked up earlier.

The method is best illustrated by example. In the table on the next page (which is overly busy for this example) the fund is growing by 10% pa with a fund management charge of 1% pa ie unit prices are growing at 8.9%pa. An error occurs in the 2005 valuation where NZ equities are overvalued by \$250,000. This leads to an erroneous unit price being declared of 1.12708 (instead of 1.08900). Redemptions require extra amounts. These are drawn from the cash sector. This is why it is very difficult to recast because where would those excess funds come from? In this example it doesn't matter because all sectors are earning 10% pa. In practice they would earn differing returns so it would matter. The methodology implicitly assumes that all sectors move in proportion to their proportion of the fund. I believe that to be a reasonable assumption. The NZ equity value error persists until 2008 when the share values are corrected.

Correct						Has Error						
		1.00%	1.20%	1.50%	1.50%							
		1.00%	1.00%	1.00%	1.00%							
Date:	01/07/2004	MANAGED FUND						MANAGED FUND				
		Cash	Fixed	NZ Equity	Int Equity			Cash	Fixed	NZ Equity	Int Equity	
01/07/2004	Sector Value	500,000.00	1,000,000.00	2,500,000.00	2,500,000.00			Sector Value	500,000.00	1,000,000.00	2,500,000.00	2,500,000.00
	Fund Charge	1.00%	1.00%	1.00%	1.00%			Fund Charge	1.00%	1.00%	1.00%	1.00%
	Fund Charge	\$0.00	\$0.00	\$0.00	\$0.00			Fund Charge	\$0.00	\$0.00	\$0.00	\$0.00
	Fund Value	6,500,000.00	500,000.00	1,000,000.00	2,500,000.00			Fund Value	6,500,000.00	500,000.00	1,000,000.00	2,500,000.00
	Opening Units	6,500,000.00000						Opening Units	6,500,000.00000			
	Units In	0.00000						Units In	0.00000			
	Units Out	0.00000						Units Out	0.00000			
	Closing Units	6,500,000.00000	100.00%					Closing Units	6,500,000.00000			
	Unit Price	1.00000						Unit Price	1.00000			
		10%	10%	10%	10%			10%	10%	10%	10%	
Date:	01/07/2005	MANAGED FUND						MANAGED FUND				
		Cash	Fixed	NZ Equity	Int Equity			Cash	Fixed	NZ Equity	Int Equity	
	Sector Value	550,000.00	1,100,000.00	2,750,000.00	2,750,000.00			Sector Value	550,000.00	1,100,000.00	3,000,000.00	2,750,000.00
	Fund Charge	1.00%	1.00%	1.00%	1.00%			Fund Charge	1.00%	1.00%	1.00%	1.00%
	Fund Charge	\$71,500.00	\$5,500.00	\$11,000.00	\$27,500.00			Fund Charge	\$74,000.00	\$5,500.00	\$11,000.00	\$30,000.00
	Fund Value	7,078,500.00	544,500.00	1,089,000.00	2,722,500.00			Fund Value	7,326,000.00	544,500.00	1,089,000.00	2,970,000.00
	Opening Units	6,500,000.00000						Opening Units	6,500,000.00000			
	Units In	0.00000						Units In	0.00000			
	Units Out	650,000.00000	Transactions taken out of funds after pricing at today's price					Units Out	650,000.00000	Transactions taken out of funds after pricing at today's price		
	Closing Units	5,850,000.00000	90.00%					Closing Units	5,850,000.00000			
	Unit Price	1.08900						Unit Price	1.12708			
		10%	10%	10%	10%			10%	10%	10%	10%	
Date:	01/07/2006	MANAGED FUND						MANAGED FUND				
		Cash	Fixed	NZ Equity	Int Equity			Cash	Fixed	NZ Equity	Int Equity	
	Sector Value	539,055.00	1,078,110.00	2,695,275.00	2,695,275.00			Sector Value	509,080.00	1,078,110.00	2,940,300.00	2,695,275.00
	Fund Charge	1.00%	1.00%	1.00%	1.00%			Fund Charge	1.00%	1.00%	1.00%	1.00%
	Fund Charge	\$70,077.15	\$5,390.55	\$10,781.10	\$26,952.75			Fund Charge	\$72,227.65	\$5,090.80	\$10,781.10	\$29,403.00
	Fund Value	6,937,637.85	533,664.45	1,067,328.90	2,668,322.25			Fund Value	7,150,537.35	503,989.20	1,067,328.90	2,910,897.00
	Opening Units	5,850,000.00000						Opening Units	5,850,000.00000			
	Units In	0.00000						Units In	0.00000			
	Units Out	585,000.00000						Units Out	585,000.00000			
	Closing Units	5,265,000.00000	90.00%					Closing Units	5,265,000.00000			
	Unit Price	1.18592						Unit Price	1.22231			
		10%	10%	10%	10%			10%	10%	10%	10%	
Date:	01/07/2007	MANAGED FUND						MANAGED FUND				
		Cash	Fixed	NZ Equity	Int Equity			Cash	Fixed	NZ Equity	Int Equity	
	Sector Value	528,327.81	1,056,655.61	2,641,639.03	2,641,639.03			Sector Value	469,570.81	1,056,655.61	2,881,788.03	2,641,639.03
	Fund Charge	1.00%	1.00%	1.00%	1.00%			Fund Charge	1.00%	1.00%	1.00%	1.00%
	Fund Charge	\$68,682.61	\$5,283.28	\$10,566.56	\$26,416.39			Fund Charge	\$70,496.53	\$4,695.71	\$10,566.56	\$28,817.88
	Fund Value	6,799,578.86	523,044.53	1,046,089.05	2,615,222.64			Fund Value	6,979,156.94	464,875.10	1,046,089.05	2,852,970.15
	Opening Units	5,265,000.00000						Opening Units	5,265,000.00000			
	Units In	0.00000						Units In	0.00000			
	Units Out	526,500.00000						Units Out	526,500.00000			
	Closing Units	4,738,500.00000	90.00%					Closing Units	4,738,500.00000			
	Unit Price	1.29147						Unit Price	1.32558			
		10%	10%	10%	10%			10%	10%	10%	10%	
Date:	30/06/2008	MANAGED FUND						MANAGED FUND				
		Cash	Fixed	NZ Equity	Int Equity			Cash	Fixed	NZ Equity	Int Equity	
	Sector Value	517,814.08	1,035,628.16	2,589,070.41	2,589,070.41			Sector Value	431,432.49	1,035,628.16	2,589,070.41	2,589,070.41
	Fund Charge	1.00%	1.00%	1.00%	1.00%			Fund Charge	1.00%	1.00%	1.00%	1.00%
	Fund Charge	\$67,315.83	\$5,178.14	\$10,356.28	\$25,890.70			Fund Charge	\$66,452.01	\$4,314.32	\$10,356.28	\$25,890.70
	Fund Value	6,664,267.24	512,635.94	1,025,271.88	2,563,179.71			Fund Value	6,578,749.46	427,118.16	1,025,271.88	2,563,179.71
	Opening Units	4,738,500.00000						Opening Units	4,738,500.00000			
	Units In	0.00000						Units In	0.00000			
	Units Out	0.00000						Units Out	0.00000			
	Closing Units	4,738,500.00000	100.00%					Closing Units	4,738,500.00000			
	Unit Price	1.40641						Unit Price	1.38836			

The end result is we have two sets on unit prices:

Date	Correct UP	Erroneous UP
01/07/2004	1.00000	1.00000
01/07/2005	1.08900	1.12708
01/07/2006	1.18592	1.22231
01/07/2007	1.29147	1.32558
01/07/2008	1.40641	1.38836

The table below shows how using the information we have and an iterative process we can move from the erroneous unit price to what the unit prices should have been.

Date	Charge error	Error in NAV	err NAV	Units	delta	trans error	cum error	adj NAV	new UP
01/07/2004	0.00	0.00	6,500,000.00	6,500,000.00	0.00	0.00		6,500,000.00	1.00000
01/07/2005	2,500.00	-247,500.00	7,326,000.00	6,500,000.00	-650,000.00	27,250.00	0.00	7,078,500.00	1.08900
01/07/2006	2,450.25	-242,574.75	7,150,537.35	5,850,000.00	-585,000.00	26,707.73	29,675.25	6,937,637.85	1.18592
01/07/2007	2,401.49	-237,747.51	6,979,156.94	5,265,000.00	-526,500.00	26,176.24	58,169.41	6,799,578.84	1.29147
01/07/2008	0.00	0.00	6,578,749.46	4,738,500.00		0.00	85,517.22	6,664,266.68	1.40641
Error UP	Iteration 1	Iteration 2	Iteration 3	Correct UP	delta				
1.00000	1.00000	1.00000	1.00000	1.00000	0.0000000				
1.12708	1.08900	1.08900	1.08900	1.08900	0.0000000				
1.22231	1.18590	1.18592	1.18592	1.18592	0.0000000				
1.32558	1.29140	1.29147	1.29147	1.29147	0.0000000				
1.38836	1.40565	1.40640	1.40641	1.40641	0.0000001				

The columns are explained as:

“Charge error” is the overcharged fund charge because of the overvalued NZ equity fund

“Error in NAV” is the amount of the NZ Equity over valuation

“Units” is units on issue

“delta” is the change in units each period

“trans error” is the transaction error – the charge error plus the error in the NAV scaled by the unit movement divided by the units on issue ($27,250 = 2,500 - 247,500 \times 650,000 / 6,500,000$)

“cum error” is the cumulative error – the prior period cum error scaled by the units on issue plus the trans error both rolled forward at the fund earning rate (which is approximated in each iteration by the latest calculated unit prices)

$(58,169.41 = (29,675.25 \times 5,265,000 / 5,850,000 + 26,707.73) \times 1.29147 / 1.18592$

“adj NAV” is the erroneous NAV plus the error in the NAV plus the cumulative error

$(6,799,578.84 = 6,979,156.94 - 237,747.51 + 58,169.41)$

“new UP” is the adjusted NAV divided by the units on issue

As each new set of unit prices are calculated they are fed back into the calculation of the “cum error” thus generating a new set of unit prices. In my testing after three or four iterations they converge to a solution which, as shown above, is what the unit prices would have been without the error. Hence the correct unit prices are achieved when further iterations yield no further change in the unit price at the selected degree of precision. Order of calculation is important. A starting set of unit prices all equal to 1 can also be used.

For those that are interested I have the example Excel spreadsheets available. I am best contacted through the email address on the cover page.

5.5. Adjustment of Value (Ownership)

The second step in unit pricing error correction is to recalculate the value unit holders would have had, had the error not occurred. In-force unit holders worse off can then be remediated by (the fund manager) purchasing units and giving those units to affected unit holders thereby re-establishing the account value they should have.

The process for this is relatively straight forward as shown in the following table.

						Unit Price 1/7/2008	
						1.38836	1.40641
Date	Correct UP	Error UP	Opening units	Transacted Units	Recast Units	Value reported	Value should have had
01/07/2004	1.00000	1.00000	1,000.00		1,000.00	1,388.36	1,406.41
01/07/2005	1.08900	1.12708		100.00	103.50	138.84	145.56
						1,527.20	1,551.97
					As units	1,100.00	1,103.50
As units at the 1.38836 unit price - the "go forward unit price"						1,100.00	1,117.84
so owed 17.84 units when remediation effected							

In this case the unit holder is owed 17.84 units which can be bought for him at the time the remediation is effected. Exited members owed money have the calculation done at time of exit with any money owing from that time rolled forward at an appropriate rate.

5.6. Checks

The following checks as a minimum should be applied:

- That the opening, closing and movements tally in accordance with the recasting worksheets
- That the individual values reported and the individual values reassessed sum satisfactorily to the same total (including those who have exited rolled forward at the fund earning rate)
- That some randomly selected individual calculations are correct and are explainable through general reasoning

6. Summary

6.1. Summary

Unit pricing is topical again. It has received some bad press that has potentially struck a chord with regulators. There were recommendations in the report of “Capital Market Development Taskforce” regarding regulation. The MED “Review of Securities Law” discussion paper picked up the issue of regulation of unit pricing practices and of addressing unit pricing errors.

Regulation of unit pricing will impact actuaries potentially through the Superannuation Schemes Act 1989 and the Insurance (Prudential Supervision) Act 2010.

Addressing unit pricing errors requires defining an error and assessing a materiality limit. Neither of these exercises is a trivial exercise and in fact there is probably no right answer for all circumstances. IFSA standards and the APRA guide may not be the definitive answers most assume they are.

Where does the NZSA fit? We will have to consider whether we will need to provide guidance for members in this area. We should be intimately involved in the debate as we have a lot to offer, both experience and understanding, in this area.

The paper finishes with a generalised approach to fixing unit pricing errors. The approach focuses on the value to unit holders and their number of units held rather than the unit price itself. This is an efficient approach because increasing the unit price to remediate unit holders’ worse off makes those already better off even better off. Recasting of erroneous unit prices is calculated using a novel recursive methodology.