Statutory Residential Land Valuation and Mass Appraisal in Australia

Associate Professor John MacFarlane
Associate Dean
College of Law and Business
University of Western Sydney
Locked Bag 1797
Penrith South DC NSW 1797

Email: j.macfarlane@uws.edu.au

Introduction

Most Australian States apply mass appraisal methods to assess residential land and/or property values for use in determining local government rates and for the possible imposition of land taxes on residential property. The sheer scale of the number of valuations required and the need for regular valuations to ensure that relativities are maintained, especially in rapidly moving metropolitan markets, has meant that individual valuations are simply not feasible. Mass appraisal methods are therefore the only real possibility but methods vary from State to State within Australia – largely for historic reasons and the different circumstances in each State.

This paper will review the approaches used for mass appraisal of residential land/property in the various Australian States and Territories. It will consider issues related to valuation accuracy and quality control with particular focus on New South Wales where the author has had some recent involvement.

Basis of Valuation

Within Australia, the basis on which statutory valuations for Local Government rating purposes is levied varies from jurisdiction to jurisdiction. A summary is provided in the following table:

Table 1: Basis of Valuation used for Rating Purposes

State/Territory	Basis of Valuation	Valuation Frequency
ACT	Unimproved Value	Annual
NSW	Unimproved Value	3 Years (Annual for Land Tax)
NT	Unimproved Capital Value (soon to be amended to Land Value)	3 Years
QLD	Unimproved	Annual
SA	Site Value or Capital Value	Annual
TAS	Land Value or Capital Value	7 Years
VIC	Site Value or Capital Improved Value	2 Years (annual)
WA	Unimproved Value	?

While the definitions of the basis of valuation may differ slightly between jurisdictions, essentially land, site or unimproved value represents the market value of the unencumbered land, assuming that any improvements had not been made, as at the prescribed date of the valuation. Capital Improved Value, or Capital Value, represents the unencumbered value of the land plus buildings and other improvements. In some States, notably South Australia and Victoria, local authorities have a choice of the basis of valuation to be used. In Victoria, the overwhelming majority of Councils use Capital Improved Values.

Quality Assurance

While valuation accuracy is always important – especially in the case of statutory residential valuations where the general public are likely to question their level of rates if the underlying valuation is clearly incorrect – a level of tolerance in valuation accuracy is required. The process of assessing the values of properties at a common date and the purpose to which these valuations are put means that consistency is often a more important criterion the accuracy. This is certainly the case for rating purposes but possibly not for land taxes which usually commence at a threshold value.

Historically, in most jurisdictions, base-dated valuations were issued periodically (often on a 3-yearly cycle but sometimes much longer, up to 10-yearly). In recent years, substantial and inconsistent movements both upward and downwards in residential land values, in short periods of time, has left such practices open to question – and given rise to a considerable increase in objections to the assessed values. The resulting move to shorter valuation cycles together with increased pressure to reduce the cost of individual valuations has meant a greater reliance on mass-appraisal methods for statutory residential valuations and a focus on the accuracy of such methods. Clearly, while individually crafted valuations would be desirable, the cost of producing individual valuations makes this totally infeasible.

While regression techniques lend themselves to the mass appraisal problem, they have quite limited use in Australia due to the lack of quality information on the important determinants of value at the individual lot basis. Regression methods are extremely powerful in that they allow a re-calibration of the basic valuation model for each cycle based on a re-assessment of each valuation factor - essentially going back to first principles.

Regrettably, the quality of available (electronic) information at the individual lot level makes it impossible to use regression methods in most locations. The massive cost of establishing the necessary data-base of information means that this situation will continue. As a result, mass appraisal methods based on making a suitable adjustment to the individual lot value from the previous valuation cycle are the most commonly applied methodologies. These valuation adjustment methods have their own inherent weaknesses, the most important of which are:

- valuation errors are perpetuated; and
- the difficulty in establishing the groups of comparable properties to which the same adjustment factor should be applied.

The balance of this paper will consider the statutory residential valuation system in New South Wales as a case study of the issues arising from the application of a valuation adjustment model for assigning statutory residential land values.

NSW Case Study

The NSW land valuation process uses the concept of identifying groups of properties with like characteristics in an LGA such that the land values of the properties within the group (called a "component") will move at a similar rate over time.

The identification of components within an LGA is a subjective process. There is no real alternative as data bases (GIS) with all the necessary and relevant characteristics for each property across NSW (which might then permit a statistical cluster analysis to identify components) is not available at the present time and is not likely to be available in the near future.

To be useful for the mass appraisal process, there should be a relatively small number of components in each LGA and a "reasonable" number of properties in each component.

By definition, a component consists of like properties with similar value movements. As a result, tracking the (land) value of one (1) property in the component should be all that is necessary to enable revaluation of the entire component. For quality control purposes and to ensure that the method is working satisfactorily, additional benchmark properties in the component may be chosen.

The method is relatively simple. The benchmark properties are valued at the base-date and from this an appreciation (or depreciation) factor is determined for the component. This factor is then applied to all properties in the component (including the benchmark properties) to determine the new set of assigned land values for the component. While, at first, it may seem strange that the benchmark properties are given their assigned value rather than their possibly more accurate initial valuation (often the two are the same), this is important to ensure the possibility of correcting any systemic errors in subsequent valuation cycles (when the same benchmark properties would be used).

For the process to maintain its integrity over time it is necessary that:

- the components are very well chosen initially; and
- the important property characteristics which have been used as the basis for allocating properties to a particular component remain, over time, the important determinants of the movements of land values for those properties (if this is not the case, say for example a new transport link affects some properties in a component but not others, then the values of all properties in the component are no longer likely to move in unison leading to a break-down in the mass appraisal process in that component).

The process of allocating properties to a component is largely a subjective one. It would be expected, however, that examining the land values of properties in a component would reveal particular patterns or distributions. Most notable among these would be that the properties fall into a relatively small range of land values. Secondly, that there would be few, if any, "outliers" (i.e. properties whose land value appears to be very different to the bulk of properties in the component). An outlier would probably identify a property which is not really comparable to others in the component and raises considerable doubt as to whether the "outlier" property belongs in the component.

It is important also that the benchmark properties are typical (representative) of properties in the component and hence that its value is close to the "middle" of values in the component.

It is possible to conduct a statistical analysis of the land values in each component of an LGA and, from this, make judgements on the performance of the mass appraisal process in that LGA and possible modifications to the implementation of the method in that LGA and its components.

The following three examples provide summary statistics of the 2001 assessed land values, by components, for three different LGAs together with details of the relevant benchmark property(s) (last seven columns). The columns are as follows:

SUMMARY STATISTICS

COMP	component label;
N	number of properties in the component;
MODE	most frequently occurring value in the component;
MEAN	average assessed land value for the component;
STD	standard deviation of the assessed land values in the component;
MIN	minimum property value;
Q1	1st quartile; value such that 25% are lower and 75% are higher;
MED	median (2nd quartile); value such that 50% are higher and 50% lower;
Q3	3rd quartile; value such that 75% are lower and 25% higher;
MAX	maximum property value;
RANGE	range of values = MAX – MIN;
QRANGE	inter-quartile range = Q3 – Q1 = range of the middle 50% of the observations;
QRP	inter-quartile range expressed as a percentage of the median land value for that component;

BENCHMARKS

ID	ID number of component benchmark;
BV2001	2001 valuation of the benchmark property (base date 2001-07-01);
BV2000	2000 valuation of the benchmark property (base date 2000-07-01);
BF	Benchmark Factor = 100*BV2001/BV2000 (%)
FG	flag ("U", "L", or blank) indicating whether or not the 2001 land value of the benchmark property falls in the upper quartile ("U"), the lower quartile ("L") or within the inter-quartile range (blank).
AV2001	2001 assigned value of the benchmark property (base date 2001-07-01);
FG2	flag ("+", "A", blank, "B" or "–") indicating whether:

AV2001 > 1.1 * BV2001	"+"
AV2001 > BV2001	"A"
AV2001 = BV2001	blank
AV2001 < BV2001	"B"
AV2001 < 0.9 * BV2001	"– "

Table 2 Summary + Benchmarks – LGA A

COMP	N	MODE	MEAN	STD	MIN	Q1	MED	Q3	MAX	RANGE	QRANGE	QRP	ID	BV2001	BV2000	BF	FG	AV2001	FG2
EA	912	30100	31973	6845	3000	28000	32150	35000	117000	114000	7000	22	179300	32500	32300	101		32300	B
EA	912	30100	31973	6845	3000	28000	32150	35000	117000	114000	7000	22	180067	39000	40000	98	U	40000	A
EA	912	30100	31973	6845	3000	28000	32150	35000	117000	114000	7000	22	191454	26000	25800	101	L	25800	B
EB	738	31300	33131	6526	3600	29500	31300	35100	87300	83700	5600	18	172385	33500	33200	101		33200	B
EB	738	31300	33131	6526	3600	29500	31300	35100	87300	83700	5600	18	177537	39000	38700	101	U	38700	B
EB	738	31300	33131	6526	3600	29500	31300	35100	87300	83700	5600	18	191790	26000	25000	104	L	25000	B
EC	821	31300	31665	7393	9900	29500	31300	33200	184000	174100	3700	12	176532	36000	35100	103	U	35100	B
EC	821	31300	31665	7393	9900	29500	31300	33200	184000	174100	3700	12	178658	32000	31300	102		31300	B
EC	821	31300	31665	7393	9900	29500	31300	33200	184000	174100	3700	12	187850	26000	25800	101	L	25800	B
ED	56	28000	28595	4133	26800	28000	28000	28000	49600	22800	0	0	175977	28000	28000	100		28000	
EF	127	41500	52667	25600	1100	39200	48600	62000	270000	268900	22800	47	173714	32500	32300	101	L	32300	B
EF	127	41500	52667	25600	1100	39200	48600	62000	270000	268900	22800	47	188249	70000	69400	101	U	69400	B
EF	127	41500	52667	25600	1100	39200	48600	62000	270000	268900	22800	47	188303	58000	57800	100		57800	B
EG	748	30400	32492	5052	5250	30400	32100	34600	75600	70350	4200	13	172547	30000	26700	112	L	28000	B
EG	748	30400	32492	5052	5250	30400	32100	34600	75600	70350	4200	13	173928	32000	30000	107		31500	B
EG	748	30400	32492	5052	5250	30400	32100	34600	75600	70350	4200	13	176455	42000	42000	100	U	42000	
EG	748	30400	32492	5052	5250	30400	32100	34600	75600	70350	4200	13	188375	35000	31000	113	U	32500	B
EH	643	20000	19379	19083	800	15000	17000	20000	420000	419200	5000	29	175264	24000	24000	100	U	24000	
EH	643	20000	19379	19083	800	15000	17000	20000	420000	419200	5000	29	183313	20000	20000	100		20000	
EH	643	20000	19379	19083	800	15000	17000	20000	420000	419200	5000	29	183936	17000	17000	100		17000	
EH	643	20000	19379	19083	800	15000	17000	20000	420000	419200	5000	29	185041	15000	15000	100		15000	
EJ	165	32800	35876	21781	23100	30800	32800	34800	240000	216900	4000	12	180810	27000	26700	101	L	26700	B
EJ	165	32800	35876	21781	23100	30800	32800	34800	240000	216900	4000	12	180813	58000	57600	101	U	57600	B
EJ	165	32800	35876	21781	23100	30800	32800	34800	240000	216900	4000	12	186281	33000	32800	101		32800	B

Table 3 Summary + Benchmarks – LGA B

COMP	N	MODE	MEAN	STD	MIN	Q1	MED	Q3	MAX	RANGE	QRANGE	QRP	ID	BV2001	BV2000	BF	FG	AV2001	FG2
EA	1688	490000	491770	122914	11000	428000	465000	525000	1300000	1289000	97000	21	682854	490000	409000	120		490000	
EB	265	218000	283536	134154	105000	218000	241000	279000	1200000	1095000	61000	25	682145	218000	182000	120		218000	
EC	455	1100000	897291	268139	44600	718000	898000	1050000	2350000	2305400	332000	37	682900	1000000	823000	122		1000000	
ED	420	1100000	846535	342609	10300	597000	825000	1050000	3000000	2989700	453000	55	682268	896000	747000	120		896000	
EE	245	1300000	1347563	572623	1	1050000	1250000	1550000	7000000	6999999	500000	40	682824	1150000	900000	128		1150000	
EF	82	879000	1695220	2.98E6	291000	771000	958500	1550000	2.6E7	2.571E7	779000	81	680475	879000	733000	120		879000	
EG	19	360000	1516053	2.41E6	271000	360000	594000	1750000	1.03E7	1.003E7	1390000	234	679819	1150000	943000	122		1150000	
EH	101	1950000	2090594	737452	650000	1850000	1950000	2200000	6500000	5850000	350000	18	682728	1950000	1480000	132		1950000	
EJ	26	1250000	1121731	294391	715000	850000	1175000	1250000	2100000	1385000	400000	34	679002	1250000	950000	132		1250000	
EN	1	740000	740000	.	740000	740000	740000	740000	740000	0	0	0	679841	740000	617000	120		740000	
EP	58	760000	1151483	589589	560000	760000	944000	1500000	3100000	2540000	740000	78	680629	760000	634000	120		760000	
ER	10	871000	5266600	6.75E6	871000	924000	2850000	4800000	2.13E7	2.043E7	3876000	136	682245	4800000	3990000	120		4800000	
ZE	8	6920	173604	232741	6920	10305	20650	390000	540000	533080	379695	1839	680004	498000	415000	120	U	498000	

Table 4 Summary + Benchmarks – LGA C

COMP	N	MODE	MEAN	STD	MIN	Q1	MED	Q3	MAX	RANGE	QRANGE	QRP	ID	BV2001	BV2000	BF	FG	AV2001	FG2
AA	1219	366000	363353	24133	196000	366000	366000	366000	701000	505000	0	0	1608819	375000	349000	107	U	366000	B
AB	722	285000	278017	28110	500	267000	285000	285000	441000	440500	18000	6	1608762	285000	272000	105		285000	
AC	3139	384000	380308	49255	500	384000	384000	392000	825000	824500	8000	2	1604259	400000	366000	109	U	384000	B
AD	851	301000	301511	29709	148000	292000	301000	308000	827000	679000	16000	5	1587120	310000	287000	108	U	301000	B
AE	550	304000	300460	34968	10000	294000	304000	312000	775000	765000	18000	6	1604878	310000	290000	107		304000	B
AF	808	384000	361519	34925	145000	353000	362000	384000	489000	344000	31000	9	1575760	365000	345000	106		362000	B
AG	938	529000	567015	114618	2500	529000	537000	590000	2100000	2097500	61000	11	1587797	535000	481000	111		529000	B
AH	615	180000	172528	24657	105000	160000	175000	180000	450000	345000	20000	11	1568732	180000	145000	124		170000	B
AJ	714	285000	278328	120291	55000	246000	285000	297000	3300000	3245000	51000	18	1582353	300000	272000	110	U	285000	B
AK	673	280000	280079	36918	15000	271000	280000	280000	1050000	1035000	9000	3	1593100	275000	259000	106		271000	B
AL	1294	228000	224672	19660	20000	217000	228000	228000	305000	285000	11000	5	1603900	235000	218000	108	U	228000	B
AM	252	260000	259121	74322	2500	250000	260000	280000	594000	591500	30000	12	1575797	260000	248000	105		260000	
AN	546	246000	254034	30287	500	246000	257000	257000	472000	471500	11000	4	1574094	260000	245000	106	U	257000	B
AP	1373	311000	305092	45128	5000	292000	302000	323000	825000	820000	31000	10	1622248	310000	283000	110		311000	A
AQ	573	246000	259709	42862	2500	246000	257000	267000	963000	960500	21000	8	1638646	270000	255000	106	U	267000	B
AT	450	233000	220531	27671	100000	207000	224000	233000	390000	290000	26000	12	1567446	240000	222000	108	U	233000	B
AW	2664	1050000	615566	315938	500	361000	565000	842000	4800000	4799500	481000	85	1562782	900000	837000	108	U	878000	B

Issues arising from the data analysis

The following issues are briefly discussed:

1. Number of Components and Component Size
2. Outliers
3. Inter-Quartile Range
4. Treatment of Benchmarks.
5. Multiple Benchmarks in a Component
6. Discrepancies between the land values for the benchmark properties between the valuations and the assigned land values for these properties.

1. Number of Components and Component Size

Components with only a small number of properties are problematic – see Table 3 (LGA "B"). Further, many of the small sized components have a large value for the QRP statistic, indicating components which may not be comprised of comparable properties. The application of component factors in these components is extremely dubious if they don't really consist of comparable properties

2. Outliers

Virtually every component can be scrutinised to detect possible outliers. For example, component "EA" in LGA "A" (Table 2) consists of 912 properties with an inter-quartile range from $28,000 to $35,000 and a QRP statistic of 22% (reasonably well behaved). However, the properties with the lowest four values ($3,000, $5,000, $7,000 and $10,700) and with the highest two values ($86,600 and $117,000) are outliers and possibly not comparable to the rest of the component (a valuation question). The higher valued outliers are likely to give rise to the most concern.

3. Inter-Quartile Range

Useful statistics are the inter-quartile range and the QRP statistic. These are:

QRANGE = the difference between the first and third quartiles
= Q3 – Q1
= the range of the middle 50% of observations.

$$\text{QRP} = \frac{QRANGE}{MEDIAN} x100$$

= a relative measure of the inter-quartile range.

Values of QRANGE and QRP should be "small" to identify components with largely comparable properties.

LGA "C" (Table 4) consists of pretty well behaved components except the last (AW). LGA "B" (Table 3) comprises very variable land values and this is indicated in the generally high QRP values while LGA "A" is somewhere in between.

4. Benchmarks

The benchmark properties should be representative of the component. The analysis above uses a flag (variable FG) as follows:

Benchmark in the inter-quartile range:	FG = blank
Benchmark in the upper quartile:	FG = "U"
Benchmark in the lower quartile:	FG = "L".

If the benchmarks are to be representative, one would expect a majority to fall into the middle two quartiles (the inter-quartile range) and a spread in those components with more than one benchmark (with a bias towards the upper quartile as the more valuable properties give rise to greater concern and potential problems). In the examples above, LGA "C" (Table 4) shows a predominance of benchmarks in the upper quartile.

5. Multiple Benchmarks in a Component

While most components have just one benchmark property, many had multiple benchmarks. LGA "A" has three benchmarks in most components (32 out of 35 components, with 6 benchmarks in one component, 2 benchmarks in one component and a single benchmark in just one component) but this seems to be unusual.

There are advantages in having multiple benchmarks per component. It provides a measure of "tri-angulation". Two or more benchmarks in a component showing similar appreciation/depreciation (via *independent* valuations) provide an added level of substantiation. In a well constructed component, benchmark properties should provide similar measures of appreciation/depreciation. However, benchmarks in a component showing different levels of appreciation/depreciation also provide valuable information (for example showing that the component should be differently constituted). Certainly, where it is suspected that a component may "fracture" over time, two or more benchmarks in sub-components would be useful.

Where there are multiple benchmarks in a component, in the vast majority of cases, they do provide similar appreciation/depreciation (variable BF in Appendices 1 to 10). The exceptions to this in the above examples is component "EA" in LGA "A".

Clearly, if there are multiple benchmarks in a component, they should be spread across the quartiles

6. Discrepancies Between Data Files for Values of Benchmark Properties

The discrepancy can be seen by looking at the first benchmark property in component "EA" for LGA "A" (Table 2). The last 7 columns relate to the benchmark property giving:

ID	ID number of component benchmark;
BV2001	2001 valuation of the benchmark property (base date 2001-07-01);
BV2000	2000 valuation of the benchmark property (base date 2000-07-01);
BF	Benchmark Factor = 100*BV2001/BV2000 (%)
FG	flag ("U", "L", or blank) indicating whether or not the 2001 land value of the benchmark property falls in the upper quartile ("U"), the lower quartile ("L") or within the inter-quartile range (blank).
AV2001	2001 assigned value of the benchmark property (base date 2001-07-01);
FG2	flag ("+", "A", blank, "B" or "–") indicating whether:

AV2001 > 1.1 * BV2001	"+"
AV2001 > BV2001	"A"
AV2001 = BV2001	blank
AV2001 < BV2001	"B"
AV2001 < 0.9 * BV2001	"–"

For component "EA", AV2001 (the assigned land value) is $32,300 yet the actual 2001 valuation on this property is $32,500 (BV2001). In this case, the discrepancy is small but this is not always the case (a "+" or "–" in the FG2 column indicates a discrepancy greater than 10% (up or down, respectively) from the valuation BV2001 while an "A" or "B" in the FG2 column indicates a discrepancy of less than 10% above or below). While there may be a philosophical question here suggesting that the "best" value (ie the direct valuation rather than the assigned value after the application of the component factor) should be assigned to each benchmark property, this would clearly lead to a breakdown in the methodology if the benchmark properties are assigned values (AV2001) differently to the others (if this were done, it would not be possible to "correct" the assigned values of all properties through the application of suitable component factors at a later date).

Nonetheless, a predominance of either "+" and "A" (above) or "–" and "B" (below) for FG2 across an LGA is not an ideal situation. A predominance of "–" and "B" indicates that the benchmarks (and, by implication, most properties in the LGA) have 2001 assigned values (via the application of the component factor) generally below their "true" values. On the other hand, a predominance of "+" and "A" indicates that the benchmarks (and, by implication, most properties in the LGA) have 2001 assigned values (via the application of the component factor) generally above their "true" values. In these cases, this would seem to indicate that the component factors which have been used in the LGA tend to be either smaller (producing the "–" and "B" values of FG2) or larger (producing the "+" and "A" values of FG2) than they should have been. The following table gives the extent of the differences in the assigned values and the valuation of the benchmark properties by LGA:

LGA	Number of Benchmarks	Number of “+” and “A”	Number of “–” and “B”	Average Difference (%)	Standard Deviation of the Differences (%)
A	107	19	66	-0.83	3.15
B	13	0	0	0.00	0.00
C	72	5	63	-1.55	6.41

On this basis, it would appear that in LGAs “A” and “C” the component factors used have tended to be on the low side. It seems that the component factors from each benchmark property have been applied precisely in LGA “B” so that BV2001 equals AV2001 for each benchmark property.

Conclusion

The use of mass appraisal methods for statutory valuation for residential rating purposes is certain to continue given the need for reasonably but not highly accurate land valuations of a huge number of properties on a regular basis. Regrettably, the use of regression methods for this purpose will not be possible except in a few very locations given the lack of useful data and the high cost in collecting and maintaining accurate property data bases for this purpose.

Given the widespread use of valuation adjustment models for these statutory residential land valuations, there is an important place for the use of statistical quality control methods to ensure the long-term accuracy of these methods and the early detection and avoidance of potential problems.

References:

Information on the statutory valuation methods used in each State or Territory is available from the web-site of the relevant Department or Authority. These are:

ACT: http://www.urbanservices.act.gov.au/ie4/buildplan/landprop.html

New South Wales: http://www.nsw.gov.au/Housing.asp

Northern Territory: http://www.lpe.nt.gov.au/about/vgreport/vg2001/default.htm

Queensland: http://www.nrm.qld.gov.au/property/valuations/index.html

South Australia: http://www.landservices.sa.gov.au/valuation/property/index.html

Tasmania: http://www.dpiwe.tas.gov.au/inter.nsf/ThemeNodes/

Victoria: http://www.land.vic.gov.au/

Western Australia: http://www.vgo.wa.gov.au/

MacFarlane, J. 2002 Unpublished Consultant's reports for the New South Wales Valuer General.