Model Smoothing – Investigative Analysis

Background :

The application of model smoothing was first undertaken in formulating the NDM proposals for 1999/00. Model smoothing has since been applied to the NDM proposals for all subsequent years, and most recently for 2005/06.

It was agreed with the Demand Estimation Sub-Committee (DESC) and Ofgem shortly after the first application of model smoothing that the method applied would be subject each year to the scrutiny of DESC and that the results of successive years of demand modelling (feeding into model smoothing) would be examined for evidence of trends if any, so as to inform decisions on the approach to and mode of application of model smoothing in future years.

The first such investigative analysis was undertaken in autumn 1999 and in the light of those results it was decided to retain model smoothing without change for deriving the NDM proposals for 2000/01. Further investigations of model smoothing were undertaken during each autumn thereafter (in each of the years from 2000 to 2004) and following discussion of those results at DESC on each occasion, it was decided to continue to apply model smoothing in deriving the NDM proposals for the forthcoming year.

The proposals (for 2005/06) having now been finalised, it is appropriate to update the analysis of model smoothing and examine the possible existence of trends so that informed decisions on the continued application of model smoothing for the spring 2006 NDM analysis can be taken.

It should also be noted that the spring 2005 NDM analysis saw significant other modelling changes in respect of revised definitions of CWVs and a revised basis for SNCWVs. Any decisions on model smoothing in respect of the spring 2006 NDM analysis should be taken in the light of these recently introduced major changes.

Principles of Model Smoothing :

Model smoothing was introduced because EUC models were exhibiting some year on year volatility. It was therefore anticipated that averaging more than one year's models would achieve greater stability.

A further obvious aspiration for the EUC models is that of improved accuracy. However, the two objectives of stability and accuracy are not necessarily consistent: if there is an underlying drift in customer behaviour which leads to changes in model characteristics then stability may be achieved at the expense of accuracy.

It is proposed here (as in the investigative analyses undertaken in previous years) that accuracy is defined as the capability of a model (or a smoothed model) to predict the model that will be fitted to the following year's data.

In order to attempt to illuminate this aspect it is possible to perform the following test on EUC models: compare the models fitted to the 2004/05 consumption data with

(a) the 2003/04 models

(b) the smoothed models based on 2001/02, 2002/03 and 2003/04 data

The test has been applied to CWV intercepts, which give a simple indication of weather sensitivity - i.e. high CWV intercept implies low weather sensitivity. For each case root mean square (RMS) values of the CWV intercept differences have been computed.

For this year's investigation of model smoothing the CWV intercepts from the analyses of the data sets for 2001/02, 2002/03, and 2003/04 along with those for 2004/05, provide the necessary information. All of these CWV intercepts relate to models derived using the revised definitions of CWVs and the revised basis for SNCWVs, that were used in the spring 2005 NDM analysis and which come into effect from 1st October 2005.

The bar charts attached as Figures 1 and 2 show, for the small and large NDM consumption band EUCs only, the difference between the respective CWV intercepts on the two bases. For the small NDM consumption band EUCs (Figure 1) the bar chart for the smoothed model (based on 2001/02, 2002/03 and 2003/04 data) shows only a small improvement, in terms of the spread of CWV intercept differences, over that for the single year (2003/04) model, and this is also reflected in the respective RMS values which are similar. For large NDM consumption band EUCs (Figure 2) the RMS values are not as good for the smoothed model (i.e. for the consumption band large NDM EUCs, the smoothed model is not as good at predicting 2004/05 than the single year, 2003/04, model).

This analysis has also been extended to include WAR band EUCs, the results from which are shown in Figures 3 and 4. The observed spread of CWV intercept differences for all small NDM EUCs (Figure 3) is narrower for the single year model than for the smoothed model, but the RMS values (which indicate the spread of CWV intercept differences around zero) are similar in both cases and slightly better for the smoothed model.

For all large NDM EUCs (Figure 4) the spread of CWV intercept differences is a little narrower for the smoothed model. For the large NDM EUCs, the smoothed model is a little better at predicting 2004/05 than the single year 2003/04. The relevant RMS values (both including and excluding EUC09B) reflect this.

This analysis, undertaken on the same basis as last year's, yields very similar results to those of previous years: although there are signs of a small improvement in "predictive ability" with the smoothed model for small and large NDM EUCs as a whole, the improvements observed are modest.

Thus, it cannot be suggested that these comparisons provide strong evidence as to the superior predictive capability of smoothed models. However, the main driver for using a smoothed model is the mitigation of year of year volatility rather than predictive capability.

Consequently, a similar test has been applied to observe the year-on-year volatility of smoothed models as against individual years' models. The bar charts in Figures 5 & 7 (small NDM) and Figures 6 & 8 (large NDM) show the difference in CWV intercepts between the smoothed models for gas year 2004/05 (based on 01/02, 02/03 and 03/04) and the smoothed models for gas year 2005/06 (based on 02/03, 03/04 and 04/05); and also between individual year models for 2003/04 and 2004/05, that would have been applied if model smoothing had not been implemented. The results in Figures 5 and 6 relate to both consumption band and WAR band EUCs, while the results in Figures 7 and 8 relate to just the consumption band EUCs. As expected, the smoothed models are associated with significantly lower year-on-year volatility as shown by both the generally narrower distribution of CWV intercept differences and reductions in the corresponding RMS values.

Model smoothing - average or trend :

Each year when this investigation of model smoothing has been carried out, there has been some discussion as to whether model averaging or model extrapolation is more appropriate. Extrapolation would only be worthy of consideration if a clear trend could be detected. There has also been some discussion in previous years about whether a trend based on a limited number of years' data should be regarded as a reliable basis for extrapolation.

An analysis of CWV intercepts (all of which are on the revised weather basis) is attached which attempts to shed some light on whether trends exist. This analysis has been applied to all EUCs, small and large NDM, including both consumption band and WAR band EUCs. Figure 9 shows the classification scheme that has been applied to the individual years comprising the smoothed models for gas year 2005/06 - essentially there are five possible patterns for a series of three CWV intercepts to follow: up/up, up/down, down/up, down/down and flat. A symbol has been associated with each of the patterns, and Table 1 shows how each EUC is classified. In Table 2 the counts of each type are shown, firstly a count by EUC across the LDZs, and secondly a count by LDZ across the EUCs.

For the analysis years 2002/03, 2003/04 and 2004/05, the overall count of the different pattern types shows that the most frequently observed patterns are "down/up", with 151 occurrences out of 429 and "up/down" with 111 occurrences. Successive annual analyses undertaken in the years up to and including 2002, had hitherto indicated that the predominant pattern alternated between "up/down" and "down/up". In 2003, this "zig-zag" tendency was partially interrupted in so far as the "down/up" pattern

was not predominant as might otherwise have been expected, but instead the two cases of “down/up” and “up/down” were much more evenly balanced. In 2004 the occurrences seemed to indicate a resumption of the “zig-zag” tendency previously observed year on year, with one case (that of “down/up”) clearly predominant. However, the most recent analysis presented in Table 2 indicates that the expectation of a “zig-zag” pattern has once again not materialised. For the second year running the “down/up” case predominates, albeit it with a small increase of the “up/down” cases as well from their 2004 level.

As has been the case in all previous years, this year too the occurrences of a consistent pattern (i.e. “up/up” or “down/down”) are no greater in each instance than what might be expected simply on a random basis. The numbers of occurrences of the “up/up” pattern is somewhat higher than in previous years. However, this is not particularly significant – for example the “down/down” pattern occurred at around the same level in the 2003 analysis.

Over the three years, there are some instances of specific EUCs and specific LDZs, where a “down/down” pattern or an “up/up” pattern occurs to a notable extent. In any event, three data points do not necessarily point to a trend and examination of a fourth year of CWV intercept data reveals that these possible instances are not sustained.

For the four most recent analysis years (01/02, 02/03, 03/04 and 04/05) CWV intercepts are available on a consistent basis. These may be categorised into four groups, namely: no consistent trend, increasing values, decreasing values and flat models. Summary results are presented as Table 3.

These show that 360 out of 429 occurrences indicate no consistent trend while the numbers of consistently decreasing or consistently increasing occurrences are now very small (9 and 25 respectively).

The count of EUCs of no consistent pattern (360) is very similar to that of last year (364). Moreover, as Table 3 shows, the results for all previous model smoothing investigations have also been very similar. The vast majority of cases are always that of no consistent trend. Furthermore, in all these investigations, the occurrences of consistent trends have been very much smaller than might be expected on purely random grounds.

The apparently concentrated occurrences: of a downward pattern in CWV intercepts over three years (e.g. NO LDZ) and of an upward pattern in CWV intercepts over three years (e.g. WM, NT, SE, SO and SW LDZs), are all not borne out over four years. For every LDZ over four years, the predominant effect is of no consistent pattern.

For all the EUCs which showed a majority of occurrences of an upward pattern in CWV intercepts over three years (namely: xx:E0505W01, xx:E0505W02, xx:E0506W02, xx:E0506W03, and xx:E0506W04) the four year picture is one of no consistent trend in every instance.

No EUCs showed a majority of occurrences of a downward pattern in CWV intercepts over three years.

The final set of information to be considered as part of this analysis is presented in Figures 10 to 18. These show the load factors for the individual years' models of the consumption band EUCs, over the four years available on a consistent basis.

These graphs of load factors (Figures 10 to 18) confirm the evidence of the CWV intercept information previously presented: that the predominant effect is one of no consistent trend.

It is the collective view of Transporters, on the basis of this material, supported also by the results of this same analysis undertaken in each of the last four previous years, that there are no signs of trends in the demand models of sufficient clarity to influence the manner in which model smoothing is applied.

Consequently Transporters believe that the current averaging approach to model smoothing continues to be appropriate and fit for purpose.

The matter of how many years to include in model smoothing also needs to be considered.

This issue was considered in each previous year following this same analysis undertaken in those years and the discussion in every case led to retention of the three year basis for NDM analysis to be undertaken in the following spring.

An argument in favour of continuing with three year model smoothing (or reverting to two years) is that, to the extent that any trends exist, they will be reflected sooner in the smoothed models than if four year model smoothing is adopted.

Last year, in considering the number of years models to include in model smoothing, it was suggested at DESC that if the predominant pattern of CWV intercepts was a “zig-zag” of alternating “up” and “down” intercept values, then that would suggest using an even number of years models in the smoothing (in other words four or two). However, the results this year and also from two years ago in 2003, show that there is no consistently predominant year on year “zig-zag” pattern of CWV intercepts as previously thought to be the case (prior to 2003). Therefore, this particular consideration does not now appear to be an appropriate basis for choosing an even number of years for model smoothing in preference to the current approach of three years.

A further pragmatic argument in favour of making no change to the number of years included in model smoothing is that with the significant (weather variable related) changes adopted for the first time in the spring 2005 NDM analysis it would probably be prudent to retain the basis of model smoothing unchanged for a further year to allow for the effects of the new weather variables and new seasonal normal basis to be observed during gas year 2005/06.

Accordingly, Transporters believe that the current basis to model smoothing of three years continues to be appropriate and fit for purpose.

DESC members are invited to review the material contained in the figures and tables attached to this note in the context of the basis of model smoothing (i.e. simple averaging or other) and the number of years to include in model smoothing, and to consider whether any changes should be introduced for the spring 2006 NDM analysis.

Figure 1: Small NDM Consumption Band EUCs - Predictive Ability

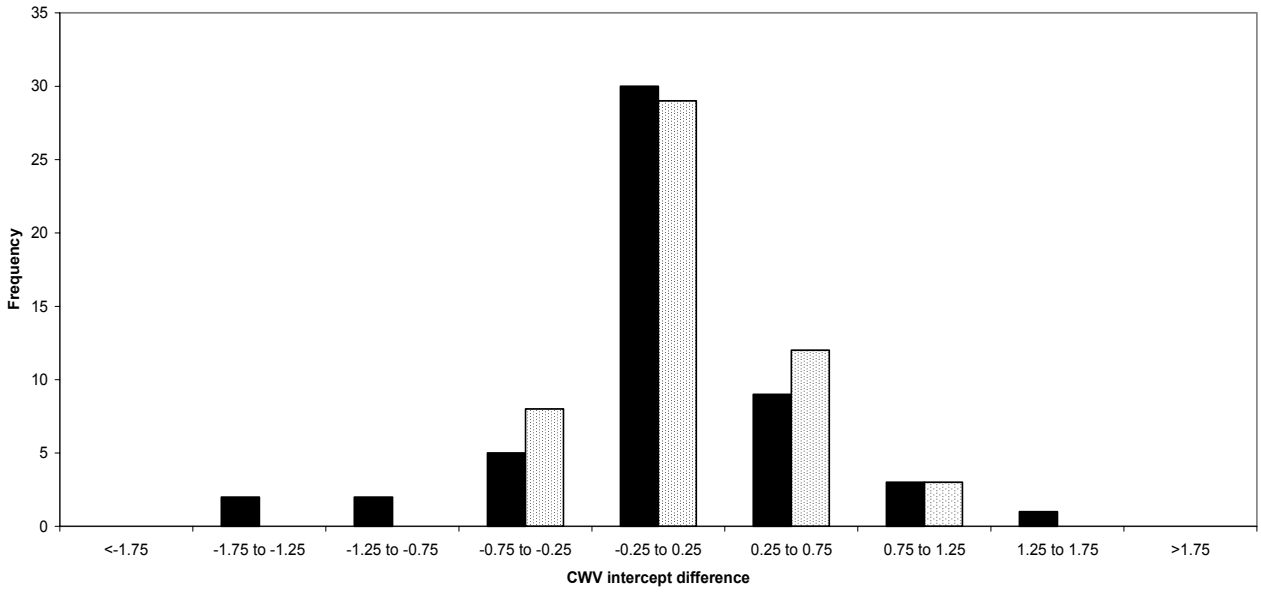


Figure 2: Large NDM Consumption Band EUCs - Predictive Ability

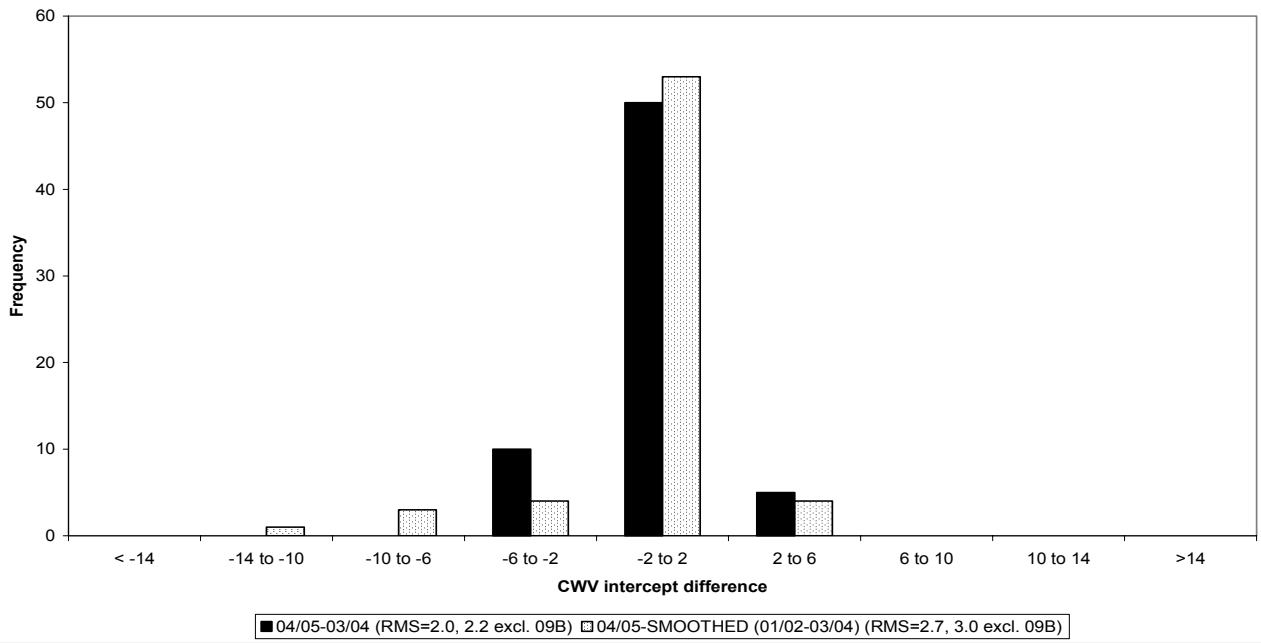


Figure 3: Small NDM EUCs - Predictive Ability

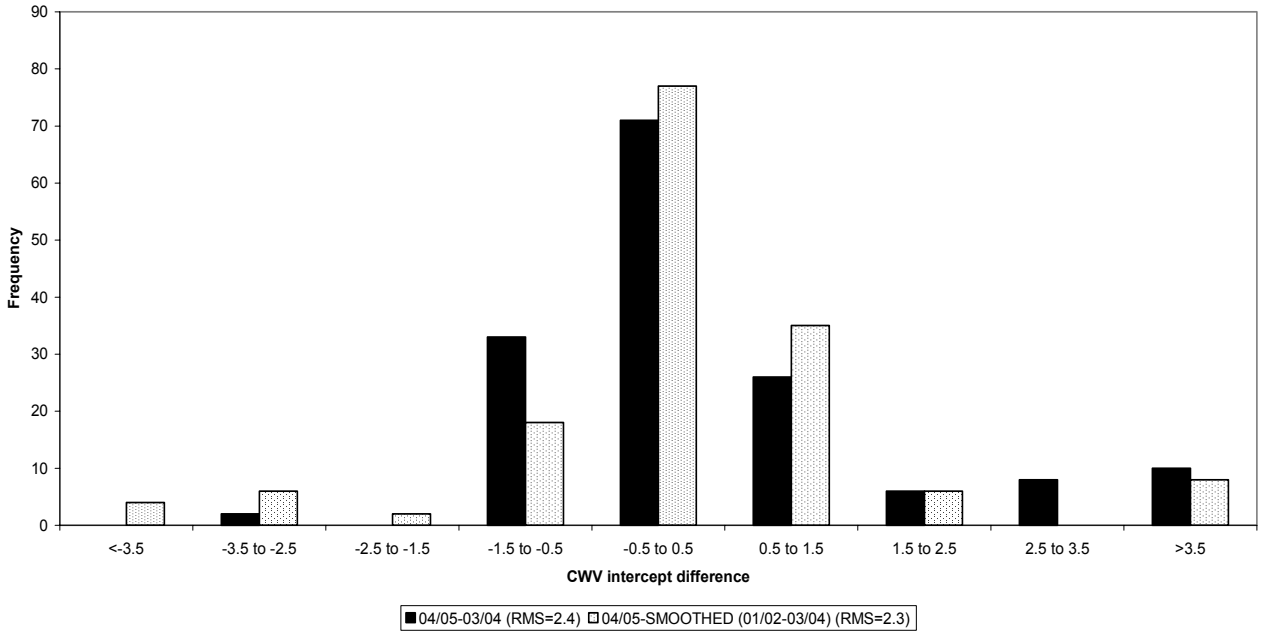


Figure 4: Large NDM EUCs - Predictive Ability

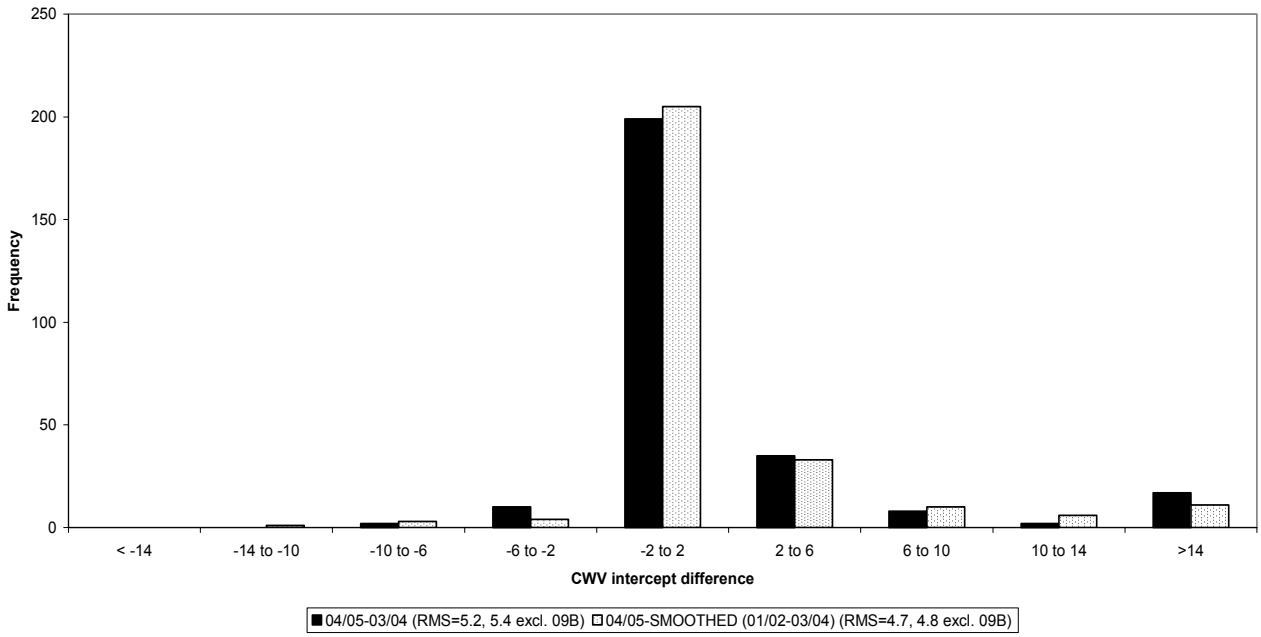


Figure 5: Small NDM EUCs - Year on Year Volatility

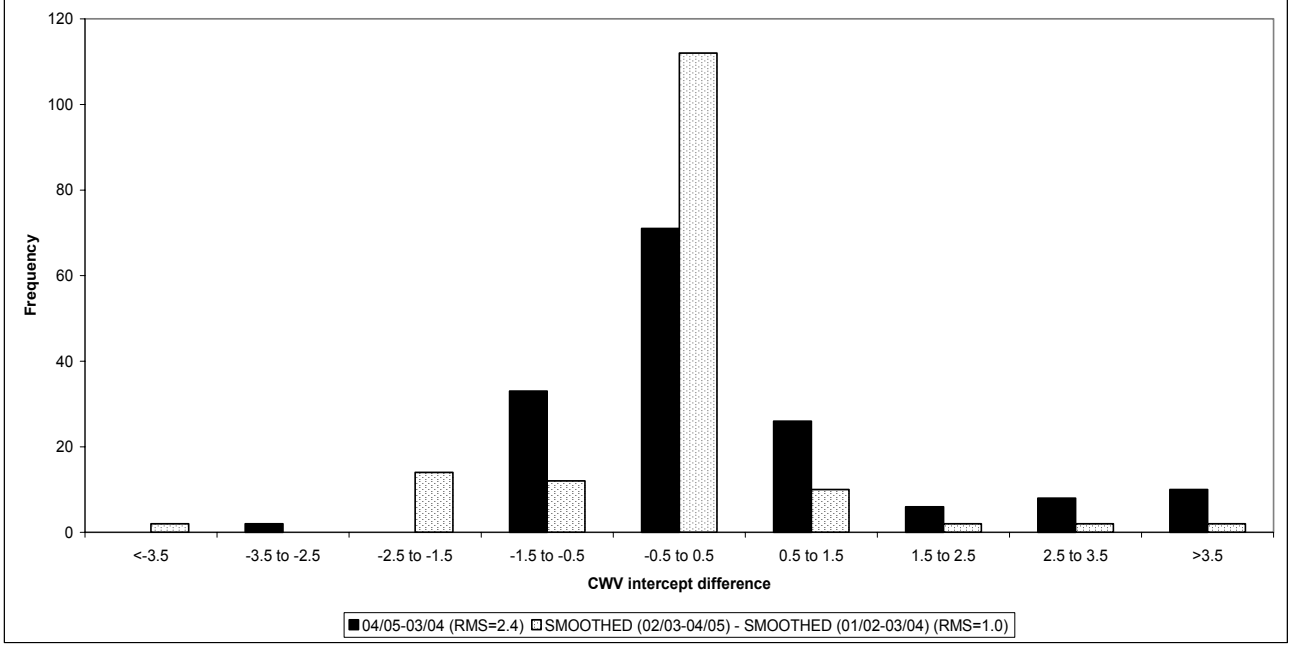


Figure 6: Large NDM EUCs - Year on Year Volatility

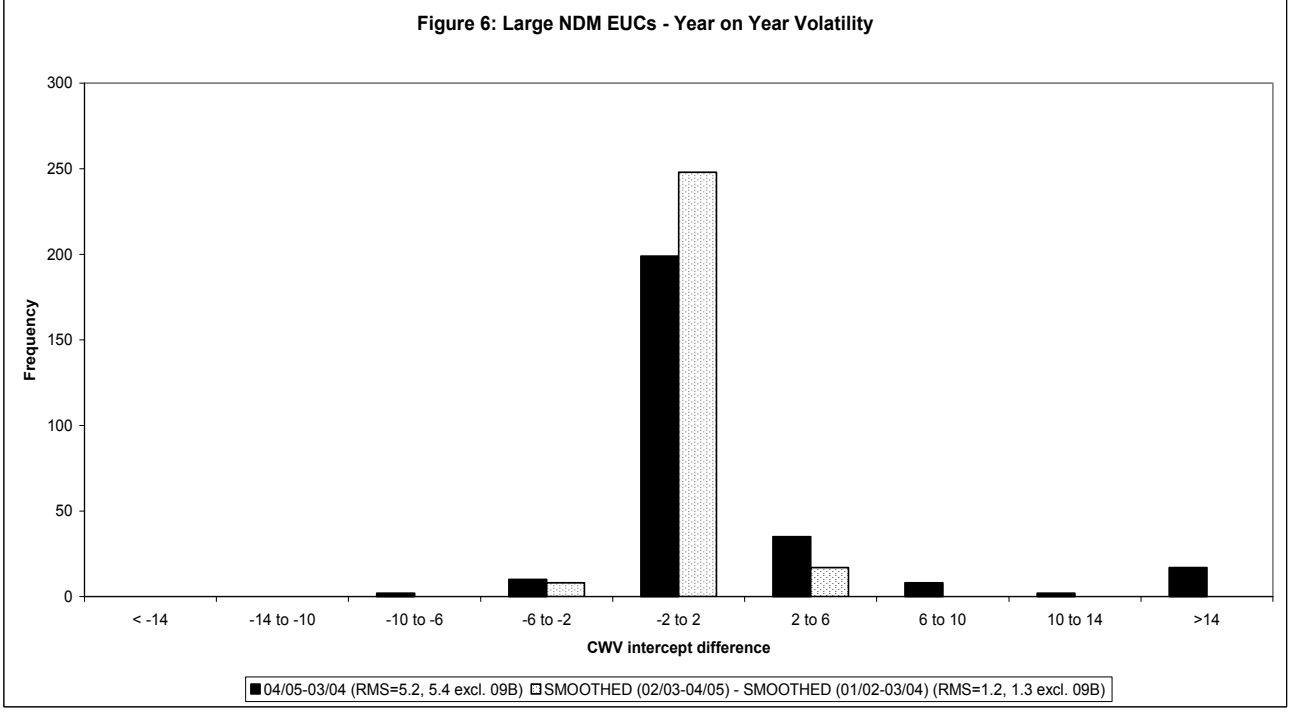


Figure 7: Small NDM Consumption Band EUCs - Year on Year Volatility

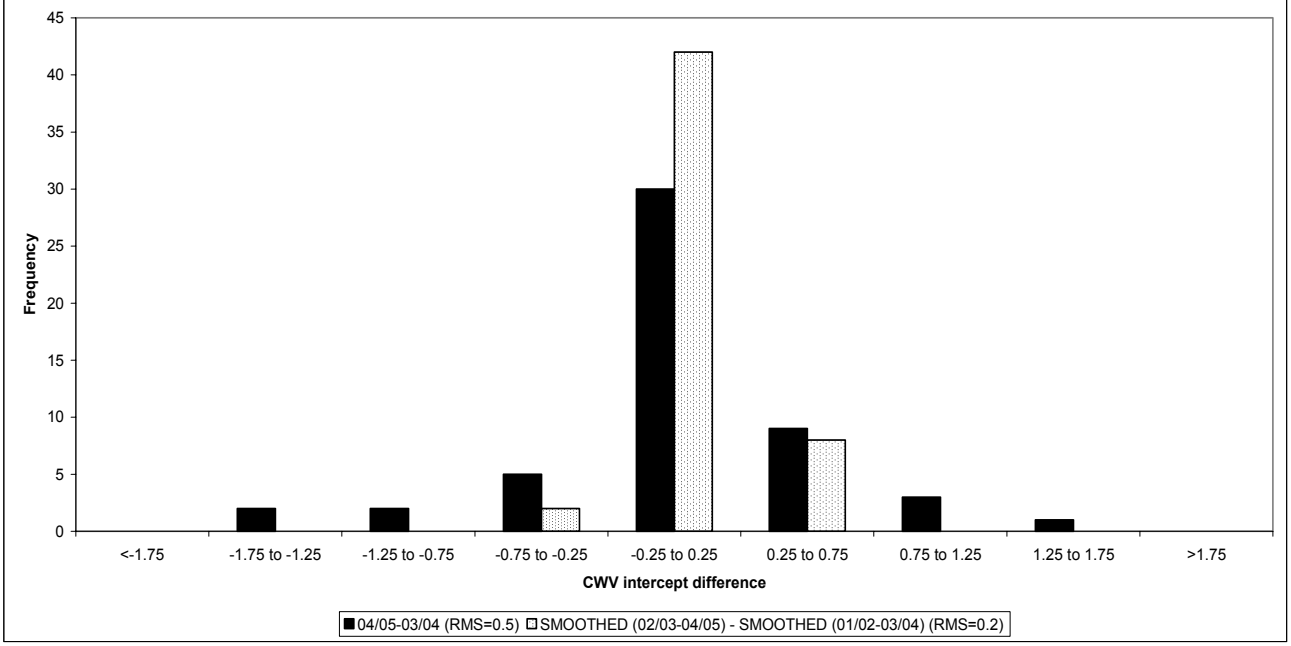


Figure 8: Large NDM Consumption Band EUCs - Year on Year Volatility

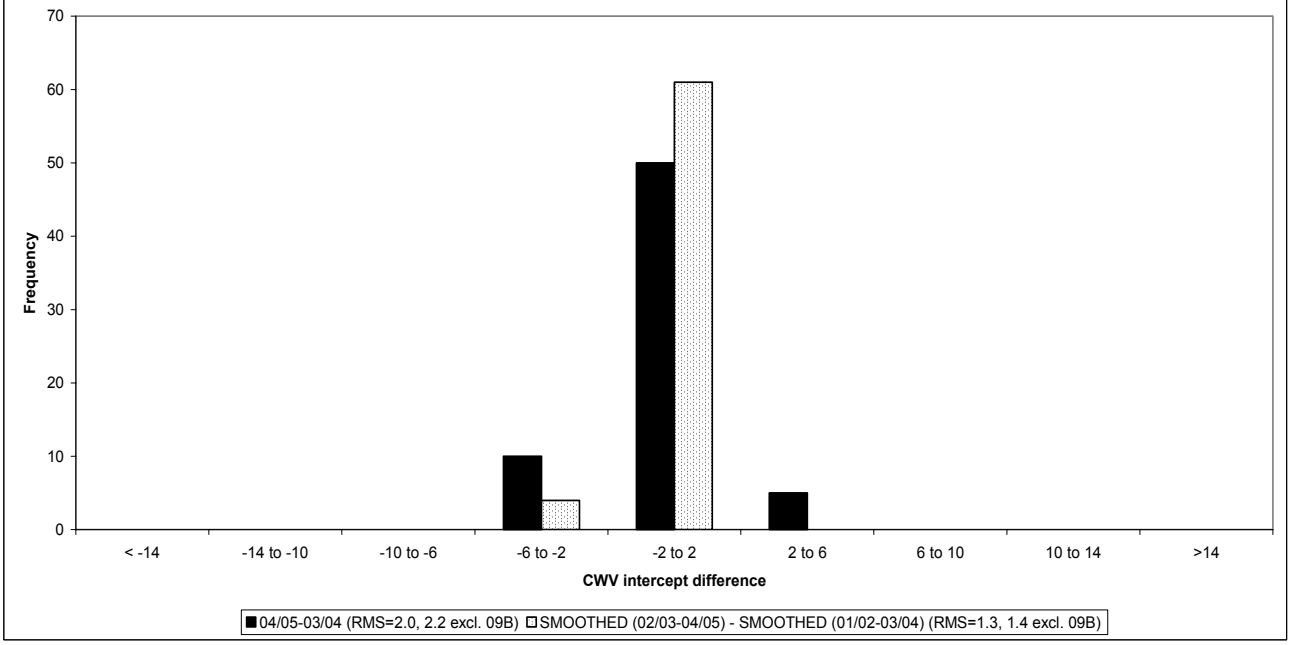


Figure 9: Key for CWV Intercept Pattern Types - 3 Years of NDM Demand Models

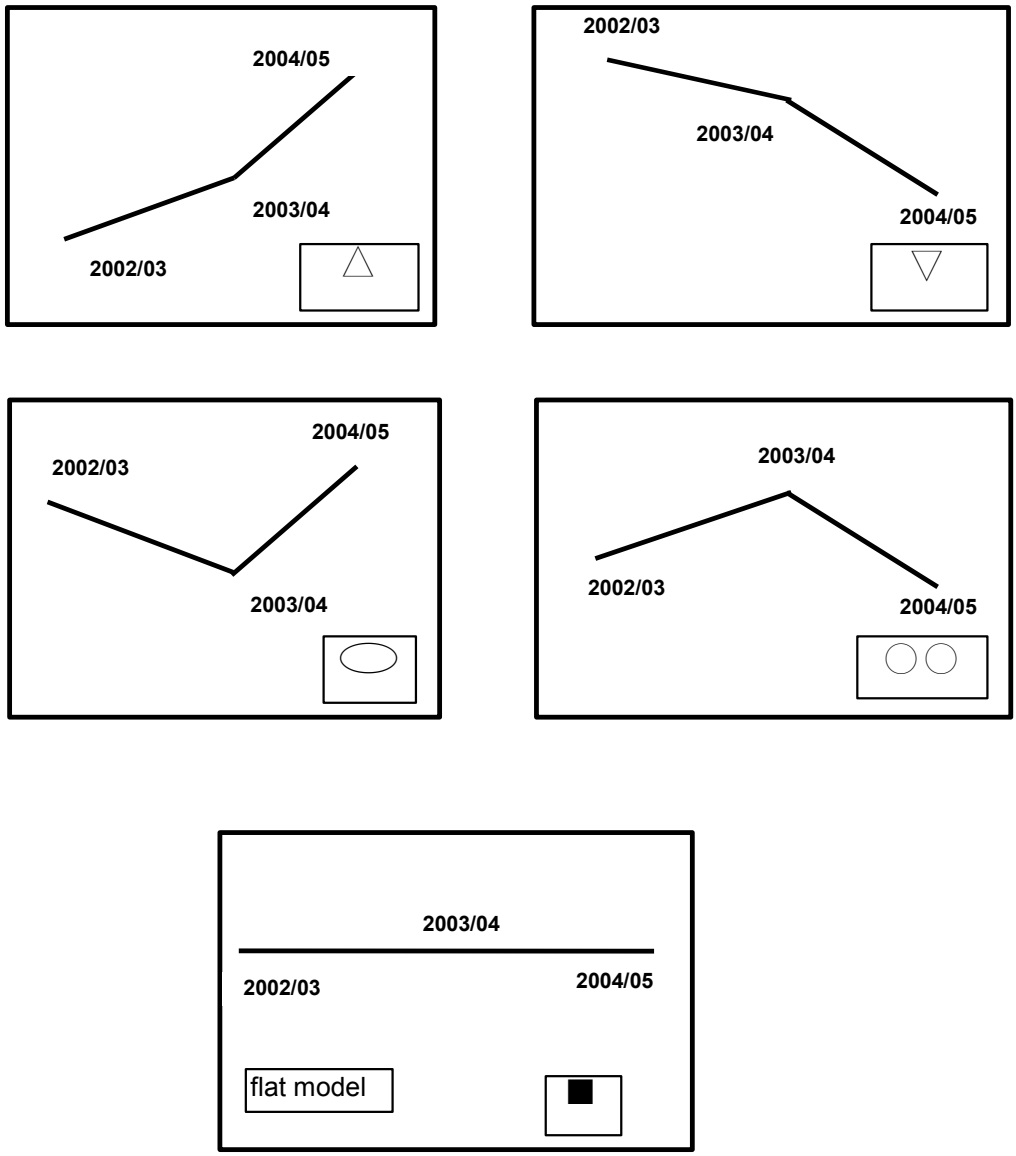


Table 1: CWV Intercept Patterns : NDM Demand Models for 2002/03, 2003/04, 2004/05

Consumption Band EUCs

xx=LDZ =	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0501B	⬭	⬭	○○	⬭	⬭	○○	○○	⬭	⬭	⬭	▽	⬭	○○
xx:E0502B	▽	▽	○○	○○	○○	○○	○○	⬭	○○	△	○○	⬭	△
xx:E0503B	⬭	○○	⬭	▽	⬭	○○	⬭	△	⬭	⬭	○○	○○	○○
xx:E0504B	⬭	○○	○○	⬭	▽	○○	○○	⬭	⬭	⬭	○○	⬭	○○
xx:E0505B	⬭	▽	⬭	▽	⬭	△	⬭	▽	▽	△	⬭	△	△
xx:E0506B	⬭	⬭	△	△	○○	○○	△	▽	⬭	⬭	⬭	○○	⬭
xx:E0507B	○○	△	△	⬭	⬭	⬭	△	⬭	⬭	⬭	⬭	⬭	⬭
xx:E0508B	▽	▽	▽	⬭	⬭	⬭	▽	○○	○○	○○	○○	○○	○○
xx:E0509B	⬭	▽	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭

First (ie. flattest, W01) ,WAR Bands in Each Consumption Range

xx=LDZ =	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0503W01	⬭	▽	○○	⬭	⬭	⬭	○○	○○	⬭	⬭	⬭	⬭	⬭
xx:E0504W01	⬭	▽	○○	⬭	⬭	⬭	○○	○○	⬭	⬭	⬭	⬭	⬭
xx:E0505W01	△	○○	△	△	⬭	△	△	○○	△	⬭	△	△	⬭
xx:E0506W01	△	○○	○○	■	■	■	○○	■	■	■	■	■	■
xx:E0507W01	■	■	■	■	■	■	■	■	■	■	■	■	■
xx:E0508W01	■	■	■	■	■	■	■	■	■	■	■	■	■

Second (ie. W02) ,WAR Bands in Each Consumption Range

xx=LDZ =	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0503W02	▽	▽	○○	▽	○○	△	○○	▽	△	△	△	△	○○
xx:E0504W02	▽	▽	○○	▽	○○	△	○○	▽	△	△	△	△	○○
xx:E0505W02	▽	△	△	○○	⬭	△	△	▽	⬭	△	△	△	⬭
xx:E0506W02	○○	○○	○○	△	△	△	○○	△	△	△	△	△	△
xx:E0507W02	⬭	⬭	⬭	⬭	⬭	⬭	⬭	△	△	△	△	△	△
xx:E0508W02	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭

Third (ie. W03) ,WAR Bands in Each Consumption Range

xx=LDZ =	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0503W03	○○	○○	○○	○○	⬭	△	○○	○○	⬭	△	△	△	△
xx:E0504W03	○○	○○	○○	○○	⬭	△	○○	○○	⬭	△	△	△	△
xx:E0505W03	○○	○○	○○	○○	⬭	△	○○	⬭	△	△	△	△	△
xx:E0506W03	○○	○○	○○	△	△	△	○○	⬭	△	△	△	○○	△
xx:E0507W03	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	△	⬭
xx:E0508W03	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭	⬭

Fourth (ie. peakiest, W04) ,WAR Bands in Each Consumption Range

xx=LDZ =	SC	NO	NW	NE	EM	WM	WN	WS	EA	NT	SE	SO	SW
xx:E0503W04	⬭	○○	○○	△	○○	△	○○	○○	⬭	△	⬭	○○	△
xx:E0504W04	⬭	○○	○○	△	○○	△	○○	○○	⬭	△	⬭	○○	△
xx:E0505W04	○○	○○	○○	△	○○	△	○○	○○	⬭	△	△	⬭	△
xx:E0506W04	○○	○○	○○	△	△	△	○○	○○	△	△	△	△	○○
xx:E0507W04	○○	○○	○○	○○	○○	○○	○○	⬭	⬭	⬭	⬭	⬭	△
xx:E0508W04	▽	▽	▽	▽	▽	○○	▽	⬭	⬭	⬭	⬭	⬭	○○

Table 2: CWV Intercept Patterns : NDM Demand Models for 2002/03, 2003/04, 2004/05
Counts of CWV Intercept Pattern Types By End User Category and by LDZ

EUC	Type					Total
	△	○○	⬭	▽	■	
xx:E0501B	0	4	8	1	0	13
xx:E0502B	2	7	2	2	0	13
xx:E0503B	1	5	6	1	0	13
xx:E0503W01	0	3	9	1	0	13
xx:E0503W02	5	4	0	4	0	13
xx:E0503W03	5	6	2	0	0	13
xx:E0503W04	4	6	3	0	0	13
xx:E0504B	0	6	6	1	0	13
xx:E0504W01	0	3	9	1	0	13
xx:E0504W02	5	4	0	4	0	13
xx:E0504W03	5	6	2	0	0	13
xx:E0504W04	4	6	3	0	0	13
xx:E0505B	4	0	5	4	0	13
xx:E0505W01	8	2	3	0	0	13
xx:E0505W02	7	1	3	2	0	13
xx:E0505W03	6	5	2	0	0	13
xx:E0505W04	5	6	2	0	0	13
xx:E0506B	3	3	6	1	0	13
xx:E0506W01	1	3	0	0	9	13
xx:E0506W02	9	4	0	0	0	13
xx:E0506W03	7	5	1	0	0	13
xx:E0506W04	7	6	0	0	0	13
xx:E0507B	3	1	9	0	0	13
xx:E0507W01	0	0	0	0	13	13
xx:E0507W02	6	0	7	0	0	13
xx:E0507W03	1	0	12	0	0	13
xx:E0507W04	1	7	5	0	0	13
xx:E0508B	0	6	3	4	0	13
xx:E0508W01	0	0	0	0	13	13
xx:E0508W02	0	0	13	0	0	13
xx:E0508W03	0	0	13	0	0	13
xx:E0508W04	0	2	5	6	0	13
xx:E0509B	0	0	12	1	0	13
Total by Type	99	111	151	33	35	429

LDZ	Type					Total
	△	○○	⬭	▽	■	
SC	2	9	14	6	2	33
NO	2	14	6	9	2	33
NW	4	18	7	2	2	33
NE	8	6	11	5	3	33
EM	3	8	17	2	3	33
WM	14	7	9	0	3	33
WN	4	18	7	2	2	33
WS	3	10	12	5	3	33
EA	8	2	19	1	3	33
NT	15	1	14	0	3	33
SE	12	4	13	1	3	33
SO	12	6	12	0	3	33
SW	12	8	10	0	3	33
Totals	99	111	151	33	35	429

Key

△	2002/03 < 2003/04 < 2004/05
○○	2002/03 < 2003/04 >= 2004/05
⬭	2002/03 >= 2003/04 < 2004/05
▽	2002/03 > 2003/04 > 2004/05
■	flat models

Total by Type for 2002/03, 2003/04 and 2004/05 Analysis Years	62	95	182	57	33	429	Autumn 2004 Investigation of Model Smoothing
Total by Type for 2000/01, 2002/03 and 2003/04 Analysis Years	21	145	130	94	39	429	Autumn 2003 Investigation of Model Smoothing
Total by Type for 1999/00, 2000/01 and 2002/03 Analysis Years	66	194	80	50	39	429	Autumn 2002 Investigation of Model Smoothing
Total by Type for 1998/99, 1999/00 and 2000/01 Analysis Years	39	83	186	82	39	429	Autumn 2001 Investigation of Model Smoothing
Total by Type for 1997/98, 1998/99 and 1999/00 Analysis Years	77	223	58	31	40	429	Autumn 2000 Investigation of Model Smoothing
Total by Type for 1996/97, 1997/98 and 1998/99 Analysis Years	57	46	233	54	39	429	Autumn 1999 Investigation of Model Smoothing

Table 3 : CWV Intercept Patterns : NDM Demand Models for 2001/02, 2002/03, 2003/04 and 2004/05
Counts of CWV Intercept Pattern Types By End User Category and by LDZ

EUC	Type				Total
	☒	▽	△	■	
xx:E0501B	12	1	0	0	13
xx:E0502B	11	0	2	0	13
xx:E0503B	12	0	1	0	13
xx:E0503W01	12	1	0	0	13
xx:E0503W02	10	1	2	0	13
xx:E0503W03	10	0	3	0	13
xx:E0503W04	13	0	0	0	13
xx:E0504B	12	1	0	0	13
xx:E0504W01	12	1	0	0	13
xx:E0504W02	10	1	2	0	13
xx:E0504W03	10	0	3	0	13
xx:E0504W04	13	0	0	0	13
xx:E0505B	12	1	0	0	13
xx:E0505W01	11	0	2	0	13
xx:E0505W02	10	1	2	0	13
xx:E0505W03	12	0	1	0	13
xx:E0505W04	13	0	0	0	13
xx:E0506B	12	1	0	0	13
xx:E0506W01	4	0	0	9	13
xx:E0506W02	13	0	0	0	13
xx:E0506W03	10	0	3	0	13
xx:E0506W04	10	0	3	0	13
xx:E0507B	13	0	0	0	13
xx:E0507W01	0	0	0	13	13
xx:E0507W02	13	0	0	0	13
xx:E0507W03	12	0	1	0	13
xx:E0507W04	13	0	0	0	13
xx:E0508B	13	0	0	0	13
xx:E0508W01	0	0	0	13	13
xx:E0508W02	13	0	0	0	13
xx:E0508W03	13	0	0	0	13
xx:E0508W04	13	0	0	0	13
xx:E0509B	13	0	0	0	13
Total by Type	360	9	25	35	429

LDZ	Type				Total
	☒	▽	△	■	
SC	30	1	0	2	33
NO	29	2	0	2	33
NW	31	0	0	2	33
NE	28	0	2	3	33
EM	28	1	1	3	33
WM	26	0	4	3	33
WN	31	0	0	2	33
WS	25	4	1	3	33
EA	26	0	4	3	33
NT	26	0	4	3	33
SE	27	1	2	3	33
SO	24	0	6	3	33
SW	29	0	1	3	33
Totals	360	9	25	35	429

Key

☒	No consistent trend over 4 years
△	increasing values over 4 years
▽	decreasing values over 4 years
■	flat models

Total by Type for 2000/01, 2001/02, 2002/03 and 2003/04 Analysis Years	364	23	9	33	429
Total by Type for 1999/00, 2000/01, 2001/02 and 2002/03 Analysis Years	353	32	5	39	429
Total by Type for 1998/99, 1999/00, 2000/01 and 2001/02 Analysis Years	352	26	12	39	429
Total by Type for 1997/98, 1998/99, 1999/00 and 2000/01 Analysis Years	348	15	27	39	429
Total by Type for 1996/97, 1997/98, 1998/99 and 1999/00 Analysis Years	361	15	14	39	429

Autumn 2005 Investigation of Model Smoothing

Autumn 2004 Investigation of Model Smoothing

Autumn 2003 Investigation of Model Smoothing

Autumn 2002 Investigation of Model Smoothing

Autumn 2001 Investigation of Model Smoothing

Autumn 2000 Investigation of Model Smoothing

Figure 10

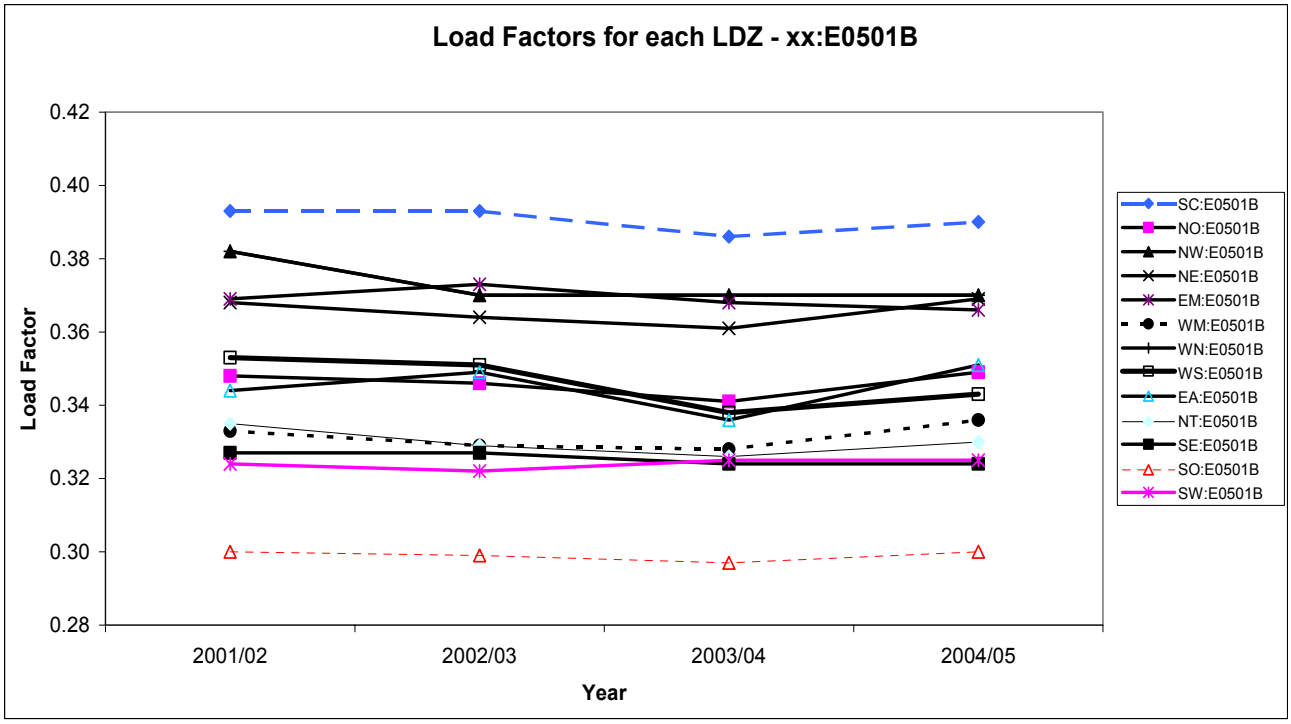


Figure 11

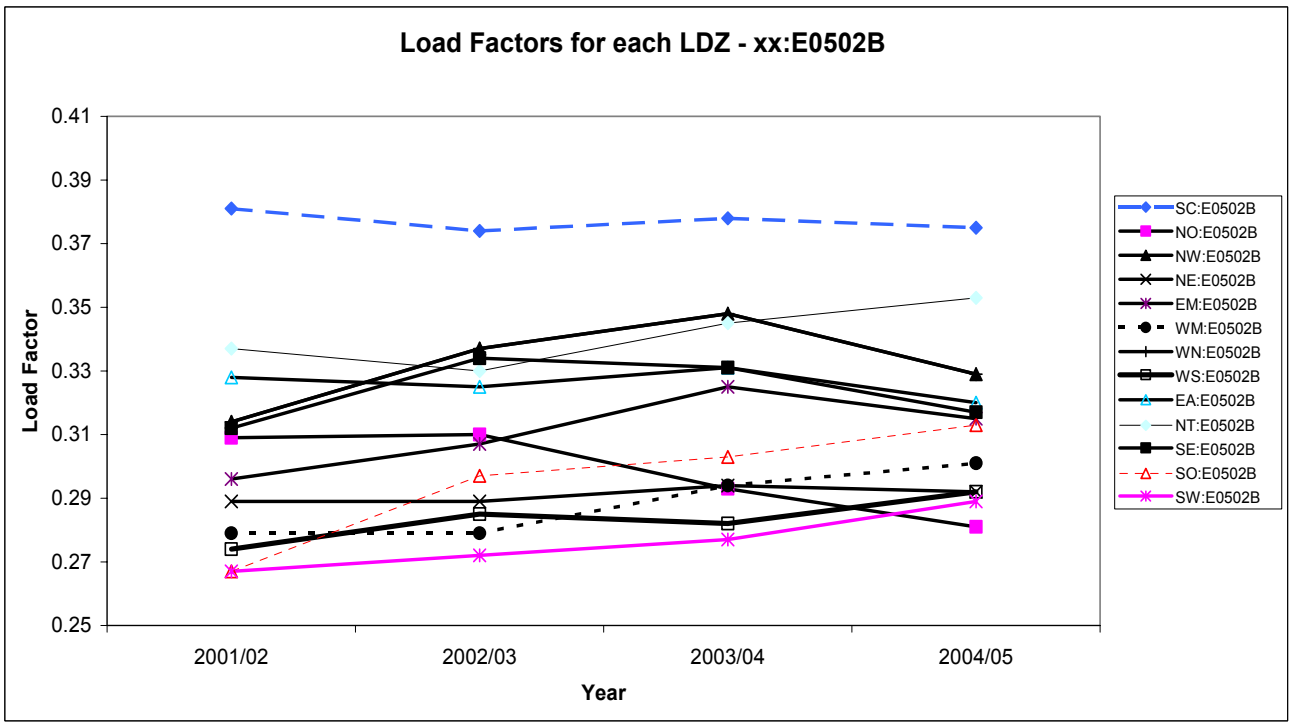


Figure 12

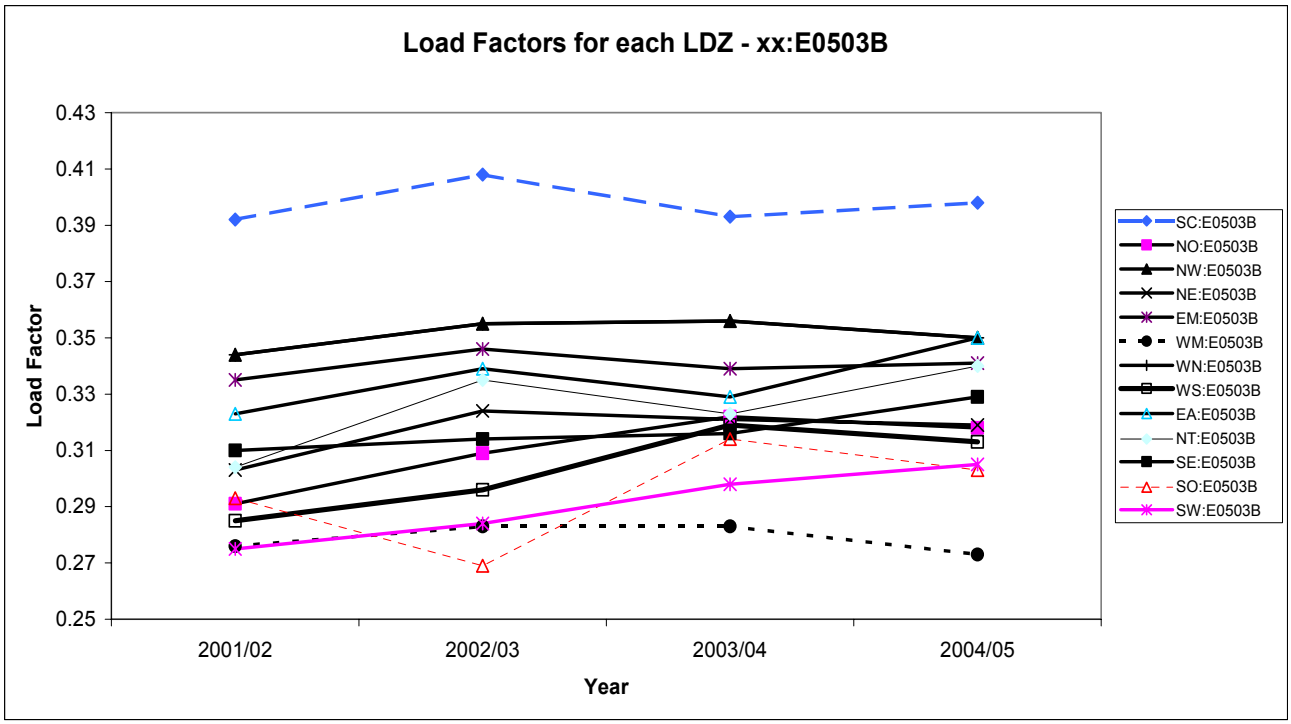


Figure 13

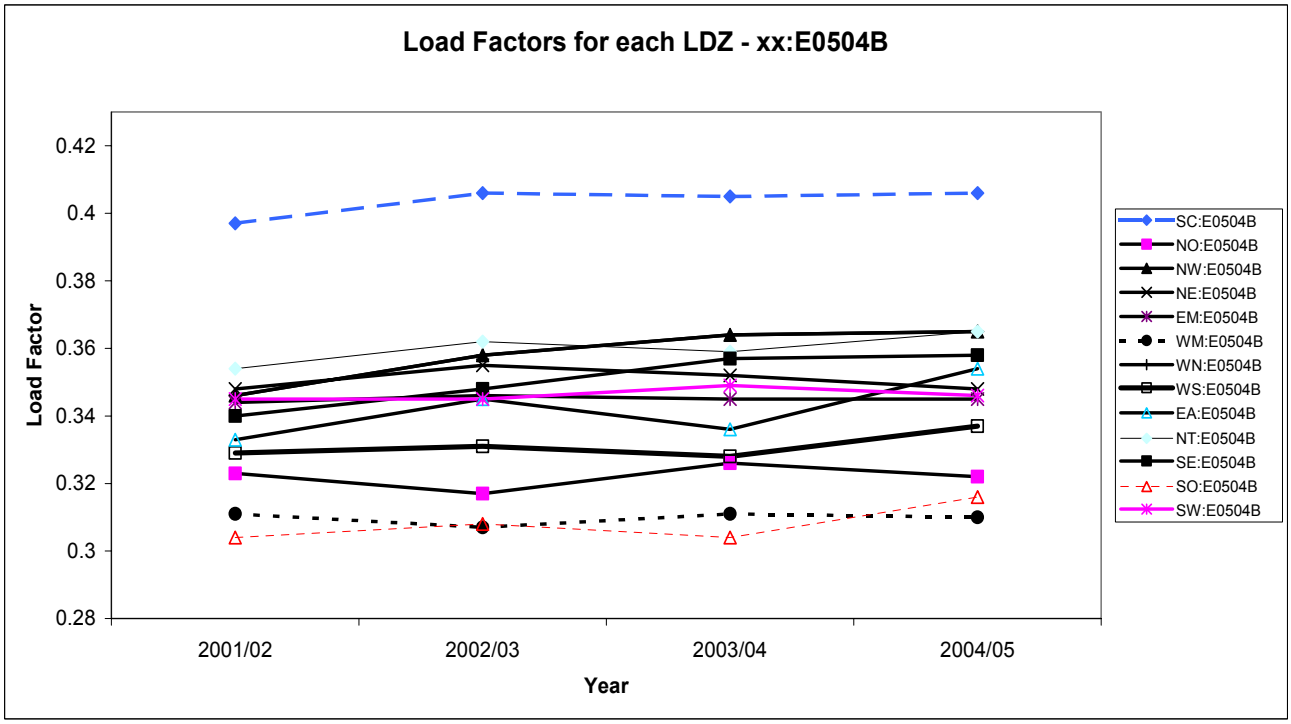


Figure 14

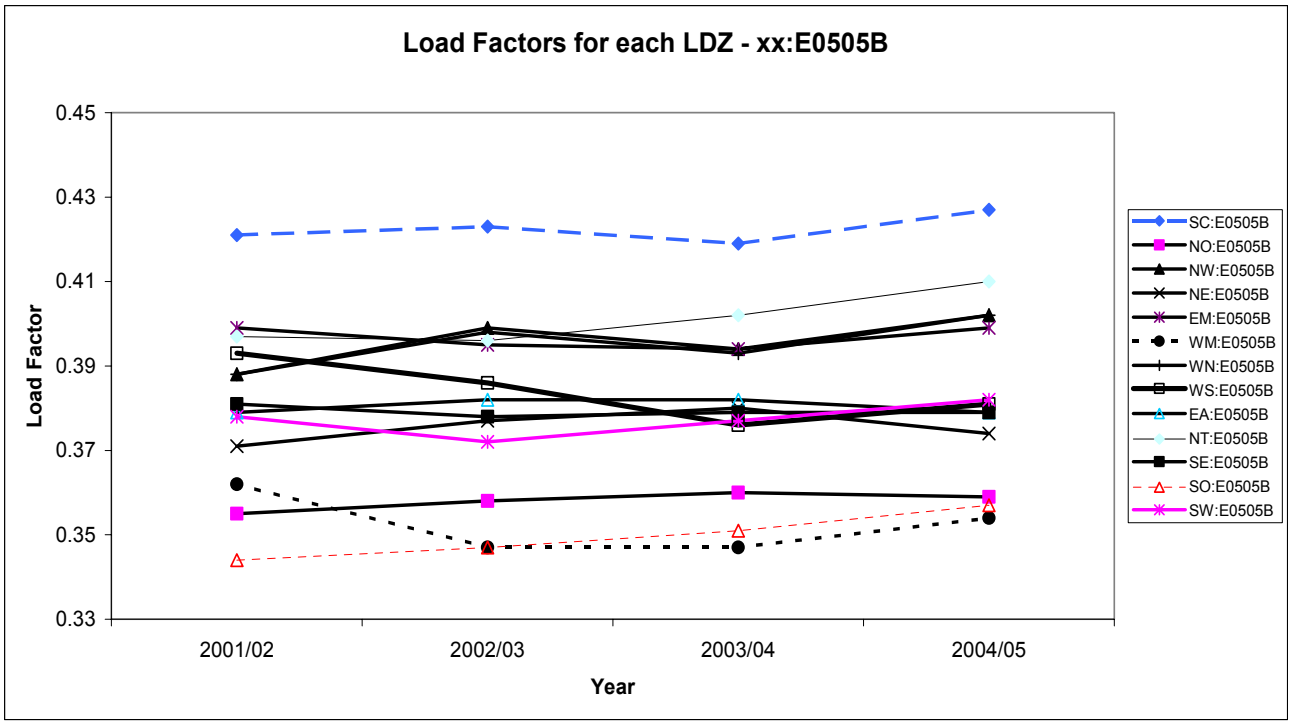


Figure 15

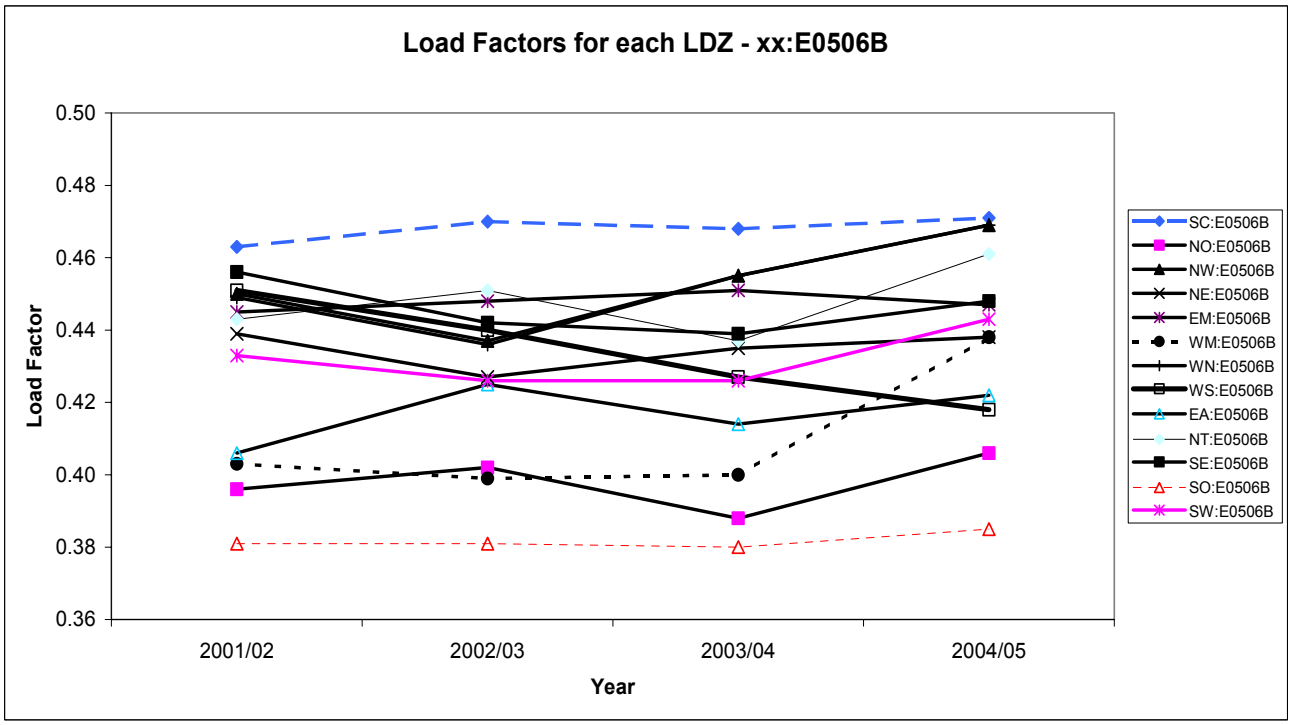


Figure 16

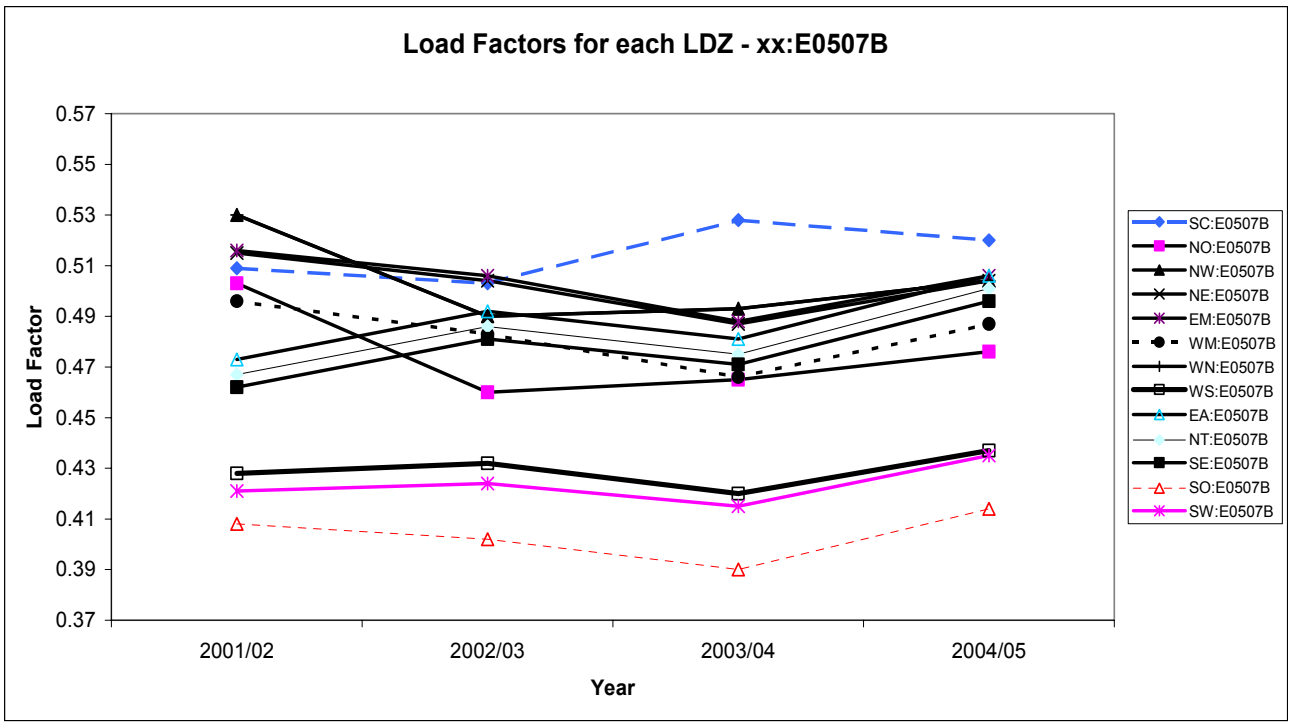


Figure 17

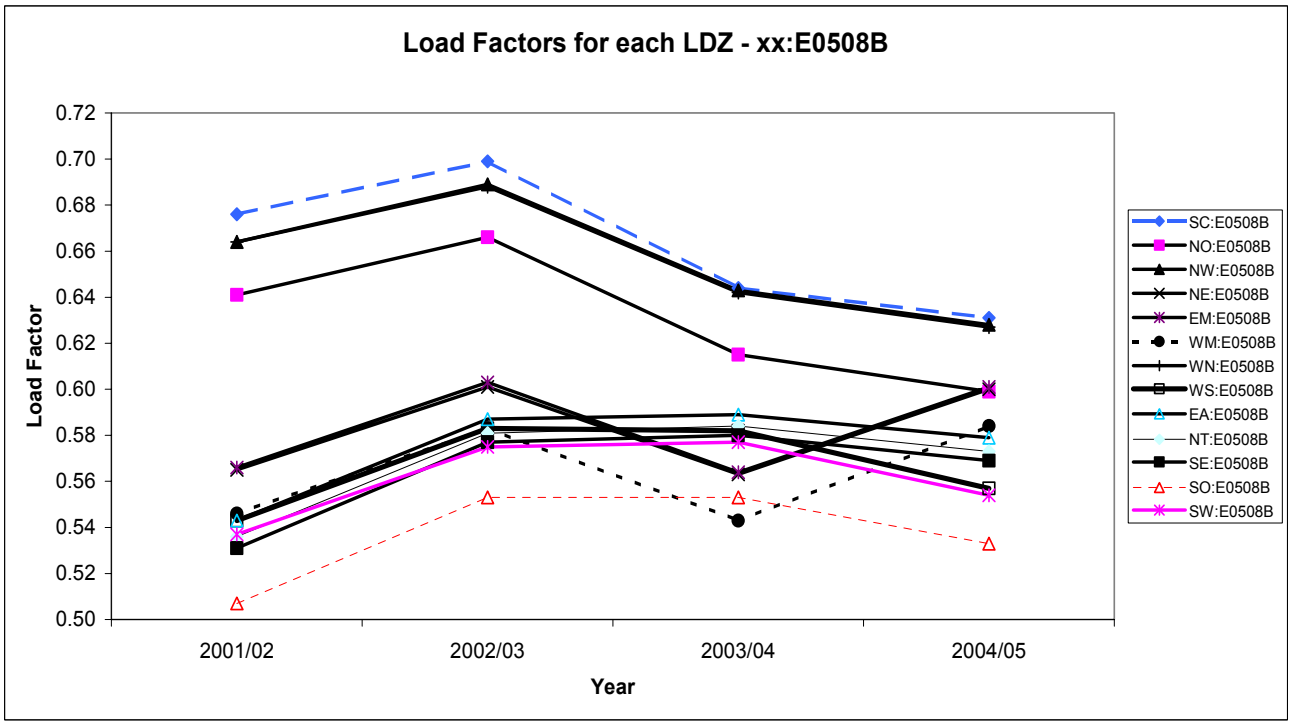
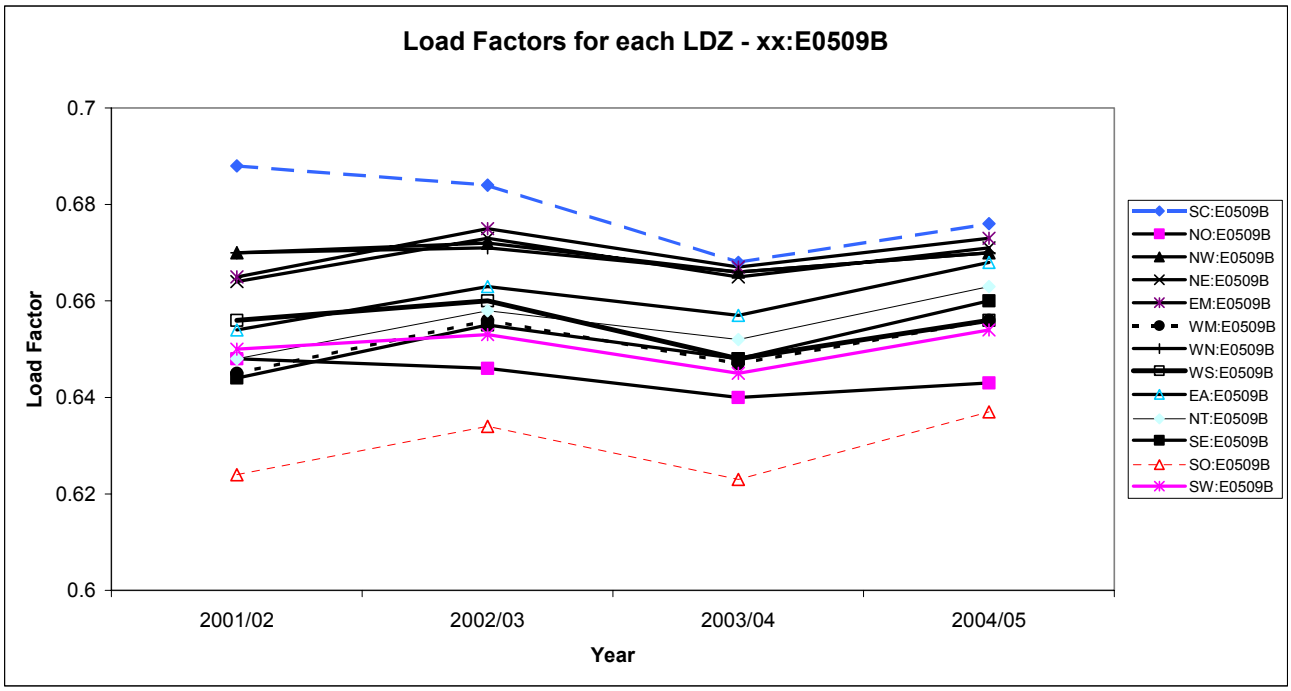


Figure 18


Load Factors for each LDZ - xx:E0509B
Load Factor
0.7
0.68
0.66
0.64
0.62
0.6
2001/02
2002/03
2003/04
2004/05
Year
SC:E0509B
NO:E0509B
NW:E0509B
NE:E0509B
EM:E0509B
WM:E0509B
WN:E0509B
WS:E0509B
EA:E0509B
NT:E0509B
SE:E0509B
SO:E0509B
SW:E0509B