

Forecast Outturn Variance Analysis

1. Introduction

The purpose of this paper is to propose possible methods for measuring the accuracy of departmental outturn forecasts.

In order to improve the Councils ability to forecast accurately, a method of measuring and assessing accuracy needs to be devised.

Due to the nature of forecasting, it is reasonable to expect that forecasts at the start of the year will be further from the final position than those at the end of the year. As time progresses, forecasts should come increasingly closer to the actual year end outturn as information becomes more certain and variables and estimates reduce.

To take this into account it has been agreed by FSB, to apply a weighted accuracy measure.

2. Process

A variance analysis between actual year end outturn and monthly outturn projections has been conducted per department for the years 2003/04 and 2004/05.

This identifies the accuracy of departmental projections, forecasting trends over the year, how departments compare to each other and areas of weakness.

Monthly projections have been taken from the Finance Monitor and final year end outturn from the Statement of Accounts.

3. Accuracy Measure Analysis

Two types of measure are proposed for discussion – a tolerance level and a weighted measure.

3.1 Tolerance Level

A tolerance level provides a buffer within which a variance is acceptable. Therefore the forecast does not need to be exactly right to be deemed accurate. To reflect the nature of forecasting, the buffer is greater at the start of the year and then reduces throughout the year.

This method provides an easy graphical representation of accuracy as both the tolerance and forecast variance can be plotted on a graph. Any variance within the tolerance is accurate and variances outside the buffer less so. The further outside of the tolerance the greater the inaccuracy.

3.1.1 Method

I have used the 'sum of digits' method to weight the variances as it takes the element of time into account by allocating a greater tolerance at the start of the year and then reduces throughout the year.

The resultant weighting provides a level of tolerance for each month. A forecast with a variance of 15.4% would be acceptable for April, but only a forecast within 1.3% of actual outturn would be acceptable in March. FSB are invited to comment on the reasonableness of these limits.

To find the appropriate weighting for each month, the number of months remaining until the year end is calculated:

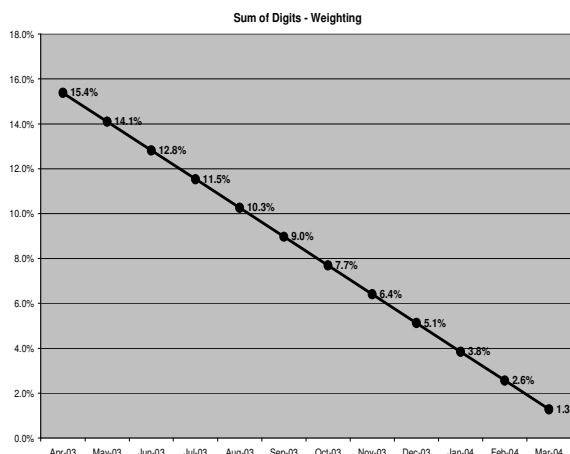
Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Months to Y/E	12	11	10	9	8	7	6	5	4	3	2	1

These figures are then added together to provide the basis of the calculation:

Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	TOTAL
	12	11	10	9	8	7	6	5	4	3	2	1	78

The weighting for each month is determined by dividing the months remaining until the year end by the sum of them for the year:

Month	Months to Y/E	Total	Tolerance
Apr	12	78	15.4%
May	11	78	14.1%
Jun	10	78	12.8%
Jul	9	78	11.5%
Aug	8	78	10.3%
Sep	7	78	9.0%
Oct	6	78	7.7%
Nov	5	78	6.4%
Dec	4	78	5.1%
Jan	3	78	3.8%
Feb	2	78	2.6%
Mar	1	78	1.3%



By applying these tolerances, the accuracy of forecasts would be expected to improve and converge by 1.3% per month on the actual year end outturn.

3.2 Weighted Measure

A weighted measure provides a way of measuring accuracy at all levels. Whereas the Tolerance level identifies whether a forecast variance is deemed accurate or not, this method evaluates accuracy.

To reflect the nature of forecasting, a lower weighting is applied at the start of the year and gradually increases throughout the year. This reflects the fact that a variance of 10% in March is worse than a 10% variance in April.

As this method provides an absolute method of scoring, accuracy can be rated and compared between departments and year on year. The lower the score the more accurate the forecast.

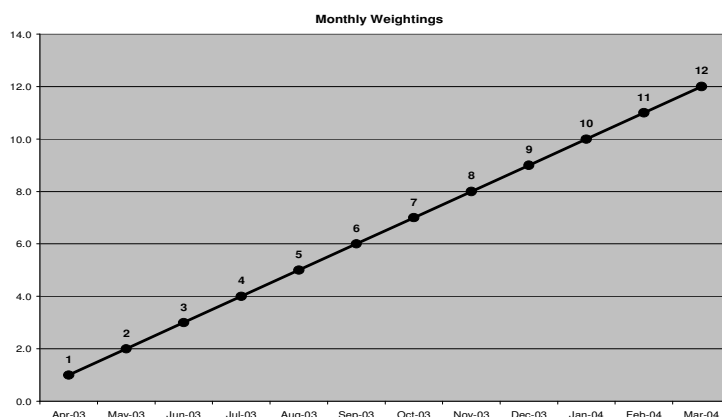
3.2.1 Method

A weighting of between 1 and 12 has been allocated to each month – 1 in April to 12 in March. This takes the timing of the forecast into account by multiplying forecast variances at the end of the year by a greater weighting than at the start.

For each month, the relevant weighting is multiplied by the percentage variance. For example, a variance of 5.5% in June, multiplied by weighting of 3, would give an accuracy rating of 17. The same variance later in the year would produce a higher score as forecasts should become increasingly accurate towards the year end. For example, a 5.5% variance in January, multiplied by weighting of 10, would give an accuracy score of 55.

Weightings for each month are below:

Month	Weighting
Apr	1
May	2
Jun	3
Jul	4
Aug	5
Sep	6
Oct	7
Nov	8
Dec	9
Jan	10
Feb	11
Mar	12



4. Analysis Results

4.1 Variance from Year-end Outturn

The following table summarises the average percentage variance from the actual year-end outturn by department:

Department	2003/04	2004/05
Housing (GF)	57.5%	20.7%
Environment	23.3%	9.7%
Social Services	2.0%	1.1%
Education	1.0%	2.5%
Central Depts	2.7%	N/A
OACE	N/A	88.1%
Corporate Services	N/A	16.7%
Finance	N/A	7.1%
DEPT TOTAL	2.0%	0.6%

The greatest variance in 2003/04 was in Housing at 57.5%, but this reduced to 20.7% in 2004/05.

In 2004/05 the greatest variance was in OACE at 88.1%. Central departments data was not broken down by department in 2003/04.

Monthly analysis of this data can be found in table and graphical format in Appendix A (page 7).

4.2 Variance from Tolerance

4.2.1 Department Performance

The following table summaries the average variance from tolerance per department:

Department	2003/04	2004/05
Housing (GF)	49.8%	12.0%
Environment	15.6%	1.8%
Social Services	0.0%	0.0%
Education	0.0%	0.0%
Central Depts	0.4%	N/A
OACE	N/A	79.1%
Corporate Services	N/A	8.8%
Finance	N/A	3.4%
DEPT TOTAL	0.1%	0.0%

Departments with a variance of 0.0% are on average within the tolerance bracket. In 2003/04, the highest variance from the tolerance was in Housing at 49.8%, which reduced to 12.0% in 2004/05. The greatest variance in 2004/05 was in OACE at 79.1%.

The graph in Appendix B (page 9) illustrates this data and compares the variance from year end outturn (4.1 above) to the variance from tolerance. The table breaks this down on a monthly basis.

A breakdown of each department's performance for 2003/04 and 2004/05 is shown graphically in Appendix C (page 11). Graphs on the left of the page highlight the level of tolerance per department and plots the forecast variance on a monthly basis. Forecasts that are below the tolerance line are deemed accurate.

Graphs on the right of the page allow consideration of the size of the budget. The horizontal black line represents the actual year end outturn, and the diagonal lines are the allowed tolerance. Forecast variances are plotted for comparison. Forecasts that lay within the resultant triangle are deemed to be accurate.

4.2.2 Council Performance

The table below relates to all departments:

	2003/04	2004/05
Variance from outturn	2.0%	0.6%
Variance from tolerance	0.1%	0.0%

This information is displayed graphically in Appendix D (page 14) by month.

The analysis suggests that forecasts for the whole council are generally accurate, despite individual departmental forecasts varying in their accuracy.

4.3 Weighting Measure

4.3.1 Departmental Performance

The following table shows the average weighted accuracy score for each department:

Department	2003/04	2004/05
Housing (GF)	350	121
Environment	161	50
Social Services	11	7
Education	6	12
Central Depts	21	N/A
OACE	N/A	526
Corporate Services	N/A	67
Finance	N/A	19
DEPT TOTAL	15	2

In 2003/04 the department with the worst accuracy rating was Housing at 350. The department with the most accurate forecast was Education with 6.

In 2004/05 the worst performing department was OACE with a score of 526, whilst Social Services were the best with 7.

The table in Appendix E (page 15) breaks down department performance per month and the graph illustrates the data above.

A breakdown of each department's performance for 2003/04 and 2004/05 is shown graphically in Appendix F (page 17). Graphs on the left of the page highlight the weighted accuracy score on a monthly basis.

Graphs on the right of the page illustrate the % variance from the final outturn per month to demonstrate the impact the weighting has on variances.

4.3.2 Council Performance

The accuracy score for the council in 2003/04 was 15, and this improved to 2 in 2004/05. The graphs in Appendix G (page 20) show the progress made by the council throughout the year.

In 2003/04, accuracy reduced as the year progressed. Accuracy in May 2003 was 3, but steadily got worse to 29 in March 2004.

In 2004/05 accuracy fluctuated in the year but remained low. February 2005 was the least accurate forecast with a rating of 6.

Appendix

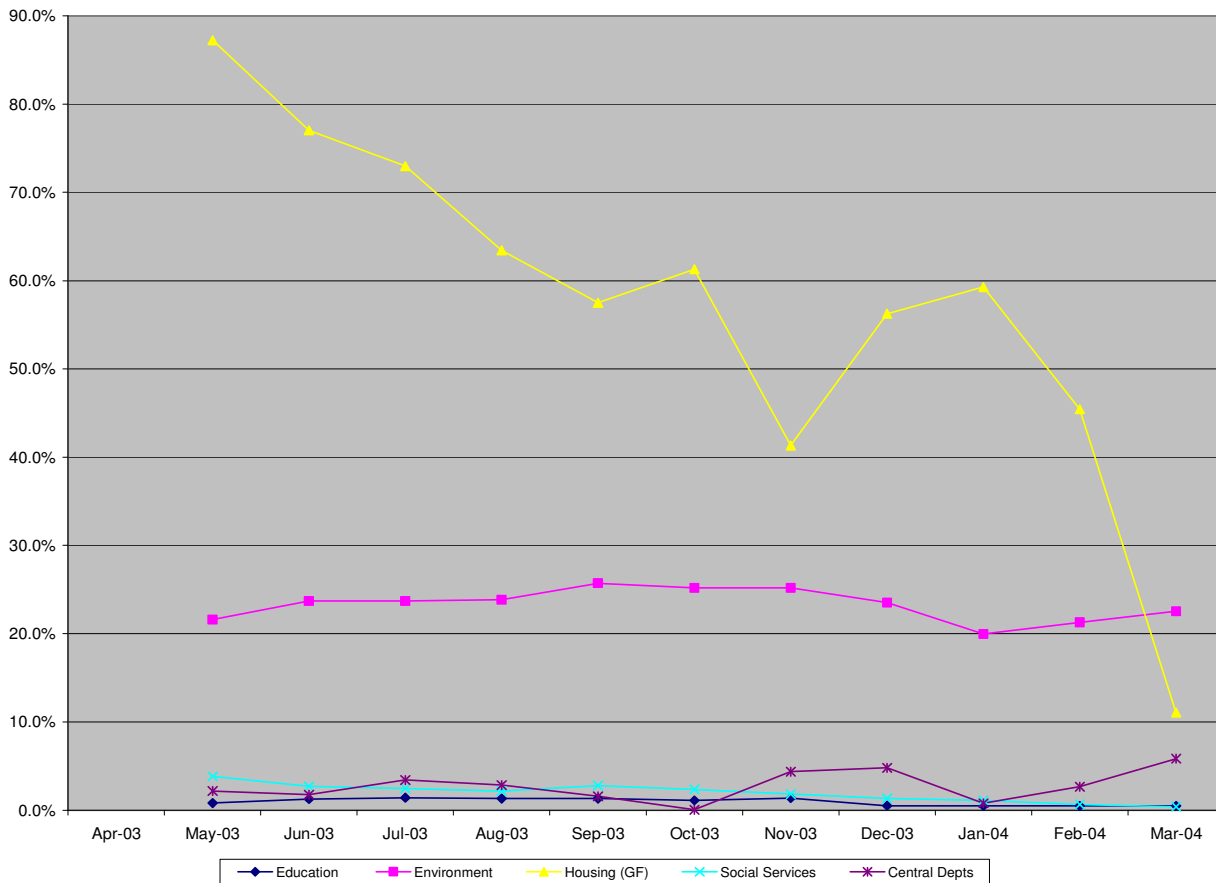
Contents	Page
A – Percentage variance from year-end outturn by department (Graph & Table) - 2003/04 - 2004/05	7
B – Average variance from tolerance by department (Graph & Table) - 2003/04 - 2004/05	9
C – Monthly % variance from YE outturn per department (Graph) - 2003/04 - 2004/05	11
D – Total departmental variance from outturn and tolerance (Graph) - 2003/04 - 2004/05	14
E – Average weighted variance by department (Graph & Table) - 2003/04 - 2004/05	15
F – Weighted variance from YE outturn per department (Graph) - 2003/04 - 2004/05	17
G – Total departmental performance – weighted (Graph) - 2003/04 - 2004/05	20

Appendix A

Percentage variance from year-end outturn by department

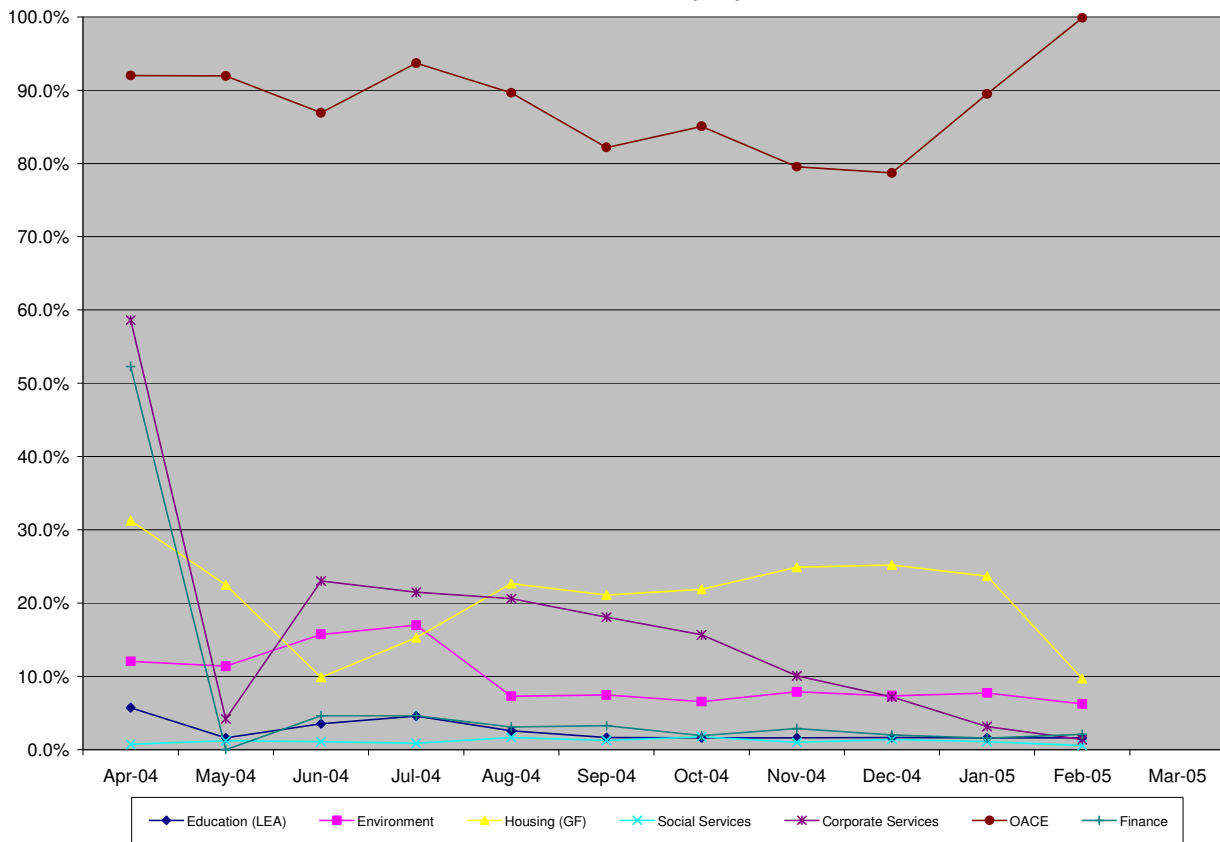
2003/04	Apr03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Avg
Education	N/A	0.8%	1.3%	1.4%	1.3%	1.3%	1.1%	1.4%	0.5%	0.5%	0.5%	0.5%	1.0%
Environment	N/A	21.6%	23.7%	23.7%	23.8%	25.7%	25.2%	25.2%	23.5%	20.0%	21.3%	22.5%	23.3%
Housing (GF)	N/A	87.2%	77.0%	73.0%	63.4%	57.5%	61.3%	41.3%	56.3%	59.3%	45.4%	11.1%	57.5%
Social Services	N/A	3.8%	2.7%	2.5%	2.2%	2.8%	2.4%	1.8%	1.3%	1.1%	0.6%	0.4%	2.0%
Central Depts	N/A	2.2%	1.7%	3.4%	2.8%	1.6%	0.0%	4.4%	4.8%	0.8%	2.7%	5.8%	2.7%
Total Departmental Outturn	N/A	1.3%	1.8%	1.7%	2.0%	2.4%	2.5%	2.5%	1.7%	1.9%	2.0%	2.4%	2.0%

% Variance from Year-end Outturn by Department 2003/04



2004/05	Apr04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Average
Education (LEA)	5.7%	1.6%	3.5%	4.6%	2.5%	1.7%	1.6%	1.6%	1.6%	1.6%	1.6%	N/A	2.5%
Environment	12.1%	11.4%	15.7%	17.0%	7.3%	7.5%	6.6%	7.9%	7.3%	7.7%	6.2%	N/A	9.7%
Housing (GF)	31.2%	22.5%	9.9%	15.3%	22.7%	21.1%	21.9%	24.9%	25.2%	23.7%	9.7%	N/A	20.7%
Social Services	0.7%	1.2%	1.1%	0.9%	1.7%	1.2%	1.7%	1.0%	1.4%	1.1%	0.6%	N/A	1.1%
Corporate Services	58.6%	4.2%	23.0%	21.5%	20.6%	18.1%	15.7%	10.1%	7.2%	3.2%	1.4%	N/A	16.7%
OACE	92.0%	91.9%	86.9%	93.7%	89.6%	82.2%	85.1%	79.6%	78.7%	89.5%	99.9%	N/A	88.1%
Finance	52.3%	0.0%	4.6%	4.6%	3.1%	3.3%	1.9%	2.9%	2.0%	1.6%	2.1%	N/A	7.1%
Total Departmental Outturn	2.1%	0.8%	0.5%	0.3%	0.7%	0.6%	0.3%	0.0%	0.2%	0.1%	0.5%	N/A	0.6%

% Variance from Year-end Outturn by Department 2004/05

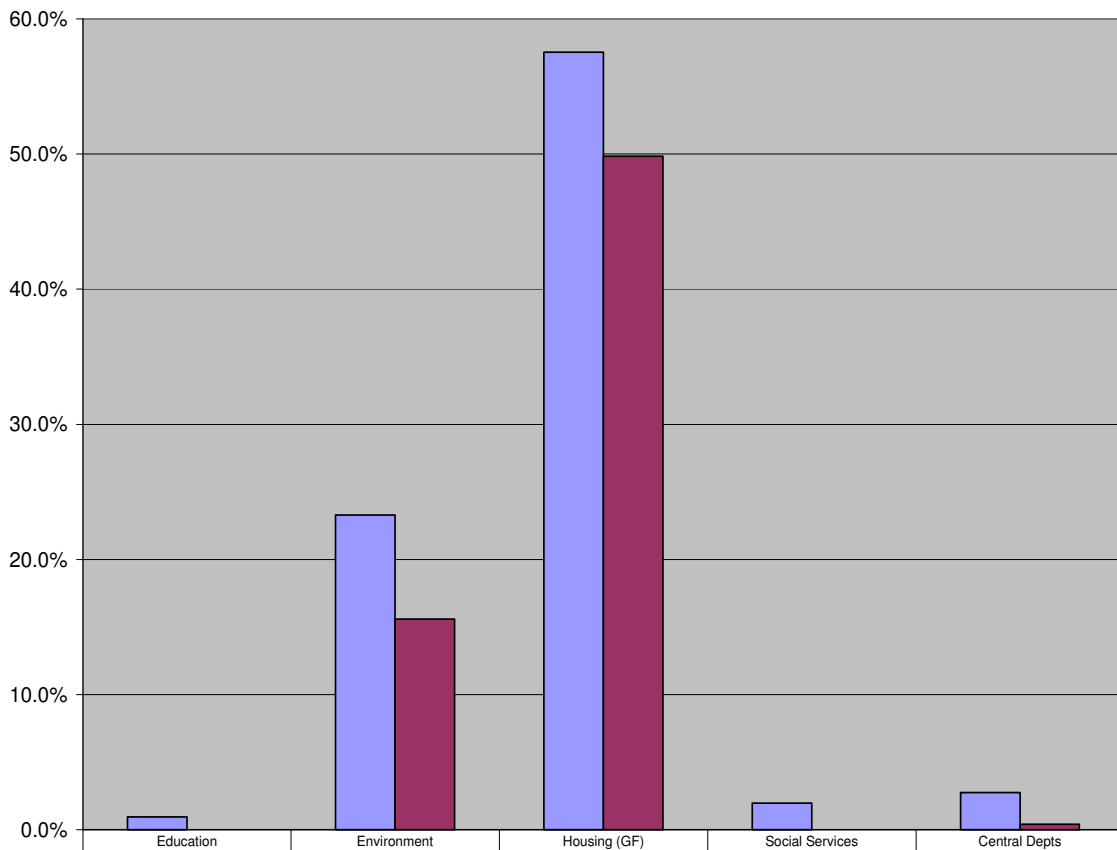


Appendix B

Average variance from tolerance by department

2003/04	Apr03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Avg
Education	N/A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Environment	N/A	7.5%	10.9%	12.2%	13.6%	16.7%	17.5%	18.8%	18.4%	16.1%	18.7%	21.2%	15.6%
Housing (GF)	N/A	73.1%	64.2%	61.4%	53.2%	48.5%	53.6%	34.9%	51.1%	55.4%	42.9%	9.8%	49.8%
Social Services	N/A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Central Depts	N/A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	4.6%	0.4%
Total Departmental Outturn	N/A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.1%

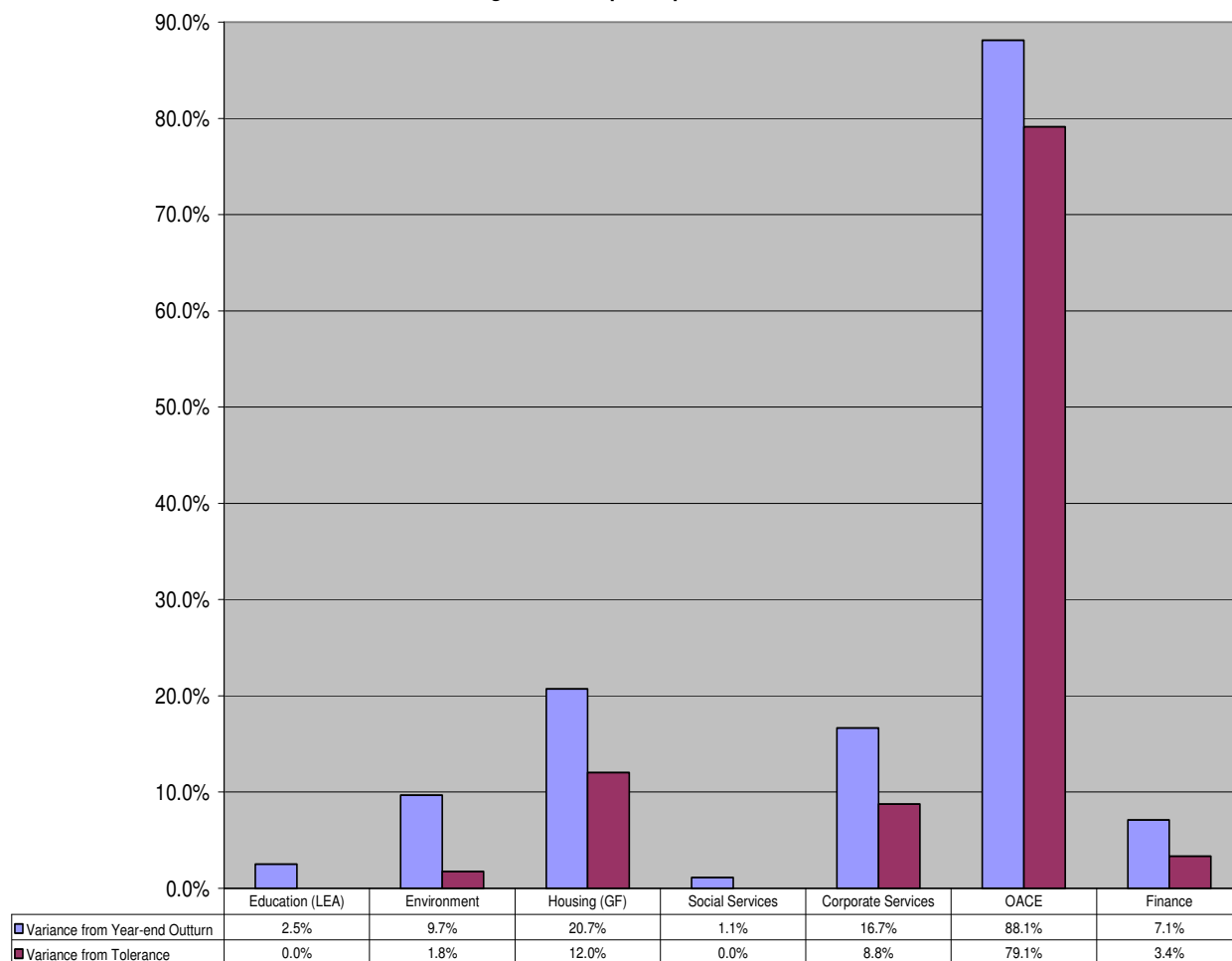
Average Variance per Department 2003/04



Variance from Year-end Outturn	1.0%	23.3%	57.5%	2.0%	2.7%
Variance from Tolerance	0.0%	15.6%	49.8%	0.0%	0.4%

2004/05	Apr04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Average
Education (LEA)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	0.0%
Environment	0.0%	0.0%	2.9%	5.4%	0.0%	0.0%	0.0%	1.5%	2.2%	3.9%	3.7%	N/A	1.8%
Housing (GF)	15.9%	8.4%	0.0%	3.7%	12.4%	12.1%	14.2%	18.5%	20.1%	19.8%	7.1%	N/A	12.0%
Social Services	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	0.0%
Corporate Services	43.2%	0.0%	10.2%	9.9%	10.4%	9.1%	8.0%	3.7%	2.1%	0.0%	0.0%	N/A	8.8%
OACE	76.6%	77.8%	74.1%	82.1%	79.4%	73.2%	77.4%	73.2%	73.6%	85.7%	97.3%	N/A	79.1%
Finance	36.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	3.4%
Total Departmental Outturn	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	0.0%

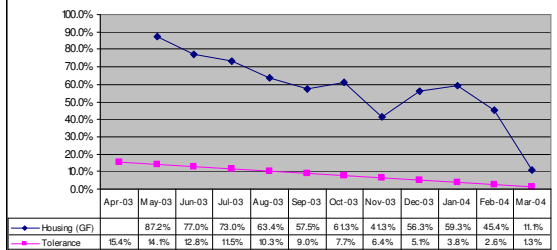
Average Variance per Department 2004/05



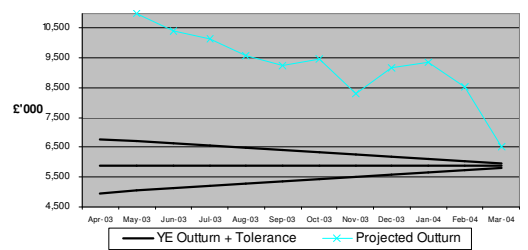
Appendix C

Monthly % variance from YE outturn per department – 2003/04

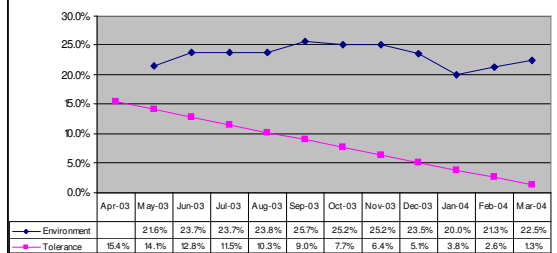
Housing (GF) - % Variance from YE Outturn 2003/04



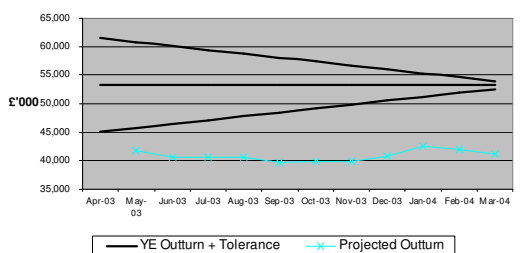
Housing (GF) - Projected Outturn 2003/04



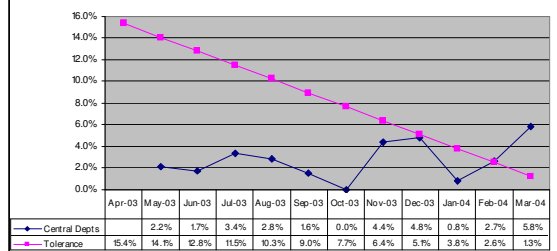
Environment - % Variance from YE Outturn 2003/04



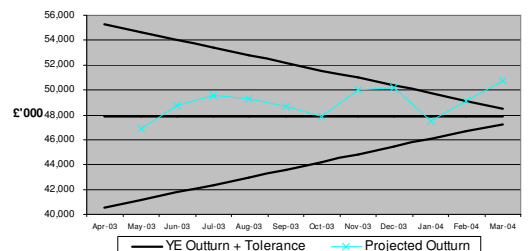
Environment - Projected Outturn 2003/04



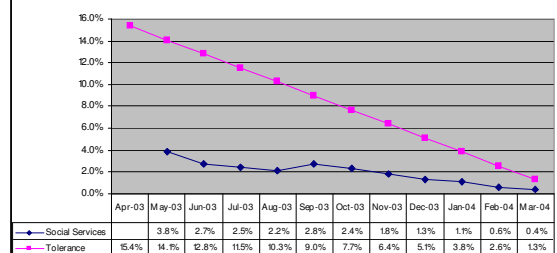
Central Depts - % Variance from YE Outturn 2003/04



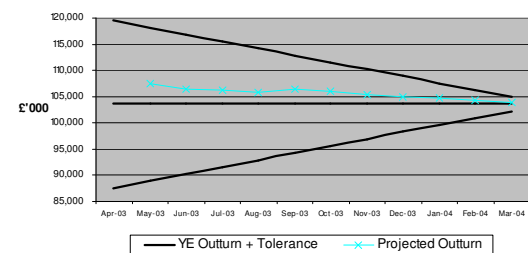
Central Depts - Projected Outturn 2003/04



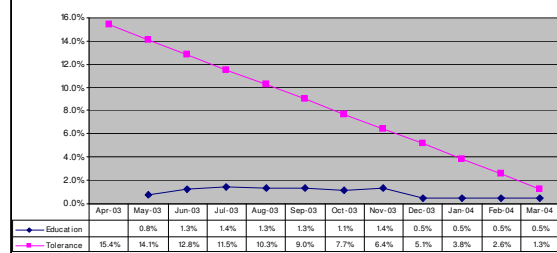
Social Services - % Variance from YE Outturn 2003/04



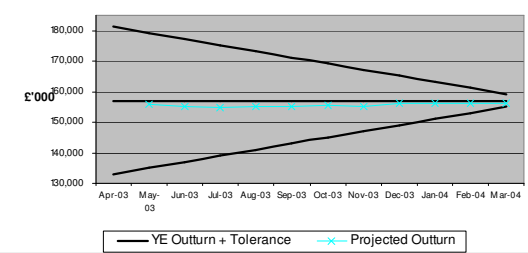
Social Services - Projected Outturn 2003/04



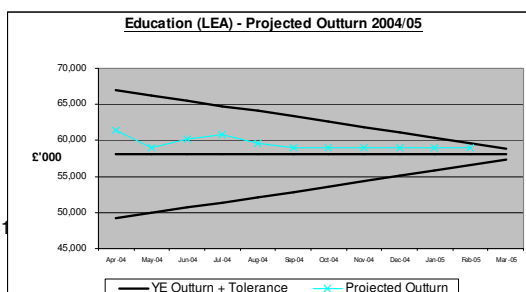
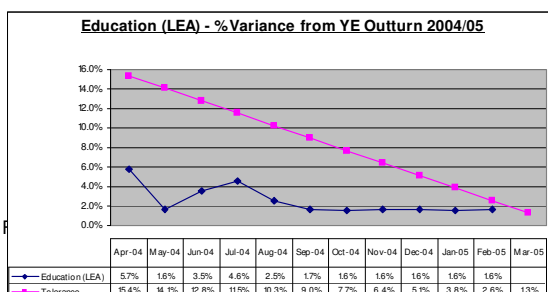
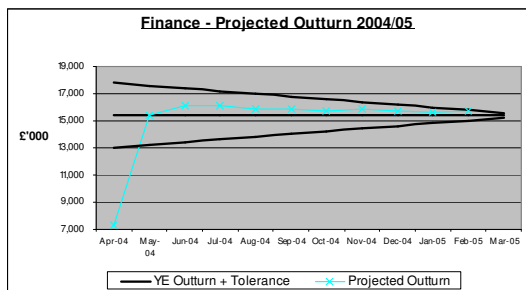
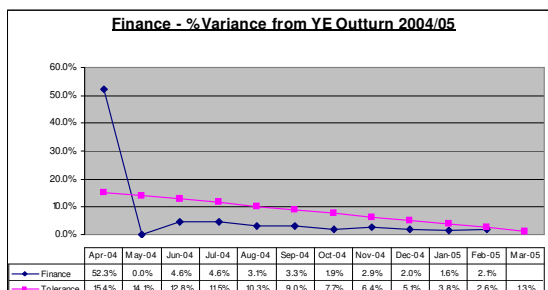
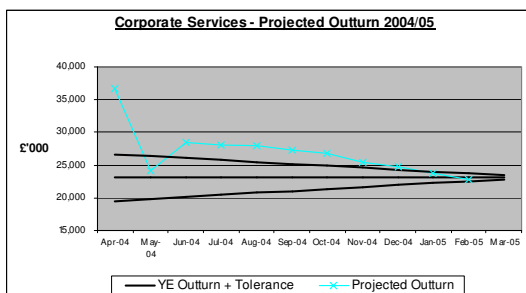
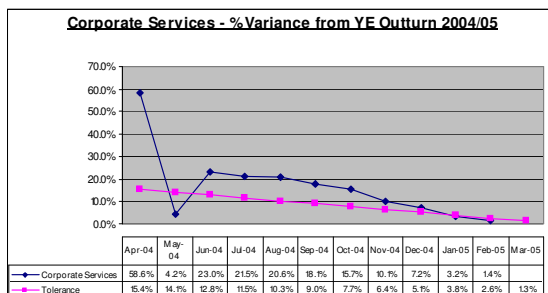
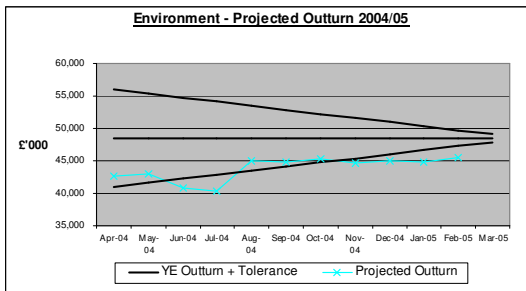
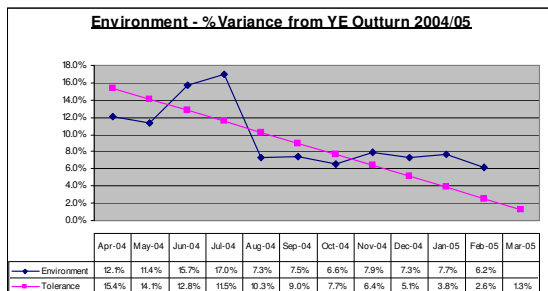
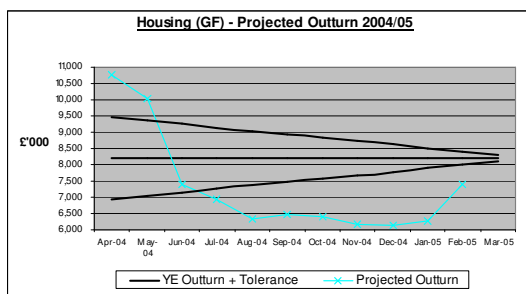
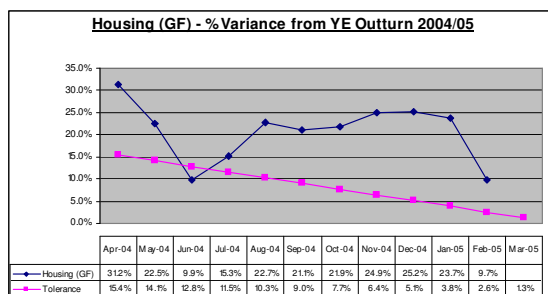
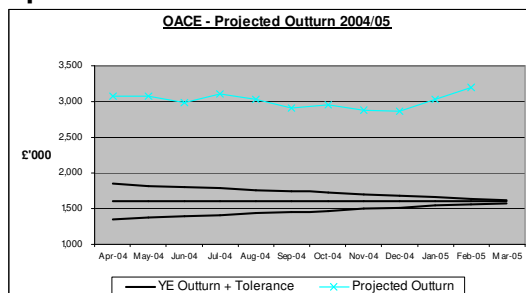
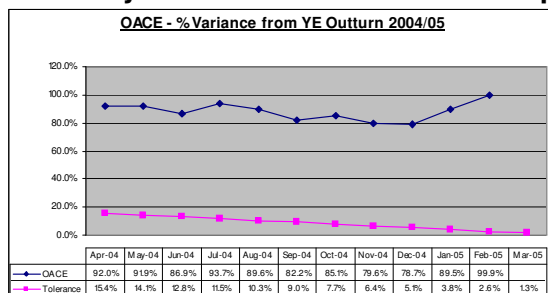
Education - % Variance from YE Outturn 2003/04



Education - Projected Outturn 2003/04



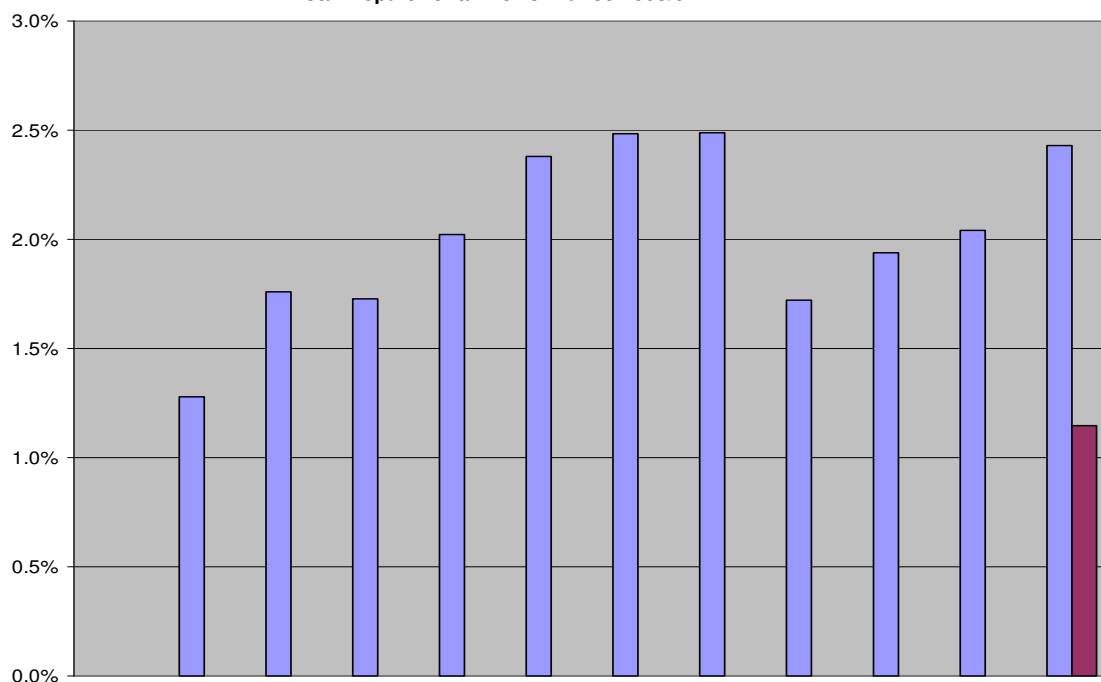
Monthly % variance from YE outturn per department – 2004/05



Appendix D

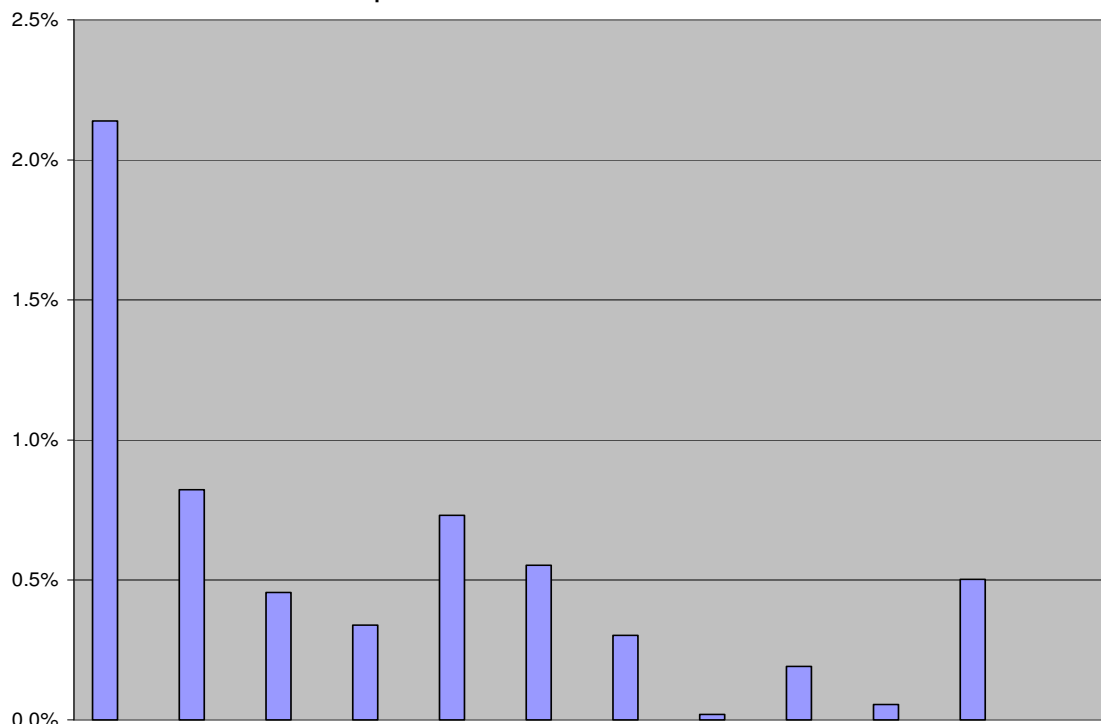
Total departmental variance from outturn and tolerance

Total Departmental Performance 2003/04



	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04
Variance from Year-end Outturn		1.3%	1.8%	1.7%	2.0%	2.4%	2.5%	2.5%	1.7%	1.9%	2.0%	2.4%
Variance from Tolerance		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%

Total Departmental Performance 2004/05



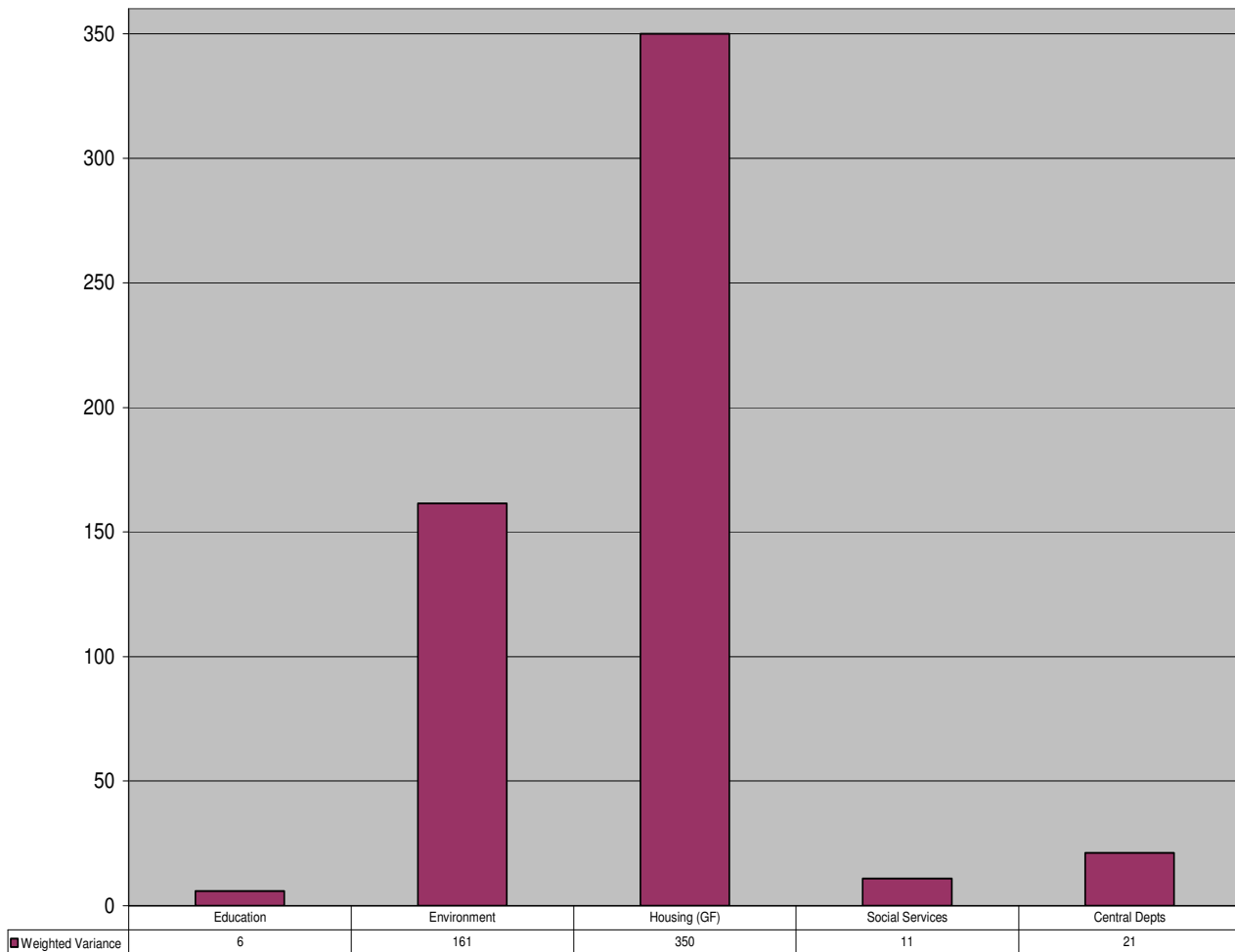
	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05
Variance from Year-end Outturn	2.1%	0.8%	0.5%	0.3%	0.7%	0.6%	0.3%	0.0%	0.2%	0.1%	0.5%	
Variance from Tolerance	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Appendix E

Average weighted variance from YE outturn by department

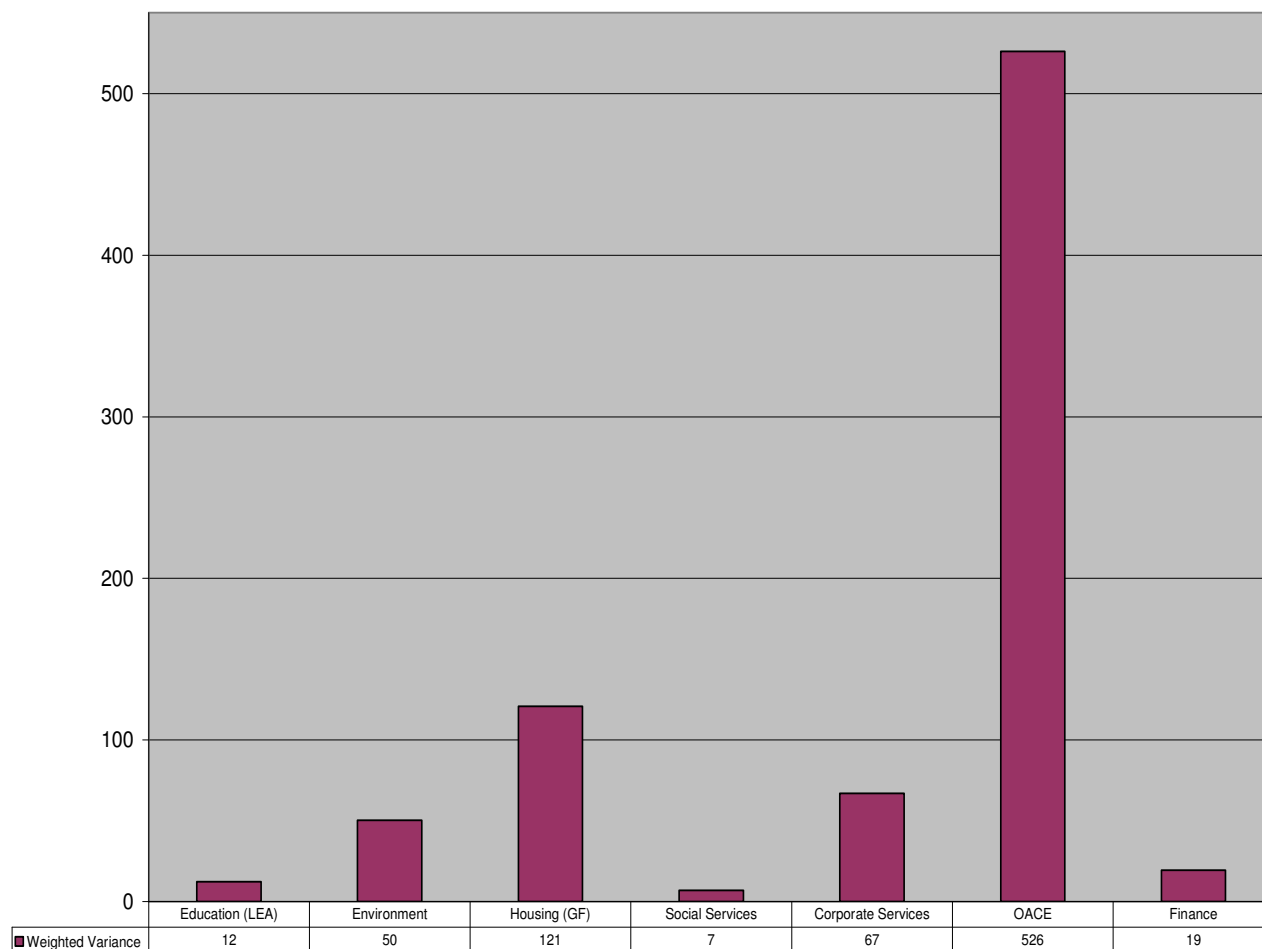
2003/04	Apr03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Avg
Education	N/A	2	4	6	7	8	8	11	5	5	5	6	6
Environment	N/A	43	71	95	119	154	176	201	212	200	234	270	161
Housing (GF)	N/A	174	231	292	317	345	429	330	506	593	500	133	350
Social Services	N/A	8	8	10	11	17	17	15	12	11	7	5	11
Central Depts	N/A	4	5	14	14	9	0	35	43	8	29	70	21
Total Departmental Outturn	N/A	3	5	7	10	14	17	20	15	19	22	29	15

Average Weighted Variance per Department 2003/04



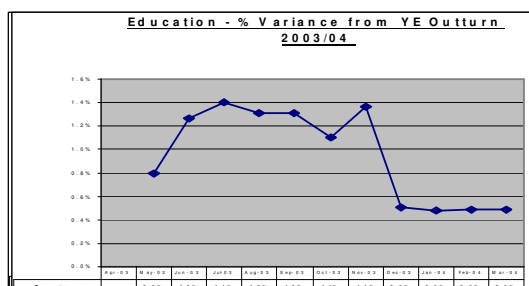
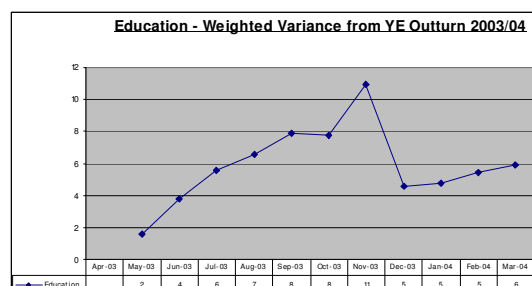
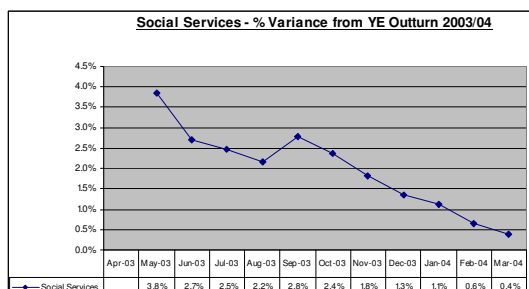
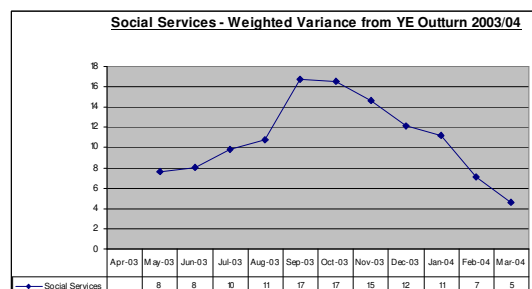
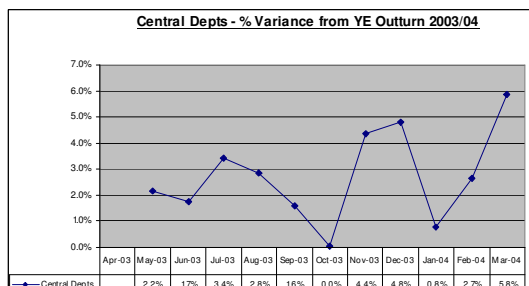
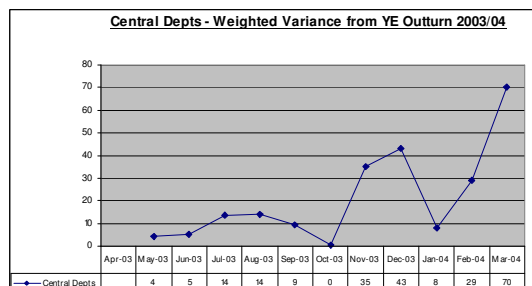
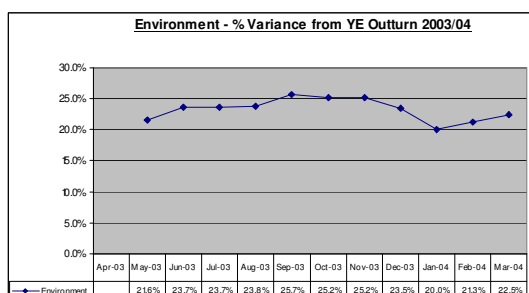
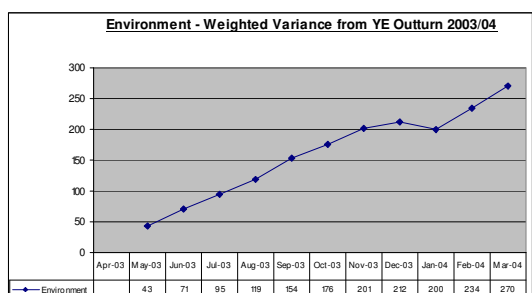
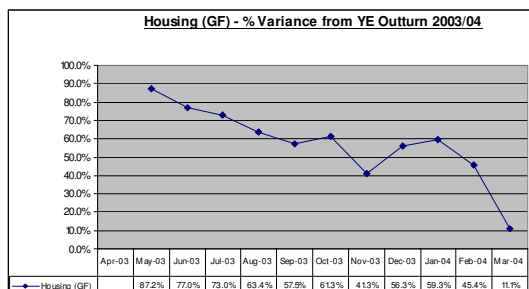
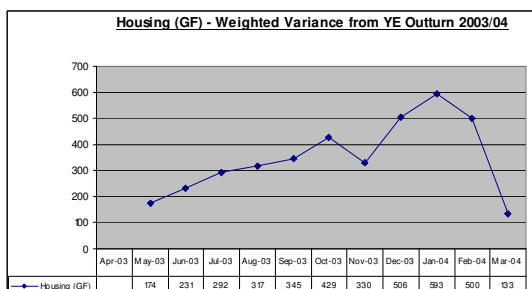
2004/05	Apr04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Average
Education (LEA)	6	3	11	18	13	10	11	13	15	16	18	N/A	12
Environment	12	23	47	68	36	45	46	63	66	77	68	N/A	50
Housing (GF)	31	45	30	61	113	127	153	199	227	237	107	N/A	121
Social Services	1	2	3	4	8	7	12	8	13	11	6	N/A	7
Corporate Services	59	8	69	86	103	108	110	81	65	32	15	N/A	67
OACE	92	184	261	375	448	493	595	637	708	895	1099	N/A	526
Finance	52	0	14	18	15	20	13	23	18	16	23	N/A	19
Total Departmental Outturn	2	2	1	1	4	3	2	0	2	1	6	N/A	2

Average Weighted Variance per Department 2004/05

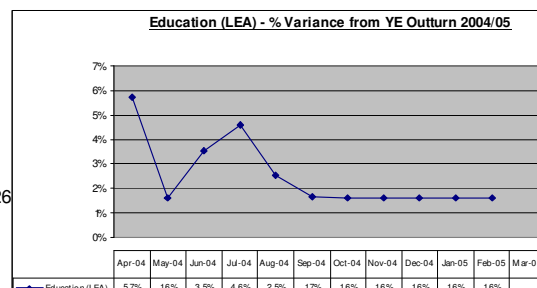
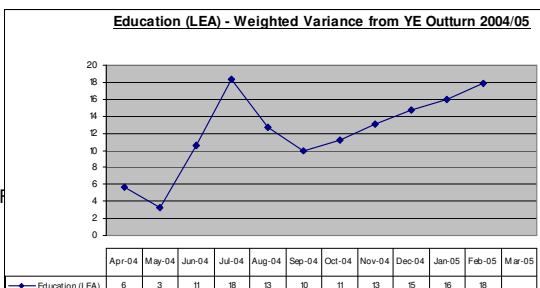
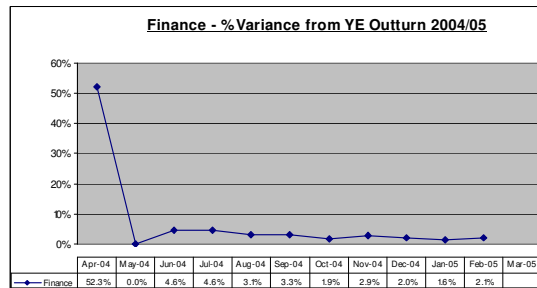
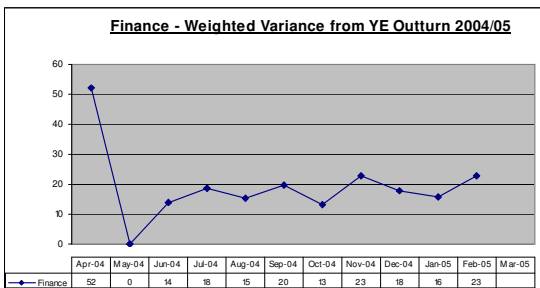
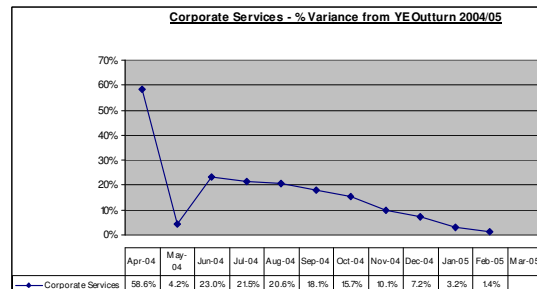
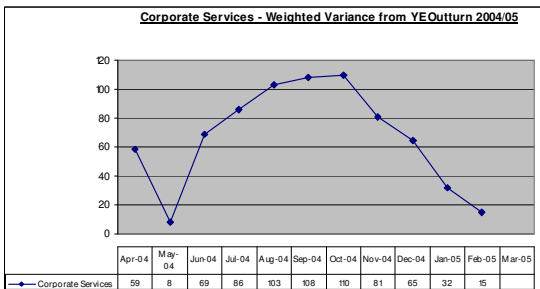
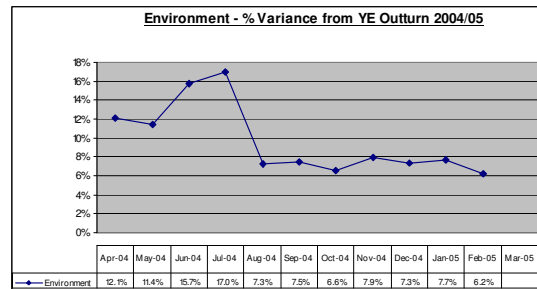
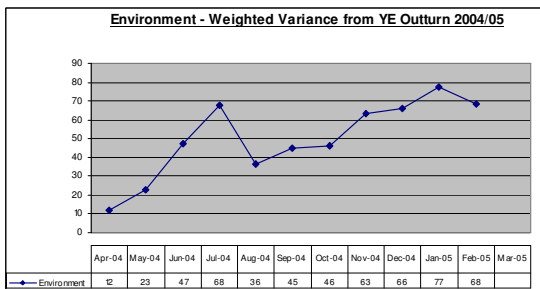
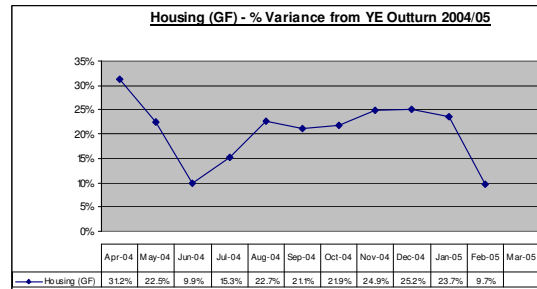
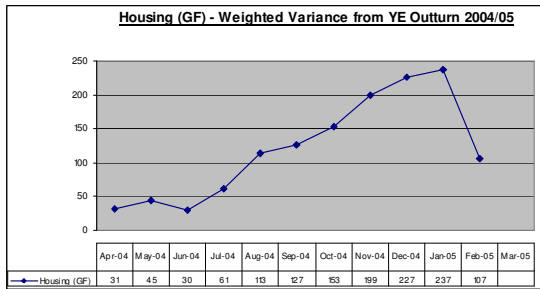
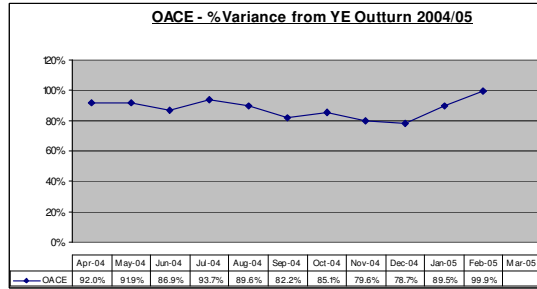
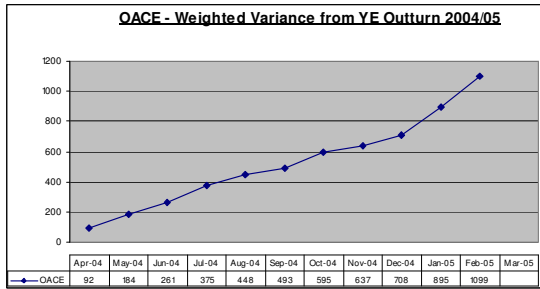


Appendix F

Weighted variance from YE outturn per department – 2003/04



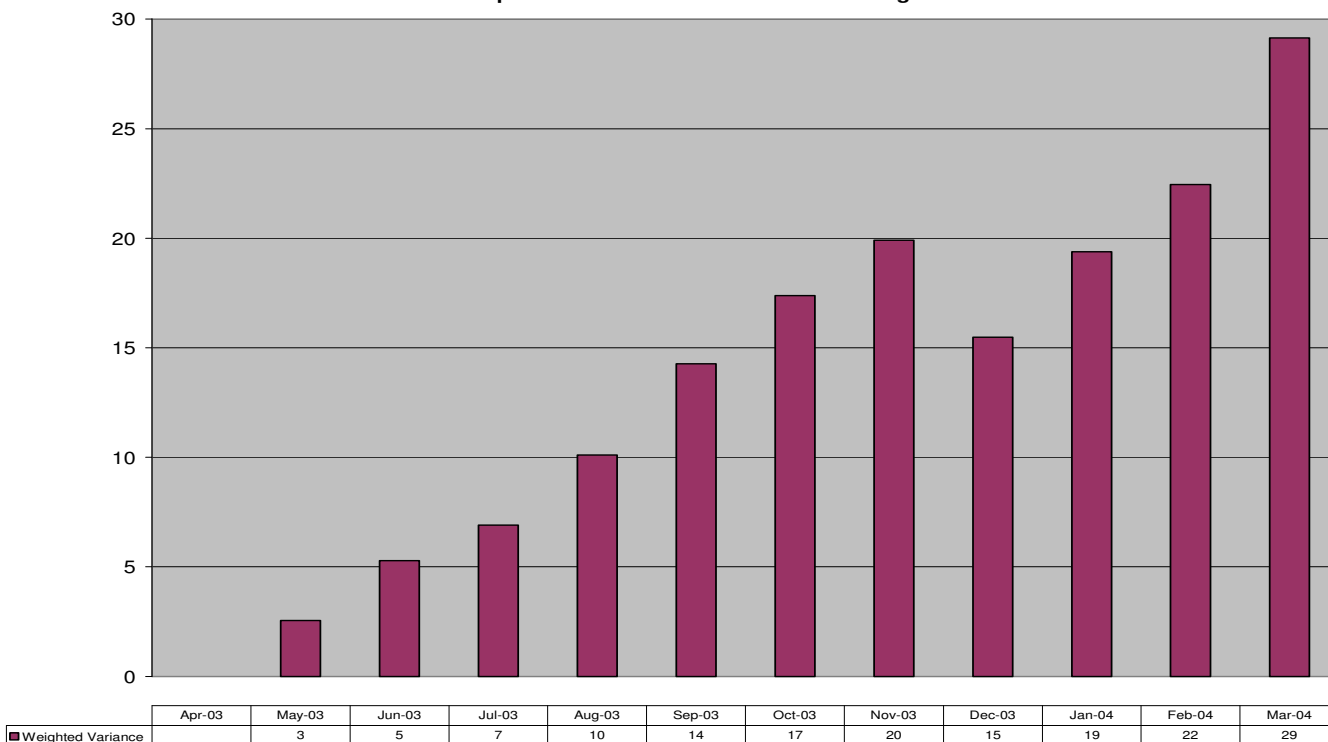
Weighted variance from YE outturn per department – 2004/05



Appendix G

Total departmental performance – weighted

Total Departmental Performance 2003/04 - Weighted



Total Departmental Performance 2004/05 - Weighted

