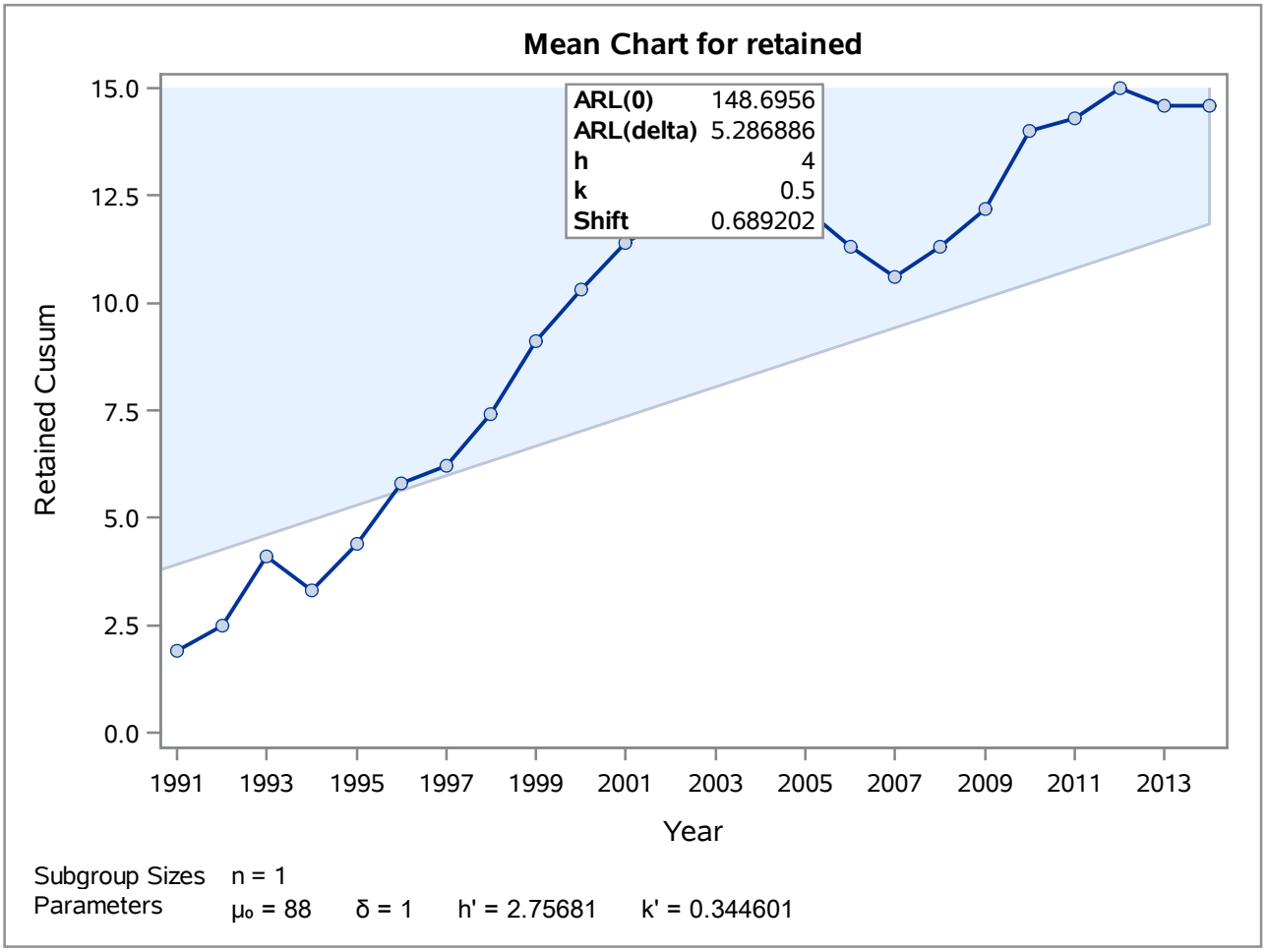
CUSUM for Retention Rate (sigma unknown)

The CUSUM Procedure



CUSUM for Retention Rate (sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	Two-Sided
Target Mean (Mu0)	88
Standard Deviation	0.68920244
Delta	1
Nominal Sample Size	1
h	4
h' (Data Units)	2.75680975
k	0.5
k' (Data Units)	0.34460122
Head Start	2
Average Run Length (Delta)	5.28688613
Average Run Length (0)	148.695619

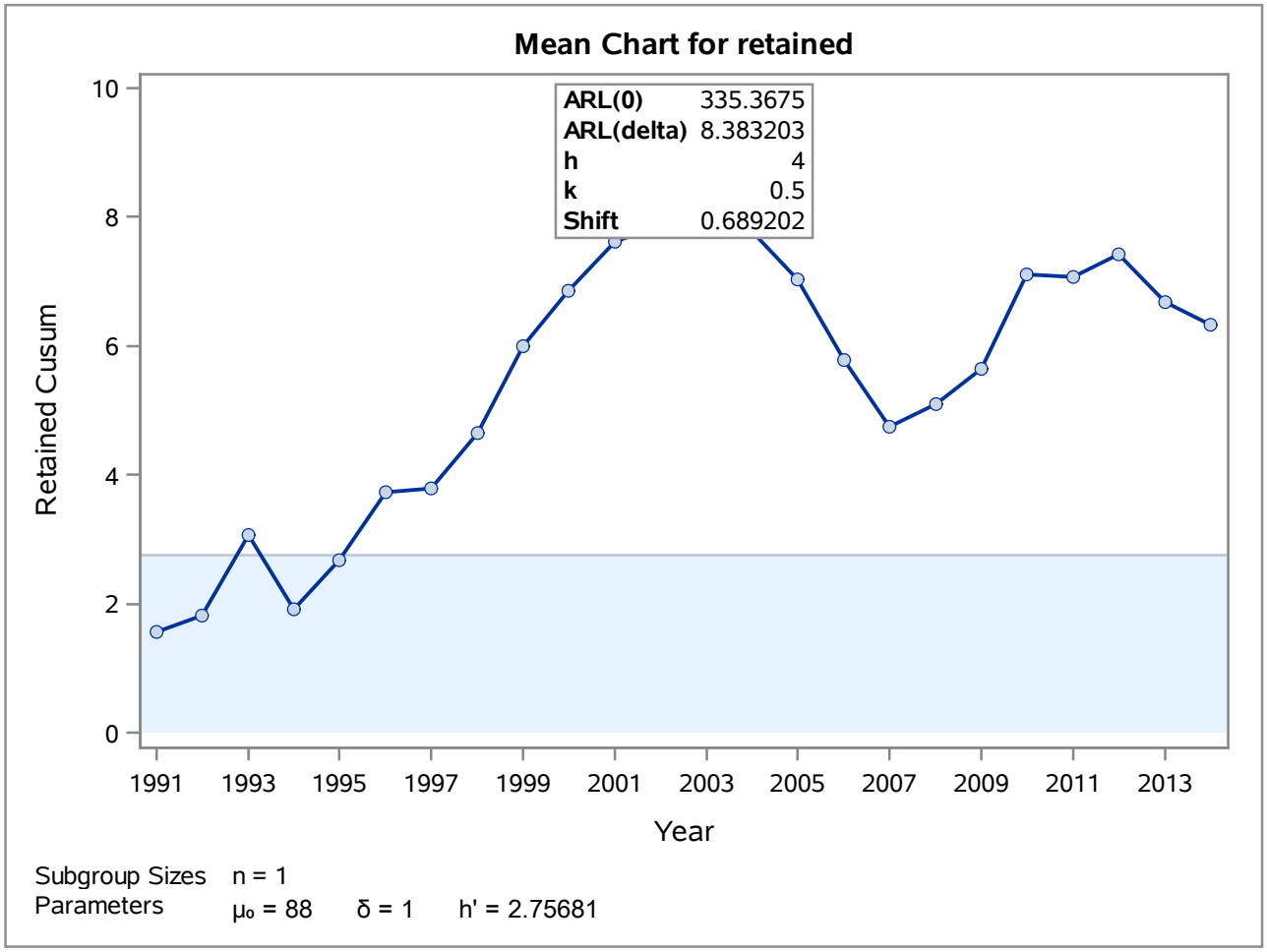
CUSUM for Retention Rate (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for retained						
year	Subgroup Sample Size	Individual Value	V-Mask Lower Limit	Cusum	V-Mask Upper Limit	V-Mask Limit Exceeded
1991	1	89.900000	3.9174	1.900000	25.2826	Lower
1992	1	88.600000	4.2620	2.500000	24.9380	Lower
1993	1	89.600000	4.6066	4.100000	24.5934	Lower
1994	1	87.200000	4.9512	3.300000	24.2488	Lower
1995	1	89.100000	5.2958	4.400000	23.9042	Lower
1996	1	89.400000	5.6404	5.800000	23.5596	
1997	1	88.400000	5.9850	6.200000	23.2150	
1998	1	89.200000	6.3296	7.400000	22.8704	
1999	1	89.700000	6.6742	9.100000	22.5258	
2000	1	89.200000	7.0188	10.300000	22.1812	
2001	1	89.100000	7.3634	11.400000	21.8366	
2002	1	88.600000	7.7080	12.000000	21.4920	
2003	1	88.500000	8.0526	12.500000	21.1474	
2004	1	88.100000	8.3972	12.600000	20.8028	
2005	1	87.600000	8.7418	12.200000	20.4582	
2006	1	87.100000	9.0864	11.300000	20.1136	
2007	1	87.300000	9.4310	10.600000	19.7690	
2008	1	88.700000	9.7756	11.300000	19.4244	
2009	1	88.900000	10.1202	12.200000	19.0798	
2010	1	89.800000	10.4648	14.000000	18.7352	
2011	1	88.300000	10.8094	14.300000	18.3906	
2012	1	88.700000	11.1540	15.000000	18.0460	
2013	1	87.600000	11.4986	14.600000	17.7014	
2014	1	88.000000	11.8432	14.600000	17.3568	

UPPER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure



UPPER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	One-Sided
Target Mean (Mu0)	88
Standard Deviation	0.68920244
Delta	1
Nominal Sample Size	1
h	4
h' (Data Units)	2.75680975
k	0.5
k' (Data Units)	0.34460122
Average Run Length (Delta)	8.38320257
Average Run Length (0)	335.367498

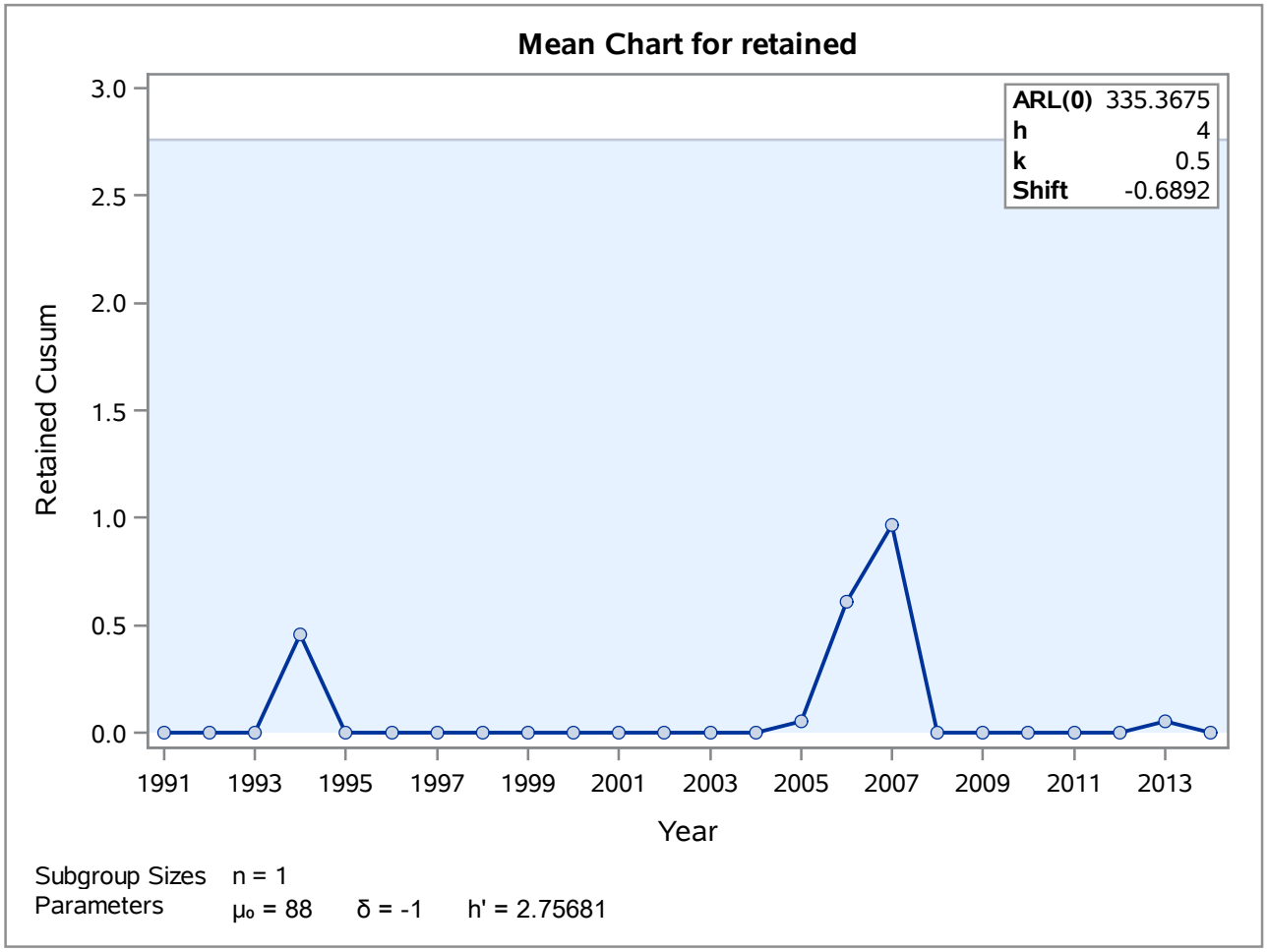
UPPER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for retained					
year	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
1991	1	89.900000	1.5553988	2.7568	
1992	1	88.600000	1.8107976	2.7568	
1993	1	89.600000	3.0661963	2.7568	Upper
1994	1	87.200000	1.9215951	2.7568	
1995	1	89.100000	2.6769939	2.7568	
1996	1	89.400000	3.7323927	2.7568	Upper
1997	1	88.400000	3.7877915	2.7568	Upper
1998	1	89.200000	4.6431902	2.7568	Upper
1999	1	89.700000	5.9985890	2.7568	Upper
2000	1	89.200000	6.8539878	2.7568	Upper
2001	1	89.100000	7.6093866	2.7568	Upper
2002	1	88.600000	7.8647854	2.7568	Upper
2003	1	88.500000	8.0201842	2.7568	Upper
2004	1	88.100000	7.7755829	2.7568	Upper
2005	1	87.600000	7.0309817	2.7568	Upper
2006	1	87.100000	5.7863805	2.7568	Upper
2007	1	87.300000	4.7417793	2.7568	Upper
2008	1	88.700000	5.0971781	2.7568	Upper
2009	1	88.900000	5.6525768	2.7568	Upper
2010	1	89.800000	7.1079756	2.7568	Upper
2011	1	88.300000	7.0633744	2.7568	Upper
2012	1	88.700000	7.4187732	2.7568	Upper
2013	1	87.600000	6.6741720	2.7568	Upper
2014	1	88.000000	6.3295707	2.7568	Upper

LOWER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure



LOWER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	One-Sided
Target Mean (Mu0)	88
Standard Deviation	0.68920244
Delta	-1
Nominal Sample Size	1
h	4
h' (Data Units)	2.75680975
k	0.5
k' (Data Units)	0.34460122
Average Run Length (Delta)	973907.392
Average Run Length (0)	335.367498

LOWER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

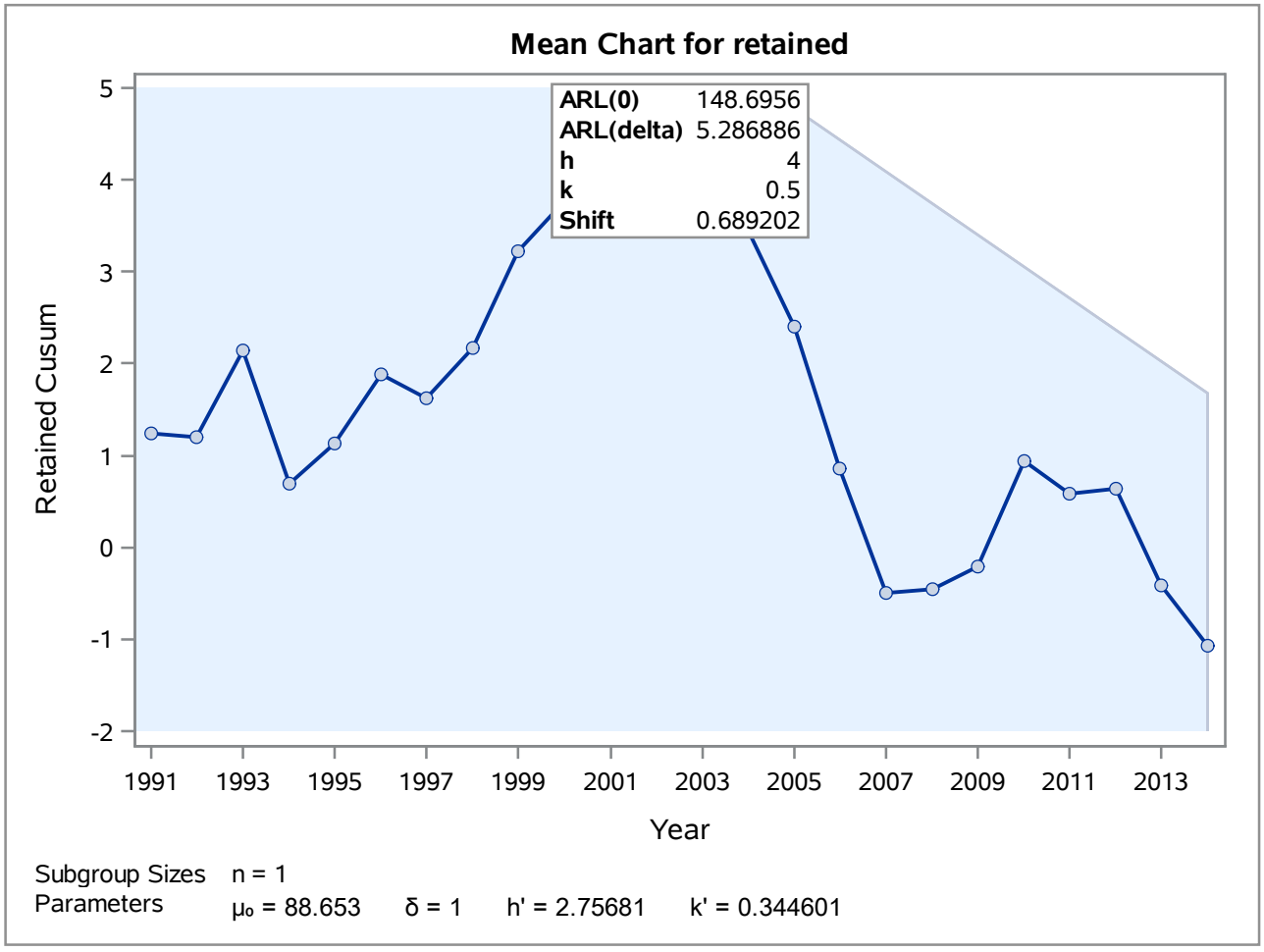
Cumulative Sum Chart Summary for retained					
year	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
1991	1	89.900000	0.00000000	2.7568	
1992	1	88.600000	0.00000000	2.7568	
1993	1	89.600000	0.00000000	2.7568	
1994	1	87.200000	0.45539878	2.7568	
1995	1	89.100000	0.00000000	2.7568	
1996	1	89.400000	0.00000000	2.7568	
1997	1	88.400000	0.00000000	2.7568	
1998	1	89.200000	0.00000000	2.7568	
1999	1	89.700000	0.00000000	2.7568	
2000	1	89.200000	0.00000000	2.7568	
2001	1	89.100000	0.00000000	2.7568	
2002	1	88.600000	0.00000000	2.7568	
2003	1	88.500000	0.00000000	2.7568	
2004	1	88.100000	0.00000000	2.7568	
2005	1	87.600000	0.05539878	2.7568	
2006	1	87.100000	0.61079756	2.7568	
2007	1	87.300000	0.96619634	2.7568	
2008	1	88.700000	0.00000000	2.7568	
2009	1	88.900000	0.00000000	2.7568	
2010	1	89.800000	0.00000000	2.7568	
2011	1	88.300000	0.00000000	2.7568	
2012	1	88.700000	0.00000000	2.7568	
2013	1	87.600000	0.05539878	2.7568	
2014	1	88.000000	0.00000000	2.7568	

CUSUM with Reset after Signal (sigma unknown)

year	xbar	n	cusum_l	hsigma	cusum_h	flag
1991	89.9	1	0.0000	2.756	1.5555	
1992	88.6	1	0.0000	2.756	1.8110	
1993	89.6	1	0.0000	2.756	3.0665	upper
1994	87.2	1	0.4555	2.756	0.0000	
1995	89.1	1	0.0000	2.756	0.7555	
1996	89.4	1	0.0000	2.756	1.8110	
1997	88.4	1	0.0000	2.756	1.8665	
1998	89.2	1	0.0000	2.756	2.7220	
1999	89.7	1	0.0000	2.756	4.0775	upper
2000	89.2	1	0.0000	2.756	0.8555	
2001	89.1	1	0.0000	2.756	1.6110	
2002	88.6	1	0.0000	2.756	1.8665	
2003	88.5	1	0.0000	2.756	2.0220	
2004	88.1	1	0.0000	2.756	1.7775	
2005	87.6	1	0.0555	2.756	1.0330	
2006	87.1	1	0.6110	2.756	0.0000	
2007	87.3	1	0.9665	2.756	0.0000	
2008	88.7	1	0.0000	2.756	0.3555	
2009	88.9	1	0.0000	2.756	0.9110	
2010	89.8	1	0.0000	2.756	2.3665	
2011	88.3	1	0.0000	2.756	2.3220	
2012	88.7	1	0.0000	2.756	2.6775	
2013	87.6	1	0.0555	2.756	1.9330	
2014	88.0	1	0.0000	2.756	1.5885	

CUSUM for Retention Rate (sigma unknown)

The CUSUM Procedure



CUSUM for Retention Rate (sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	Two-Sided
Target Mean (Mu0)	88.653
Standard Deviation	0.68920244
Delta	1
Nominal Sample Size	1
h	4
h' (Data Units)	2.75680975
k	0.5
k' (Data Units)	0.34460122
Head Start	2
Average Run Length (Delta)	5.28688613
Average Run Length (0)	148.695619

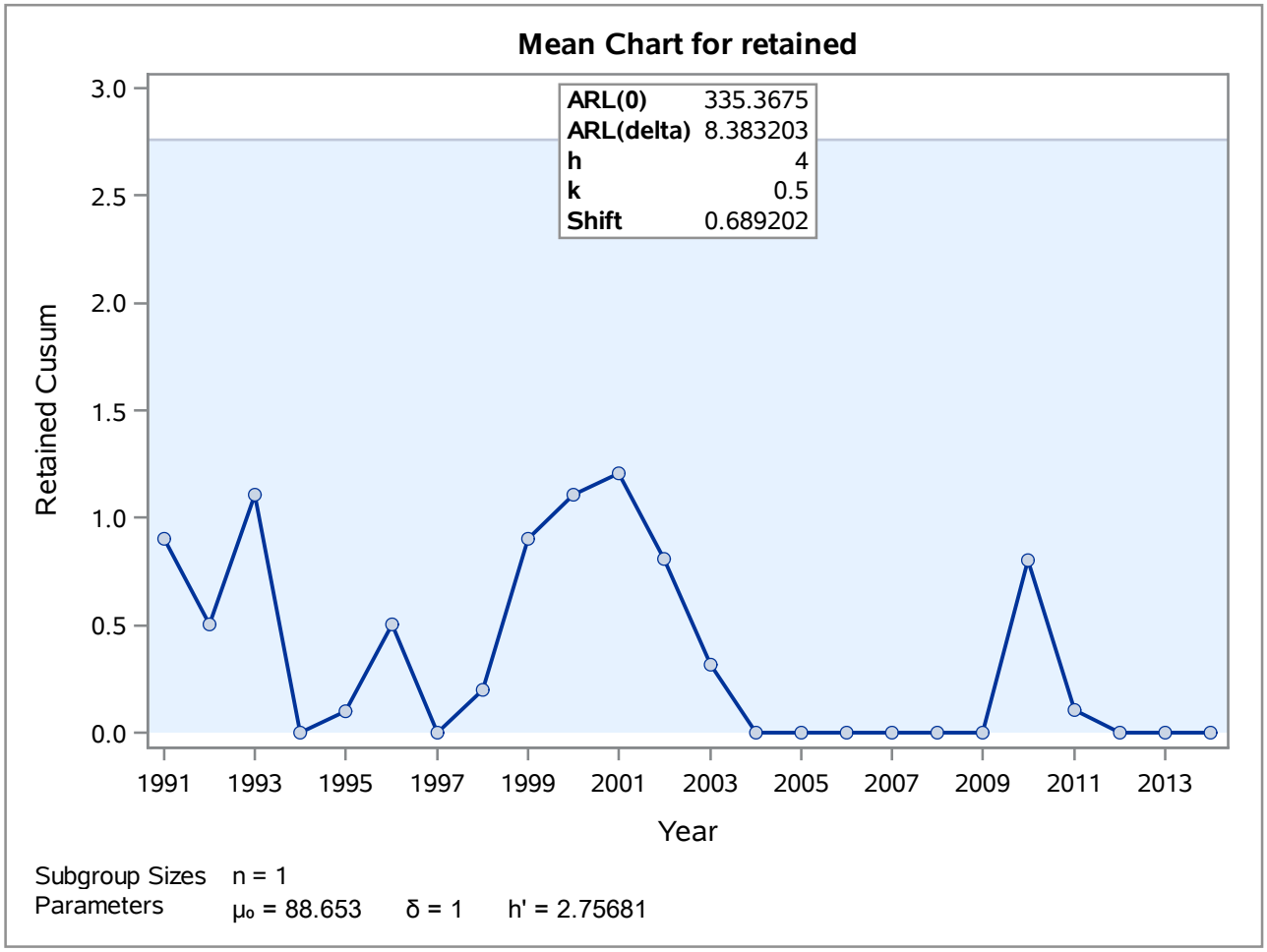
CUSUM for Retention Rate (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for retained						
year	Subgroup Sample Size	Individual Value	V-Mask Lower Limit	Cusum	V-Mask Upper Limit	V-Mask Limit Exceeded
1991	1	89.900000	-11.7546	1.2470000	9.6106	
1992	1	88.600000	-11.4100	1.1940000	9.2660	
1993	1	89.600000	-11.0654	2.1410000	8.9214	
1994	1	87.200000	-10.7208	0.6880000	8.5768	
1995	1	89.100000	-10.3762	1.1350000	8.2322	
1996	1	89.400000	-10.0316	1.8820000	7.8876	
1997	1	88.400000	-9.6870	1.6290000	7.5430	
1998	1	89.200000	-9.3424	2.1760000	7.1984	
1999	1	89.700000	-8.9978	3.2230000	6.8538	
2000	1	89.200000	-8.6532	3.7700000	6.5092	
2001	1	89.100000	-8.3086	4.2170000	6.1646	
2002	1	88.600000	-7.9640	4.1640000	5.8200	
2003	1	88.500000	-7.6194	4.0110000	5.4754	
2004	1	88.100000	-7.2748	3.4580000	5.1308	
2005	1	87.600000	-6.9302	2.4050000	4.7862	
2006	1	87.100000	-6.5856	0.8520000	4.4416	
2007	1	87.300000	-6.2410	-0.5010000	4.0970	
2008	1	88.700000	-5.8964	-0.4540000	3.7524	
2009	1	88.900000	-5.5518	-0.2070000	3.4078	
2010	1	89.800000	-5.2072	0.9400000	3.0632	
2011	1	88.300000	-4.8626	0.5870000	2.7186	
2012	1	88.700000	-4.5180	0.6340000	2.3740	
2013	1	87.600000	-4.1734	-0.4190000	2.0294	
2014	1	88.000000	-3.8288	-1.0720000	1.6848	

UPPER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure



UPPER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	One-Sided
Target Mean (Mu0)	88.653
Standard Deviation	0.68920244
Delta	1
Nominal Sample Size	1
h	4
h' (Data Units)	2.75680975
k	0.5
k' (Data Units)	0.34460122
Average Run Length (Delta)	8.38320257
Average Run Length (0)	335.367498

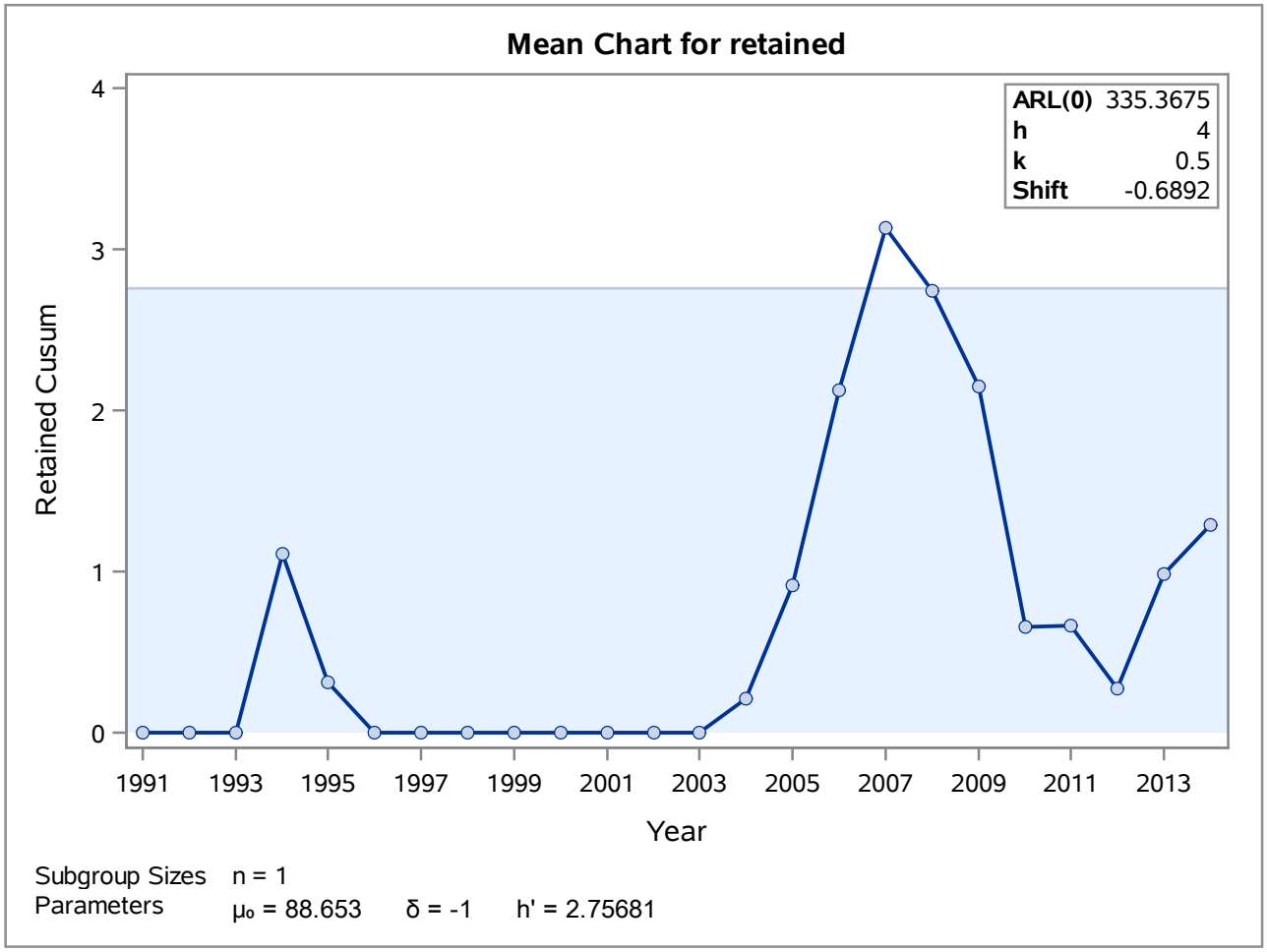
UPPER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for retained					
year	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
1991	1	89.900000	0.9023988	2.7568	
1992	1	88.600000	0.5047976	2.7568	
1993	1	89.600000	1.1071963	2.7568	
1994	1	87.200000	0.0000000	2.7568	
1995	1	89.100000	0.1023988	2.7568	
1996	1	89.400000	0.5047976	2.7568	
1997	1	88.400000	0.0000000	2.7568	
1998	1	89.200000	0.2023988	2.7568	
1999	1	89.700000	0.9047976	2.7568	
2000	1	89.200000	1.1071963	2.7568	
2001	1	89.100000	1.2095951	2.7568	
2002	1	88.600000	0.8119939	2.7568	
2003	1	88.500000	0.3143927	2.7568	
2004	1	88.100000	0.0000000	2.7568	
2005	1	87.600000	0.0000000	2.7568	
2006	1	87.100000	0.0000000	2.7568	
2007	1	87.300000	0.0000000	2.7568	
2008	1	88.700000	0.0000000	2.7568	
2009	1	88.900000	0.0000000	2.7568	
2010	1	89.800000	0.8023988	2.7568	
2011	1	88.300000	0.1047976	2.7568	
2012	1	88.700000	0.0000000	2.7568	
2013	1	87.600000	0.0000000	2.7568	
2014	1	88.000000	0.0000000	2.7568	

LOWER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure



LOWER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	One-Sided
Target Mean (Mu0)	88.653
Standard Deviation	0.68920244
Delta	-1
Nominal Sample Size	1
h	4
h' (Data Units)	2.75680975
k	0.5
k' (Data Units)	0.34460122
Average Run Length (Delta)	973907.392
Average Run Length (0)	335.367498

LOWER ONE-SIDED CUSUM for Retention Rate(sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for retained					
year	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
1991	1	89.900000	0.0000000	2.7568	
1992	1	88.600000	0.0000000	2.7568	
1993	1	89.600000	0.0000000	2.7568	
1994	1	87.200000	1.1083988	2.7568	
1995	1	89.100000	0.3167976	2.7568	
1996	1	89.400000	0.0000000	2.7568	
1997	1	88.400000	0.0000000	2.7568	
1998	1	89.200000	0.0000000	2.7568	
1999	1	89.700000	0.0000000	2.7568	
2000	1	89.200000	0.0000000	2.7568	
2001	1	89.100000	0.0000000	2.7568	
2002	1	88.600000	0.0000000	2.7568	
2003	1	88.500000	0.0000000	2.7568	
2004	1	88.100000	0.2083988	2.7568	
2005	1	87.600000	0.9167976	2.7568	
2006	1	87.100000	2.1251963	2.7568	
2007	1	87.300000	3.1335951	2.7568	Upper
2008	1	88.700000	2.7419939	2.7568	
2009	1	88.900000	2.1503927	2.7568	
2010	1	89.800000	0.6587915	2.7568	
2011	1	88.300000	0.6671902	2.7568	
2012	1	88.700000	0.2755890	2.7568	
2013	1	87.600000	0.9839878	2.7568	
2014	1	88.000000	1.2923866	2.7568	

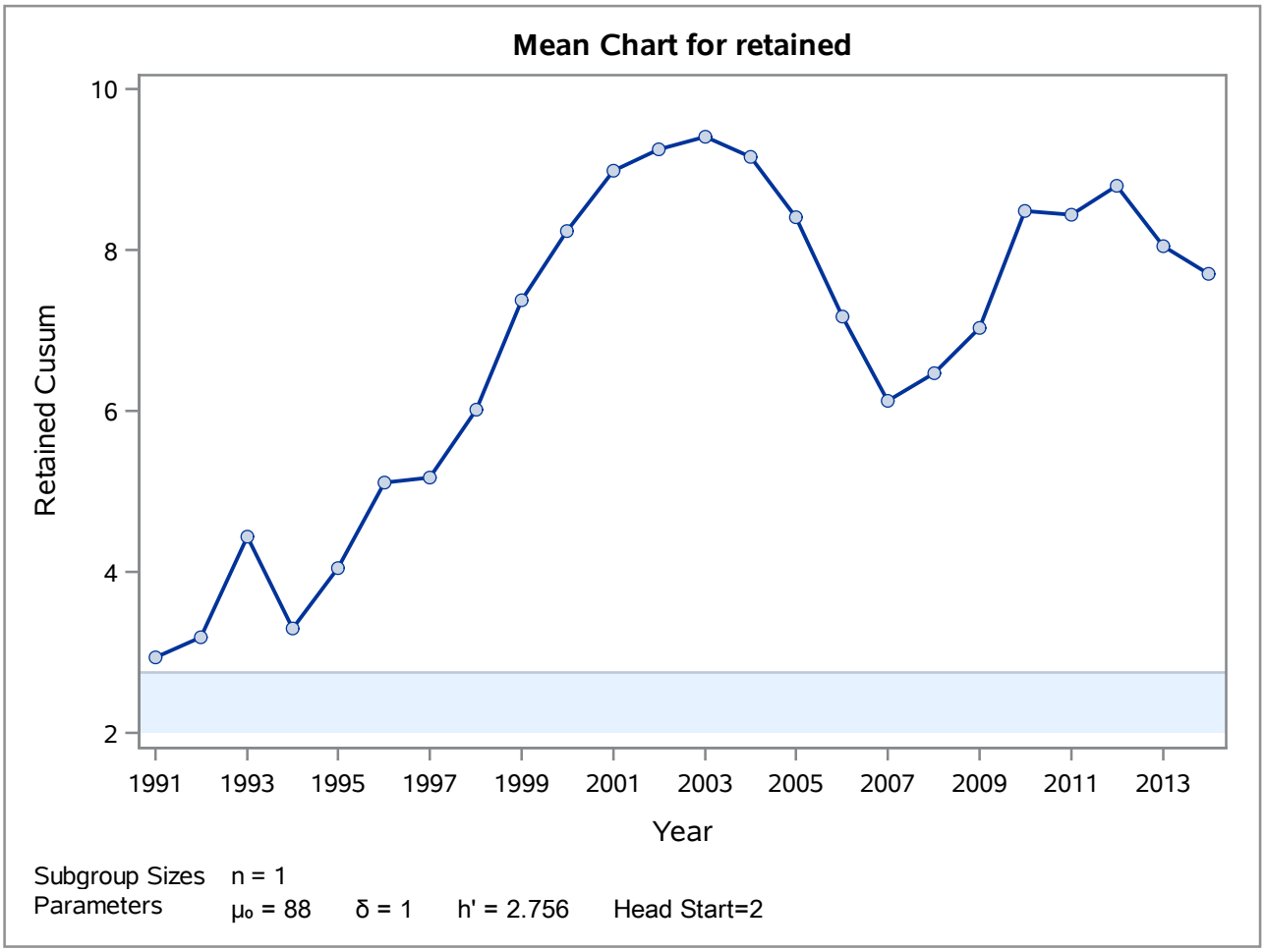
CUSUM with Reset after Signal (sigma unknown)

year	xbar	n	cusum_l	hsigma	cusum_h	flag
1991	89.9	1	0.0000	2.756	0.9025	
1992	88.6	1	0.0000	2.756	0.5050	
1993	89.6	1	0.0000	2.756	1.1075	
1994	87.2	1	1.1085	2.756	0.0000	
1995	89.1	1	0.3170	2.756	0.1025	
1996	89.4	1	0.0000	2.756	0.5050	
1997	88.4	1	0.0000	2.756	0.0000	
1998	89.2	1	0.0000	2.756	0.2025	
1999	89.7	1	0.0000	2.756	0.9050	
2000	89.2	1	0.0000	2.756	1.1075	
2001	89.1	1	0.0000	2.756	1.2100	
2002	88.6	1	0.0000	2.756	0.8125	
2003	88.5	1	0.0000	2.756	0.3150	
2004	88.1	1	0.2085	2.756	0.0000	
2005	87.6	1	0.9170	2.756	0.0000	
2006	87.1	1	2.1255	2.756	0.0000	
2007	87.3	1	3.1340	2.756	0.0000	lower
2008	88.7	1	0.0000	2.756	0.0000	
2009	88.9	1	0.0000	2.756	0.0000	
2010	89.8	1	0.0000	2.756	0.8025	
2011	88.3	1	0.0085	2.756	0.1050	
2012	88.7	1	0.0000	2.756	0.0000	
2013	87.6	1	0.7085	2.756	0.0000	
2014	88.0	1	1.0170	2.756	0.0000	

FIR CUSUM with Reset after Signal

year	xbar	n	fir	cusum_l	hsigma	cusum_h	flag
1991	89.9	1	0.01	0.0000	0.02	1.5555	upper
1992	88.6	1	0.01	0.0000	0.02	1.8110	upper
1993	89.6	1	0.01	0.0000	0.02	3.0665	upper
1994	87.2	1	0.01	0.4555	0.02	0.0000	lower
1995	89.1	1	0.01	0.0000	0.02	0.7555	upper
1996	89.4	1	0.01	0.0000	0.02	1.8110	upper
1997	88.4	1	0.01	0.0000	0.02	1.8665	upper
1998	89.2	1	0.01	0.0000	0.02	2.7220	upper
1999	89.7	1	0.01	0.0000	0.02	4.0775	upper
2000	89.2	1	0.01	0.0000	0.02	0.8555	upper
2001	89.1	1	0.01	0.0000	0.02	1.6110	upper
2002	88.6	1	0.01	0.0000	0.02	1.8665	upper
2003	88.5	1	0.01	0.0000	0.02	2.0220	upper
2004	88.1	1	0.01	0.0000	0.02	1.7775	upper
2005	87.6	1	0.01	0.0555	0.02	1.0330	lower
2005	87.6	1	0.01	0.0555	0.02	1.0330	upper
2006	87.1	1	0.01	0.6110	0.02	0.0000	lower
2007	87.3	1	0.01	0.9665	0.02	0.0000	lower
2008	88.7	1	0.01	0.0000	0.02	0.3555	upper
2009	88.9	1	0.01	0.0000	0.02	0.9110	upper
2010	89.8	1	0.01	0.0000	0.02	2.3665	upper
2011	88.3	1	0.01	0.0000	0.02	2.3220	upper
2012	88.7	1	0.01	0.0000	0.02	2.6775	upper
2013	87.6	1	0.01	0.0555	0.02	1.9330	lower
2013	87.6	1	0.01	0.0555	0.02	1.9330	upper
2014	88.0	1	0.01	0.0000	0.02	1.5885	upper

The CUSUM Procedure



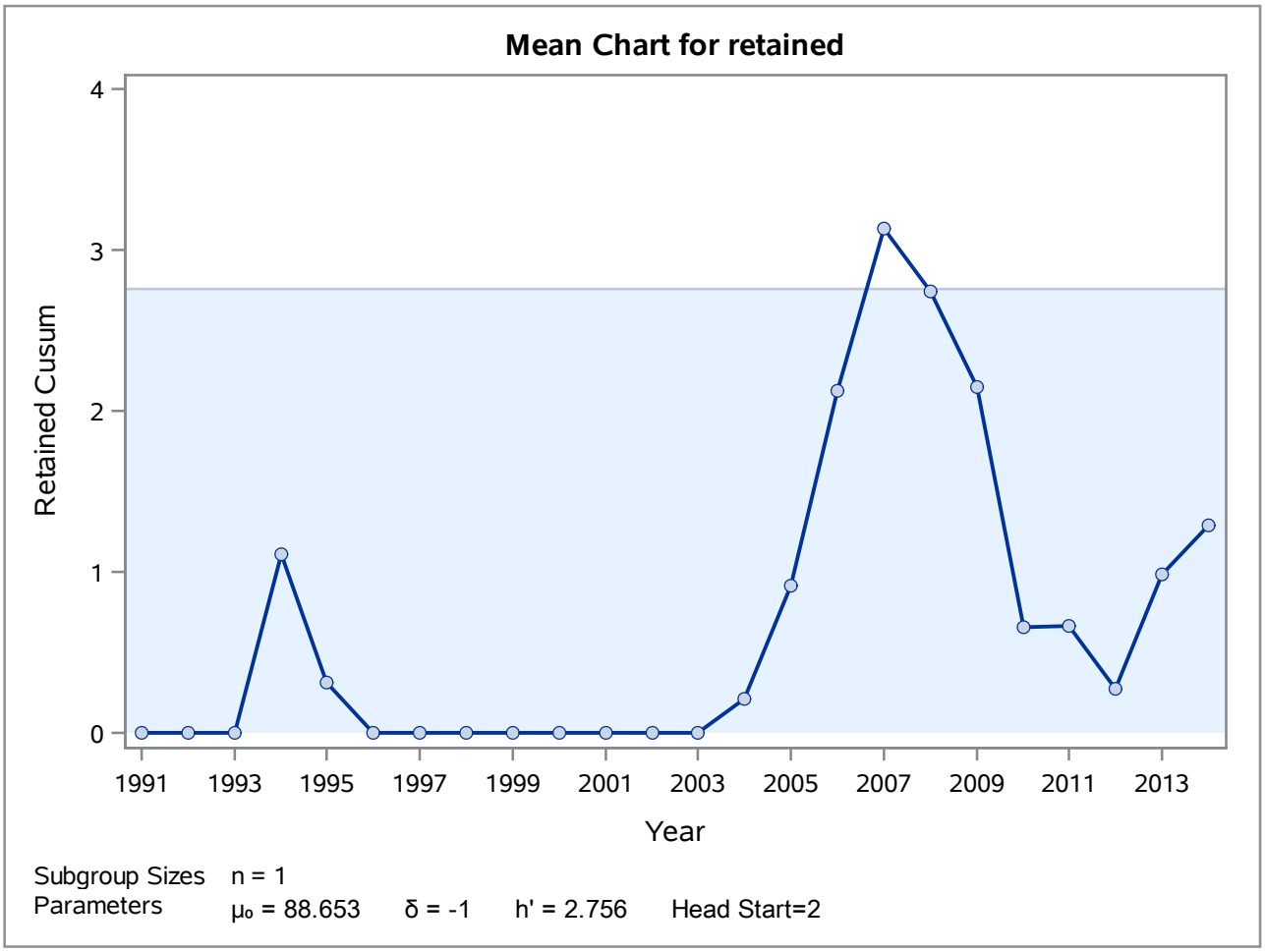
The CUSUM Procedure

Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	One-Sided
Target Mean (Mu0)	88
Sigma0	0.689
Delta	1
Nominal Sample Size	1
h	4
h' (Data Units)	2.756
k	0.5
k' (Data Units)	0.3445
Head Start	2
Average Run Length (Delta)	5.29102011
Average Run Length (0)	316.379368

The CUSUM Procedure

Computational Cumulative Sum for retained				
year	Subgroup Sample Size	Individual Value	Upper Cusum	Number of Consecutive Upper Sums > 0
1991	1	89.900000	2.9335000	1
1992	1	88.600000	3.1890000	2
1993	1	89.600000	4.4445000	3
1994	1	87.200000	3.3000000	4
1995	1	89.100000	4.0555000	5
1996	1	89.400000	5.1110000	6
1997	1	88.400000	5.1665000	7
1998	1	89.200000	6.0220000	8
1999	1	89.700000	7.3775000	9
2000	1	89.200000	8.2330000	10
2001	1	89.100000	8.9885000	11
2002	1	88.600000	9.2440000	12
2003	1	88.500000	9.3995000	13
2004	1	88.100000	9.1550000	14
2005	1	87.600000	8.4105000	15
2006	1	87.100000	7.1660000	16
2007	1	87.300000	6.1215000	17
2008	1	88.700000	6.4770000	18
2009	1	88.900000	7.0325000	19
2010	1	89.800000	8.4880000	20
2011	1	88.300000	8.4435000	21
2012	1	88.700000	8.7990000	22
2013	1	87.600000	8.0545000	23
2014	1	88.000000	7.7100000	24

The CUSUM Procedure



The CUSUM Procedure

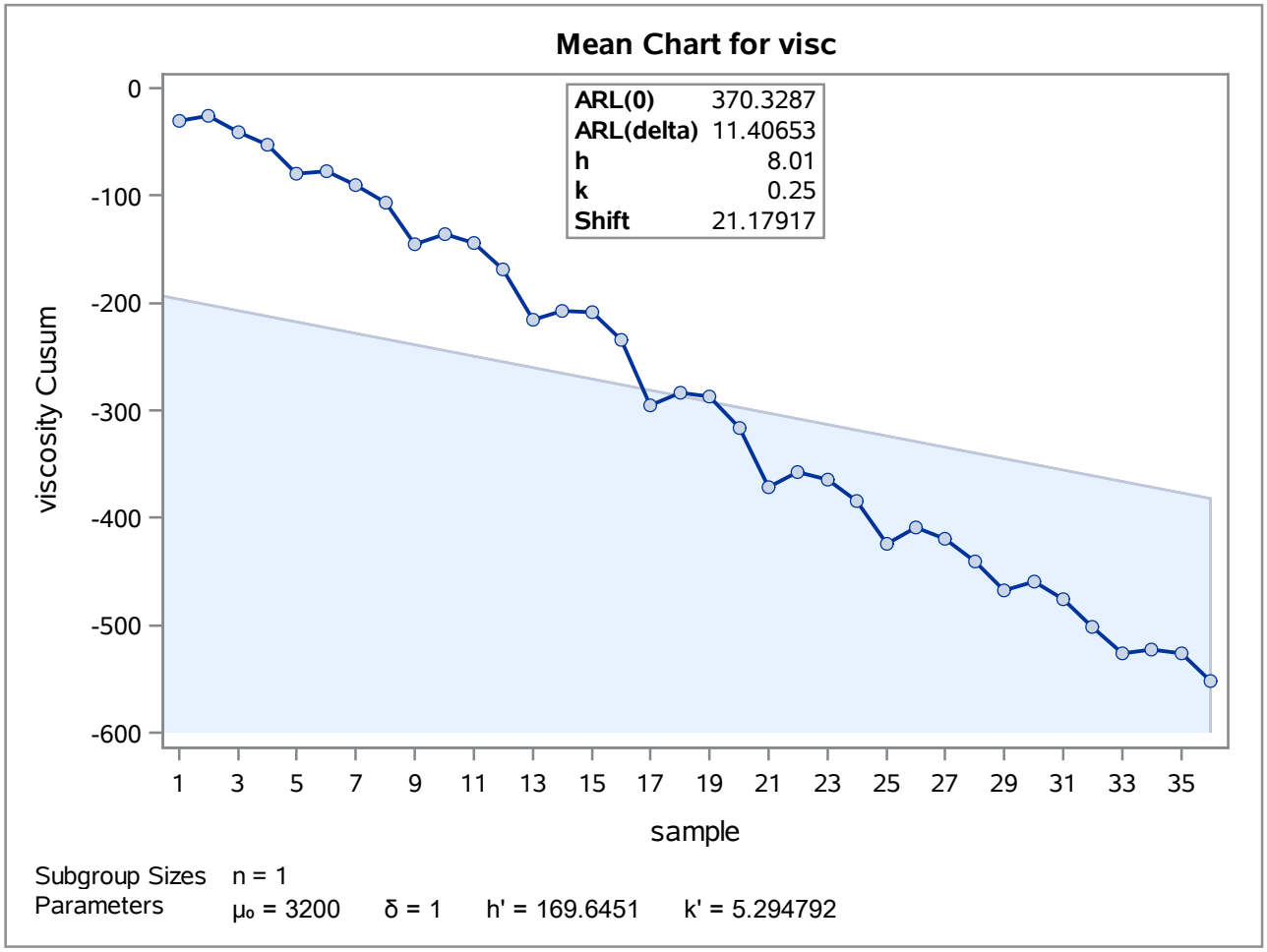
Cusum Parameters	
Process Variable	retained (Retained Cusum)
Subgroup Variable	year (Year)
Scheme	One-Sided
Target Mean (Mu0)	88.653
Sigma0	0.689
Delta	-1
Nominal Sample Size	1
h	4
h' (Data Units)	2.756
k	0.5
k' (Data Units)	0.3445
Head Start	2
Average Run Length (Delta)	973432.42
Average Run Length (0)	316.379368

The CUSUM Procedure

Computational Cumulative Sum for retained				
year	Subgroup Sample Size	Individual Value	Lower Cusum	Number of Consecutive Lower Sums > 0
1991	1	89.900000	0.0000000	0
1992	1	88.600000	0.0000000	0
1993	1	89.600000	0.0000000	0
1994	1	87.200000	1.1085000	1
1995	1	89.100000	0.3170000	2
1996	1	89.400000	0.0000000	0
1997	1	88.400000	0.0000000	0
1998	1	89.200000	0.0000000	0
1999	1	89.700000	0.0000000	0
2000	1	89.200000	0.0000000	0
2001	1	89.100000	0.0000000	0
2002	1	88.600000	0.0000000	0
2003	1	88.500000	0.0000000	0
2004	1	88.100000	0.2085000	1
2005	1	87.600000	0.9170000	2
2006	1	87.100000	2.1255000	3
2007	1	87.300000	3.1340000	4
2008	1	88.700000	2.7425000	5
2009	1	88.900000	2.1510000	6
2010	1	89.800000	0.6595000	7
2011	1	88.300000	0.6680000	8
2012	1	88.700000	0.2765000	9
2013	1	87.600000	0.9850000	10
2014	1	88.000000	1.2935000	11

CUSUM for viscosity (sigma unknown)

The CUSUM Procedure



CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	visc (viscosity Cusum)
Subgroup Variable	sample (sample)
Scheme	Two-Sided
Target Mean (Mu0)	3200
Standard Deviation	21.1791677
Delta	1
Nominal Sample Size	1
h	8.01
h' (Data Units)	169.645133
k	0.25
k' (Data Units)	5.29479192
Average Run Length (Delta)	11.4065336
Average Run Length (0)	370.328713

CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc						
sample	Subgroup Sample Size	Individual Value	V-Mask Lower Limit	Cusum	V-Mask Upper Limit	V-Mask Limit Exceeded
1	1	3169.0000	-906.9629	-31.00000	-197.0371	Upper
2	1	3205.0000	-901.6681	-26.00000	-202.3319	Upper
3	1	3185.0000	-896.3733	-41.00000	-207.6267	Upper
4	1	3188.0000	-891.0785	-53.00000	-212.9215	Upper
5	1	3173.0000	-885.7837	-80.00000	-218.2163	Upper
6	1	3203.0000	-880.4889	-77.00000	-223.5111	Upper
7	1	3187.0000	-875.1941	-90.00000	-228.8059	Upper
8	1	3183.0000	-869.8993	-107.00000	-234.1007	Upper
9	1	3162.0000	-864.6045	-145.00000	-239.3955	Upper
10	1	3209.0000	-859.3097	-136.00000	-244.6903	Upper
11	1	3192.0000	-854.0149	-144.00000	-249.9851	Upper
12	1	3175.0000	-848.7201	-169.00000	-255.2799	Upper
13	1	3154.0000	-843.4253	-215.00000	-260.5747	Upper
14	1	3208.0000	-838.1306	-207.00000	-265.8694	Upper
15	1	3199.0000	-832.8358	-208.00000	-271.1642	Upper
16	1	3174.0000	-827.5410	-234.00000	-276.4590	Upper
17	1	3139.0000	-822.2462	-295.00000	-281.7538	
18	1	3211.0000	-816.9514	-284.00000	-287.0486	Upper
19	1	3197.0000	-811.6566	-287.00000	-292.3434	Upper
20	1	3171.0000	-806.3618	-316.00000	-297.6382	
21	1	3145.0000	-801.0670	-371.00000	-302.9330	
22	1	3214.0000	-795.7722	-357.00000	-308.2278	
23	1	3193.0000	-790.4774	-364.00000	-313.5226	
24	1	3180.0000	-785.1826	-384.00000	-318.8174	
25	1	3160.0000	-779.8878	-424.00000	-324.1122	
26	1	3215.0000	-774.5931	-409.00000	-329.4069	
27	1	3190.0000	-769.2983	-419.00000	-334.7017	
28	1	3179.0000	-764.0035	-440.00000	-339.9965	
29	1	3172.0000	-758.7087	-468.00000	-345.2913	
30	1	3209.0000	-753.4139	-459.00000	-350.5861	
31	1	3183.0000	-748.1191	-476.00000	-355.8809	
32	1	3175.0000	-742.8243	-501.00000	-361.1757	
33	1	3175.0000	-737.5295	-526.00000	-366.4705	
34	1	3203.0000	-732.2347	-523.00000	-371.7653	

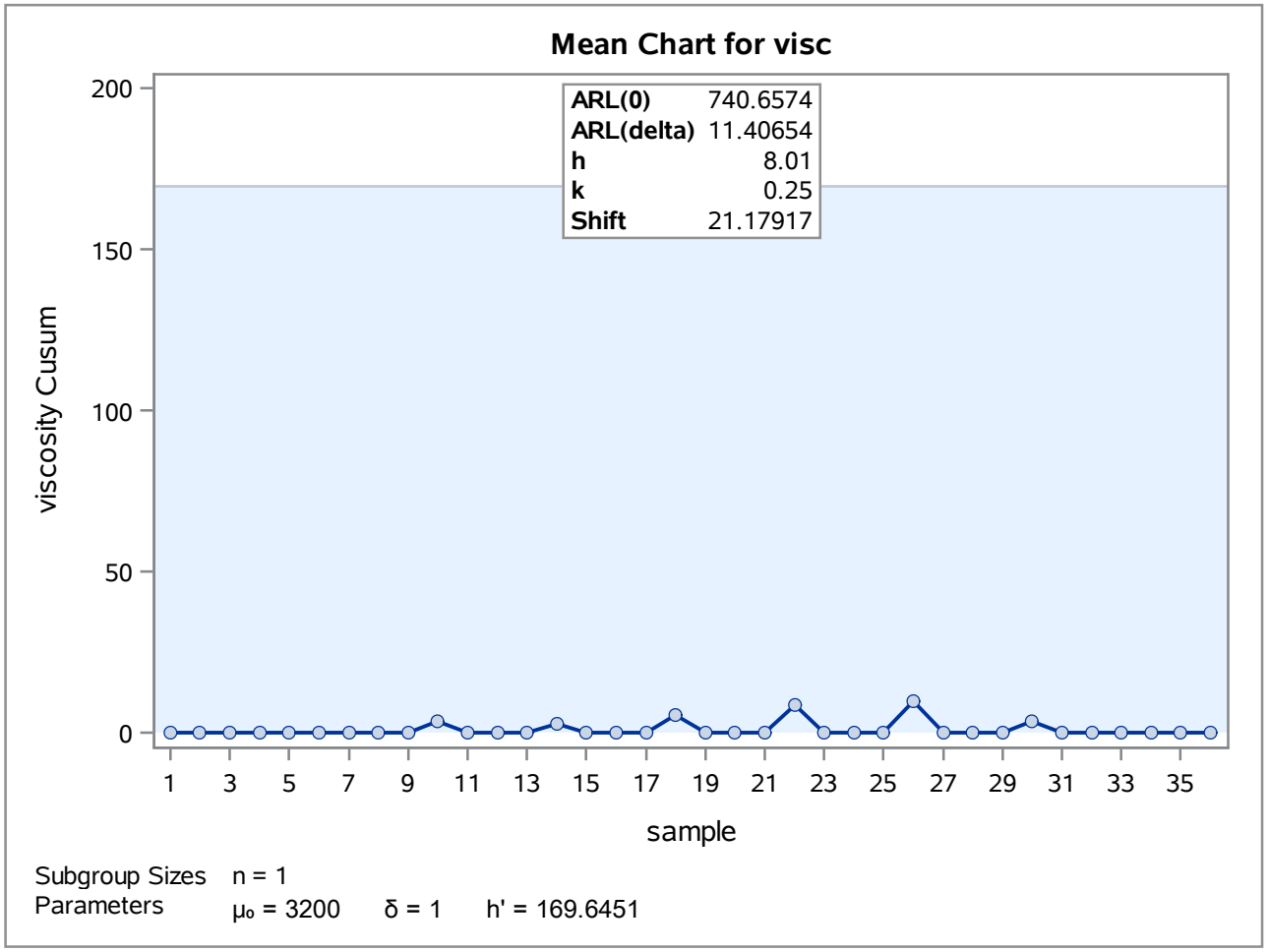
CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc						
sample	Subgroup Sample Size	Individual Value	V-Mask Lower Limit	Cusum	V-Mask Upper Limit	V-Mask Limit Exceeded
35	1	3197.0000	-726.9399	-526.00000	-377.0601	
36	1	3174.0000	-721.6451	-552.00000	-382.3549	

UPPER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure



UPPER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	visc (viscosity Cusum)
Subgroup Variable	sample (sample)
Scheme	One-Sided
Target Mean (Mu0)	3200
Standard Deviation	21.1791677
Delta	1
Nominal Sample Size	1
h	8.01
h' (Data Units)	169.645133
k	0.25
k' (Data Units)	5.29479192
Average Run Length (Delta)	11.4065412
Average Run Length (0)	740.657426

UPPER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc					
sample	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
1	1	3169.0000	0.0000000	169.6451	
2	1	3205.0000	0.0000000	169.6451	
3	1	3185.0000	0.0000000	169.6451	
4	1	3188.0000	0.0000000	169.6451	
5	1	3173.0000	0.0000000	169.6451	
6	1	3203.0000	0.0000000	169.6451	
7	1	3187.0000	0.0000000	169.6451	
8	1	3183.0000	0.0000000	169.6451	
9	1	3162.0000	0.0000000	169.6451	
10	1	3209.0000	3.7052081	169.6451	
11	1	3192.0000	0.0000000	169.6451	
12	1	3175.0000	0.0000000	169.6451	
13	1	3154.0000	0.0000000	169.6451	
14	1	3208.0000	2.7052081	169.6451	
15	1	3199.0000	0.0000000	169.6451	
16	1	3174.0000	0.0000000	169.6451	
17	1	3139.0000	0.0000000	169.6451	
18	1	3211.0000	5.7052081	169.6451	
19	1	3197.0000	0.0000000	169.6451	
20	1	3171.0000	0.0000000	169.6451	
21	1	3145.0000	0.0000000	169.6451	
22	1	3214.0000	8.7052081	169.6451	
23	1	3193.0000	0.0000000	169.6451	
24	1	3180.0000	0.0000000	169.6451	
25	1	3160.0000	0.0000000	169.6451	
26	1	3215.0000	9.7052081	169.6451	
27	1	3190.0000	0.0000000	169.6451	
28	1	3179.0000	0.0000000	169.6451	
29	1	3172.0000	0.0000000	169.6451	
30	1	3209.0000	3.7052081	169.6451	
31	1	3183.0000	0.0000000	169.6451	
32	1	3175.0000	0.0000000	169.6451	
33	1	3175.0000	0.0000000	169.6451	
34	1	3203.0000	0.0000000	169.6451	

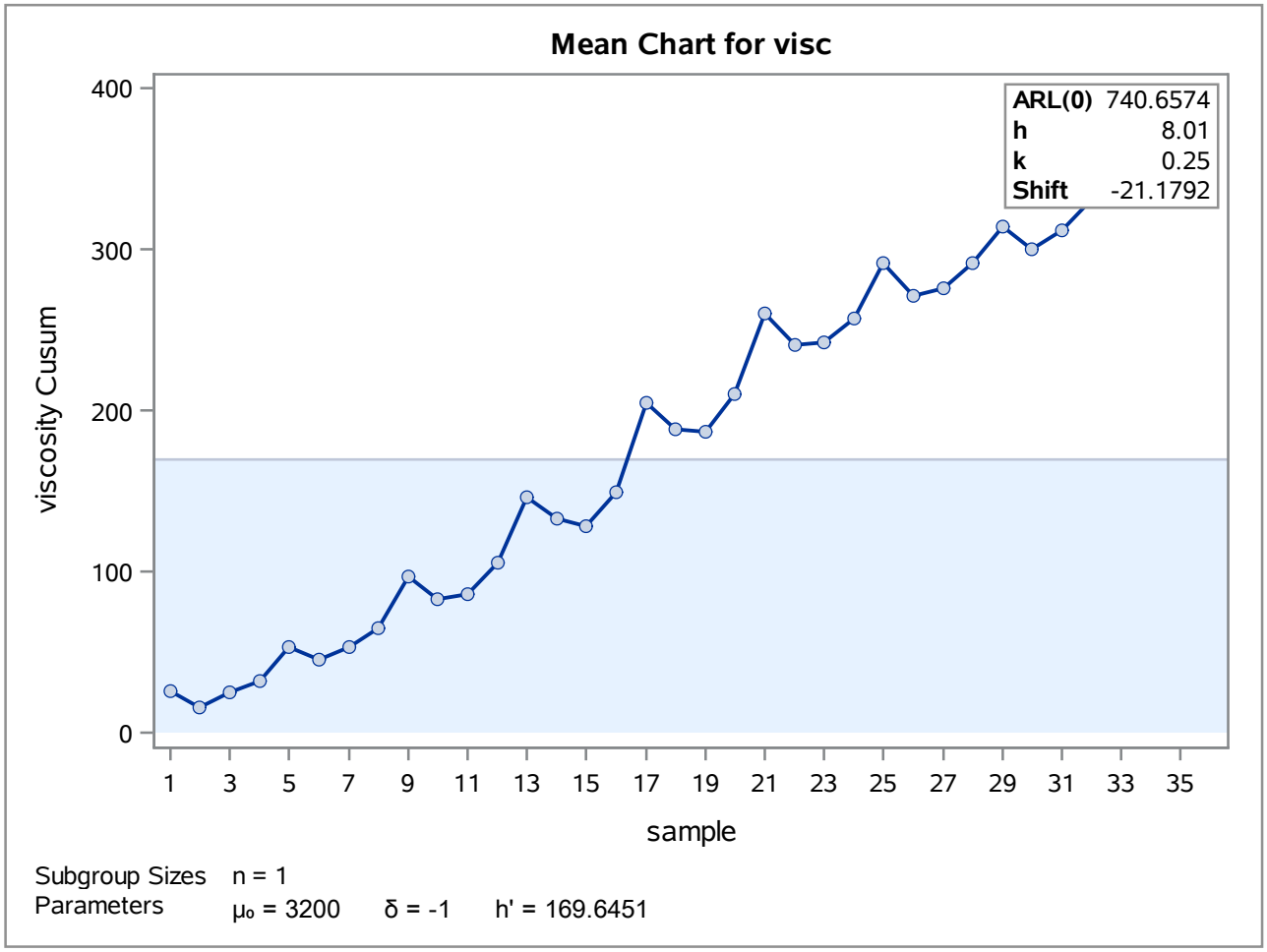
UPPER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc					
sample	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
35	1	3197.0000	0.0000000	169.6451	
36	1	3174.0000	0.0000000	169.6451	

LOWER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure



LOWER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	visc (viscosity Cusum)
Subgroup Variable	sample (sample)
Scheme	One-Sided
Target Mean (Mu0)	3200
Standard Deviation	21.1791677
Delta	-1
Nominal Sample Size	1
h	8.01
h' (Data Units)	169.645133
k	0.25
k' (Data Units)	5.29479192
Average Run Length (Delta)	17287591.2
Average Run Length (0)	740.657426

LOWER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc					
sample	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
1	1	3169.0000	25.70521	169.6451	
2	1	3205.0000	15.41042	169.6451	
3	1	3185.0000	25.11562	169.6451	
4	1	3188.0000	31.82083	169.6451	
5	1	3173.0000	53.52604	169.6451	
6	1	3203.0000	45.23125	169.6451	
7	1	3187.0000	52.93646	169.6451	
8	1	3183.0000	64.64166	169.6451	
9	1	3162.0000	97.34687	169.6451	
10	1	3209.0000	83.05208	169.6451	
11	1	3192.0000	85.75729	169.6451	
12	1	3175.0000	105.46250	169.6451	
13	1	3154.0000	146.16771	169.6451	
14	1	3208.0000	132.87291	169.6451	
15	1	3199.0000	128.57812	169.6451	
16	1	3174.0000	149.28333	169.6451	
17	1	3139.0000	204.98854	169.6451	Upper
18	1	3211.0000	188.69375	169.6451	Upper
19	1	3197.0000	186.39895	169.6451	Upper
20	1	3171.0000	210.10416	169.6451	Upper
21	1	3145.0000	259.80937	169.6451	Upper
22	1	3214.0000	240.51458	169.6451	Upper
23	1	3193.0000	242.21979	169.6451	Upper
24	1	3180.0000	256.92499	169.6451	Upper
25	1	3160.0000	291.63020	169.6451	Upper
26	1	3215.0000	271.33541	169.6451	Upper
27	1	3190.0000	276.04062	169.6451	Upper
28	1	3179.0000	291.74583	169.6451	Upper
29	1	3172.0000	314.45103	169.6451	Upper
30	1	3209.0000	300.15624	169.6451	Upper
31	1	3183.0000	311.86145	169.6451	Upper
32	1	3175.0000	331.56666	169.6451	Upper
33	1	3175.0000	351.27187	169.6451	Upper
34	1	3203.0000	342.97707	169.6451	Upper

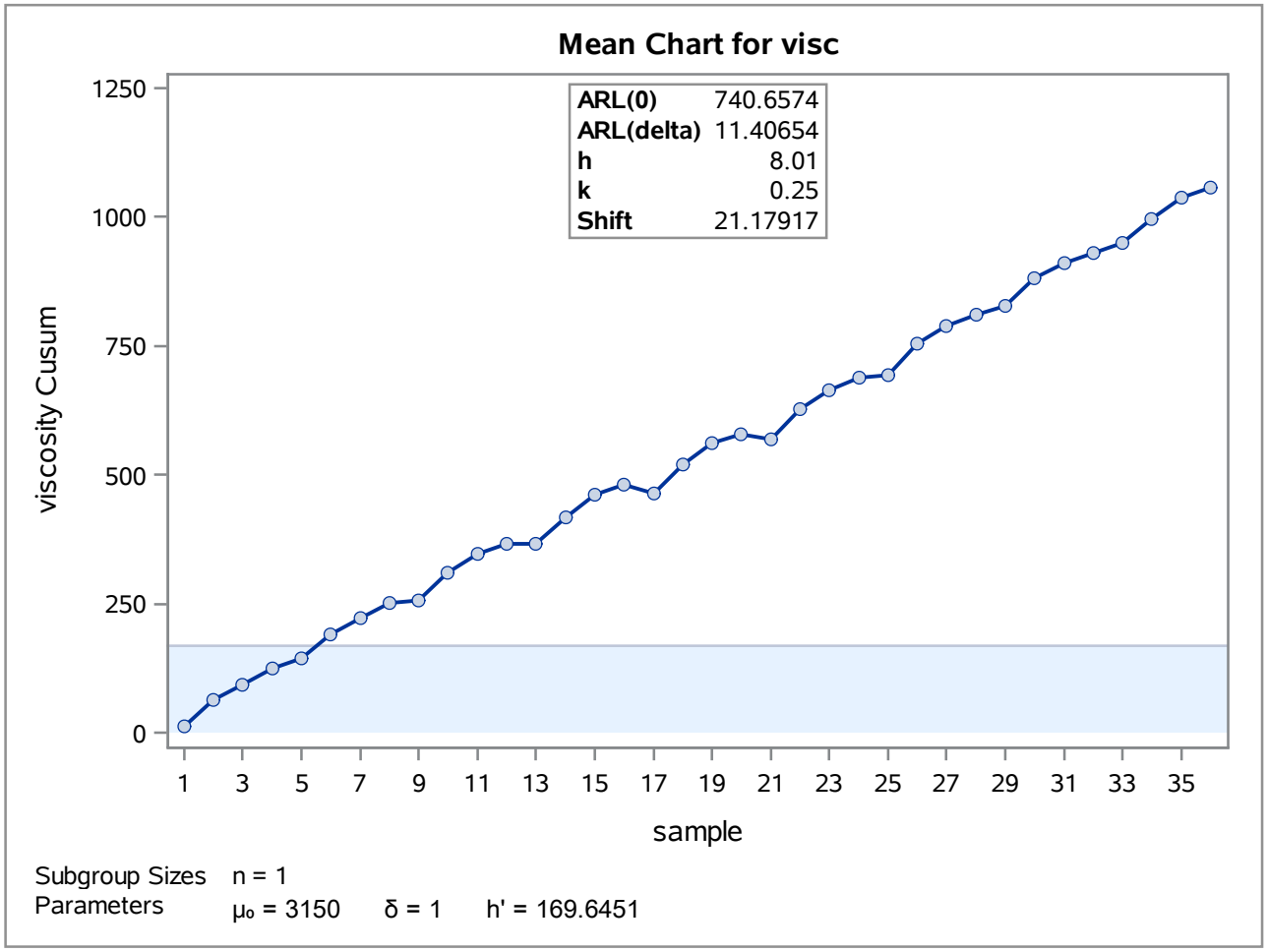
LOWER ONE-SIDED CUSUM for viscosity (sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc					
sample	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
35	1	3197.0000	340.68228	169.6451	Upper
36	1	3174.0000	361.38749	169.6451	Upper

UPPER ONE-SIDED CUSUM for viscosity (mu = 3150)(sigma unknown)

The CUSUM Procedure



UPPER ONE-SIDED CUSUM for viscosity (mu = 3150)(sigma unknown)

The CUSUM Procedure

Cusum Parameters	
Process Variable	visc (viscosity Cusum)
Subgroup Variable	sample (sample)
Scheme	One-Sided
Target Mean (Mu0)	3150
Standard Deviation	21.1791677
Delta	1
Nominal Sample Size	1
h	8.01
h' (Data Units)	169.645133
k	0.25
k' (Data Units)	5.29479192
Average Run Length (Delta)	11.4065412
Average Run Length (0)	740.657426

UPPER ONE-SIDED CUSUM for viscosity (mu = 3150)(sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc					
sample	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
1	1	3169.0000	13.7052	169.6451	
2	1	3205.0000	63.4104	169.6451	
3	1	3185.0000	93.1156	169.6451	
4	1	3188.0000	125.8208	169.6451	
5	1	3173.0000	143.5260	169.6451	
6	1	3203.0000	191.2312	169.6451	Upper
7	1	3187.0000	222.9365	169.6451	Upper
8	1	3183.0000	250.6417	169.6451	Upper
9	1	3162.0000	257.3469	169.6451	Upper
10	1	3209.0000	311.0521	169.6451	Upper
11	1	3192.0000	347.7573	169.6451	Upper
12	1	3175.0000	367.4625	169.6451	Upper
13	1	3154.0000	366.1677	169.6451	Upper
14	1	3208.0000	418.8729	169.6451	Upper
15	1	3199.0000	462.5781	169.6451	Upper
16	1	3174.0000	481.2833	169.6451	Upper
17	1	3139.0000	464.9885	169.6451	Upper
18	1	3211.0000	520.6937	169.6451	Upper
19	1	3197.0000	562.3990	169.6451	Upper
20	1	3171.0000	578.1042	169.6451	Upper
21	1	3145.0000	567.8094	169.6451	Upper
22	1	3214.0000	626.5146	169.6451	Upper
23	1	3193.0000	664.2198	169.6451	Upper
24	1	3180.0000	688.9250	169.6451	Upper
25	1	3160.0000	693.6302	169.6451	Upper
26	1	3215.0000	753.3354	169.6451	Upper
27	1	3190.0000	788.0406	169.6451	Upper
28	1	3179.0000	811.7458	169.6451	Upper
29	1	3172.0000	828.4510	169.6451	Upper
30	1	3209.0000	882.1562	169.6451	Upper
31	1	3183.0000	909.8615	169.6451	Upper
32	1	3175.0000	929.5667	169.6451	Upper
33	1	3175.0000	949.2719	169.6451	Upper
34	1	3203.0000	996.9771	169.6451	Upper

UPPER ONE-SIDED CUSUM for viscosity (mu = 3150)(sigma unknown)

The CUSUM Procedure

Cumulative Sum Chart Summary for visc					
sample	Subgroup Sample Size	Individual Value	Cusum	Decision Interval	Decision Interval Exceeded
35	1	3197.0000	1038.6823	169.6451	Upper
36	1	3174.0000	1057.3875	169.6451	Upper