

# Exponential Smoothing

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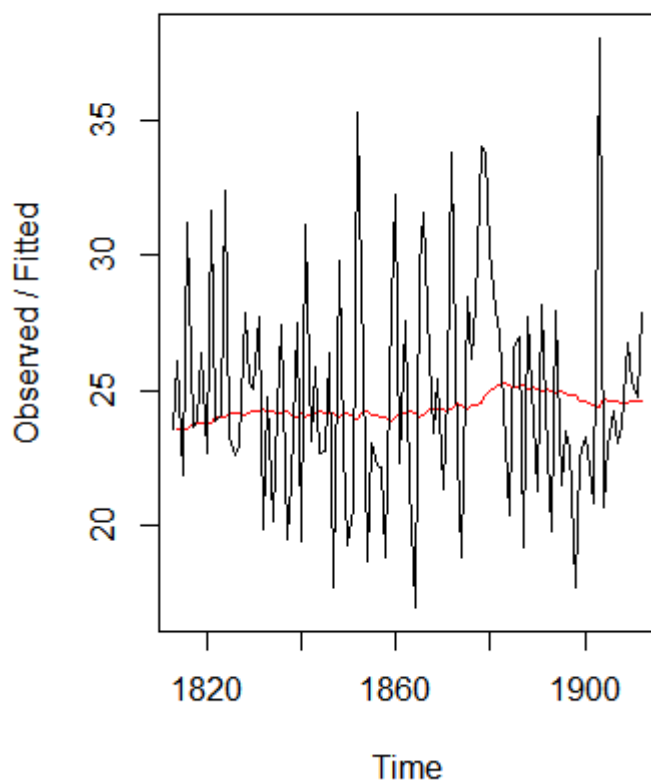
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## Single Exponential Smoothing:

- Single Exponential Smoothing for data containing total annual rainfall(inch) in London from 1813-1912
- Plotting timeseries values

## Holt-Winters filtering



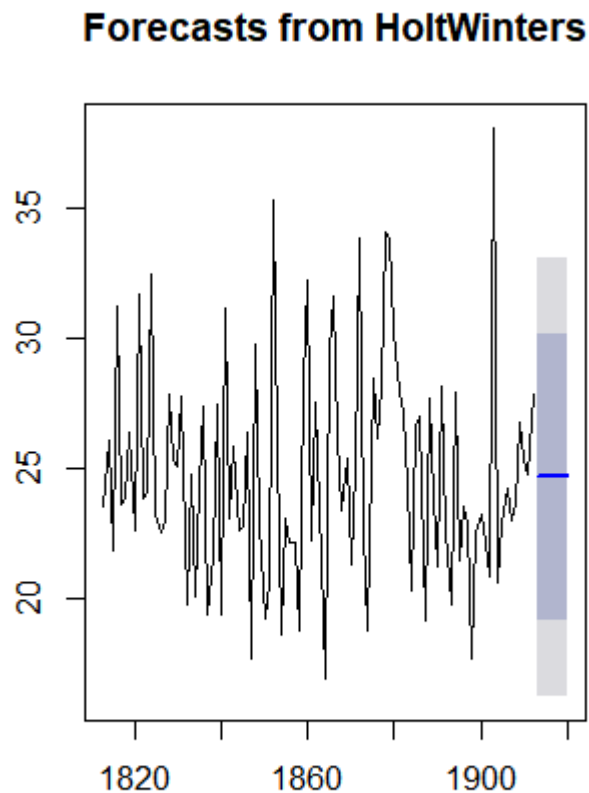
- Performing Single Exponential Smoothing, Forecasted values are given below with 80% and 95% confidence level.

Alpha value 0.02412151

	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
1913	24.67819	19.17493	30.18145	16.26169	33.09470
1914	24.67819	19.17333	30.18305	16.25924	33.09715
1915	24.67819	19.17173	30.18465	16.25679	33.09960
1916	24.67819	19.17013	30.18625	16.25434	33.10204

1917	24.67819	19.16853	30.18785	16.25190	33.10449
1918	24.67819	19.16694	30.18945	16.24945	33.10694
1919	24.67819	19.16534	30.19105	16.24701	33.10938
1920	24.67819	19.16374	30.19265	16.24456	33.11182

Forecasted Plot for next 8 years:



### Double Exponential Smoothing:

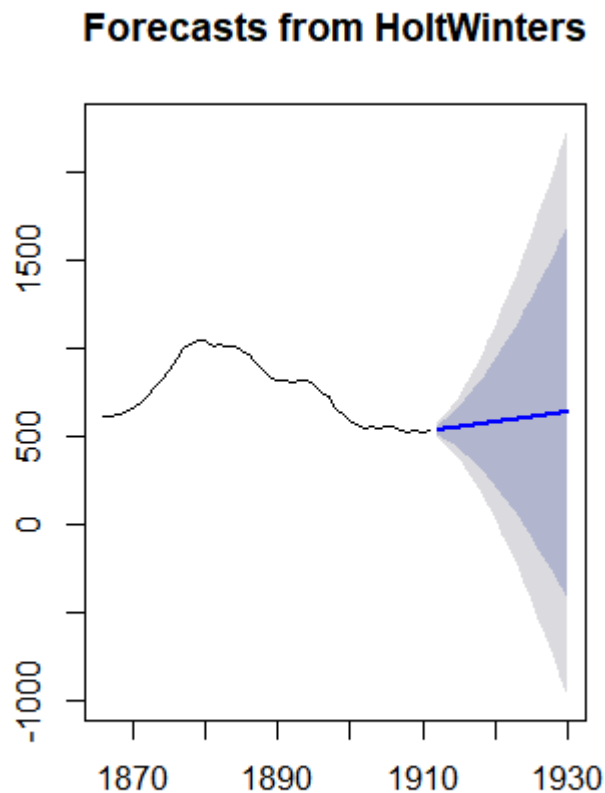
- dataset: diameter of women skirts produced at hem annually from 1866-1911
- Smoothing Parameters  
alpha: 0.8383481    beta : 1

Dataset after forecasting prediction from 1912-1930:

Point	Forecast	Lo 80	Hi 80	Lo 95	Hi 95
1912	534.9990	509.55210	560.4460	496.08130	573.9168
1913	540.6895	491.01052	590.3685	464.71204	616.6670
1914	546.3800	465.36129	627.3987	422.47258	670.2874
1915	552.0704	434.40205	669.7388	372.11216	732.0287
1916	557.7609	398.94120	716.5806	314.86713	800.6547
1917	563.4514	359.47147	767.4313	251.49103	875.4117
1918	569.1418	316.34076	821.9429	182.51596	955.7677
1919	574.8323	269.81480	879.8498	108.34829	1041.3163
1920	580.5228	220.10648	940.9391	29.31362	1131.7319
1921	586.2132	167.39191	1005.0345	-54.31870	1226.7452
1922	591.9037	111.82029	1071.9871	-142.32052	1326.1279
1923	597.5942	53.52019	1141.6681	-234.49517	1429.6835
1924	603.2846	-7.39593	1213.9652	-330.67069	1537.2399
1925	608.9751	-70.82861	1288.7788	-430.69495	1648.6451

1926	614.6655	-136.68903	1366.0201	-534.43211	1763.7632
1927	620.3560	-204.89720	1445.6092	-641.75986	1882.4719
1928	626.0465	-275.38060	1527.4736	-752.56728	2004.6602
1929	631.7369	-348.07309	1611.5470	-866.75319	2130.2271
1930	637.4274	-422.91396	1697.7688	-984.22478	2259.0796

Forecasted Plot (Dark Region 90% confidence,Light region 95% Confidence):



### Triple Exponential Smoothing:

- time series of the log of monthly sales for the souvenir shop at a beach resort town in Queensland, Australia
- smoothening parameters:
  - alpha: 0.413418
  - beta : 0
  - gamma: 0.9561275

Forecasted Data : Making prediction for next 4 years 1994-1997 :

Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95	
Jan 1994	9.597062	9.381514	9.812611	9.267409	9.926715
Feb 1994	9.830781	9.597539	10.064024	9.474068	10.187495
Mar 1994	10.477542	10.227856	10.727227	10.095680	10.859403
Apr 1994	10.254867	9.989756	10.519978	9.849415	10.660319
May 1994	10.167100	9.887413	10.446787	9.739356	10.594845
Jun 1994	10.375632	10.082092	10.669172	9.926701	10.824562
Jul 1994	10.664248	10.357480	10.971016	10.195087	11.133409

Aug 1994	10.717796	10.398347	11.037244	10.229241	11.206350
Sep 1994	10.742782	10.411137	11.074427	10.235575	11.249989
Oct 1994	10.728230	10.384822	11.071638	10.203032	11.253427
Nov 1994	11.124151	10.769369	11.478933	10.581559	11.666743
Dec 1994	11.917062	11.551260	12.282864	11.357616	12.476508
Jan 1995	9.956620	9.534825	10.378416	9.311540	10.601701
Feb 1995	10.190339	9.759233	10.621446	9.531020	10.849659
Mar 1995	10.837100	10.396880	11.277319	10.163842	11.510358
Apr 1995	10.614425	10.165277	11.063573	9.927512	11.301338
May 1995	10.526659	10.068756	10.984562	9.826356	11.226961
Jun 1995	10.735190	10.268697	11.201684	10.021750	11.448630
Jul 1995	11.023806	10.548878	11.498735	10.297466	11.750146
Aug 1995	11.077354	10.594138	11.560570	10.338339	11.816369
Sep 1995	11.102340	10.610976	11.593704	10.350863	11.853817
Oct 1995	11.087788	10.588409	11.587167	10.324053	11.851523
Nov 1995	11.483709	10.976442	11.990977	10.707910	12.259508
Dec 1995	12.276620	11.761585	12.791656	11.488942	13.064299
Jan 1996	10.316179	9.759975	10.872382	9.465539	11.166818
Feb 1996	10.549898	9.986601	11.113194	9.688410	11.411385
Mar 1996	11.196658	10.626357	11.766960	10.324457	12.068859
Apr 1996	10.973983	10.396762	11.551205	10.091199	11.856767
May 1996	10.886217	10.302157	11.470276	9.992975	11.779459
Jun 1996	11.094748	10.503930	11.685567	10.191170	11.998327
Jul 1996	11.383364	10.785864	11.980865	10.469566	12.297163
Aug 1996	11.436912	10.832803	12.041022	10.513006	12.360818
Sep 1996	11.461898	10.851252	12.072545	10.527995	12.395802
Oct 1996	11.447346	10.830232	12.064460	10.503551	12.391141
Nov 1996	11.843268	11.219753	12.466782	10.889684	12.796851
Dec 1996	12.636179	12.006328	13.266029	11.672905	13.599452
Jan 1997	10.675737	10.011800	11.339674	9.660333	11.691141
Feb 1997	10.909456	10.239565	11.579346	9.884947	11.933965
Mar 1997	11.556216	10.880425	12.232008	10.522682	12.589750
Apr 1997	11.333542	10.651900	12.015183	10.291061	12.376022
May 1997	11.245775	10.558334	11.933217	10.194424	12.297126
Jun 1997	11.454307	10.761113	12.147500	10.394159	12.514454
Jul 1997	11.742923	11.044025	12.441820	10.674051	12.811794
Aug 1997	11.796470	11.091915	12.501026	10.718946	12.873995
Sep 1997	11.821457	11.111288	12.531625	10.735347	12.907566
Oct 1997	11.806904	11.091167	12.522642	10.712278	12.901531
Nov 1997	12.202826	11.481562	12.924089	11.099748	13.305903
Dec 1997	12.995737	12.268989	13.722485	11.884272	14.107202

Forecasted plot :

