

INTERDECADAL PACIFIC OSCILLATION TIME SERIES

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The Interdecadal Pacific Oscillation (IPO) is almost the same as a Pacific-wide manifestation of the Pacific Decadal Oscillation of Mantua et al (1997), with as much variance in the Southern Hemisphere Pacific down to at least 55°S as in the Northern Hemisphere (Folland et al, 2002). The IPO is a multidecadal sea surface temperature (SST) pattern quite like that of ENSO, but differing in several ways. It shows a marked amount of symmetry about the equator and much less variance in the eastern-most Pacific. It also shows relatively more variance in the extratropics and the positive tropical part of the positive IPO pattern appears to extend further towards the Tropical West Pacific

The IPO was introduced by Power et al (1999) based on work by Folland et al (1999). Power et al showed that the IPO modulated ENSO climate teleconnections to Australia. The near equivalence of the PDO and IPO and some likely independent effects of the IPO relative to ENSO on the South Pacific Convergence Zone were shown by Folland et al (2002). The concept of the IPO was used in South Pacific paleoclimatic studies by Linsley et al (2004) and has been related to tropical rainfall patterns by Meinke et al (2005). The latter also compared IPO influences to those of SST on purely decadal time scales. The physical nature of the IPO is under investigation; it is still not clear, despite the above studies, to what extent the IPO is really independent of ENSO red noise and especially of SST variations near a decadal time scale where some physical processes have been identified. Meehl et al (2006) provide a possible physical mechanism based on a climate model.

The IPO was reanalysed using the improved HadSST2 (Rayner et al, 2006) data by Parker et al (2007) using a longer period for defining the IPO pattern. The changes in IPO pattern and time series from the previous version were not large but we use the Parker et al (2007) definition here, the second low frequency filtered global covariance empirical orthogonal function of SST for period 1891-2005. The IPO time series is shown below in two forms: in its smoothed form, smoothed on time scales approximately greater than 11 years and calculated seasonally (Table 1), and unsmoothed calculated monthly (Table 2) using HadISST1. IPO data before about 1875 should be regarded with great caution. Unfiltered IPO data is created by projecting unfiltered monthly SSTs from the HadISST data set (Rayner et al, 2003) onto the Parker et al (2007) EOF. This data starts in 1871. HadISST1 is not used to create the IPO EOF itself, as HadISST is constructed using EOFs. However for calculating unfiltered monthly time series, HadISST1 is less noisy as it does not include data gaps like HadSST2. Noise is a particular problem with HadSST2 on the monthly time scale. The low frequency filter used in Parker et al (2007) was chosen to exclude purely decadal SST and other climate time scales known to be important in the tropical Atlantic (Chang et al, 1997) because these are thought to be separate. Folland et al (1999) showed that a similar pattern to the SST IPO is seen in a similar EOF analysis of an independent night marine air temperature (NMAT) data set, with a similar time series since 1870. Parker et al (2007) found broadly similar results using 1891-2005 data, though the new NMAT IPO is somewhat less similar to the SST version, probably due to poor coverage of NMAT data in the Pacific before 1911.

Note that because of filtering of the smoothed version of the IPO, future values may significantly affect the filtered values for about the most recent 5 years, so these should be regarded with caution. In the filtered HadISST version shown here we have slightly tapered the last sixteen seasons by extending to the data to later dates by the average of the last 16 seasons before filtering. After filtering we remove the extended data. We have done a similar tapering at the beginning of the data. This procedure tends to reduce exaggerated trends that can otherwise occur at the beginning and end of the data. The last few years of filtered data in Table 1 should be regarded with caution anyway.

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TABLE 1
FILTERED IPO TIME SERIES USING 11 YEAR CHEBYCHEV FILTER
(provided by Andrew Colman, Met Office).

All season 1891-2005 global HadSST2 LOW FREQUENCY EOF 2
projected onto JFM 1871 TO JAS 2017 HadISST.

	JFM	AMJ	JAS	OND
1871.00	-1.96	-1.94	-1.92	-1.89
1872.00	-1.86	-1.83	-1.79	-1.74
1873.00	-1.69	-1.62	-1.55	-1.48
1874.00	-1.38	-1.30	-1.19	-1.09
1875.00	-0.96	-0.85	-0.73	-0.59
1876.00	-0.46	-0.32	-0.19	-0.06
1877.00	0.06	0.18	0.28	0.39
1878.00	0.47	0.55	0.61	0.67
1879.00	0.71	0.75	0.79	0.82
1880.00	0.83	0.85	0.87	0.88
1881.00	0.90	0.90	0.92	0.92
1882.00	0.93	0.93	0.94	0.94
1883.00	0.95	0.95	0.95	0.95
1884.00	0.95	0.94	0.93	0.92
1885.00	0.90	0.87	0.85	0.82
1886.00	0.78	0.73	0.69	0.64
1887.00	0.60	0.54	0.48	0.42
1888.00	0.36	0.28	0.21	0.14
1889.00	0.05	-0.04	-0.12	-0.21
1890.00	-0.30	-0.39	-0.47	-0.54
1891.00	-0.62	-0.68	-0.73	-0.78
1892.00	-0.82	-0.84	-0.86	-0.87
1893.00	-0.86	-0.84	-0.82	-0.77
1894.00	-0.70	-0.63	-0.54	-0.43
1895.00	-0.33	-0.22	-0.09	0.04
1896.00	0.17	0.30	0.43	0.55
1897.00	0.69	0.82	0.94	1.07
1898.00	1.18	1.30	1.42	1.53
1899.00	1.65	1.75	1.84	1.94
1900.00	2.03	2.10	2.18	2.25
1901.00	2.30	2.34	2.38	2.41
1902.00	2.42	2.43	2.43	2.41
1903.00	2.39	2.36	2.32	2.26
1904.00	2.20	2.13	2.06	1.97
1905.00	1.88	1.79	1.67	1.56
1906.00	1.43	1.30	1.17	1.03
1907.00	0.89	0.76	0.64	0.51
1908.00	0.39	0.28	0.17	0.07
1909.00	-0.02	-0.09	-0.16	-0.22
1910.00	-0.25	-0.28	-0.29	-0.29
1911.00	-0.29	-0.27	-0.25	-0.22
1912.00	-0.18	-0.14	-0.10	-0.06
1913.00	-0.03	0.02	0.06	0.09
1914.00	0.12	0.15	0.17	0.19
1915.00	0.21	0.21	0.22	0.22
1916.00	0.22	0.23	0.23	0.22
1917.00	0.23	0.23	0.24	0.24
1918.00	0.25	0.25	0.27	0.26
1919.00	0.26	0.26	0.24	0.23
1920.00	0.22	0.20	0.18	0.18
1921.00	0.17	0.16	0.16	0.15

1922.00	0.16	0.18	0.19	0.21
1923.00	0.24	0.28	0.32	0.36
1924.00	0.40	0.46	0.51	0.57
1925.00	0.63	0.69	0.75	0.81
1926.00	0.87	0.92	0.96	1.01
1927.00	1.05	1.09	1.12	1.14
1928.00	1.17	1.19	1.21	1.22
1929.00	1.23	1.24	1.24	1.24
1930.00	1.23	1.21	1.20	1.17
1931.00	1.14	1.10	1.06	1.01
1932.00	0.96	0.91	0.84	0.79
1933.00	0.73	0.69	0.64	0.60
1934.00	0.56	0.54	0.51	0.50
1935.00	0.49	0.48	0.49	0.49
1936.00	0.50	0.51	0.53	0.55
1937.00	0.58	0.60	0.63	0.67
1938.00	0.71	0.74	0.79	0.83
1939.00	0.88	0.93	0.96	1.01
1940.00	1.03	1.06	1.07	1.07
1941.00	1.07	1.04	1.02	0.98
1942.00	0.93	0.86	0.79	0.71
1943.00	0.62	0.54	0.45	0.36
1944.00	0.27	0.17	0.07	-0.03
1945.00	-0.12	-0.22	-0.31	-0.40
1946.00	-0.50	-0.59	-0.68	-0.77
1947.00	-0.86	-0.95	-1.04	-1.13
1948.00	-1.21	-1.30	-1.38	-1.46
1949.00	-1.53	-1.61	-1.67	-1.73
1950.00	-1.78	-1.82	-1.86	-1.89
1951.00	-1.92	-1.94	-1.95	-1.95
1952.00	-1.96	-1.96	-1.95	-1.96
1953.00	-1.96	-1.96	-1.94	-1.93
1954.00	-1.92	-1.89	-1.87	-1.84
1955.00	-1.80	-1.76	-1.71	-1.65
1956.00	-1.59	-1.52	-1.44	-1.35
1957.00	-1.28	-1.20	-1.12	-1.04
1958.00	-0.98	-0.92	-0.86	-0.80
1959.00	-0.76	-0.72	-0.70	-0.68
1960.00	-0.66	-0.65	-0.65	-0.65
1961.00	-0.64	-0.64	-0.65	-0.65
1962.00	-0.65	-0.65	-0.66	-0.65
1963.00	-0.64	-0.65	-0.63	-0.62
1964.00	-0.61	-0.60	-0.59	-0.59
1965.00	-0.58	-0.56	-0.56	-0.56
1966.00	-0.56	-0.55	-0.56	-0.58
1967.00	-0.59	-0.60	-0.63	-0.64
1968.00	-0.67	-0.70	-0.73	-0.76
1969.00	-0.81	-0.85	-0.90	-0.95
1970.00	-1.00	-1.07	-1.12	-1.18
1971.00	-1.23	-1.28	-1.32	-1.36
1972.00	-1.40	-1.42	-1.44	-1.46
1973.00	-1.46	-1.46	-1.45	-1.43
1974.00	-1.39	-1.34	-1.28	-1.21
1975.00	-1.12	-1.03	-0.91	-0.80
1976.00	-0.67	-0.53	-0.38	-0.23
1977.00	-0.07	0.08	0.23	0.38
1978.00	0.52	0.66	0.80	0.93
1979.00	1.05	1.17	1.28	1.38
1980.00	1.48	1.57	1.64	1.72
1981.00	1.78	1.83	1.87	1.90

1982.00	1.92	1.94	1.95	1.94
1983.00	1.93	1.91	1.87	1.83
1984.00	1.79	1.74	1.70	1.63
1985.00	1.59	1.54	1.49	1.44
1986.00	1.40	1.35	1.31	1.26
1987.00	1.22	1.17	1.13	1.08
1988.00	1.04	1.00	0.97	0.94
1989.00	0.92	0.90	0.90	0.91
1990.00	0.92	0.93	0.96	0.99
1991.00	1.03	1.07	1.11	1.15
1992.00	1.19	1.23	1.26	1.29
1993.00	1.31	1.32	1.32	1.33
1994.00	1.33	1.30	1.29	1.26
1995.00	1.23	1.19	1.14	1.09
1996.00	1.03	0.97	0.90	0.82
1997.00	0.75	0.66	0.57	0.48
1998.00	0.38	0.27	0.17	0.08
1999.00	-0.02	-0.11	-0.19	-0.26
2000.00	-0.33	-0.39	-0.44	-0.48
2001.00	-0.51	-0.53	-0.55	-0.56
2002.00	-0.57	-0.57	-0.58	-0.58
2003.00	-0.58	-0.59	-0.59	-0.60
2004.00	-0.62	-0.64	-0.65	-0.69
2005.00	-0.71	-0.74	-0.78	-0.82
2006.00	-0.86	-0.90	-0.94	-0.99
2007.00	-1.03	-1.07	-1.12	-1.15
2008.00	-1.20	-1.22	-1.25	-1.27
2009.00	-1.28	-1.29	-1.29	-1.29
2010.00	-1.28	-1.26	-1.24	-1.21
2011.00	-1.17	-1.12	-1.06	-0.98
2012.00	-0.90	-0.81	-0.71	-0.60
2013.00	-0.49	-0.38	-0.25	-0.13
2014.00	-0.00	0.12	0.25	0.36
2015.00	0.48	0.59	0.69	0.79
2016.00	0.88	0.96	1.04	1.10
2017.00	1.16	1.20	0.00	0.00

TABLE 2
UNFILTERED MONTHLY IPO
All season 1891-2005 global HadSST2 Low Frequency EOF 2
projected onto HadISST, January 1871 TO June 2017

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1871	-0.96	-0.36	0.10	-0.45	-1.12	-1.05	-0.26	0.41	-0.31	-0.43	-0.62	-1.15
1872	-1.85	-1.85	-1.37	-2.14	-1.41	-1.11	-0.16	-2.40	-2.50	-3.37	-3.06	-3.77
1873	-3.49	-4.05	-4.00	-1.84	-0.77	-1.49	-1.76	-2.53	-3.02	-3.47	-3.56	-3.34
1874	-2.90	-2.99	-2.40	-1.62	-1.01	-1.18	-2.09	-3.14	-3.83	-3.86	-3.28	-2.41
1875	-1.07	-1.44	-1.43	-1.79	-3.15	-2.85	-3.28	-3.21	-2.79	-2.06	-0.68	-2.47
1876	-2.56	-2.83	-2.78	-2.79	-2.40	-1.64	-1.86	-2.03	-0.98	0.84	2.11	2.56
1877	2.41	2.13	2.01	1.78	2.21	1.92	5.06	4.22	5.53	5.67	5.78	6.14
1878	6.88	7.25	4.63	4.20	4.02	4.55	3.68	1.94	0.20	-0.03	0.50	0.86
1879	1.59	0.88	1.21	0.29	-0.20	-0.81	-0.62	-0.42	-0.65	-0.86	-1.69	-0.70
1880	-0.85	-1.45	-1.67	-1.49	-1.48	-1.40	-0.83	-0.59	-0.16	0.51	1.29	1.19
1881	0.68	0.59	1.47	2.52	3.15	2.46	1.75	0.50	0.47	0.33	0.08	-0.45
1882	-0.82	-1.34	-0.65	0.47	0.83	0.15	-0.77	-0.22	-0.49	-0.37	-0.87	-0.51
1883	0.72	-0.11	-0.44	0.59	0.48	1.26	1.23	0.10	-0.12	-0.46	0.15	-0.42
1884	-0.57	-0.53	0.72	2.00	2.69	1.70	1.83	2.10	1.94	1.91	2.17	2.95
1885	2.75	2.04	2.16	2.00	2.61	2.11	1.44	2.06	2.55	3.09	2.99	2.96
1886	1.84	1.81	1.71	1.69	-1.43	-2.53	-1.03	-1.17	-1.61	-1.65	-2.15	-2.68
1887	-2.48	-0.95	-1.37	-1.66	-0.84	-0.03	-0.65	-1.59	-0.76	0.22	0.96	0.85
1888	1.38	2.96	2.80	2.56	3.56	3.56	3.35	3.37	4.20	5.25	5.80	5.45
1889	3.25	2.66	2.45	2.83	3.26	0.99	1.13	0.01	-0.69	-2.03	-1.61	-2.53
1890	-4.65	-4.03	-1.95	-1.81	-2.04	-2.58	-1.94	-2.17	-2.42	-2.29	-1.83	-0.78
1891	-0.31	-0.39	0.44	0.82	1.31	1.07	1.03	0.25	-0.18	0.19	-0.14	-0.01
1892	-0.36	-0.00	-0.46	-0.33	-0.30	0.03	-0.40	-1.37	-2.34	-3.62	-2.66	-1.83
1893	-1.42	-1.96	-2.36	-2.40	-2.89	-3.21	-4.34	-4.61	-4.13	-4.07	-3.25	-3.48
1894	-2.99	-3.13	-3.24	-2.88	-2.48	-2.08	-1.69	-2.03	-2.84	-2.80	-2.58	-0.93
1895	-0.70	-0.38	-0.01	-0.10	0.15	0.34	0.41	1.86	1.50	1.80	1.66	1.36
1896	1.50	0.71	0.03	0.23	0.81	1.15	2.20	3.31	4.15	3.70	3.99	3.91
1897	4.04	3.72	2.55	2.14	2.38	2.48	2.24	2.12	1.60	1.95	0.83	-0.31
1898	-1.15	-1.02	-0.62	-0.22	0.10	0.33	-0.15	-0.41	-0.96	-0.55	0.20	0.49
1899	-0.23	-0.98	-0.71	-0.38	0.75	1.03	-0.01	2.61	2.43	1.76	3.58	4.82
1900	4.57	4.35	4.33	4.18	3.75	3.79	3.80	3.08	2.43	1.72	1.48	3.90
1901	3.76	2.68	1.95	1.33	0.84	0.56	1.01	0.96	0.34	1.01	1.36	1.95
1902	1.80	2.52	2.73	4.70	3.87	5.41	5.90	4.52	3.41	4.21	3.39	2.95
1903	2.88	2.21	2.53	1.49	2.40	2.83	3.01	2.50	2.03	-0.44	-0.60	0.48
1904	-0.44	-1.24	-1.19	-0.64	0.66	2.23	2.96	3.62	2.64	2.53	2.83	4.64
1905	4.15	4.53	5.30	3.70	4.52	4.01	3.60	5.41	4.13	3.07	3.74	2.75
1906	3.16	3.86	4.22	3.87	2.94	2.31	0.37	-0.10	-2.13	-0.79	1.21	0.34
1907	-1.65	0.26	-0.64	-0.84	0.20	1.54	1.03	0.06	0.83	0.07	0.25	0.34
1908	0.01	0.88	1.44	0.47	0.42	0.93	0.39	-1.71	-0.83	-1.59	-1.56	-1.31
1909	1.01	-0.81	-0.06	-0.93	0.13	-1.10	-1.28	-2.42	-3.98	-4.19	-3.96	-3.04
1910	-3.93	-2.26	-1.85	-2.63	-3.06	-3.14	-1.67	-2.65	-4.11	-3.15	-2.00	-0.94
1911	-0.66	-1.24	-0.60	-1.75	-2.10	-1.26	-0.05	-1.53	-0.79	-0.65	1.19	2.39
1912	2.37	2.15	1.71	2.37	1.43	1.54	1.37	0.90	1.42	0.58	1.47	-0.27
1913	-0.39	2.54	0.85	-1.90	-0.57	1.26	1.05	0.76	-0.25	0.84	1.24	2.09
1914	2.36	1.90	1.84	2.08	0.88	0.93	-0.17	2.08	1.84	0.42	0.45	1.73
1915	2.68	2.53	3.68	3.42	4.07	4.94	2.57	0.80	0.24	-0.06	-0.39	0.22
1916	0.37	-0.83	-0.25	-0.26	0.09	-0.07	-2.20	-3.08	-3.70	-3.66	-4.49	-3.13
1917	-3.37	-2.83	-2.57	-1.70	-1.40	-0.58	0.37	-0.21	-1.28	-1.30	-1.62	-1.85
1918	-1.21	-1.70	-1.62	-1.11	0.18	2.04	2.00	2.31	2.60	3.85	3.85	4.08
1919	5.25	3.47	2.69	3.51	4.18	3.50	2.58	2.47	2.37	1.32	0.24	2.30
1920	2.72	1.76	0.59	-0.11	1.40	0.47	-0.47	-0.32	-1.04	-1.81	-1.12	-0.53
1921	-0.22	-0.95	-2.25	-1.05	-2.14	-1.37	-0.86	-1.13	-1.52	-0.45	-0.40	0.18
1922	-1.08	0.10	-0.06	-0.43	-0.06	-1.59	-1.47	-2.06	-1.66	-0.75	-1.34	-1.29
1923	-0.59	-0.30	-0.50	0.65	-0.83	0.57	0.36	0.26	-0.01	1.98	1.83	0.73
1924	-0.73	1.29	0.03	-0.02	-1.37	-0.86	-1.89	-2.29	-2.31	-1.75	-1.54	-0.44
1925	-1.10	0.51	-0.45	1.23	-0.32	-1.44	1.06	0.53	1.73	2.59	3.59	4.56

1926	4.65	4.57	5.58	3.99	4.58	3.55	2.79	1.92	1.11	0.43	1.42	2.44
1927	2.52	3.18	1.27	1.35	-0.63	0.87	-0.92	-1.44	-0.63	-0.33	0.47	-0.06
1928	2.03	2.59	1.67	0.83	1.14	1.25	0.77	-0.67	-1.55	-1.15	-0.07	-0.15
1929	0.22	0.47	0.55	1.09	0.90	0.77	1.32	0.65	1.50	0.95	0.71	2.02
1930	1.15	2.19	1.74	1.65	0.02	1.50	0.71	2.47	2.52	3.65	4.87	4.57
1931	4.86	6.53	5.88	5.01	4.13	3.66	3.07	1.98	1.10	1.59	1.25	0.59
1932	0.90	1.72	2.08	1.86	1.04	1.79	0.89	0.85	-0.40	-0.12	-0.06	-0.73
1933	0.12	-0.33	-0.22	-0.09	-0.79	-1.75	-3.05	-2.91	-3.05	-2.95	-1.29	-1.79
1934	-0.90	-0.38	0.82	1.11	0.23	-0.29	-1.25	0.18	-0.56	0.60	0.86	-0.25
1935	-0.66	-1.08	-0.75	0.11	0.83	0.42	-0.95	0.47	0.12	0.09	0.66	0.57
1936	1.34	2.37	1.76	2.16	2.41	1.27	1.49	-0.12	-0.76	1.99	1.54	2.84
1937	0.58	2.14	1.11	0.30	-0.85	0.89	0.72	-1.33	0.44	-0.40	0.68	0.46
1938	-0.53	-1.06	-0.95	-1.77	-1.48	-1.93	-2.57	-3.84	-1.11	-1.57	-1.69	-1.45
1939	-0.35	-1.89	-2.17	-0.61	0.48	1.18	0.53	-0.11	-0.37	-2.50	0.90	2.96
1940	3.74	4.38	4.25	3.87	3.59	3.99	1.78	3.02	2.12	2.91	3.40	4.51
1941	4.57	4.98	5.69	6.04	5.71	4.25	4.51	4.79	3.41	3.28	3.16	4.49
1942	3.65	1.82	2.22	2.10	1.54	0.64	-0.24	-0.98	-1.78	-2.53	-2.63	-2.07
1943	-1.44	-0.50	-0.46	0.26	0.42	-0.75	-0.69	-1.46	-1.55	-0.65	-0.43	-0.64
1944	0.56	0.44	-0.46	0.17	-0.48	0.02	0.36	-0.43	-0.32	-1.18	-1.06	-1.25
1945	-0.92	0.37	-2.53	-1.97	-0.08	-0.26	0.22	-0.50	-0.88	-1.56	-1.64	-2.28
1946	-2.04	-0.59	-0.80	-0.62	-1.28	-0.15	-0.32	0.06	0.08	-1.56	-1.24	-0.46
1947	0.72	0.52	2.59	-0.50	-0.55	2.27	0.27	-0.85	-0.47	-0.52	-1.48	0.42
1948	0.54	0.02	0.64	-0.97	-0.15	0.42	0.19	-1.51	-1.64	-2.09	-0.54	-0.39
1949	-2.78	-2.01	-2.51	-1.08	-0.45	-0.97	-1.65	-2.24	-3.62	-4.16	-4.30	-2.88
1950	-3.65	-4.70	-3.66	-3.16	-4.40	-4.08	-5.30	-4.42	-4.61	-3.80	-5.39	-3.61
1951	-3.39	-3.26	-3.33	-2.16	-1.60	-0.38	0.75	-0.76	0.25	0.71	0.90	-0.43
1952	-0.53	0.04	-0.25	-0.18	-0.38	-1.94	-1.75	-2.14	-1.49	-0.95	-1.43	-1.07
1953	0.60	0.50	0.02	0.83	0.62	0.08	-0.31	-1.31	-0.49	-1.45	-1.06	-0.50
1954	-1.37	-1.09	-0.74	-2.00	-1.80	-1.49	-1.64	-2.63	-3.75	-2.79	-2.97	-3.10
1955	-1.93	-3.33	-3.18	-4.29	-4.34	-4.50	-4.71	-4.32	-4.90	-7.17	-6.14	-5.51
1956	-4.77	-4.11	-3.97	-3.86	-3.92	-4.32	-3.49	-3.07	-2.99	-3.80	-3.62	-2.27
1957	-1.83	-1.42	-0.32	-0.20	1.06	1.25	2.02	0.82	1.27	1.95	1.59	1.99
1958	2.90	2.89	1.84	1.49	2.09	1.37	0.83	1.98	0.54	-0.11	0.57	1.29
1959	1.21	0.86	0.23	0.07	0.26	0.24	-0.20	-0.97	-0.71	0.35	0.22	-0.24
1960	0.29	0.36	0.50	0.65	0.55	-0.38	-0.83	-0.86	-1.47	-1.53	-2.08	-0.26
1961	0.37	1.05	0.48	0.57	-0.52	-0.60	-2.16	-1.59	-2.72	-3.64	-2.83	-3.21
1962	-2.61	-2.06	-2.16	-2.43	-2.53	-2.84	-2.00	-1.28	-3.05	-2.65	-1.81	-1.44
1963	-0.93	-0.78	-0.69	-0.35	-0.94	-1.27	-0.60	-0.49	1.01	0.75	0.29	0.85
1964	0.51	0.05	-1.27	-2.06	-3.61	-3.08	-2.54	-3.38	-2.81	-2.81	-2.39	-2.32
1965	-1.86	-1.15	-0.51	0.34	0.79	0.52	1.07	2.49	1.93	1.71	2.20	2.01
1966	1.19	0.66	0.21	0.37	0.04	0.12	0.59	0.50	0.50	-0.49	-0.99	-0.77
1967	-1.04	-1.19	-0.77	-1.11	-1.33	-1.34	-2.07	-3.62	-2.66	-2.83	-2.43	-2.42
1968	-2.31	-1.35	-1.64	-2.16	-1.94	-0.37	0.09	0.41	0.54	0.99	1.44	1.70
1969	1.81	1.89	1.84	1.83	1.86	2.30	1.41	0.79	0.78	3.12	2.49	2.56
1970	2.43	1.46	1.49	0.18	-0.29	-0.88	-1.73	-2.74	-2.81	-2.88	-2.78	-3.74
1971	-4.59	-5.29	-4.63	-3.47	-3.00	-3.92	-3.47	-2.39	-1.94	-2.72	-3.36	-3.56
1972	-1.93	-0.93	-1.26	-0.53	0.02	0.85	0.78	2.48	2.19	2.81	2.46	3.25
1973	2.22	0.21	-0.26	-1.33	-1.43	-2.07	-2.63	-2.73	-3.17	-3.58	-4.55	-5.06
1974	-5.13	-5.15	-4.44	-3.46	-2.42	-2.63	-2.45	-1.77	-2.36	-2.84	-2.43	-2.83
1975	-3.15	-2.68	-2.78	-2.52	-3.82	-2.80	-2.69	-3.33	-4.51	-5.44	-5.34	-5.80
1976	-4.56	-2.91	-2.65	-2.11	-1.13	-0.11	0.87	2.27	2.49	3.04	3.38	2.81
1977	3.31	2.69	1.47	0.55	1.43	2.36	1.96	1.25	1.18	1.83	2.08	1.72
1978	2.54	1.61	1.72	1.02	1.33	0.55	-0.02	-0.01	0.07	1.21	1.67	0.75
1979	0.74	-0.02	-0.02	1.16	1.94	1.37	1.07	1.32	2.32	2.94	2.21	2.67
1980	2.16	2.56	2.58	2.82	2.99	1.45	1.19	1.03	0.71	1.80	2.17	2.56
1981	1.41	0.79	1.91	1.23	2.03	2.11	1.60	0.87	1.78	0.80	0.82	1.27
1982	1.24	0.68	0.79	1.45	2.16	2.35	2.80	3.17	4.55	4.96	4.59	5.33
1983	5.49	6.25	6.18	5.20	4.74	5.52	5.30	4.30	1.90	1.28	1.21	1.79
1984	1.81	1.40	0.99	0.54	-0.00	-0.89	-0.96	-0.60	0.22	-0.60	-0.89	-1.80
1985	-0.79	-0.86	-0.86	-0.82	-1.00	-0.22	0.14	-0.12	-0.40	-0.79	-1.28	-0.39
1986	-0.46	0.54	0.64	0.72	0.64	1.39	2.07	1.31	1.91	2.99	3.52	3.43
1987	3.39	3.78	4.95	4.88	5.16	4.33	4.79	5.14	5.48	5.12	4.48	3.72
1988	2.88	2.14	2.66	1.84	0.65	-0.64	-1.66	-1.54	-1.81	-2.27	-2.01	-2.44
1989	-3.72	-3.02	-3.01	-2.33	-2.14	-1.68	-0.73	-1.72	-1.36	-1.39	-1.08	0.08
1990	-0.63	-0.73	-1.08	-0.24	0.08	-0.19	-0.10	-0.01	0.07	-0.46	-1.01	-0.94
1991	-0.48	-0.29	-0.01	-0.18	0.96	0.56	0.99	0.75	1.27	2.28	2.68	2.23

1992	2.46	2.40	2.54	3.74	4.99	3.52	3.48	2.32	2.00	2.55	2.28	1.16
1993	2.10	2.68	2.87	3.37	4.14	4.01	2.84	2.75	2.08	2.34	1.91	1.62
1994	1.67	0.57	1.36	2.03	2.06	1.83	0.89	-0.25	0.20	1.76	0.84	0.64
1995	1.46	1.57	1.33	1.42	2.03	2.05	2.62	0.95	1.44	0.18	0.01	-0.33
1996	-0.51	-0.02	0.47	0.40	0.69	1.04	0.59	-0.13	-0.10	0.02	0.41	-0.77
1997	0.07	-0.38	1.03	2.10	3.82	4.54	3.88	4.90	5.45	5.67	5.97	5.40
1998	5.51	5.13	4.81	3.24	2.61	1.36	-0.03	-0.21	-0.75	-2.03	-1.94	-2.74
1999	-3.03	-2.96	-2.18	-2.66	-2.85	-3.37	-3.47	-3.22	-3.56	-4.24	-4.02	-4.06
2000	-3.91	-3.15	-2.71	-1.74	-2.47	-2.58	-2.39	-2.29	-2.17	-2.31	-2.54	-2.01
2001	-1.94	-1.94	-0.57	-0.41	-0.60	-0.96	-1.88	-1.61	-1.88	-1.91	-1.41	-1.74
2002	-1.09	-1.41	0.30	-0.12	-0.29	-0.29	0.03	-0.08	0.00	0.89	2.59	2.67
2003	2.30	1.75	1.62	1.04	-0.63	-0.28	0.08	0.33	-0.35	1.20	1.16	0.85
2004	1.23	0.67	1.05	1.17	0.56	-0.39	-0.47	-0.29	0.22	-0.04	-0.14	-0.13
2005	0.08	-0.24	1.01	0.63	1.49	0.77	-0.28	-0.44	-1.53	-2.52	-3.30	-2.47
2006	-1.12	-0.23	-0.20	-0.60	0.06	0.28	0.00	-0.26	0.05	0.49	1.25	1.54
2007	0.66	0.64	-0.41	0.01	-0.89	-0.80	-0.03	-1.27	-2.45	-4.00	-3.96	-4.17
2008	-4.54	-3.92	-3.38	-2.81	-2.22	-2.38	-2.11	-1.30	-1.46	-1.39	-1.66	-2.31
2009	-2.20	-2.14	-2.21	-0.76	0.42	1.01	1.22	1.28	2.02	1.99	2.23	2.09
2010	1.86	1.56	1.56	1.67	0.85	-1.24	-2.85	-4.59	-5.13	-4.55	-4.39	-5.05
2011	-5.41	-4.38	-3.32	-2.76	-2.15	-2.57	-3.28	-3.75	-3.95	-3.77	-4.02	-4.15
2012	-3.11	-0.79	-0.78	-0.05	-0.66	-0.07	-0.47	-0.60	-1.03	-0.04	0.17	-0.42
2013	-0.99	-0.73	-0.36	-0.44	-0.87	-2.27	-2.12	-2.35	-1.59	-1.09	-0.98	-1.47
2014	-1.43	-1.45	0.29	0.49	1.31	0.30	0.19	-0.36	-0.32	1.08	1.94	2.00
2015	1.43	0.98	1.24	2.50	2.44	3.34	4.46	3.96	4.43	4.71	3.82	3.94
2016	4.93	3.18	4.40	3.60	3.13	2.39	0.79	0.06	-0.77	-0.99	0.45	0.06
2017	0.75	1.41	1.31	1.30	1.35	0.52	0.00	0.00	0.00	0.00	0.00	0.00