[] Dendrochronology Program Library Run QUVE Program COF 10:47 Fri 04 Sep 2020 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 31295

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: SCBI\_quve.rwl

CONTENTS:

Part 1: Title page, options selected, summary, absent rings by series

Part 2: Histogram of time spans

Part 3: Master series with sample depth and absent rings by year

Part 4: Bar plot of Master Dating Series

Part 5: Correlation by segment of each series with Master

Part 6: Potential problems: low correlation, divergent year-to-year changes, absent rings, outliers

Part 7: Descriptive statistics

RUN CONTROL OPTIONS SELECTED VALUE

1 Cubic smoothing spline 50% wavelength cutoff for filtering

32 years

2 Segments examined are 50 years lagged successively by 25 years

3 Autoregressive model applied A Residuals are used in master dating series and testing

4 Series transformed to logarithms Y Each series log-transformed for master dating series and testing

5 CORRELATION is Pearson (parametric, quantitative)

Critical correlation, 99% confidence level .3281

6 Master dating series saved N

7 Ring measurements listed N

8 Parts printed 1234567

9 Absent rings are omitted from master series and segment correlations (Y)

Time span of Master dating series is 1824 to 2017 194 years

Continuous time span is 1824 to 2017 194 years

Portion with two or more series is 1889 to 2017 129 years

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*C\* Number of dated series 83 \*C\*

\*O\* Master series 1824 2017 194 yrs \*O\*

\*F\* Total rings in all series 7054 \*F\*

\*E\* Total dated rings checked 6989 \*E\*

\*C\* Series intercorrelation .518 \*C\*

\*H\* Average mean sensitivity .183 \*H\*

\*A\* Segments, possible problems 29 \*A\*

\*\*\* Mean length of series 85.0 \*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

ABSENT RINGS listed by SERIES: (See Master Dating Series for absent rings listed by year)

No ring measurements of zero value

PART 2: TIME PLOT OF TREE-RING SERIES: 10:47 Fri 04 Sep 2020 Page 2

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

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. . . . . . . . . . . . . . . . <=================> . 132396 1 1824 2009 186

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PART 2: TIME PLOT OF TREE-RING SERIES: 10:47 Fri 04 Sep 2020 Page 3

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050

PART 3: Master Dating Series: 10:47 Fri 04 Sep 2020 Page 4

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Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

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1850 .212 1 1900 .543 6 1950 .527 78 2000 -.828 83

1851 1.328 1 1901 .094 6 1951 1.064 78 2001 1.106 83

1852 2.088 1 1902 -1.215 7 1952 -.557 78 2002 .721 83

1853 .246 1 1903 1.261 8 1953 -.501 78 2003 .597 83

1854 -2.698 1 1904 .689 9 1954 -1.217 78 2004 -.047 83

1855 -.728 1 1905 .209 10 1955 -1.055 78 2005 .624 82

1856 -2.747 1 1906 -.152 10 1956 .192 78 2006 -.078 82

1857 .585 1 1907 -.714 10 1957 .736 78 2007 -.245 81

1858 -1.531 1 1908 -.282 10 1958 1.728 80 2008 -.297 81

1859 -.174 1 1909 .080 12 1959 -.388 80 2009 .442 79

1860 -.301 1 1910 .272 12 1960 .168 81 2010 .810 11

1861 .541 1 1911 -1.336 13 1961 .232 81 2011 .665 11

1862 1.128 1 1912 -.420 15 1962 .177 81 2012 -.530 11

1863 .534 1 1913 -.610 17 1963 .382 81 2013 -.699 11

1864 -1.810 1 1914 -.838 18 1964 -.271 81 2014 -1.017 9

1865 1.036 1 1915 .985 19 1965 -.401 81 2015 -1.102 8

1866 -.334 1 1916 .885 21 1966 -1.261 81 2016 .158 4

1867 -.048 1 1917 .097 24 1967 -.609 81 2017 -2.319 2

1868 -.232 1 1918 -.703 27 1968 1.460 82

1869 3.003 1 1919 .714 29 1969 .840 83

1870 2.309 1 1920 .154 30 1970 1.476 83

1871 2.700 1 1921 .737 31 1971 -.049 83

1872 .141 1 1922 .874 33 1972 -.476 83

1873 .951 1 1923 -.405 38 1973 -1.078 83

1824 1.546 1 1874 -.368 1 1924 .496 40 1974 -.750 83

1825 .230 1 1875 1.271 1 1925 -.899 44 1975 .444 83

1826 -2.143 1 1876 -.203 1 1926 .213 45 1976 .413 83

1827 -.672 1 1877 .401 1 1927 .730 47 1977 -1.225 83

1828 -1.190 1 1878 -.365 1 1928 .557 47 1978 .967 83

1829 -1.507 1 1879 -.160 1 1929 .279 47 1979 .248 83

1830 .482 1 1880 -2.383 1 1930 -1.298 51 1980 -1.093 83

1831 .901 1 1881 1.090 1 1931 -.747 53 1981 -.519 83

1832 1.727 1 1882 -1.555 1 1932 -1.556 54 1982 .184 83

1833 2.272 1 1883 .625 1 1933 -.109 55 1983 .208 83

1834 .366 1 1884 -.295 1 1934 -.135 57 1984 -.039 83

1835 -.452 1 1885 .116 1 1935 -.097 58 1985 -.436 83

1836 .842 1 1886 -1.007 1 1936 .286 59 1986 .967 83

1837 1.116 1 1887 -1.440 1 1937 .710 62 1987 .547 83

1838 -.541 1 1888 -2.531 1 1938 .945 62 1988 -.493 83

1839 -.687 1 1889 -1.360 3 1939 -.247 66 1989 .074 83

1840 2.150 1 1890 -1.538 3 1940 .559 66 1990 .887 83

1841 -.733 1 1891 .916 3 1941 .262 66 1991 -.700 83

1842 .031 1 1892 1.110 3 1942 .339 67 1992 .130 83

1843 -.533 1 1893 -.198 4 1943 -.545 69 1993 .507 83

1844 -.919 1 1894 .087 4 1944 -.429 70 1994 .536 83

1845 -3.319 1 1895 .208 5 1945 .574 71 1995 .439 83

1846 1.621 1 1896 .865 6 1946 -.106 73 1996 .038 83

1847 -.321 1 1897 .466 6 1947 -.609 73 1997 -1.885 83

1848 -.194 1 1898 .076 6 1948 -.140 74 1998 .187 83

1849 1.683 1 1899 -.157 6 1949 .639 75 1999 -.936 83

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PART 4: Master Bar Plot: 10:47 Fri 04 Sep 2020 Page 5

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Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value

1850------A 1900-------B 1950-------B 2000--c

1851----------E 1901-----@ 1951---------D 2001---------D

1852----------H 1902-e 1952--b 2002--------C

1853------A 1903---------E 1953--b 2003--------B

1854k 1904--------C 1954-e 2004----@

1855--c 1905------A 1955-d 2005--------B

1856k 1906----a 1956------A 2006----@

1857-------B 1907--c 1957--------C 2007----a

1858f 1908---a 1958----------G 2008---a

1859----a 1909-----@ 1959---b 2009-------B

1860---a 1910------A 1960------A 2010--------C

1861-------B 1911e 1961------A 2011--------C

1862---------E 1912---b 1962------A 2012--b

1863-------B 1913--b 1963-------B 2013--c

1864g 1914-c 1964----a 2014-d

1865---------D 1915---------D 1965---b 2015-d

1866---a 1916---------D 1966-e 2016-----A

1867----@ 1917-----@ 1967--b 2017i

1868----a 1918--c 1968----------F

1869----------L 1919--------C 1969---------C

1870----------I 1920-----A 1970----------F

1871----------K 1921--------C 1971----@

1872-----A 1922---------C 1972---b

1873---------D 1923---b 1973-d

1824----------F 1874---a 1924-------B 1974--c

1825------A 1875---------E 1925-d 1975-------B

1826i 1876----a 1926------A 1976-------B

1827--c 1877-------B 1927--------C 1977-e

1828-e 1878---a 1928-------B 1978---------D

1829f 1879----a 1929------A 1979------A

1830-------B 1880j 1930-e 1980-d

1831---------D 1881---------D 1931--c 1981--b

1832----------G 1882f 1932f 1982------A

1833----------I 1883--------C 1933----@ 1983------A

1834-------A 1884---a 1934----a 1984----@

1835---b 1885-----@ 1935----@ 1985---b

1836---------C 1886-d 1936------A 1986---------D

1837---------D 1887f 1937--------C 1987-------B

1838--b 1888j 1938---------D 1988---b

1839--c 1889e 1939----a 1989-----@

1840----------I 1890f 1940-------B 1990---------D

1841--c 1891---------D 1941------A 1991--c

1842-----@ 1892---------D 1942------A 1992-----A

1843--b 1893----a 1943--b 1993-------B

1844-d 1894-----@ 1944---b 1994-------B

1845m 1895------A 1945-------B 1995-------B

1846----------F 1896---------C 1946----@ 1996-----@

1847---a 1897-------B 1947--b 1997h

1848----a 1898-----@ 1948----a 1998------A

1849----------G 1899----a 1949--------C 1999-d

PART 5: CORRELATION OF SERIES BY SEGMENTS: 10:47 Fri 04 Sep 2020 Page 5

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Correlations of 50-year dated segments, lagged 25 years

Flags: A = correlation under .3281 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1875 1900 1925 1950 1975

1924 1949 1974 1999 2024

--- -------- --------- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----

1 132396 1824 2009 .57 .56 .41 .55 .53

2 52276 1889 2009 .40 .45 .54 .53 .52

3 80576 1889 2009 .38 .51 .66 .78 .74

4 142568 1893 2015 .67 .73 .57 .49 .56

5 142575 1895 2009 .46 .53 .54 .49 .49

6 182130 1896 2009 .48 .51 .39 .61 .59

7 140756 1902 2009 .26A .32B .61 .58

8 130991 1903 2009 .26B .64 .67 .68

9 140934 1904 2009 .38 .76 .51 .39

10 131009 1905 2009 .61 .68 .74 .64

11 70228A 1909 2017 .63 .78 .84 .72

12 121379 1909 2009 .54 .48 .53 .51

13 90577 1911 2009 .33A .53 .66 .60

14 102238 1912 2009 .54 .54 .67 .66

15 182024 1912 2017 .30A .46 .34 .28A

16 80046 1913 2009 .73 .76 .76 .69

17 140761 1913 2009 .51 .56 .64 .54

18 160935 1914 2009 .54 .62 .70 .70

19 62007 1915 2009 .27B .51 .65 .60

20 140931 1916 2009 .55 .62 .69 .64

21 162566 1916 2009 .62 .67 .73 .74

22 91493 1917 2009 .27A .49 .29A .15B

23 110920 1917 2009 .62 .64 .78 .76

24 152645 1917 2009 .56 .64 .68 .72

25 42248 1918 2009 .62 .65 .71 .73

26 42304 1918 2009 .44 .46 .57 .49

27 80159 1918 2009 .51 .48 .45 .35

28 82418A 1919 2016 .42 .47 .39 .32A

29 140736 1919 2009 .57 .58 .60 .62

30 42283 1920 2009 .34 .39 .69 .67

31 132542 1921 2009 .32A .41 .62 .68

32 80148 1922 2009 .71 .71 .64 .67

33 80156 1922 2009 .62 .63 .65 .58

34 50404 1923 2009 .25A .28A .38 .30A

35 80056 1923 2009 .62 .64 .60 .52

36 82434 1923 2009 .54 .58 .57 .42B

37 112206 1923 2009 .58 .56 .57 .58

38 150951 1923 2009 .31A .40 .78 .67

39 112440 1924 2014 .72 .72 .69 .65

40 160921 1924 2006 .57 .61 .66 .70

41 32177A 1925 2015 .62 .75 .76

42 52403 1925 2009 .62 .35 .27A

43 152651 1925 2015 .70 .63 .59

44 171167 1925 2009 .48 .64 .56

45 110819 1926 2009 .48 .69 .73

46 32368 1927 2009 .42 .71 .73

47 42207 1927 2009 .46 .55 .51

48 90650 1930 2009 .38 .49 .48

49 152656 1930 2009 .58 .59 .50

50 190807 1930 2013 .50 .53 .71

51 192239 1930 2009 .41 .47 .38

52 100551 1931 2009 .63 .67 .53

53 101123 1931 2009 .49 .56 .50

54 101215 1932 2009 .50 .66 .68

55 40533 1933 2009 .77 .80 .70

56 32493 1934 2009 .61 .72 .68

57 180929 1934 2009 .51 .63 .68

58 190830 1935 2009 .63 .62 .58

59 150957 1936 2009 .70 .79 .74

60 90634 1937 2009 .48 .43 .36B

61 111163 1937 2009 .63 .50 .47

62 130911 1937 2008 .44 .63 .60

63 22371 1939 2009 .56 .69 .57

64 32498 1939 2009 .60 .73 .71

65 90104 1939 2009 .53 .49 .50

66 140733 1939 2009 .53 .48 .34B

67 152490 1942 2009 .70 .70 .70

68 91499 1943 2009 .47 .52 .39

69 180778 1943 2013 .36 .59 .53

70 132250 1944 2009 .60 .69 .66

71 90631 1945 2004 .39 .28A .31A

72 82059r 1946 2016 .23A .42 .43

73 82120 1946 2009 .50 .56 .55

74 90084 1948 2009 .59 .59 .53

75 132232 1949 2009 .35 .31A .27A

76 10517 1950 2008 .37 .34

77 142015 1950 2009 .60 .63

78 182686 1950 2009 .07B .00B

79 60549 1958 2009 .64 .60

80 120162 1958 2009 .44 .51

81 12445A 1960 2009 .12B

82 122521 1968 2015 .15B

83 132386 1969 2009 .65

Av segment correlation .49 .50 .54 .58 .55

PART 6: POTENTIAL PROBLEMS: 10:47 Fri 04 Sep 2020 Page 6

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For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 50-year segments of series filtered with 32-year spline,

at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

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132396 1824 to 2009 186 years Series 1

[\*] Early part of series cannot be checked from 1824 to 1888 -- not matched by another series

[B] Entire series, effect on correlation ( .525) is:

Lower 1993< -.022 1889< -.020 1943> -.015 1937< -.013 1973> -.011 1939< -.010 Higher 1911 .034 1997 .029

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1889 -5.3 SD; 1943 +3.4 SD

====================================================================================================================================

52276 1889 to 2009 121 years Series 2

[B] Entire series, effect on correlation ( .474) is:

Lower 1988< -.043 1960< -.019 1889> -.017 1921< -.014 1928< -.014 1890< -.013 Higher 1911 .021 1977 .021

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1889 +3.0 SD; 1988 -5.4 SD

====================================================================================================================================

80576 1889 to 2009 121 years Series 3

[B] Entire series, effect on correlation ( .545) is:

Lower 1902> -.041 1890> -.035 1895< -.014 1933< -.011 1896< -.010 1889> -.010 Higher 1930 .029 1997 .018

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1890 +5.1 SD; 1902 +4.4 SD

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142568 1893 to 2015 123 years Series 4

[B] Entire series, effect on correlation ( .581) is:

Lower 1993< -.027 1997> -.022 1956< -.019 1994< -.013 1980> -.013 1898< -.012 Higher 1911 .026 1977 .018

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1894 +3.4 SD

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142575 1895 to 2009 115 years Series 5

[B] Entire series, effect on correlation ( .500) is:

Lower 1967< -.039 1911> -.023 1902> -.019 1986< -.016 1980> -.012 1952> -.011 Higher 1978 .013 1959 .012

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1903 +3.3 SD; 1967 -5.6 SD

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182130 1896 to 2009 114 years Series 6

[B] Entire series, effect on correlation ( .543) is:

Lower 1940< -.034 1932> -.024 1967< -.021 1941< -.017 1915< -.015 1898> -.011 Higher 1911 .034 1977 .024

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1932 +3.4 SD; 2009 +3.1 SD

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140756 1902 to 2009 108 years Series 7

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1902 1951 0 .23 .20 .12 .18 -.13 .09 -.12 -.05 -.15 -.06 .26\*-.22 -.14 -.22 -.04 -.12 -.01 .19 -.27 .20 -.09

1925 1974 -10 .35\*-.04 .09 .07 -.08 .13 -.07 -.17 -.17 -.01 .32| .09 .08 -.22 -.28 -.21 .00 .19 .01 -.05 .02

[B] Entire series, effect on correlation ( .437) is:

Lower 1940< -.091 1925> -.019 1921< -.016 1911> -.015 1978< -.014 1973> -.010 Higher 1968 .025 1902 .020

1902 to 1951 segment:

Lower 1940< -.170 1925> -.036 1921< -.030 1911> -.022 1937< -.013 1942< -.011 Higher 1902 .068 1903 .041

1925 to 1974 segment:

Lower 1940< -.191 1925> -.038 1973> -.021 1959> -.018 1937< -.014 1942< -.013 Higher 1968 .070 1954 .027

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1925 +3.0 SD; 1940 -5.9 SD; 1968 +3.1 SD

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130991 1903 to 2009 107 years Series 8

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1903 1952 -7 -.19 -.08 -.23 .37\*-.20 -.04 .16 .15 .08 .06 .26|-.17 .05 -.04 -.10 .06 -.09 -.05 -.14 .12 -.20

[B] Entire series, effect on correlation ( .499) is:

Lower 1905< -.033 1903< -.029 1923> -.026 1988> -.020 1951< -.016 1911> -.016 Higher 1997 .026 1932 .020

1903 to 1952 segment:

Lower 1905< -.059 1923> -.053 1903< -.053 1951< -.031 1930> -.020 1911> -.019 Higher 1932 .074 1925 .041

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1923 +4.2 SD; 1988 +3.5 SD

====================================================================================================================================

140934 1904 to 2009 106 years Series 9

[B] Entire series, effect on correlation ( .431) is:

Lower 1911> -.056 1995< -.029 1904< -.016 1906> -.014 2009< -.013 1914> -.011 Higher 1930 .025 1932 .017

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1906 +3.4 SD; 1911 +4.0 SD

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131009 1905 to 2009 105 years Series 10

[B] Entire series, effect on correlation ( .644) is:

Lower 1997> -.014 1936< -.010 2009< -.010 1930> -.009 1990< -.008 1944< -.008 Higher 1977 .016 1980 .012

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70228A 1909 to 2017 109 years Series 11

[B] Entire series, effect on correlation ( .688) is:

Lower 1911> -.028 1918> -.014 2014> -.014 1927< -.014 2016< -.012 2015> -.011 Higher 1997 .037 1930 .016

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121379 1909 to 2009 101 years Series 12

[B] Entire series, effect on correlation ( .530) is:

Lower 1983< -.026 1997> -.024 1932> -.014 1966> -.013 1916< -.011 1943> -.011 Higher 1911 .035 1930 .016

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1915 +3.3 SD; 1929 +3.3 SD; 1994 +3.1 SD

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90577 1911 to 2009 99 years Series 13

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1911 1960 0 -.37 .20 .07 -.01 -.05 .10 .02 -.29 .01 -.09 .33\* .04 -.23 -.01 -.15 .05 .07 .22 .19 -.16 -.09

[B] Entire series, effect on correlation ( .449) is:

Lower 1922< -.090 2009< -.020 1941< -.011 1973> -.009 1952> -.008 2000> -.007 Higher 1997 .033 1980 .024

1911 to 1960 segment:

Lower 1922< -.141 1941< -.016 1952> -.015 1919< -.009 1960< -.008 1924< -.006 Higher 1959 .027 1951 .024

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1921 +4.1 SD; 1939 -4.6 SD; 1980 -4.8 SD

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102238 1912 to 2009 98 years Series 14

[B] Entire series, effect on correlation ( .610) is:

Lower 1977> -.024 1926< -.022 1958< -.012 2001< -.011 1988> -.011 1913> -.009 Higher 1997 .054 1968 .014

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182024 1912 to 2017 106 years Series 15

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1912 1961 0 -.33 .01 -.09 -.16 .23 -.03 .08 -.01 .01 .21 .30\* .21 -.28 .03 -.24 -.07 -.02 .07 .17 -.09 -.10

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1968 2017 0 .15 -.27 .09 .09 -.02 .02 .03 -.02 .06 -.09 .28\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .297) is:

Lower 1997> -.047 1988> -.023 1918> -.019 2015> -.018 1930> -.012 2001< -.012 Higher 2017 .037 1980 .022

1912 to 1961 segment:

Lower 1918> -.050 1930> -.034 1916< -.016 1959> -.013 1936< -.013 1915< -.012 Higher 1947 .029 1951 .028

1968 to 2017 segment:

Lower 1997> -.086 1988> -.042 2015> -.033 2001< -.023 1986< -.016 2000> -.016 Higher 2017 .081 1980 .043

[E] Outliers 6 3.0 SD above or -4.5 SD below mean for year

1918 +3.8 SD; 1921 +3.2 SD; 1988 +4.7 SD; 1989 +3.3 SD; 1997 +4.2 SD; 2015 +3.6 SD

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80046 1913 to 2009 97 years Series 16

[B] Entire series, effect on correlation ( .705) is:

Lower 1977> -.024 2006< -.021 1990< -.016 1952> -.014 1942< -.011 1939> -.010 Higher 1997 .035 1930 .023

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

2003 +3.3 SD

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140761 1913 to 2009 97 years Series 17

[B] Entire series, effect on correlation ( .521) is:

Lower 1918< -.033 1977> -.029 1980> -.022 1940< -.021 1968< -.019 1942< -.010 Higher 1997 .043 1991 .016

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1918 -5.9 SD

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160935 1914 to 2009 96 years Series 18

[B] Entire series, effect on correlation ( .625) is:

Lower 1915< -.031 1928< -.026 1999> -.020 1991> -.016 1954> -.010 1955> -.009 Higher 1997 .058 1932 .014

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62007 1915 to 2009 95 years Series 19

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1915 1964 8 -.21 .11 .04 -.14 -.19 .10 .01 -.27 .06 -.17 .27| .12 -.11 .13 -.18 -.04 -.07 .11 .35\*-.12 .10

[B] Entire series, effect on correlation ( .403) is:

Lower 1922< -.108 1919< -.015 1928< -.012 1974> -.012 2003< -.008 1982< -.008 Higher 1959 .021 2001 .020

1915 to 1964 segment:

Lower 1922< -.155 1919< -.023 1928< -.016 1952> -.011 1926< -.010 1923> -.009 Higher 1959 .050 1921 .024

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1921 +4.3 SD; 1974 +3.4 SD

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140931 1916 to 2009 94 years Series 20

[B] Entire series, effect on correlation ( .598) is:

Lower 1980> -.027 1930> -.025 1947> -.015 1921< -.013 1986< -.012 1948< -.009 Higher 1997 .033 1977 .024

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1940 +4.1 SD

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162566 1916 to 2009 94 years Series 21

[B] Entire series, effect on correlation ( .694) is:

Lower 1917< -.024 1977> -.012 1959> -.011 1988> -.009 1918> -.008 1947> -.007 Higher 1997 .051 1980 .013

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1954 -4.5 SD

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91493 1917 to 2009 93 years Series 22

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1917 1966 0 -.19 -.08 .05 .06 .19 .10 -.31 -.13 -.11 .18 .27\* .24 .02 -.03 -.11 -.05 -.02 -.10 -.10 -.05 -.12

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1950 1999 0 .15 -.12 .12 .14 -.15 -.13 -.12 -.13 -.06 -.24 .29\* .28 -.02 -.04 .16 -.13 -.11 .09 .17 -.10 .04

1960 2009 -6 .02 -.07 -.02 .04 .22\*-.21 .04 .16 -.14 -.22 .15| .21 -.13 -.08 .11 -.11 -.12 .02 .05 - -

[B] Entire series, effect on correlation ( .194) is:

Lower 2003< -.073 1997> -.050 1919< -.025 1918> -.019 1945< -.010 1976< -.009 Higher 1930 .030 1968 .030

1917 to 1966 segment:

Lower 1919< -.064 1918> -.046 1917< -.029 1945< -.027 1946> -.020 1951< -.018 Higher 1930 .065 1925 .026

1950 to 1999 segment:

Lower 1997> -.121 1989< -.029 1976< -.027 1985> -.022 1951< -.019 1950< -.015 Higher 1968 .064 1977 .028

1960 to 2009 segment:

Lower 2003< -.129 1997> -.088 1985> -.014 1976< -.014 1989< -.013 2004> -.011 Higher 1968 .056 1978 .023

[C] Year-to-year changes diverging by over 4.0 std deviations:

2003 2004 4.6 SD

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1985 +3.3 SD; 1997 +3.5 SD; 2003 -6.9 SD

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110920 1917 to 2009 93 years Series 23

[B] Entire series, effect on correlation ( .682) is:

Lower 1940< -.043 1977> -.017 1947> -.015 1959> -.011 1946< -.010 2000> -.007 Higher 1997 .045 1932 .013

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152645 1917 to 2009 93 years Series 24

[B] Entire series, effect on correlation ( .632) is:

Lower 1918> -.026 1956< -.022 1939> -.018 1920< -.011 1961< -.010 2009< -.008 Higher 1997 .028 1930 .017

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1918 +3.2 SD; 1939 +3.7 SD; 2001 +3.5 SD

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42248 1918 to 2009 92 years Series 25

[B] Entire series, effect on correlation ( .674) is:

Lower 1977> -.024 1959> -.021 1954> -.015 1952> -.012 1931> -.011 1933< -.011 Higher 1997 .038 1930 .029

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42304 1918 to 2009 92 years Series 26

[B] Entire series, effect on correlation ( .471) is:

Lower 1959> -.018 1930> -.015 1972< -.015 1977> -.014 1919< -.014 2001< -.014 Higher 1980 .028 1968 .013

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80159 1918 to 2009 92 years Series 27

[B] Entire series, effect on correlation ( .457) is:

Lower 1975< -.040 2000> -.032 1961< -.027 1947> -.018 1921< -.014 1971> -.012 Higher 1930 .052 1977 .027

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1947 +3.7 SD; 2000 +5.6 SD

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82418A 1919 to 2016 98 years Series 28

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1967 2016 0 -.04 -.32 .15 .05 -.08 -.01 -.28 .09 .13 -.28 .32\* .27 - - - - - - - - -

[B] Entire series, effect on correlation ( .357) is:

Lower 2011< -.037 1987< -.027 1993< -.019 1980> -.016 1997> -.015 1928< -.014 Higher 1986 .021 1970 .019

1967 to 2016 segment:

Lower 2011< -.074 1987< -.055 1993< -.038 1980> -.028 1997> -.023 2013> -.015 Higher 1986 .044 1970 .039

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1947 -4.9 SD; 1986 +3.8 SD; 2008 +3.3 SD

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140736 1919 to 2009 91 years Series 29

[B] Entire series, effect on correlation ( .580) is:

Lower 1997> -.029 1950< -.016 2003< -.013 1928< -.013 1954> -.011 1991> -.010 Higher 1977 .023 1980 .015

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1922 +3.6 SD; 1937 +3.1 SD; 1976 +3.3 SD

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42283 1920 to 2009 90 years Series 30

[B] Entire series, effect on correlation ( .529) is:

Lower 1999> -.022 1924< -.018 1930> -.018 1947> -.016 1945< -.013 1993< -.011 Higher 1997 .062 1977 .041

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1947 +3.2 SD; 1999 +3.8 SD

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132542 1921 to 2009 89 years Series 31

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1921 1970 0 -.06 -.17 -.29 .09 .01 .10 .00 -.21 .15 -.24 .32\* .11 -.20 -.02 -.11 .24 -.05 .16 -.05 -.16 -.03

[B] Entire series, effect on correlation ( .477) is:

Lower 1949< -.087 1958< -.032 1922< -.024 1923> -.014 1944> -.011 1945< -.010 Higher 1997 .090 1930 .027

1921 to 1970 segment:

Lower 1949< -.144 1958< -.053 1922< -.036 1923> -.024 1944> -.018 1945< -.017 Higher 1930 .072 1959 .034

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1944 +3.1 SD; 1949 -6.0 SD; 2002 +3.0 SD

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80148 1922 to 2009 88 years Series 32

[B] Entire series, effect on correlation ( .685) is:

Lower 1977> -.023 1952> -.015 1990< -.013 1950< -.009 1956< -.009 1946< -.008 Higher 1997 .043 1930 .024

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1978 +3.9 SD

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80156 1922 to 2009 88 years Series 33

[B] Entire series, effect on correlation ( .589) is:

Lower 1980> -.031 1932> -.029 1929< -.026 1938< -.013 2004< -.011 1955> -.010 Higher 1930 .032 1997 .029

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1932 +3.0 SD; 1981 +3.1 SD

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50404 1923 to 2009 87 years Series 34

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1923 1972 0 -.08 -.25 .18 .17 .14 .20 -.28 .03 .03 -.05 .25\*-.11 .21 -.18 .17 .03 .08 -.12 -.08 -.20 .01

1925 1974 0 -.06 -.25 .17 .18 .13 .15 -.32 .00 .02 -.01 .28\*-.10 .21 -.18 .15 -.01 .14 -.05 -.04 -.20 .00

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1960 2009 0 .03 -.24 .02 -.01 .09 -.05 -.16 .02 -.13 -.01 .30\* .04 .16 -.02 .07 -.16 -.03 -.01 -.01 - -

[B] Entire series, effect on correlation ( .260) is:

Lower 1928< -.040 1998< -.036 2005< -.025 1966> -.024 1990< -.022 1999> -.013 Higher 1977 .082 1968 .026

1923 to 1972 segment:

Lower 1928< -.086 1966> -.046 1923> -.024 1926< -.023 1943> -.022 1937< -.018 Higher 1968 .052 1954 .044

1925 to 1974 segment:

Lower 1928< -.092 1966> -.049 1943> -.024 1926< -.023 1937< -.018 1949< -.017 Higher 1968 .053 1958 .043

1960 to 2009 segment:

Lower 1998< -.064 2005< -.044 1966> -.042 1990< -.038 1999> -.024 1985> -.018 Higher 1977 .144 1968 .041

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1943 +3.7 SD; 1966 +3.4 SD; 1998 -4.7 SD

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80056 1923 to 2009 87 years Series 35

[B] Entire series, effect on correlation ( .566) is:

Lower 1980> -.026 1938< -.020 1970< -.014 2002< -.014 1947> -.011 2008> -.010 Higher 1968 .019 1932 .016

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1945 +4.2 SD; 1981 +3.2 SD; 2008 +3.4 SD

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82434 1923 to 2009 87 years Series 36

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1960 2009 8 .21 -.02 .12 .02 -.07 .12 -.36 -.04 -.13 -.13 .42| .07 -.18 .13 -.10 -.09 .13 .03 .43\* - -

[B] Entire series, effect on correlation ( .447) is:

Lower 2009< -.089 1940< -.024 1924< -.021 1977> -.020 1990< -.015 1957< -.014 Higher 1930 .025 1997 .024

1960 to 2009 segment:

Lower 2009< -.148 1977> -.033 1990< -.024 1989< -.017 1960< -.015 1991> -.012 Higher 1997 .044 1978 .037

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1978 +3.7 SD; 2009 -4.6 SD

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112206 1923 to 2009 87 years Series 37

[B] Entire series, effect on correlation ( .575) is:

Lower 1980> -.029 1925> -.020 1983< -.019 1993< -.016 1926< -.011 1951< -.011 Higher 1930 .040 1977 .025

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1929 +3.3 SD; 1941 +3.0 SD; 1983 -5.3 SD

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150951 1923 to 2009 87 years Series 38

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1923 1972 0 -.13 .14 .05 .16 .05 .08 -.09 -.15 -.19 -.03 .31\* .11 .14 -.08 .07 -.04 -.09 .11 .01 -.21 -.14

[B] Entire series, effect on correlation ( .467) is:

Lower 1928< -.038 1930> -.034 1923> -.028 1939< -.019 1929< -.016 1925> -.014 Higher 1997 .063 1958 .015

1923 to 1972 segment:

Lower 1928< -.057 1930> -.052 1923> -.045 1929< -.023 1925> -.020 1924< -.019 Higher 1958 .036 1968 .031

[E] Outliers 4 3.0 SD above or -4.5 SD below mean for year

1923 +3.5 SD; 1928 -4.6 SD; 1929 -4.8 SD; 1939 -4.8 SD

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112440 1924 to 2014 91 years Series 39

[B] Entire series, effect on correlation ( .662) is:

Lower 1977> -.022 1947> -.014 1999> -.013 1980> -.013 2012> -.013 1946> -.011 Higher 1997 .058 1930 .029

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160921 1924 to 2006 83 years Series 40

[B] Entire series, effect on correlation ( .620) is:

Lower 1996< -.034 1924< -.027 1947> -.024 1951< -.021 1931> -.012 1955> -.009 Higher 1930 .020 1980 .018

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1947 +3.7 SD

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32177A 1925 to 2015 91 years Series 41

[B] Entire series, effect on correlation ( .688) is:

Lower 1947> -.015 1937< -.009 1988> -.008 1953> -.008 1942< -.007 1960< -.006 Higher 1997 .047 1968 .007

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1997 -5.1 SD

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52403 1925 to 2009 85 years Series 42

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1960 2009 0 .06 .07 .22 -.10 -.16 .07 .03 .04 -.08 .07 .27\*-.16 -.07 .08 -.06 -.16 .03 -.11 .13 - -

[B] Entire series, effect on correlation ( .454) is:

Lower 1982< -.083 1997> -.020 1969< -.013 1963< -.013 1977> -.012 1973> -.011 Higher 1930 .037 1968 .031

1960 to 2009 segment:

Lower 1982< -.115 1969< -.019 1963< -.018 1973> -.016 2009< -.014 1971> -.014 Higher 1968 .071 1980 .038

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1968 +3.5 SD; 1982 -5.3 SD

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152651 1925 to 2015 91 years Series 43

[B] Entire series, effect on correlation ( .619) is:

Lower 1947> -.019 1939> -.017 1997> -.015 1980> -.013 2002< -.011 1987< -.010 Higher 1930 .031 2001 .015

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171167 1925 to 2009 85 years Series 44

[B] Entire series, effect on correlation ( .486) is:

Lower 1939> -.019 1940< -.019 1925> -.018 1997> -.016 1947> -.016 1930> -.016 Higher 1980 .029 1932 .028

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1939 +3.3 SD; 1990 +3.2 SD; 2007 +3.5 SD

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110819 1926 to 2009 84 years Series 45

[B] Entire series, effect on correlation ( .580) is:

Lower 1930> -.028 1933< -.018 1955< -.017 1991> -.016 2005< -.013 1954> -.013 Higher 1997 .076 1958 .016

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32368 1927 to 2009 83 years Series 46

[B] Entire series, effect on correlation ( .598) is:

Lower 1948< -.022 1955> -.020 1930> -.020 1929< -.017 1961< -.013 1980> -.012 Higher 1977 .034 1997 .031

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1955 +3.3 SD

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42207 1927 to 2009 83 years Series 47

[B] Entire series, effect on correlation ( .463) is:

Lower 1930> -.032 1927< -.017 2002< -.016 1997> -.016 1985> -.014 1973> -.010 Higher 1980 .033 1966 .019

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1959 -5.3 SD; 1985 +3.0 SD

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90650 1930 to 2009 80 years Series 48

[B] Entire series, effect on correlation ( .425) is:

Lower 1997> -.037 1930> -.035 1978< -.031 1955> -.020 1947< -.020 1934< -.015 Higher 1968 .020 1980 .020

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1933 +5.0 SD; 1955 +3.5 SD

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152656 1930 to 2009 80 years Series 49

[B] Entire series, effect on correlation ( .519) is:

Lower 1997> -.030 1977> -.029 1942< -.018 1962< -.011 1988> -.011 2002< -.009 Higher 1991 .013 1968 .012

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1933 +3.6 SD; 1998 +3.9 SD

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190807 1930 to 2013 84 years Series 50

[B] Entire series, effect on correlation ( .554) is:

Lower 1951< -.068 1950< -.027 1932> -.021 1998< -.017 1988> -.015 1954> -.011 Higher 1930 .046 1997 .034

[C] Year-to-year changes diverging by over 4.0 std deviations:

1951 1952 4.0 SD

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1951 -7.3 SD

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192239 1930 to 2009 80 years Series 51

[B] Entire series, effect on correlation ( .403) is:

Lower 1939< -.043 1978< -.026 1975< -.020 1988> -.020 1991> -.015 1945< -.013 Higher 1977 .030 1958 .022

[E] Outliers 4 3.0 SD above or -4.5 SD below mean for year

1933 +4.8 SD; 1939 -6.0 SD; 1962 +3.1 SD; 1988 +3.3 SD

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100551 1931 to 2009 79 years Series 52

[B] Entire series, effect on correlation ( .545) is:

Lower 1938< -.022 2007< -.017 1991> -.016 1982< -.014 1962< -.014 2005< -.013 Higher 1932 .018 1977 .017

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1933 +3.1 SD

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101123 1931 to 2009 79 years Series 53

[B] Entire series, effect on correlation ( .475) is:

Lower 1947< -.052 1997> -.026 1959> -.025 1937< -.023 1978< -.018 1986< -.014 Higher 1932 .027 1958 .017

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1947 -6.5 SD

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101215 1932 to 2009 78 years Series 54

[B] Entire series, effect on correlation ( .603) is:

Lower 1977> -.017 1955> -.015 1973> -.014 1949< -.014 1960< -.011 1992< -.009 Higher 1997 .096 1978 .013

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40533 1933 to 2009 77 years Series 55

[B] Entire series, effect on correlation ( .720) is:

Lower 2007< -.029 2006> -.013 1942< -.010 1972> -.009 1984> -.009 1981> -.008 Higher 1997 .033 1977 .023

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32493 1934 to 2009 76 years Series 56

[B] Entire series, effect on correlation ( .637) is:

Lower 2006< -.019 1959> -.018 1936< -.017 1991> -.013 1978< -.011 1946< -.009 Higher 1977 .033 1997 .016

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180929 1934 to 2009 76 years Series 57

[B] Entire series, effect on correlation ( .556) is:

Lower 1935< -.034 1959> -.025 1947> -.025 1991> -.016 1969< -.016 2004> -.013 Higher 1997 .049 1977 .048

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1947 +3.4 SD; 2004 +3.3 SD

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190830 1935 to 2009 75 years Series 58

[B] Entire series, effect on correlation ( .591) is:

Lower 2008< -.027 1990< -.020 1952> -.016 1999> -.014 1982< -.009 1957< -.008 Higher 1980 .019 2001 .014

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150957 1936 to 2009 74 years Series 59

[B] Entire series, effect on correlation ( .693) is:

Lower 1936< -.034 1939> -.016 1971> -.011 1944< -.010 2009< -.009 1953< -.009 Higher 1977 .018 1997 .014

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1994 +3.3 SD

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90634 1937 to 2009 73 years Series 60

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1960 2009 -7 -.01 .00 .19 .42\*-.12 -.04 -.05 .00 -.20 .00 .36|-.15 -.03 .02 -.06 -.13 -.14 -.07 .22 - -

[B] Entire series, effect on correlation ( .382) is:

Lower 1997> -.092 1947< -.032 1986< -.015 1946> -.011 2004< -.011 1982< -.011 Higher 1980 .032 1958 .028

1960 to 2009 segment:

Lower 1997> -.153 2004< -.036 1986< -.027 1982< -.023 1972> -.011 2008> -.011 Higher 1980 .062 1968 .044

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1947 -4.7 SD; 1997 +4.3 SD

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111163 1937 to 2009 73 years Series 61

[B] Entire series, effect on correlation ( .501) is:

Lower 1997> -.086 1994< -.039 1977> -.033 1955> -.023 1947> -.014 1938< -.011 Higher 1980 .034 1991 .024

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130911 1937 to 2008 72 years Series 62

[B] Entire series, effect on correlation ( .520) is:

Lower 1950< -.024 1938< -.020 1995< -.016 1937< -.015 2008> -.013 1977> -.013 Higher 1997 .121 1978 .019

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1994 +3.9 SD; 2008 +3.4 SD

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22371 1939 to 2009 71 years Series 63

[B] Entire series, effect on correlation ( .558) is:

Lower 2009< -.044 1985> -.023 1947> -.023 1979< -.022 2002< -.020 1946> -.020 Higher 1997 .065 1977 .047

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1946 +3.2 SD; 1947 +3.7 SD; 1985 +3.8 SD

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32498 1939 to 2009 71 years Series 64

[B] Entire series, effect on correlation ( .656) is:

Lower 1980> -.033 1941< -.017 1939> -.016 1984> -.014 1942< -.013 2008< -.012 Higher 1997 .057 1977 .030

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1984 +3.6 SD

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90104 1939 to 2009 71 years Series 65

[B] Entire series, effect on correlation ( .517) is:

Lower 1977> -.047 1992< -.045 1991> -.022 1984< -.020 1957< -.016 1948< -.007 Higher 1999 .018 1952 .014

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1950 +3.9 SD; 1976 +3.0 SD; 1977 +4.0 SD

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140733 1939 to 2009 71 years Series 66

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1960 2009 8 -.13 .05 .01 -.08 .11 .12 -.08 -.06 -.23 -.08 .34|-.24 -.01 .15 -.21 .04 .11 -.11 .34\* - -

[B] Entire series, effect on correlation ( .405) is:

Lower 2009< -.073 1986< -.031 1985< -.023 1997> -.021 1991> -.013 1939> -.012 Higher 1958 .031 1966 .025

1960 to 2009 segment:

Lower 2009< -.087 1986< -.038 1997> -.026 1991> -.018 1985< -.018 1999> -.015 Higher 1978 .036 1966 .036

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1998 +3.8 SD; 2009 -4.9 SD

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152490 1942 to 2009 68 years Series 67

[B] Entire series, effect on correlation ( .678) is:

Lower 1993< -.040 2000< -.013 1959> -.010 1971> -.010 1957< -.009 1982< -.007 Higher 1977 .032 1997 .022

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1942 +3.7 SD

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91499 1943 to 2009 67 years Series 68

[B] Entire series, effect on correlation ( .431) is:

Lower 1945< -.031 1998< -.028 1999> -.028 1943> -.023 2003< -.020 1978< -.016 Higher 1997 .057 1959 .030

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1943 +3.0 SD

====================================================================================================================================

180778 1943 to 2013 71 years Series 69

[B] Entire series, effect on correlation ( .453) is:

Lower 2003< -.039 1954> -.032 1977> -.026 1949< -.025 2012> -.020 1968< -.015 Higher 1997 .138 1980 .022

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1954 +3.6 SD; 1955 +3.3 SD; 2013 +3.1 SD

====================================================================================================================================

132250 1944 to 2009 66 years Series 70

[B] Entire series, effect on correlation ( .590) is:

Lower 1948< -.040 1954> -.025 2002< -.025 1985> -.021 1944> -.013 1993< -.010 Higher 1977 .044 1959 .017

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1944 +3.3 SD; 1985 +3.5 SD

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90631 1945 to 2004 60 years Series 71

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1950 1999 0 -.06 -.08 .21 .14 -.11 -.32 .03 .08 -.16 .25 .28\* .07 -.23 .15 -.03 -.03 .15 -.08 .12 -.16 -.15

1955 2004 0 -.07 -.02 .22 .14 -.17 -.33 -.03 .08 -.17 .30 .31\* .04 -.23 .15 -.01 -.07 .19 -.06 .16 -.17 -.17

[B] Entire series, effect on correlation ( .291) is:

Lower 1997> -.068 1998< -.049 1958< -.048 1959> -.019 1947> -.018 1966> -.018 Higher 1977 .059 1980 .056

1950 to 1999 segment:

Lower 1997> -.079 1998< -.053 1958< -.050 1959> -.023 1966> -.021 1985> -.016 Higher 1977 .064 1980 .060

1955 to 2004 segment:

Lower 1997> -.080 1998< -.053 1958< -.053 1959> -.022 1966> -.020 1985> -.016 Higher 1977 .063 1980 .060

[C] Year-to-year changes diverging by over 4.0 std deviations:

1997 1998 -4.2 SD

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1957 +3.5 SD; 1997 +3.6 SD

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82059r 1946 to 2016 71 years Series 72

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1946 1995 0 -.02 -.09 -.10 .11 .03 -.05 .00 .01 -.23 -.12 .23\* .02 -.01 .22 -.10 .15 -.03 -.06 .16 -.19 .04

[B] Entire series, effect on correlation ( .336) is:

Lower 1949< -.029 1966> -.025 1954> -.023 1994< -.023 1985> -.023 1955> -.021 Higher 1997 .127 1958 .022

1946 to 1995 segment:

Lower 1949< -.044 1966> -.038 1985> -.037 1954> -.035 1955> -.034 1994< -.033 Higher 1977 .042 1958 .041

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1955 +3.5 SD; 1956 +3.6 SD; 1985 +3.6 SD

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82120 1946 to 2009 64 years Series 73

[B] Entire series, effect on correlation ( .504) is:

Lower 2006< -.034 1959> -.023 1949< -.021 1980> -.018 1985> -.015 1953< -.011 Higher 1977 .057 1991 .023

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90084 1948 to 2009 62 years Series 74

[B] Entire series, effect on correlation ( .514) is:

Lower 1978< -.040 1990< -.029 2000> -.022 2008> -.020 1973> -.015 1954> -.015 Higher 1997 .148 1966 .022

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1957 +4.4 SD; 2000 +3.0 SD; 2008 +3.7 SD

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132232 1949 to 2009 61 years Series 75

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1950 1999 0 .06 -.09 -.29 .07 .13 -.13 -.03 -.27 .04 .03 .31\* .01 -.02 .06 -.05 .03 .16 .04 -.06 -.13 -.05

1960 2009 0 -.11 -.09 -.12 .04 .12 .18 -.25 -.11 .02 -.26 .27\* .06 .13 -.08 .07 .04 .08 .05 -.05 - -

[B] Entire series, effect on correlation ( .273) is:

Lower 2002< -.070 1956< -.039 1980> -.033 1993< -.024 1999> -.023 2005< -.015 Higher 1997 .049 2001 .043

1950 to 1999 segment:

Lower 1956< -.064 1980> -.043 1993< -.037 1999> -.030 1978< -.019 1985> -.015 Higher 1997 .067 1977 .039

1960 to 2009 segment:

Lower 2002< -.096 1980> -.042 1993< -.031 1999> -.029 2005< -.019 1978< -.018 Higher 1997 .066 2001 .057

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

2001 +3.5 SD

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10517 1950 to 2008 59 years Series 76

[B] Entire series, effect on correlation ( .313) is:

Lower 2001< -.033 1978< -.031 1957< -.026 1981> -.025 1958< -.023 1990< -.017 Higher 1997 .122 1970 .034

[C] Year-to-year changes diverging by over 4.0 std deviations:

2003 2004 4.4 SD

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1981 +3.9 SD; 2001 -5.7 SD; 2003 -5.3 SD

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142015 1950 to 2009 60 years Series 77

[B] Entire series, effect on correlation ( .611) is:

Lower 1956< -.025 1969< -.021 1964> -.018 1988> -.017 1998< -.015 1971> -.015 Higher 1997 .054 1978 .017

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1964 +3.2 SD

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182686 1950 to 2009 60 years Series 78

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1950 1999 1 -.03 .01 .21 .11 .06 .07 -.23 -.12 .08 -.04 .07| .62\*-.31 -.11 -.03 -.22 -.05 -.07 -.04 -.06 -.03

1960 2009 1 .17 -.09 .22 .18 .00 .02 -.15 -.08 .01 -.14 .00| .60\*-.27 -.08 -.03 -.14 -.07 -.03 -.01 - -

[B] Entire series, effect on correlation ( .071) is:

Lower 1997> -.064 1977> -.057 2000> -.025 1959> -.016 1970< -.010 1988> -.010 Higher 1954 .027 1980 .020

1950 to 1999 segment:

Lower 1997> -.078 1977> -.069 1959> -.019 1996< -.017 1960< -.012 1970< -.012 Higher 1954 .032 1980 .024

1960 to 2009 segment:

Lower 1997> -.071 1977> -.065 2000> -.028 1988> -.012 1974> -.010 1960< -.009 Higher 1980 .026 1999 .025

[E] Outliers 5 3.0 SD above or -4.5 SD below mean for year

1967 +3.2 SD; 1977 +4.3 SD; 1995 +3.3 SD; 1997 +3.9 SD; 2000 +4.5 SD

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60549 1958 to 2009 52 years Series 79

[B] Entire series, effect on correlation ( .601) is:

Lower 2009< -.037 1980> -.036 1998< -.017 1959> -.015 1985> -.013 2005< -.013 Higher 1977 .052 1997 .048

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1982 +3.2 SD; 1999 -4.9 SD

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120162 1958 to 2009 52 years Series 80

[B] Entire series, effect on correlation ( .440) is:

Lower 1958< -.080 1996< -.053 2002< -.028 1988> -.021 2000> -.018 1975< -.012 Higher 1997 .151 2001 .022

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12445A 1960 to 2009 50 years Series 81

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1960 2009 -6 -.14 -.06 -.19 .11 .27\*-.07 .06 .02 -.28 -.03 .12| .01 .08 .03 -.18 -.03 .06 -.10 -.06 - -

[B] Entire series, effect on correlation ( .117) is:

Lower 2003< -.068 1980> -.055 1999> -.045 1968< -.019 1998< -.016 1970< -.015 Higher 1997 .052 1991 .047

1960 to 2009 segment:

Lower 2003< -.068 1980> -.055 1999> -.045 1968< -.019 1998< -.016 1970< -.015 Higher 1997 .052 1991 .047

[C] Year-to-year changes diverging by over 4.0 std deviations:

1998 1999 4.5 SD

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1963 +3.1 SD; 1980 +3.5 SD; 1985 +3.1 SD

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122521 1968 to 2015 48 years Series 82

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1968 2015 2 -.25 .01 -.04 .01 .08 .01 .13 .16 -.23 .10 .15|-.14 .18\* - - - - - - - -

[B] Entire series, effect on correlation ( .149) is:

Lower 1970< -.069 1997> -.050 1980> -.035 1999> -.032 1978< -.028 2003< -.022 Higher 1991 .071 1968 .026

1968 to 2015 segment:

Lower 1970< -.069 1997> -.050 1980> -.035 1999> -.032 1978< -.028 2003< -.022 Higher 1991 .071 1968 .026

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1997 +3.4 SD; 1999 +3.1 SD; 2003 -5.5 SD

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132386 1969 to 2009 41 years Series 83

[B] Entire series, effect on correlation ( .652) is:

Lower 1991> -.052 1973> -.021 2000< -.018 1988> -.011 1994< -.011 1993< -.008 Higher 1977 .044 1997 .041

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1987 +3.1 SD

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Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

--- -------- --------- ----- ----- ----- ------ ----- ----- ----- ----- ----- ----- ----- ----- --

1 132396 1824 2009 186 5 0 .525 1.44 3.55 .678 .893 .174 2.78 .516 -.052 1

2 52276 1889 2009 121 5 0 .474 2.50 6.35 1.377 .898 .168 2.38 .316 -.021 1

3 80576 1889 2009 121 5 0 .545 1.63 4.48 .889 .838 .222 2.64 .456 -.018 1

4 142568 1893 2015 123 5 0 .581 1.54 2.85 .486 .491 .244 2.84 .625 .068 1

5 142575 1895 2009 115 5 0 .500 1.85 3.45 .633 .696 .210 2.90 .430 .011 1

6 182130 1896 2009 114 5 0 .543 1.86 3.79 .779 .800 .197 2.79 .503 .006 4

7 140756 1902 2009 108 4 2 .437 2.75 8.64 1.703 .904 .186 2.87 .416 .017 1

8 130991 1903 2009 107 4 1 .499 2.81 5.32 .848 .823 .142 2.71 .493 .002 1

9 140934 1904 2009 106 4 0 .431 2.01 6.49 1.387 .959 .157 2.70 .513 .008 1

10 131009 1905 2009 105 4 0 .644 2.81 4.82 .651 .600 .159 2.66 .477 -.042 1

11 70228A 1909 2017 109 4 0 .688 2.94 8.16 2.004 .947 .165 2.54 .456 -.010 1

12 121379 1909 2009 101 4 0 .530 3.01 8.00 1.322 .783 .209 2.74 .414 -.050 3

13 90577 1911 2009 99 4 1 .449 2.76 31.59 3.047 .039 .231 3.17 .429 -.032 1

14 102238 1912 2009 98 4 0 .610 3.06 7.38 1.391 .834 .196 2.60 .423 .024 1

15 182024 1912 2017 106 4 2 .297 1.63 2.92 .525 .644 .215 2.75 .514 .011 1

16 80046 1913 2009 97 4 0 .705 2.97 8.89 1.532 .920 .154 2.75 .592 -.046 1

17 140761 1913 2009 97 4 0 .521 2.64 5.20 .954 .751 .190 2.57 .387 .009 1

18 160935 1914 2009 96 4 0 .625 2.48 4.05 .683 .638 .191 2.57 .476 -.057 1

19 62007 1915 2009 95 4 1 .403 1.99 4.95 .904 .596 .252 3.11 .389 -.058 1

20 140931 1916 2009 94 4 0 .598 1.43 3.66 .455 .739 .162 2.83 .556 .028 1

21 162566 1916 2009 94 4 0 .694 2.34 3.89 .684 .522 .213 2.71 .437 -.018 1

22 91493 1917 2009 93 4 3 .194 1.36 2.91 .583 .857 .184 2.50 .361 .021 1

23 110920 1917 2009 93 4 0 .682 3.48 7.34 1.570 .893 .150 2.61 .541 -.047 1

24 152645 1917 2009 93 4 0 .632 3.04 7.07 1.164 .802 .164 2.91 .491 -.106 4

25 42248 1918 2009 92 4 0 .674 3.11 7.53 1.649 .925 .150 2.67 .560 -.046 1

26 42304 1918 2009 92 4 0 .471 1.80 3.74 .818 .889 .158 2.55 .539 .027 1

27 80159 1918 2009 92 4 0 .457 1.24 2.73 .774 .950 .174 2.89 .528 -.136 1

28 82418A 1919 2016 98 4 1 .357 1.15 3.60 .716 .880 .204 2.89 .401 -.058 1

29 140736 1919 2009 91 4 0 .580 2.68 4.26 .504 .627 .129 2.81 .482 -.013 1

30 42283 1920 2009 90 4 0 .529 2.16 3.60 .575 .815 .130 2.63 .486 -.066 1

31 132542 1921 2009 89 4 1 .477 3.10 6.89 1.540 .910 .139 2.59 .466 .048 1

32 80148 1922 2009 88 4 0 .685 3.45 7.32 1.455 .861 .174 2.84 .435 .000 1

33 80156 1922 2009 88 4 0 .589 1.95 4.29 .833 .822 .198 2.80 .565 .012 1

34 50404 1923 2009 87 4 3 .260 1.05 2.66 .582 .826 .181 2.60 .442 -.047 1

35 80056 1923 2009 87 4 0 .566 2.19 4.71 .980 .888 .160 2.80 .456 -.054 1

36 82434 1923 2009 87 4 1 .447 3.99 9.03 1.700 .902 .145 2.87 .464 -.025 1

37 112206 1923 2009 87 4 0 .575 2.58 7.72 1.538 .849 .247 2.68 .403 -.063 1

38 150951 1923 2009 87 4 1 .467 1.52 2.51 .404 .597 .180 2.59 .461 .002 1

39 112440 1924 2014 91 4 0 .662 3.11 6.99 1.692 .944 .142 2.54 .428 .016 1

40 160921 1924 2006 83 4 0 .620 3.30 5.61 1.091 .817 .156 2.63 .595 .091 1

41 32177A 1925 2015 91 3 0 .688 2.88 5.14 .863 .634 .190 2.43 .349 -.045 1

42 52403 1925 2009 85 3 1 .454 2.97 5.25 1.109 .873 .145 2.95 .465 .070 1

43 152651 1925 2015 91 3 0 .619 2.68 4.96 1.004 .765 .197 2.84 .454 -.056 1

44 171167 1925 2009 85 3 0 .486 2.33 4.42 .619 .664 .161 2.80 .543 .006 1

45 110819 1926 2009 84 3 0 .580 3.04 7.10 .924 .675 .178 2.65 .472 .008 1

46 32368 1927 2009 83 3 0 .598 2.89 4.27 .730 .793 .143 2.60 .469 .007 1

47 42207 1927 2009 83 3 0 .463 .88 2.54 .406 .680 .267 2.53 .454 -.001 1

48 90650 1930 2009 80 3 0 .425 3.24 5.20 .787 .580 .147 2.84 .408 -.027 1

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Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

--- -------- --------- ----- ----- ----- ------ ----- ----- ----- ----- ----- ----- ----- ----- --

49 152656 1930 2009 80 3 0 .519 1.96 4.43 .879 .877 .179 2.72 .478 -.046 1

50 190807 1930 2013 84 3 0 .554 1.98 3.88 .810 .843 .179 2.57 .497 .053 1

51 192239 1930 2009 80 3 0 .403 1.32 3.22 .593 .883 .155 2.75 .368 -.032 1

52 100551 1931 2009 79 3 0 .545 2.39 6.11 .966 .666 .182 2.68 .541 .004 1

53 101123 1931 2009 79 3 0 .475 1.79 3.87 .906 .908 .180 2.38 .356 -.027 1

54 101215 1932 2009 78 3 0 .603 3.33 11.05 1.913 .852 .170 2.45 .351 -.009 1

55 40533 1933 2009 77 3 0 .720 2.28 3.93 .527 .579 .167 2.60 .479 -.044 1

56 32493 1934 2009 76 3 0 .637 1.81 3.58 .624 .796 .161 2.53 .429 .014 1

57 180929 1934 2009 76 3 0 .556 1.91 3.15 .471 .758 .134 2.59 .529 -.019 1

58 190830 1935 2009 75 3 0 .591 2.48 4.48 .696 .543 .176 2.67 .475 -.061 1

59 150957 1936 2009 74 3 0 .693 3.55 7.00 1.202 .780 .188 2.86 .701 .081 1

60 90634 1937 2009 73 3 1 .382 2.14 4.41 .956 .846 .162 2.49 .354 -.005 1

61 111163 1937 2009 73 3 0 .501 3.20 12.71 1.855 .905 .152 2.81 .543 .061 1

62 130911 1937 2008 72 3 0 .520 2.03 5.16 1.438 .958 .196 2.70 .418 -.077 1

63 22371 1939 2009 71 3 0 .558 2.09 4.54 .803 .705 .224 2.79 .559 .019 1

64 32498 1939 2009 71 3 0 .656 2.74 5.66 .811 .784 .140 2.62 .535 -.058 1

65 90104 1939 2009 71 3 0 .517 2.60 6.75 1.113 .825 .174 2.88 .675 -.004 1

66 140733 1939 2009 71 3 1 .405 3.00 6.54 1.378 .904 .146 2.74 .485 .050 1

67 152490 1942 2009 68 3 0 .678 2.56 3.84 .663 .621 .158 2.83 .591 .034 1

68 91499 1943 2009 67 3 0 .431 1.08 7.15 1.061 .894 .285 3.02 .637 .009 1

69 180778 1943 2013 71 3 0 .453 1.10 2.53 .673 .952 .173 2.41 .415 -.002 1

70 132250 1944 2009 66 3 0 .590 1.85 3.04 .521 .482 .227 2.63 .576 -.065 1

71 90631 1945 2004 60 3 2 .291 .91 8.12 .995 -.039 .301 3.31 .605 .096 1

72 82059r 1946 2016 71 3 1 .336 .61 1.81 .322 .865 .192 2.74 .523 -.096 1

73 82120 1946 2009 64 3 0 .504 1.37 2.78 .648 .897 .181 2.66 .566 .030 1

74 90084 1948 2009 62 3 0 .514 2.53 9.81 1.350 .716 .147 2.90 .392 -.013 1

75 132232 1949 2009 61 3 2 .273 1.37 3.41 .661 .773 .221 2.97 .519 -.081 1

76 10517 1950 2008 59 2 0 .313 .70 4.21 .845 .811 .416 3.20 .630 .075 1

77 142015 1950 2009 60 2 0 .611 2.09 3.38 .567 .498 .209 2.69 .473 .109 1

78 182686 1950 2009 60 2 2 .071 2.34 6.05 1.168 .849 .187 2.73 .513 -.069 1

79 60549 1958 2009 52 2 0 .601 2.25 13.73 1.731 .781 .185 2.72 .479 -.002 3

80 120162 1958 2009 52 2 0 .440 4.03 7.49 1.680 .884 .165 2.55 .534 .182 1

81 12445A 1960 2009 50 1 1 .117 .70 6.82 1.047 .623 .287 2.86 .478 -.038 1

82 122521 1968 2015 48 1 1 .149 3.60 5.57 1.181 .895 .127 2.54 .520 -.040 1

83 132386 1969 2009 41 1 0 .652 1.09 1.62 .243 .512 .172 2.69 .619 .115 1

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Total or mean: 7054 284 29 .518 2.28 31.59 1.001 .770 .183 3.31 .482 -.010

- = [ COFECHA QUVE COF ] = -