[] Dendrochronology Program Library Run CATO Program COF 10:41 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\_cato.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 1868 to 2017 150 years

Continuous time span is 1868 to 2017 150 years

Portion with two or more series is 1889 to 2016 128 years

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

\*C\* Number of dated series 16 \*C\*

\*O\* Master series 1868 2017 150 yrs \*O\*

\*F\* Total rings in all series 1386 \*F\*

\*E\* Total dated rings checked 1364 \*E\*

\*C\* Series intercorrelation .382 \*C\*

\*H\* Average mean sensitivity .280 \*H\*

\*A\* Segments, possible problems 22 \*A\*

\*\*\* Mean length of series 86.6 \*\*\*

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

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: 10:41 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

: : : : : : : : : : : : : : : : : : : : : -------- --- ---- ---- ----

. . . . . . . . . . . . . . . . .<=============> . 142538 1 1868 2008 141

. . . . . . . . . . . . . . . . . <============> . 182279 2 1889 2013 125

. . . . . . . . . . . . . . . . . <========>. . 202341 3 1906 1996 91

. . . . . . . . . . . . . . . . . .<=========> . 171194 4 1919 2016 98

. . . . . . . . . . . . . . . . . . <=======> . 080479 5 1920 2007 88

. . . . . . . . . . . . . . . . . . <=======> . 152464 6 1920 2008 89

. . . . . . . . . . . . . . . . . . <========> . 130992 7 1922 2014 93

. . . . . . . . . . . . . . . . . . <=======> . 111227 8 1926 2000 75

. . . . . . . . . . . . . . . . . . <========> . 12080A 9 1929 2016 88

. . . . . . . . . . . . . . . . . . <=======> . 131179 10 1930 2012 83

. . . . . . . . . . . . . . . . . . <======> . 152185 11 1935 2009 75

. . . . . . . . . . . . . . . . . . <======> . 131183 12 1940 2015 76

. . . . . . . . . . . . . . . . . . <======> . 152057 13 1943 2010 68

. . . . . . . . . . . . . . . . . . <======> . 90639A 14 1946 2017 72

. . . . . . . . . . . . . . . . . . <=====> . 62100A 15 1948 2004 57

. . . . . . . . . . . . . . . . . . <=====> . 62369A 16 1950 2016 67

: : : : : : : : : : : : : : : : : : : : :

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: 10:41 Fri 04 Sep 2020 Page 3

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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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1900 .568 2 1950 -.048 16 2000 1.126 15

1901 .674 2 1951 -.699 16 2001 .442 14

1902 2.430 2 1952 -1.962 16 2002 .186 14

1903 1.870 2 1953 -1.152 16 2003 -1.064 14

1904 1.015 2 1954 .176 16 2004 -.495 14

1905 .036 2 1955 .665 16 2005 -.423 13

1906 .464 3 1956 -.155 16 2006 -.151 13

1907 -.770 3 1957 -.238 16 2007 -.586 13

1908 -.264 3 1958 1.334 16 2008 -.740 12

1909 .788 3 1959 .397 16 2009 .264 10

1910 -2.537 3 1960 .990 16 2010 1.164 9

1911 -.977 3 1961 .738 16 2011 -.408 8

1912 -.269 3 1962 1.177 16 2012 .205 8

1913 -3.302 3 1963 .603 16 2013 .823 7

1914 -.035 3 1964 -.523 16 2014 .561 6

1915 .941 3 1965 -.780 16 2015 .686 5

1916 1.464 3 1966 -1.015 16 2016 .540 4

1917 -.323 3 1967 .212 16 2017 .493 1

1868 .589 1 1918 -3.974 3 1968 .808 16

1869 1.992 1 1919 -.288 4 1969 -.560 16

1870 1.211 1 1920 .670 6 1970 .783 16

1871 -1.147 1 1921 .956 6 1971 -.402 16

1872 -1.070 1 1922 .680 7 1972 .359 16

1873 -1.810 1 1923 -1.072 7 1973 .653 16

1874 -.845 1 1924 .206 7 1974 -.188 16

1875 .319 1 1925 -.328 7 1975 .159 16

1876 2.835 1 1926 -.974 8 1976 -.873 16

1877 1.500 1 1927 -.541 8 1977 -1.848 16

1878 -.471 1 1928 .146 8 1978 -.461 16

1879 1.054 1 1929 1.200 9 1979 -.630 16

1880 -.424 1 1930 -.294 10 1980 -.456 16

1881 .054 1 1931 .418 10 1981 .297 16

1882 -.195 1 1932 .374 10 1982 .529 16

1883 -1.348 1 1933 -.037 10 1983 .226 16

1884 -.791 1 1934 .927 10 1984 -.729 16

1885 -.967 1 1935 -.525 11 1985 -.274 16

1886 -1.618 1 1936 .401 11 1986 .413 16

1887 -.964 1 1937 -.371 11 1987 -.358 16

1888 .360 1 1938 .127 11 1988 -.520 16

1889 2.408 2 1939 -2.099 11 1989 -.046 16

1890 .341 2 1940 .865 12 1990 -.482 16

1891 -.023 2 1941 1.165 12 1991 -.262 16

1892 -2.073 2 1942 .756 12 1992 .773 16

1893 -2.156 2 1943 .088 13 1993 1.039 16

1894 -.777 2 1944 .617 13 1994 .599 16

1895 -.581 2 1945 .043 13 1995 .193 16

1896 .951 2 1946 .236 14 1996 -.734 16

1897 .659 2 1947 -.458 14 1997 .507 15

1898 .822 2 1948 .326 15 1998 .384 15

1899 .888 2 1949 -1.129 15 1999 .146 15

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PART 4: Master Bar Plot: 10:41 Fri 04 Sep 2020 Page 4

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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

1900-------B 1950----@ 2000---------E

1901--------C 1951--c 2001-------B

1902----------J 1952h 2002-----A

1903----------G 1953-e 2003-d

1904---------D 1954-----A 2004--b

1905-----@ 1955--------C 2005---b

1906-------B 1956----a 2006----a

1907--c 1957----a 2007--b

1908----a 1958----------E 2008--c

1909--------C 1959------B 2009------A

1910j 1960---------D 2010---------E

1911-d 1961--------C 2011---b

1912----a 1962---------E 2012-----A

1913m 1963--------B 2013---------C

1914----@ 1964--b 2014-------B

1915---------D 1965-c 2015--------C

1916----------F 1966-d 2016-------B

1917---a 1967-----A 2017-------B

1868-------B 1918p 1968--------C

1869----------H 1919----a 1969--b

1870----------E 1920--------C 1970--------C

1871-e 1921---------D 1971---b

1872-d 1922--------C 1972------A

1873g 1923-d 1973--------C

1874-c 1924-----A 1974----a

1875------A 1925---a 1975-----A

1876----------K 1926-d 1976-c

1877----------F 1927--b 1977g

1878---b 1928-----A 1978---b

1879---------D 1929---------E 1979--c

1880---b 1930----a 1980---b

1881-----@ 1931-------B 1981------A

1882----a 1932------A 1982-------B

1883-e 1933----@ 1983-----A

1884-c 1934---------D 1984--c

1885-d 1935--b 1985----a

1886f 1936------B 1986------B

1887-d 1937---a 1987---a

1888------A 1938-----A 1988--b

1889----------J 1939h 1989----@

1890------A 1940---------C 1990---b

1891-----@ 1941---------E 1991----a

1892h 1942--------C 1992--------C

1893i 1943-----@ 1993---------D

1894-c 1944--------B 1994--------B

1895--b 1945-----@ 1995-----A

1896---------D 1946------A 1996--c

1897--------C 1947---b 1997-------B

1898---------C 1948------A 1998------B

1899---------D 1949-e 1999-----A

PART 5: CORRELATION OF SERIES BY SEGMENTS: 10:41 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 142538 1868 2008 .51 .56 .52 .30A .20B

2 182279 1889 2013 .55 .60 .53 .46 .42

3 202341 1906 1996 .53 .50 .71

4 171194 1919 2016 .42 .46 .32A .25A

5 080479 1920 2007 .26A .20B .36 .25A

6 152464 1920 2008 .52 .51 .31A .27A

7 130992 1922 2014 .33 .30A .40 .37

8 111227 1926 2000 .33 .18B .22A

9 12080A 1929 2016 .58 .50 .48

10 131179 1930 2012 .31A .41 .37B

11 152185 1935 2009 .40 .28A .17B

12 131183 1940 2015 .19A .24B .22B

13 152057 1943 2010 .42 .47 .39

14 90639A 1946 2017 .48 .41 .31A

15 62100A 1948 2004 .51 .51 .54

16 62369A 1950 2016 .17B .23A

Av segment correlation .53 .46 .42 .38 .31

PART 6: POTENTIAL PROBLEMS: 10:41 Fri 04 Sep 2020 Page 5

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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

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

142538 1868 to 2008 141 years Series 1

[\*] Early part of series cannot be checked from 1868 to 1888 -- not matched by another series

[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 .01 -.14 -.09 .00 .02 .09 .07 .12 -.12 .04 .30\*-.15 -.22 -.16 -.06 .03 -.22 .18 .24 .02 -.04

1959 2008 8 -.17 -.10 -.11 .03 -.01 .08 .12 .01 -.02 .05 .20|-.08 -.16 -.16 -.12 .09 -.17 .01 .35\* .00 -

[B] Entire series, effect on correlation ( .465) is:

Lower 1913> -.040 1977> -.022 1982< -.010 1901> -.010 1970< -.009 1927> -.008 Higher 1918 .062 1910 .029

1950 to 1999 segment:

Lower 1977> -.082 1970< -.037 1982< -.036 1997< -.024 1951> -.024 1979> -.020 Higher 1952 .096 1958 .046

1959 to 2008 segment:

Lower 1977> -.084 1970< -.037 1982< -.036 1997< -.024 2005> -.023 1979> -.021 Higher 2003 .078 1993 .037

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

1913 +3.5 SD; 1977 +3.7 SD; 1978 +3.4 SD

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182279 1889 to 2013 125 years Series 2

[B] Entire series, effect on correlation ( .484) is:

Lower 1892> -.029 1987< -.022 1927> -.017 1981< -.014 1901< -.011 1911< -.010 Higher 1939 .019 1910 .018

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

1927 +3.2 SD

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

202341 1906 to 1996 91 years Series 3

[B] Entire series, effect on correlation ( .569) is:

Lower 1942< -.025 1930> -.020 1913< -.016 1911> -.011 1917> -.011 1912> -.011 Higher 1918 .049 1910 .036

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171194 1919 to 2016 98 years Series 4

[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 -.07 -.05 -.09 -.18 -.23 .24 -.06 .12 .10 .06 .32\*-.03 .14 .08 -.06 .09 -.10 -.10 .09 .09 .00

1967 2016 0 .10 -.04 -.02 -.09 -.19 .03 -.14 .20 .02 -.09 .25\* .05 - - - - - - - - -

[B] Entire series, effect on correlation ( .332) is:

Lower 1978< -.028 1977> -.026 1949> -.020 2003> -.019 2014< -.016 1988> -.016 Higher 1939 .079 1952 .036

1950 to 1999 segment:

Lower 1978< -.058 1977> -.054 1988> -.028 1956> -.019 1993< -.016 1959> -.016 Higher 1952 .075 1970 .023

1967 to 2016 segment:

Lower 1977> -.062 1978< -.045 2003> -.044 1988> -.034 2014< -.029 2016< -.027 Higher 1969 .042 2010 .034

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

1977 1978 -4.3 SD

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

1969 -4.8 SD

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080479 1920 to 2007 88 years Series 5

[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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1920 1969 0 .17 -.13 -.21 -.07 .12 .11 .04 -.20 -.07 -.01 .26\* .11 -.03 .04 -.05 -.13 -.28 .09 .17 -.17 -.03

1925 1974 -10 .26\*-.13 -.12 .00 .04 -.06 .06 -.06 .06 -.02 .20| .08 -.03 -.01 -.10 -.12 -.28 .06 .12 -.19 -.03

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

1958 2007 0 -.09 -.32 .24 -.16 .07 -.17 .02 .18 -.05 .11 .25\* .09 -.03 -.07 -.22 -.20 -.15 -.08 -.08 -.09 .05

[B] Entire series, effect on correlation ( .256) is:

Lower 1939> -.055 2003> -.030 1963< -.020 1940< -.016 1933> -.016 1971> -.015 Higher 1977 .054 1952 .048

1920 to 1969 segment:

Lower 1939> -.092 1963< -.033 1933> -.028 1940< -.024 1928< -.020 1969> -.019 Higher 1952 .081 1949 .053

1925 to 1974 segment:

Lower 1939> -.083 1963< -.032 1940< -.026 1933> -.025 1971> -.023 1928< -.021 Higher 1952 .092 1949 .063

1958 to 2007 segment:

Lower 2003> -.065 1963< -.038 1971> -.031 1976> -.026 1969> -.024 1974> -.021 Higher 1977 .135 2000 .032

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

1939 1940 -4.5 SD

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

1939 +4.0 SD; 2003 +3.1 SD

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152464 1920 to 2008 89 years Series 6

[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 .05 -.08 .08 .02 -.12 -.16 -.09 .01 -.29 -.20 .31\* .21 .02 -.22 -.06 .06 -.18 .18 .25 .09 -.06

1959 2008 0 -.04 -.10 .09 .13 -.04 -.17 -.12 .05 -.07 -.12 .27\* .20 .09 -.30 -.26 .00 -.10 -.05 .19 .07 -

[B] Entire series, effect on correlation ( .461) is:

Lower 1949> -.027 1953> -.018 1982< -.016 1960< -.015 1966> -.013 2004> -.012 Higher 1939 .061 1952 .022

1950 to 1999 segment:

Lower 1953> -.036 1982< -.034 1960< -.030 1966> -.024 1990> -.023 1962< -.018 Higher 1952 .075 1977 .038

1959 to 2008 segment:

Lower 1982< -.036 1960< -.032 1966> -.026 1990> -.025 2004> -.025 1962< -.019 Higher 2000 .057 1977 .045

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

1939 -6.5 SD

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130992 1922 to 2014 93 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

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

1925 1974 0 .07 .25 -.07 -.17 -.21 -.18 .14 -.24 .13 .08 .30\* .01 -.06 .21 .07 .11 .04 -.19 -.08 -.10 .00

[B] Entire series, effect on correlation ( .349) is:

Lower 1927< -.064 1987> -.027 1925> -.022 1992< -.020 1926> -.015 1969> -.012 Higher 1958 .017 2010 .016

1925 to 1974 segment:

Lower 1927< -.113 1925> -.038 1926> -.023 1969> -.019 1974> -.014 1965> -.011 Higher 1958 .032 1940 .024

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

1926 1927 -5.1 SD

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

1925 +3.2 SD; 1927 -4.7 SD; 1987 +3.3 SD

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111227 1926 to 2000 75 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

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

1950 1999 3 -.08 .05 -.04 -.19 -.15 -.05 -.06 -.10 -.04 .12 .18|-.02 .06 .18\* .14 .05 .11 .04 -.03 -.02 -.21

1951 2000 0 -.09 .05 .02 -.13 -.13 -.05 -.10 -.07 -.01 .12 .22\*-.01 .05 .10 .12 .03 .10 .01 -.06 .01 -.12

[B] Entire series, effect on correlation ( .296) is:

Lower 1999< -.030 1984> -.022 1956> -.019 1970< -.015 1964> -.013 1939> -.011 Higher 1949 .036 1952 .023

1950 to 1999 segment:

Lower 1999< -.057 1984> -.034 1956> -.032 1970< -.029 1964> -.021 1975< -.013 Higher 1952 .065 1958 .025

1951 to 2000 segment:

Lower 1999< -.058 1984> -.033 1956> -.031 1970< -.029 1964> -.020 1975< -.013 Higher 1952 .060 2000 .043

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

1984 +3.0 SD

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12080A 1929 to 2016 88 years Series 9

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

Lower 1967< -.019 2007> -.017 1936< -.016 2015< -.012 2006> -.011 1965> -.011 Higher 2003 .018 1939 .013

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131179 1930 to 2012 83 years Series 10

[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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1930 1979 0 .02 -.30 .00 .08 -.03 .10 .06 .09 -.18 .04 .31\*-.19 .16 -.04 -.19 -.06 -.16 .13 -.01 .05 .01

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

1963 2012 -8 -.08 -.15 .41\* .03 .20 -.09 -.02 -.08 -.29 .18 .37| .14 .17 -.09 .02 -.08 - - - - -

[B] Entire series, effect on correlation ( .289) is:

Lower 2008> -.029 1940< -.024 1939> -.023 1971> -.021 1947> -.013 1950< -.010 Higher 1977 .056 1984 .020

1930 to 1979 segment:

Lower 1940< -.037 1939> -.034 1971> -.029 1930< -.019 1947> -.017 1950< -.017 Higher 1977 .076 1934 .021

1963 to 2012 segment:

Lower 2008> -.056 1971> -.040 1992< -.015 1986< -.013 1980> -.013 2002< -.013 Higher 1977 .100 1984 .033

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

1939 1940 -4.5 SD

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

2008 +3.1 SD

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152185 1935 to 2009 75 years Series 11

[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 -.21 .03 -.24 .12 .02 -.09 .08 -.06 -.01 .15 .28\* .02 -.04 .04 -.11 .11 -.14 -.17 -.10 -.23 .05

1960 2009 -7 -.31 .11 -.20 .17\* .07 -.15 -.11 -.28 -.03 .09 .17| .05 .08 .07 -.14 .16 .07 -.17 -.07 - -

[B] Entire series, effect on correlation ( .358) is:

Lower 1987> -.029 1984> -.021 1979> -.021 1980> -.020 1947> -.020 1988> -.016 Higher 1952 .054 1939 .030

1950 to 1999 segment:

Lower 1987> -.046 1984> -.034 1979> -.033 1980> -.031 1988> -.026 1971> -.025 Higher 1952 .095 1958 .044

1960 to 2009 segment:

Lower 1987> -.046 1979> -.033 1984> -.033 1980> -.030 1988> -.025 1973< -.025 Higher 2003 .057 1962 .039

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

1980 +3.3 SD

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131183 1940 to 2015 76 years Series 12

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

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

1940 1989 0 .04 -.05 .10 -.22 -.15 .01 .13 -.12 -.08 .02 .19\*-.07 -.02 -.01 .07 .02 .05 -.12 .05 .03 .09

1950 1999 8 -.02 -.10 -.10 -.05 -.09 .04 .11 -.18 -.07 .01 .24| .08 -.13 -.04 .05 -.08 .15 -.01 .32\*-.03 -.04

1966 2015 -5 .04 -.23 -.22 -.03 -.04 .26\* .04 -.10 -.06 -.11 .22| .08 .02 - - - - - - - -

[B] Entire series, effect on correlation ( .195) is:

Lower 1952> -.058 1977> -.036 2011> -.029 1996> -.024 1940< -.019 1970< -.015 Higher 1969 .027 1993 .023

1940 to 1989 segment:

Lower 1952> -.084 1977> -.052 1940< -.024 1970< -.019 1979> -.018 1942< -.014 Higher 1969 .034 1962 .029

1950 to 1999 segment:

Lower 1952> -.094 1977> -.056 1996> -.036 1965< -.028 1970< -.027 1979> -.019 Higher 1993 .036 1969 .036

1966 to 2015 segment:

Lower 1977> -.072 2011> -.057 1996> -.048 1970< -.032 1979> -.025 2001< -.021 Higher 1969 .049 1993 .046

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

1952 +3.4 SD

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152057 1943 to 2010 68 years Series 13

[B] Entire series, effect on correlation ( .372) is:

Lower 2003> -.029 1998< -.025 1961< -.017 2008> -.014 1947> -.013 1984> -.011 Higher 1977 .054 2010 .025

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90639A 1946 to 2017 72 years Series 14

[\*] Later part of series cannot be checked from 2017 to 2017 -- not matched by another series

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

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

1967 2016 0 .08 -.19 -.19 .02 -.06 .12 .02 .18 -.03 -.19 .31\* .21 - - - - - - - - -

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

Lower 1955< -.031 2010< -.025 1950< -.021 1951> -.016 1977> -.015 2000< -.015 Higher 1952 .060 1949 .036

1967 to 2016 segment:

Lower 2010< -.037 2000< -.022 1977> -.022 1997< -.020 1971> -.018 2003> -.016 Higher 1976 .044 1984 .039

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62100A 1948 to 2004 57 years Series 15

[B] Entire series, effect on correlation ( .535) is:

Lower 1951> -.032 1984> -.029 1953> -.026 1970< -.023 1964> -.018 1971> -.016 Higher 1952 .076 2003 .027

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62369A 1950 to 2016 67 years Series 16

[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 -3 .18 .06 .14 .20 .08 .08 -.20 .22\* .15 -.09 .17|-.25 -.30 -.22 -.10 .14 -.01 .06 .01 -.11 .09

1967 2016 0 .20 .13 .19 -.03 -.12 .04 -.19 .20 .04 .15 .23\*-.21 - - - - - - - - -

[B] Entire series, effect on correlation ( .114) is:

Lower 1959< -.033 1958< -.027 2013< -.024 1952> -.023 2015< -.017 2002> -.017 Higher 1970 .025 2010 .020

1950 to 1999 segment:

Lower 1959< -.061 1958< -.042 1952> -.036 1984> -.023 1969> -.022 1954< -.020 Higher 1970 .034 1968 .023

1967 to 2016 segment:

Lower 2013< -.044 2002> -.035 2015< -.033 1984> -.027 1969> -.026 1988> -.024 Higher 1970 .032 2010 .024

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

2002 +4.5 SD

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PART 7: DESCRIPTIVE STATISTICS: 10:41 Fri 04 Sep 2020 Page 6

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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 142538 1868 2008 141 5 2 .465 .65 2.57 .357 .810 .233 2.63 .424 -.010 1

2 182279 1889 2013 125 5 0 .484 1.13 3.73 .745 .694 .327 2.74 .463 -.064 1

3 202341 1906 1996 91 3 0 .569 .85 1.80 .441 .681 .320 2.52 .373 -.037 1

4 171194 1919 2016 98 4 2 .332 .80 2.82 .594 .878 .282 2.56 .447 -.048 1

5 080479 1920 2007 88 4 3 .256 .67 1.73 .395 .722 .314 2.68 .454 -.060 2

6 152464 1920 2008 89 4 2 .461 .62 1.68 .274 .689 .258 2.57 .360 -.012 1

7 130992 1922 2014 93 4 1 .349 .84 2.21 .575 .889 .251 2.55 .447 -.095 2

8 111227 1926 2000 75 3 2 .296 .72 1.98 .522 .883 .263 2.95 .479 .006 2

9 12080A 1929 2016 88 3 0 .520 1.39 4.28 .671 .718 .205 2.73 .496 -.012 1

10 131179 1930 2012 83 3 2 .289 1.24 3.73 1.020 .909 .300 2.70 .470 -.016 1

11 152185 1935 2009 75 3 2 .358 1.22 3.04 .582 .481 .351 2.91 .668 .043 1

12 131183 1940 2015 76 3 3 .195 .74 2.16 .535 .886 .252 2.72 .439 .009 1

13 152057 1943 2010 68 3 0 .372 1.31 4.96 1.201 .849 .295 2.74 .520 -.012 1

14 90639A 1946 2017 72 3 1 .382 .58 1.57 .323 .787 .280 2.71 .538 .003 2

15 62100A 1948 2004 57 3 0 .535 .80 2.47 .530 .840 .286 2.67 .421 -.055 1

16 62369A 1950 2016 67 2 2 .114 1.23 3.00 .609 .608 .286 3.12 .534 .059 1

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Total or mean: 1386 55 22 .382 .91 4.96 .575 .770 .280 3.12 .465 -.022

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