[] Dendrochronology Program Library Run LEMP5 Program COF 12:21 Mon 06 Nov 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30262

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: LEMP5\_TSCA\_corr2-50

File of DATED series: LEMP5\_TSCA\_corr2.txt

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 Y

8 Parts printed 1234567

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

Time span of Master dating series is 1851 to 2015 165 years

Continuous time span is 1851 to 2015 165 years

Portion with two or more series is 1851 to 2015 165 years

>> 1022B 2004 absent in 1 of 34 series, but is not usually narrow: master index is -.148

>> 1022B 2007 absent in 1 of 34 series, but is not usually narrow: master index is .106

>> 1022B 2009 absent in 1 of 34 series, but is not usually narrow: master index is .154

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

\*C\* Number of dated series 34 \*C\*

\*O\* Master series 1851 2015 165 yrs \*O\*

\*F\* Total rings in all series 4230 \*F\*

\*E\* Total dated rings checked 4230 \*E\*

\*C\* Series intercorrelation .563 \*C\*

\*H\* Average mean sensitivity .231 \*H\*

\*A\* Segments, possible problems 14 \*A\*

\*\*\* Mean length of series 124.4 \*\*\*

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

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

1022B 6 absent rings: 2004 2006 2007 2008 2009 2011

6 absent rings .142%

PART 2: TIME PLOT OF TREE-RING SERIES: LEMP5\_TSCA\_corr2-50 12:21 Mon 06 Nov 2017 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

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

. . . . . . . . . . . . . . . . . <==========> . 1007A 1 1903 2015 113

. . . . . . . . . . . . . . . . . <==========> . 1017A 2 1909 2015 107

. . . . . . . . . . . . . . . . . .<=========> . 1017B 3 1912 2015 104

. . . . . . . . . . . . . . . . <===============> . 1018A 4 1853 2015 163

. . . . . . . . . . . . . . . . . <=============> . 1018B 5 1871 2015 145

. . . . . . . . . . . . . . . . . .<=========> . 1019A 6 1915 2015 101

. . . . . . . . . . . . . . . . . . <========> . 1019B 7 1925 2015 91

. . . . . . . . . . . . . . . . <===============> . 1020A 8 1851 2015 165

. . . . . . . . . . . . . . . . . <============> . 1020B 9 1881 2015 135

. . . . . . . . . . . . . . . . . <============> . 1021A 10 1883 2015 133

. . . . . . . . . . . . . . . . . <============> . 1021B 11 1889 2015 127

. . . . . . . . . . . . . . . . . .<=========> . 1022A 12 1917 2015 99

. . . . . . . . . . . . . . . . . .<=========> . 1022B 13 1917 2015 99

. . . . . . . . . . . . . . . . .<==============> . 1023A 14 1865 2015 151

. . . . . . . . . . . . . . . . . <============> . 1023B 15 1888 2015 128

. . . . . . . . . . . . . . . . .<==============> . 1024A 16 1860 2015 156

. . . . . . . . . . . . . . . . . <============> . 1024B 17 1885 2015 131

. . . . . . . . . . . . . . . . <===============> . 1025A 18 1851 2015 165

. . . . . . . . . . . . . . . . . <============> . 1025B 19 1886 2015 130

. . . . . . . . . . . . . . . . . . <========> . 1026A 20 1926 2015 90

. . . . . . . . . . . . . . . . . <===========> . 1026B 21 1893 2015 123

. . . . . . . . . . . . . . . . . <==========> . 1027A 22 1905 2015 111

. . . . . . . . . . . . . . . . . <=============> . 1027B 23 1873 2015 143

. . . . . . . . . . . . . . . . . <===========> . 1028A 24 1896 2015 120

. . . . . . . . . . . . . . . . . <===========> . 1028B 25 1897 2015 119

. . . . . . . . . . . . . . . . . .<=========> . 1029A 26 1917 2015 99

. . . . . . . . . . . . . . . . . . <======> . 1029B 27 1947 2015 69

. . . . . . . . . . . . . . . . . <=============> . 1032A 28 1875 2015 141

. . . . . . . . . . . . . . . . <===============> . 1032B 29 1858 2015 158

. . . . . . . . . . . . . . . . . . <========> . 1033A 30 1929 2015 87

. . . . . . . . . . . . . . . . . <============> . 1033B 31 1884 2015 132

. . . . . . . . . . . . . . . . . <============> . 1034A 32 1886 2015 130

. . . . . . . . . . . . . . . . . <===========> . 1034B 33 1891 2015 125

. . . . . . . . . . . . . . . . . <=============> . 1007B 34 1876 2015 140

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

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: LEMP5\_TSCA\_corr2-50 12:21 Mon 06 Nov 2017 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

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

1900 -1.111 22 1950 -1.169 34 2000 -1.164 34

1851 -2.003 2 1901 -1.907 22 1951 .092 34 2001 .186 34

1852 .903 2 1902 .004 22 1952 .379 34 2002 .708 34

1853 -.118 3 1903 .570 23 1953 .781 34 2003 -.953 34

1854 -.028 3 1904 -.727 23 1954 1.352 34 2004 -.148 34 1<<

1855 -1.995 3 1905 -.310 24 1955 1.583 34 2005 .218 34

1856 -.325 3 1906 -.310 24 1956 -.048 34 2006 -1.640 34 1

1857 .832 3 1907 -1.427 24 1957 1.628 34 2007 .106 34 1<<

1858 1.120 4 1908 -1.023 24 1958 1.895 34 2008 -.759 34 1

1859 .774 4 1909 .593 25 1959 -.955 34 2009 .154 34 1<<

1860 1.169 5 1910 1.442 25 1960 -1.477 34 2010 2.026 34

1861 1.856 5 1911 -1.178 25 1961 .388 34 2011 -.529 34 1

1862 2.037 5 1912 .617 26 1962 -1.497 34 2012 1.419 34

1863 .318 5 1913 1.098 26 1963 -.491 34 2013 .264 34

1864 -.191 5 1914 .063 26 1964 -.791 34 2014 1.229 34

1865 .793 6 1915 .969 27 1965 .039 34 2015 -1.511 34

1866 .989 6 1916 1.164 27 1966 .205 34

1867 1.268 6 1917 -.043 30 1967 .922 34

1868 .440 6 1918 -2.818 30 1968 .611 34

1869 -1.194 6 1919 -.166 30 1969 -.172 34

1870 -.971 6 1920 -.516 30 1970 -.562 34

1871 .249 7 1921 .978 30 1971 .997 34

1872 -.142 7 1922 .439 30 1972 -1.133 34

1873 -.518 8 1923 .020 30 1973 .800 34

1874 -.824 8 1924 .769 30 1974 -.660 34

1875 -1.338 9 1925 .840 31 1975 -1.183 34

1876 -2.343 10 1926 -.550 32 1976 -1.028 34

1877 -1.818 10 1927 .279 32 1977 .075 34

1878 -1.665 10 1928 -.133 32 1978 -.862 34

1879 -1.098 10 1929 -.870 33 1979 -.408 34

1880 -.763 10 1930 -1.028 33 1980 1.088 34

1881 -.086 11 1931 -1.123 33 1981 .680 34

1882 1.513 11 1932 -.252 33 1982 .573 34

1883 1.032 12 1933 .519 33 1983 .292 34

1884 1.728 13 1934 -.074 33 1984 -.214 34

1885 1.305 14 1935 .475 33 1985 .835 34

1886 1.535 16 1936 .716 33 1986 1.042 34

1887 .240 16 1937 .477 33 1987 .679 34

1888 .186 17 1938 1.073 33 1988 -.415 34

1889 .498 18 1939 .695 33 1989 -1.847 34

1890 .814 18 1940 -.405 33 1990 -.253 34

1891 .380 19 1941 -.327 33 1991 .048 34

1892 -.345 19 1942 -.489 33 1992 1.244 34

1893 -.539 20 1943 -.778 33 1993 1.156 34

1894 1.023 20 1944 -.633 33 1994 -1.511 34

1895 -.436 20 1945 .476 33 1995 .190 34

1896 -.071 21 1946 .282 33 1996 -.478 34

1897 .653 22 1947 -.199 34 1997 .191 34

1898 .923 22 1948 -3.577 34 1998 .018 34

1899 -1.345 22 1949 .110 34 1999 .651 34

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PART 4: Master Bar Plot: LEMP5\_TSCA\_corr2-50 12:21 Mon 06 Nov 2017 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-d 1950-e 2000-e

1851h 1901h 1951-----@ 2001------A

1852--------D 1902-----@ 1952------B 2002--------C

1853----@ 1903-------B 1953--------C 2003-d

1854-----@ 1904--c 1954----------E 2004----a

1855h 1905---a 1955----------F 2005------A

1856---a 1906---a 1956----@ 2006g

1857--------C 1907-f 1957----------G 2007-----@

1858---------D 1908-d 1958----------H 2008--c

1859--------C 1909-------B 1959-d 2009-----A

1860---------E 1910----------F 1960f 2010----------H

1861----------G 1911-e 1961------B 2011---b

1862----------H 1912-------B 1962f 2012----------F

1863------A 1913---------D 1963---b 2013------A

1864----a 1914-----@ 1964--c 2014---------E

1865--------C 1915---------D 1965-----@ 2015f

1866---------D 1916---------E 1966------A

1867---------E 1917----@ 1967--------D

1868-------B 1918k 1968-------B

1869-e 1919----a 1969----a

1870-d 1920---b 1970---b

1871------A 1921---------D 1971---------D

1872----a 1922-------B 1972-e

1873---b 1923-----@ 1973--------C

1874--c 1924--------C 1974--c

1875-e 1925--------C 1975-e

1876i 1926---b 1976-d

1877g 1927------A 1977-----@

1878g 1928----a 1978--c

1879-d 1929--c 1979---b

1880--c 1930-d 1980---------D

1881----@ 1931-d 1981-------C

1882----------F 1932----a 1982-------B

1883---------D 1933-------B 1983------A

1884----------G 1934----@ 1984----a

1885----------E 1935-------B 1985--------C

1886----------F 1936--------C 1986---------D

1887------A 1937-------B 1987-------C

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

1889-------B 1939--------C 1989g

1890--------C 1940---b 1990----a

1891------B 1941---a 1991-----@

1892---a 1942---b 1992---------E

1893---b 1943--c 1993---------E

1894---------D 1944--c 1994f

1895---b 1945-------B 1995------A

1896----@ 1946------A 1996---b

1897-------C 1947----a 1997------A

1898--------D 1948n 1998-----@

1899-e 1949-----@ 1999-------C

PART 5: CORRELATION OF SERIES BY SEGMENTS: LEMP5\_TSCA\_corr2-50 12:21 Mon 06 Nov 2017 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 1850 1875 1900 1925 1950 1975

1899 1924 1949 1974 1999 2024

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

1 1007A 1903 2015 .34 .40 .56 .57

2 1017A 1909 2015 .13B .03B .27A .60

3 1017B 1912 2015 .32A .36 .43 .52

4 1018A 1853 2015 .51 .62 .62 .72 .69 .65

5 1018B 1871 2015 .63 .65 .55 .58 .77 .57

6 1019A 1915 2015 .61 .60 .43 .45

7 1019B 1925 2015 .74 .58 .51

8 1020A 1851 2015 .68 .44 .51 .79 .47 .45

9 1020B 1881 2015 .25A .51 .56 .46 .40

10 1021A 1883 2015 .64 .54 .60 .55 .42

11 1021B 1889 2015 .64 .70 .70 .68 .72

12 1022A 1917 2015 .50 .39 .64 .48

13 1022B 1917 2015 .70 .64 .69 .55

14 1023A 1865 2015 .65 .58 .65 .73 .34 .34

15 1023B 1888 2015 .46 .73 .74 .68 .54

16 1024A 1860 2015 .75 .85 .77 .65 .59 .65

17 1024B 1885 2015 .65 .71 .62 .56 .54

18 1025A 1851 2015 .54 .63 .63 .74 .79 .77

19 1025B 1886 2015 .61 .58 .54 .63 .68

20 1026A 1926 2015 .51 .56 .68

21 1026B 1893 2015 .46 .60 .72 .69 .65

22 1027A 1905 2015 .67 .62 .64 .60

23 1027B 1873 2015 .84 .86 .78 .67 .58 .54

24 1028A 1896 2015 .76 .77 .66 .47 .40

25 1028B 1897 2015 .74 .78 .74 .61 .64

26 1029A 1917 2015 .63 .52 .34B .44

27 1029B 1947 2015 .53 .42 .31A

28 1032A 1875 2015 .44 .49 .41 .49 .68

29 1032B 1858 2015 .30B .37 .39 .46 .63 .75

30 1033A 1929 2015 .60 .52 .56

31 1033B 1884 2015 .33A .64 .66 .54 .61

32 1034A 1886 2015 .22B .34 .44 .60 .65

33 1034B 1891 2015 .29A .31A .40 .50 .66

34 1007B 1876 2015 .12B .21B .60 .72 .72

Av segment correlation .61 .53 .56 .58 .56 .57

PART 6: POTENTIAL PROBLEMS: LEMP5\_TSCA\_corr2-50 12:21 Mon 06 Nov 2017 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

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

1007A 1903 to 2015 113 years Series 1

[B] Entire series, effect on correlation ( .490) is:

Lower 1967< -.015 1948> -.012 1937< -.010 1940> -.009 1986< -.009 1907> -.009 Higher 1989 .017 2012 .012

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

1959 -4.6 SD

1007A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1903 142 110 106 159 163 103 170

1910 255 147 161 130 118 185 223 182 119 122

1920 136 185 133 142 167 120 138 108 133 112

1930 101 116 188 186 143 133 127 94 115 196

1940 182 156 122 124 118 149 124 165 122 117

1950 126 143 142 135 145 146 113 149 144 60

1960 92 117 111 104 100 106 95 88 95 131

1970 131 133 95 133 110 117 123 151 135 151

1980 185 160 177 125 85 94 73 82 62 42

1990 61 50 66 62 44 49 32 41 30 49

2000 35 30 34 23 30 29 23 37 30 30

2010 33 22 46 32 34 27

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

1017A 1909 to 2015 107 years Series 2

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

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

1909 1958 7 -.10 -.09 .11 .05 -.04 .18 .25 .10 -.11 -.28 .13|-.14 -.17 -.07 .18 -.05 .13 .28\* .00 .08 -.30

1925 1974 4 -.09 .04 .28 .13 .12 .18 -.10 .03 -.20 -.23 .03|-.12 -.05 .01 .34\* .18 .13 -.05 -.01 -.06 -.26

1950 1999 0 .02 .10 .10 .15 .24 .21 -.13 -.09 -.32 -.17 .27\*-.24 -.13 .13 .03 .16 .22 -.11 .02 .10 .05

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

Lower 1918> -.042 1948> -.041 1922< -.031 1962> -.019 1953< -.016 1955< -.015 Higher 1911 .041 2010 .022

1909 to 1958 segment:

Lower 1918> -.069 1948> -.066 1922< -.029 1955< -.021 1953< -.021 1936< -.019 Higher 1911 .125 1926 .032

1925 to 1974 segment:

Lower 1948> -.065 1962> -.037 1953< -.032 1955< -.032 1936< -.030 1950> -.019 Higher 1926 .049 1958 .039

1950 to 1999 segment:

Lower 1962> -.057 1953< -.051 1955< -.047 1950> -.028 1967< -.024 1971< -.023 Higher 1994 .075 1972 .038

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

1911 -4.9 SD; 1918 +3.4 SD; 1948 +3.2 SD

1017A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1909 83

1910 91 46 95 149 159 194 182 211 217 235

1920 203 217 144 183 238 209 172 214 227 240

1930 243 245 276 287 294 269 236 277 333 289

1940 281 327 304 243 212 295 227 236 258 259

1950 271 249 277 183 176 143 139 194 289 213

1960 198 250 268 321 236 227 161 107 94 92

1970 92 75 50 54 57 56 90 180 95 79

1980 93 104 134 118 88 90 75 80 74 53

1990 119 226 254 276 107 81 62 71 59 86

2000 52 50 121 43 39 22 21 52 65 71

2010 148 84 116 60 84 54

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

1017B 1912 to 2015 104 years Series 3

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

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

1912 1961 0 -.39 .08 .01 -.14 .00 .11 -.04 .16 -.13 .12 .32\*-.18 -.02 -.12 -.06 .20 .06 .00 .07 -.24 .01

[B] Entire series, effect on correlation ( .400) is:

Lower 1912< -.024 1918> -.021 1943< -.019 1935< -.018 1917> -.018 1967< -.015 Higher 1948 .030 2010 .019

1912 to 1961 segment:

Lower 1912< -.038 1918> -.037 1917> -.030 1935< -.028 1921< -.019 1950> -.017 Higher 1948 .067 1959 .038

1017B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1912 73 111 150 224 193 293 185 201

1920 171 149 173 151 167 184 148 164 204 180

1930 175 150 231 211 204 164 194 188 221 253

1940 184 229 199 144 228 299 202 237 175 193

1950 242 252 263 197 271 321 243 287 319 164

1960 178 202 165 142 124 126 100 78 75 149

1970 117 80 61 62 51 50 73 69 65 95

1980 115 93 111 117 82 92 97 92 92 73

1990 106 124 120 101 75 60 61 71 66 78

2000 50 59 103 57 68 52 52 100 99 95

2010 158 92 130 77 101 61

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1018A 1853 to 2015 163 years Series 4

[B] Entire series, effect on correlation ( .627) is:

Lower 1938< -.016 1869> -.011 1897< -.009 1982< -.009 1943> -.007 1895> -.006 Higher 1948 .032 1994 .013

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

1994 -4.9 SD

1018A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1853 70 87 48 74 110 97 112

1860 101 151 115 56 59 80 91 113 116 100

1870 62 39 61 28 12 19 15 13 17 7

1880 8 142 352 327 294 436 386 429 218 173

1890 184 189 122 97 93 132 102 66 127 36

1900 53 45 72 121 57 107 74 38 101 163

1910 246 155 222 289 271 316 255 206 113 141

1920 149 151 113 118 91 92 69 57 47 42

1930 28 29 20 26 20 34 42 49 27 31

1940 29 32 42 51 36 67 46 37 15 53

1950 45 72 79 103 119 124 92 157 144 112

1960 69 129 69 109 112 130 147 203 156 128

1970 129 196 130 180 144 146 152 135 116 142

1980 144 158 127 135 155 172 175 217 196 160

1990 175 152 146 133 94 144 148 174 162 240

2000 199 220 229 210 177 233 168 209 217 261

2010 281 195 334 240 269 151

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

1018B 1871 to 2015 145 years Series 5

[B] Entire series, effect on correlation ( .579) is:

Lower 2005< -.066 1898< -.014 1948> -.013 1896< -.011 1943> -.008 2003> -.008 Higher 1918 .021 1989 .013

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

2005 -5.4 SD

1018B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1871 70 47 59 55 51 50 58 43 85

1880 239 340 422 342 452 416 430 315 291 272

1890 248 324 177 176 275 207 111 216 97 87

1900 97 95 87 120 79 129 98 51 67 102

1910 167 125 213 220 172 187 197 202 82 139

1920 131 178 123 118 119 100 79 78 55 48

1930 30 27 18 29 31 54 90 86 58 59

1940 60 76 71 93 52 89 86 60 64 116

1950 69 99 95 103 128 129 98 173 166 135

1960 84 136 83 128 129 141 162 216 259 172

1970 156 210 164 219 168 170 177 192 176 207

1980 210 187 197 227 211 253 239 256 224 162

1990 235 175 243 254 181 212 182 191 182 208

2000 164 216 218 203 163 91 122 198 185 206

2010 216 140 198 163 181 117

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1019A 1915 to 2015 101 years Series 6

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

Lower 1999< -.061 2003> -.017 1988> -.012 1994> -.010 2007< -.008 1987< -.006 Higher 2015 .025 1948 .013

1019A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 238 277 140 95 140

1920 146 140 143 166 162 181 133 122 70 43

1930 30 42 35 82 83 110 119 113 162 142

1940 121 104 98 88 52 85 61 23 7 57

1950 50 86 72 80 148 155 151 223 173 133

1960 114 125 90 95 159 210 251 242 252 164

1970 114 146 156 228 155 140 178 196 169 211

1980 253 237 225 248 269 322 342 275 331 205

1990 277 280 301 375 314 319 297 269 284 182

2000 196 230 208 248 217 216 187 169 161 243

2010 277 230 293 276 338 183

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

1019B 1925 to 2015 91 years Series 7

[B] Entire series, effect on correlation ( .621) is:

Lower 1994> -.030 1988> -.016 2003> -.016 1972> -.015 2014< -.015 1943> -.010 Higher 1948 .046 1989 .018

1019B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 163 122 152 108 59

1930 68 58 89 138 110 132 131 120 136 131

1940 92 133 100 122 77 118 80 45 17 80

1950 65 110 102 120 152 123 102 164 148 100

1960 82 111 60 88 119 121 185 176 167 149

1970 191 239 203 241 150 141 152 135 106 131

1980 153 161 168 189 197 281 290 302 354 219

1990 282 274 308 333 321 313 271 272 300 294

2000 302 362 316 320 311 327 223 261 248 316

2010 344 271 285 247 205 157

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

1020A 1851 to 2015 165 years Series 8

[B] Entire series, effect on correlation ( .531) is:

Lower 1991< -.081 1918> -.040 1912< -.013 1852< -.010 2000> -.010 1913< -.006 Higher 1948 .038 2015 .015

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

1990 1991 -5.3 SD 1991 1992 4.0 SD

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

1918 +3.3 SD; 1991 -6.4 SD

1020A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1851 11 14 18 21 14 23 29 36 43

1860 45 62 58 16 13 18 27 46 37 19

1870 21 23 11 8 18 15 8 53 54 119

1880 161 313 429 383 366 301 318 244 243 216

1890 207 167 150 145 185 140 152 157 158 118

1900 116 108 124 100 83 69 66 34 29 52

1910 91 65 34 38 34 94 151 112 128 156

1920 114 150 137 115 112 117 67 75 74 73

1930 55 58 57 83 91 119 142 144 172 157

1940 120 121 147 125 151 283 185 153 71 148

1950 115 123 142 120 132 119 83 137 218 143

1960 116 170 94 143 111 158 154 209 154 103

1970 102 167 101 135 111 124 94 106 136 101

1980 153 243 172 168 136 166 160 173 194 151

1990 183 55 185 200 102 112 139 140 210 234

2000 230 239 210 155 167 154 144 147 124 209

2010 211 166 206 163 189 126

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

1020B 1881 to 2015 135 years Series 9

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

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

1881 1930 0 .02 -.09 -.03 .15 .04 .06 .01 .18 -.10 -.05 .25\* .17 -.05 -.01 -.14 -.25 .09 -.03 .09 -.05 -.02

[B] Entire series, effect on correlation ( .351) is:

Lower 1898< -.096 1881< -.025 1885< -.021 1936< -.017 1994> -.015 2011> -.013 Higher 1918 .034 2015 .016

1881 to 1930 segment:

Lower 1898< -.205 1881< -.047 1885< -.042 1912< -.012 1903< -.011 1899> -.008 Higher 1918 .101 1884 .025

1020B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1881 177 232 230 322 212 263 231 211 318

1890 296 268 193 196 240 170 174 222 52 61

1900 76 67 93 53 44 36 24 13 21 57

1910 63 37 33 106 105 141 162 114 50 88

1920 116 108 146 170 195 190 143 133 131 123

1930 112 121 169 186 119 89 44 57 69 75

1940 72 78 92 66 59 123 122 127 93 192

1950 145 180 232 341 328 345 345 368 316 150

1960 92 139 87 54 96 138 120 155 120 90

1970 85 88 59 81 78 41 69 109 114 90

1980 144 121 69 77 117 153 268 271 332 281

1990 337 355 288 280 277 295 248 245 223 212

2000 146 132 162 188 177 201 159 203 154 249

2010 348 326 243 180 256 151

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

1021A 1883 to 2015 133 years Series 10

[B] Entire series, effect on correlation ( .531) is:

Lower 2003< -.027 1994> -.015 1993< -.011 1889< -.011 1936< -.011 1942> -.008 Higher 1899 .017 1959 .016

1021A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1883 78 86 90 108 96 72 43

1890 59 48 52 36 67 52 51 70 72 21

1900 27 26 61 76 53 66 139 146 132 162

1910 181 118 220 278 362 456 438 325 182 267

1920 221 255 211 168 211 184 156 201 184 134

1930 113 119 93 150 113 83 65 62 104 84

1940 69 74 113 85 83 106 103 62 41 107

1950 62 67 75 103 133 125 105 149 110 25

1960 28 68 39 64 47 68 72 127 106 40

1970 41 61 47 75 70 33 59 81 77 82

1980 84 96 87 116 137 196 184 176 163 137

1990 186 156 180 141 153 195 180 142 150 161

2000 162 164 201 114 139 152 153 160 149 163

2010 205 193 280 270 248 173

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

1021B 1889 to 2015 127 years Series 11

[B] Entire series, effect on correlation ( .726) is:

Lower 1994> -.026 1926> -.016 1938< -.011 1998< -.008 1914> -.007 1891< -.007 Higher 1918 .020 1948 .019

1021B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1889 72

1890 99 47 55 43 69 65 59 70 96 48

1900 51 54 90 113 81 95 80 92 133 217

1910 240 167 269 332 434 530 471 390 177 255

1920 234 315 266 252 226 227 296 272 249 173

1930 158 141 195 188 134 154 115 103 83 90

1940 71 73 109 76 71 98 149 118 63 132

1950 121 159 123 137 179 177 127 178 178 76

1960 63 111 67 74 84 90 96 126 85 49

1970 48 66 53 61 55 40 48 65 83 79

1980 93 137 116 136 135 174 197 181 171 131

1990 181 177 244 254 234 254 230 216 163 200

2000 182 169 189 147 171 175 136 196 193 208

2010 281 197 252 202 228 142

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1022A 1917 to 2015 99 years Series 12

[B] Entire series, effect on correlation ( .489) is:

Lower 1938< -.126 2015> -.027 1968< -.009 1989> -.008 1931> -.007 1974> -.007 Higher 1918 .074 1948 .024

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

1938 -5.0 SD

1022A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 358 159 285

1920 341 365 334 231 268 322 318 288 281 225

1930 263 309 292 324 255 265 229 238 66 94

1940 112 111 150 230 261 295 288 238 112 194

1950 244 353 380 358 371 440 190 258 299 140

1960 173 373 249 280 212 218 285 348 206 144

1970 104 235 217 304 295 245 177 229 216 192

1980 241 319 284 300 251 311 324 269 179 189

1990 167 191 317 233 115 179 203 251 229 287

2000 211 207 215 84 38 57 34 39 41 51

2010 70 63 79 69 117 96

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1022B 1917 to 2015 99 years Series 13

[B] Entire series, effect on correlation ( .635) is:

Lower 1934< -.041 2015> -.029 1990< -.018 1931> -.015 1989> -.008 1917> -.008 Higher 1918 .058 1948 .032

[D] 6 Absent rings: Year Master N series Absent

2004 -.148 34 1 >> WARNING: Ring is not usually narrow

2006 -1.640 34 1

2007 .106 34 1 >> WARNING: Ring is not usually narrow

2008 -.759 34 1

2009 .154 34 1 >> WARNING: Ring is not usually narrow

2011 -.529 34 1

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

1934 -4.7 SD

1022B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 312 116 237

1920 274 293 248 203 199 279 243 227 233 184

1930 176 239 172 192 125 176 169 195 216 197

1940 168 143 110 112 136 142 198 176 97 159

1950 118 155 186 192 206 237 143 164 188 93

1960 91 172 132 153 113 131 138 161 126 73

1970 64 103 81 137 50 67 66 96 103 101

1980 172 258 261 270 275 284 306 244 177 152

1990 89 105 150 138 82 129 134 105 77 96

2000 62 80 88 19 0 69 0 0 0 0

2010 49 0 70 62 30 31

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1023A 1865 to 2015 151 years Series 14

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

Lower 1983< -.082 1915< -.025 1901> -.013 1896< -.012 1994> -.009 1883< -.009 Higher 1948 .043 1899 .014

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

1982 1983 -4.4 SD 1983 1984 4.3 SD

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

1983 -7.8 SD

1023A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1865 74 84 73 73 44

1870 44 50 52 39 51 51 34 47 54 65

1880 64 74 106 71 129 91 106 81 93 89

1890 93 76 82 72 111 88 64 98 111 74

1900 70 104 120 114 89 106 123 110 117 153

1910 175 117 244 283 153 63 130 122 59 150

1920 136 193 195 203 217 197 148 103 84 84

1930 89 77 84 110 84 118 159 164 181 146

1940 83 78 111 96 98 87 105 99 29 71

1950 43 50 61 51 78 101 81 119 173 101

1960 69 210 176 226 185 232 270 355 295 261

1970 194 255 147 232 190 176 125 168 148 147

1980 152 148 120 44 95 139 191 200 160 134

1990 121 143 166 167 180 276 250 335 384 291

2000 222 285 229 193 172 181 168 149 125 136

2010 178 132 131 133 126 103

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1023B 1888 to 2015 128 years Series 15

[B] Entire series, effect on correlation ( .571) is:

Lower 1899> -.026 1888< -.022 1895> -.017 1894< -.013 1926< -.012 2014< -.009 Higher 1948 .044 1918 .033

1023B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1888 48 65

1890 76 100 87 82 69 104 85 80 116 123

1900 89 77 92 102 57 69 93 98 97 192

1910 187 114 246 236 200 275 195 158 72 123

1920 108 168 140 129 131 118 63 75 81 77

1930 74 56 56 56 56 77 87 80 78 87

1940 86 75 83 89 76 76 77 78 40 99

1950 60 82 119 204 222 276 236 290 296 192

1960 163 306 195 276 246 256 297 413 350 283

1970 221 304 205 306 221 195 183 200 170 156

1980 151 141 160 137 121 128 134 128 115 117

1990 130 133 169 160 131 167 136 211 221 174

2000 134 176 143 146 185 164 152 160 122 149

2010 250 185 163 174 153 140

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1024A 1860 to 2015 156 years Series 16

[B] Entire series, effect on correlation ( .706) is:

Lower 1961< -.018 1987< -.017 1932< -.014 1989> -.012 1934< -.008 1887< -.007 Higher 1918 .030 1948 .022

1024A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1860 177 174 155 143 121 132 134 158 120 71

1870 79 100 82 77 64 68 55 64 69 71

1880 106 131 176 186 239 182 197 113 176 174

1890 196 172 170 158 200 155 170 219 228 156

1900 141 119 171 198 153 140 150 129 172 222

1910 257 182 265 299 248 226 211 182 90 176

1920 162 204 163 166 197 203 143 174 160 145

1930 120 120 90 103 83 111 105 115 146 175

1940 145 116 127 144 180 155 162 169 67 190

1950 150 244 253 380 452 465 331 484 497 226

1960 242 92 102 172 139 155 164 271 234 175

1970 152 268 159 323 256 169 169 306 239 268

1980 317 375 340 333 330 368 398 236 170 237

1990 259 326 295 270 220 299 287 298 287 266

2000 205 284 236 213 202 198 183 221 153 243

2010 307 237 304 311 400 199

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1024B 1885 to 2015 131 years Series 17

[B] Entire series, effect on correlation ( .636) is:

Lower 1973< -.031 1920< -.022 1941< -.014 1893< -.014 2002< -.014 1939< -.009 Higher 1948 .049 1918 .046

1024B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1885 236 251 177 208 175

1890 185 137 156 95 186 161 150 204 223 130

1900 127 123 176 169 193 183 136 130 148 223

1910 216 139 205 219 185 199 188 144 58 140

1920 75 136 151 145 129 132 126 141 131 133

1930 130 118 133 140 123 117 130 132 146 106

1940 112 84 129 134 169 171 183 171 56 176

1950 134 221 229 236 191 232 190 234 245 69

1960 108 248 188 227 178 185 134 209 189 135

1970 163 237 165 110 164 169 144 219 157 187

1980 235 248 257 228 217 241 221 214 172 178

1990 170 156 192 229 165 215 170 174 158 145

2000 109 130 110 112 151 177 147 173 140 199

2010 260 174 224 194 228 153

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1025A 1851 to 2015 165 years Series 18

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

Lower 1936< -.016 1902< -.016 1911> -.010 1899> -.008 1940> -.008 1873> -.006 Higher 1948 .035 1994 .011

1025A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1851 51 298 173 105 89 113 144 180 158

1860 173 167 172 163 176 203 193 197 168 115

1870 123 139 207 207 179 128 82 124 118 145

1880 150 167 214 193 256 226 248 194 229 214

1890 239 205 200 193 199 127 151 188 222 137

1900 86 85 54 76 59 57 60 56 81 85

1910 95 73 75 98 64 67 88 52 43 82

1920 65 92 69 58 74 76 71 86 84 72

1930 84 95 134 126 119 114 91 111 118 117

1940 134 119 126 109 124 142 134 121 84 138

1950 113 123 148 179 162 202 145 163 178 126

1960 112 150 101 153 122 129 125 181 200 163

1970 197 275 150 246 200 193 173 221 201 193

1980 331 222 205 219 210 205 202 202 171 147

1990 172 185 196 215 130 204 176 185 139 194

2000 119 129 136 130 118 159 93 131 132 117

2010 164 96 171 125 121 108

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1025B 1886 to 2015 130 years Series 19

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

Lower 2015> -.020 1917< -.019 1958< -.019 1887< -.010 1975> -.009 1948> -.009 Higher 1918 .031 1994 .013

1025B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 268 215 229 259

1890 276 222 211 195 210 157 157 157 244 131

1900 136 128 240 224 174 170 114 95 116 126

1910 129 90 108 143 112 85 94 49 41 60

1920 61 85 80 68 84 102 64 97 84 83

1930 73 75 69 69 74 78 112 119 130 119

1940 101 86 87 81 112 89 100 107 75 151

1950 99 93 116 149 184 216 133 162 59 46

1960 28 46 32 69 38 61 87 108 126 78

1970 127 184 114 218 145 166 145 166 126 155

1980 178 155 144 155 112 117 147 181 98 93

1990 96 115 180 156 72 123 88 99 66 106

2000 56 70 72 46 55 86 48 84 57 66

2010 67 36 70 61 78 63

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1026A 1926 to 2015 90 years Series 20

[B] Entire series, effect on correlation ( .651) is:

Lower 1973< -.045 1972> -.015 1963< -.013 1962> -.010 1933< -.010 1960> -.009 Higher 1994 .025 1948 .024

1026A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1926 38 87 48 51

1930 84 94 151 99 113 138 187 160 194 199

1940 144 135 133 121 129 164 189 167 103 209

1950 121 130 126 178 210 249 171 208 306 154

1960 164 234 157 87 60 91 124 180 204 129

1970 129 212 176 102 141 151 128 194 148 211

1980 242 296 260 268 267 277 286 225 176 146

1990 158 225 261 258 141 252 229 255 219 241

2000 150 197 188 169 232 258 148 174 223 225

2010 237 139 243 209 360 173

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1026B 1893 to 2015 123 years Series 21

[B] Entire series, effect on correlation ( .634) is:

Lower 1924< -.012 1962> -.009 2012< -.009 1931> -.009 1990< -.008 2006> -.008 Higher 1948 .050 1959 .012

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

1948 -4.5 SD

1026B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1893 307 323 242 315 289 291 192

1900 129 148 208 207 167 159 134 79 101 117

1910 110 85 119 142 87 96 64 32 29 56

1920 74 86 79 55 45 49 51 92 87 102

1930 119 153 185 170 148 113 134 166 148 162

1940 147 196 165 151 143 133 158 160 64 180

1950 120 174 163 167 158 210 161 187 190 73

1960 97 157 157 198 174 186 172 191 191 124

1970 123 162 123 208 150 146 126 157 136 170

1980 191 154 206 225 223 258 266 270 215 163

1990 114 134 157 139 90 133 108 137 108 112

2000 92 98 87 76 96 124 100 111 107 112

2010 144 65 68 72 78 57

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1027A 1905 to 2015 111 years Series 22

[B] Entire series, effect on correlation ( .636) is:

Lower 2006> -.026 1937< -.020 1911> -.016 1922< -.013 1983< -.011 2009< -.009 Higher 1918 .052 1948 .017

1027A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1905 197 127 80 86 114

1910 134 121 120 140 111 120 127 91 33 87

1920 85 101 63 85 112 122 75 112 97 95

1930 96 88 108 101 108 112 107 78 104 107

1940 96 82 87 103 97 106 122 122 88 133

1950 104 111 145 155 175 268 229 230 202 153

1960 115 151 124 153 165 262 243 269 265 209

1970 164 219 167 223 176 159 161 189 189 181

1980 206 151 139 118 113 143 173 171 150 131

1990 143 165 166 160 118 141 140 146 139 141

2000 101 133 149 112 118 171 160 156 133 105

2010 141 101 140 106 138 109

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1027B 1873 to 2015 143 years Series 23

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

Lower 1998< -.036 1969< -.015 1972> -.009 1873> -.006 2010< -.006 1999< -.006 Higher 1918 .031 1899 .009

1027B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1873 62 61 46 52 55 64 77

1880 101 165 255 237 268 239 279 178 183 190

1890 217 231 191 161 239 166 171 178 170 95

1900 77 83 158 164 127 115 92 54 57 67

1910 104 70 84 84 61 61 77 52 33 45

1920 38 49 50 49 57 52 42 62 54 48

1930 50 54 68 78 77 100 117 114 162 124

1940 129 112 106 103 117 122 125 119 89 160

1950 114 153 202 230 239 264 224 212 212 134

1960 95 164 94 115 113 155 162 177 152 88

1970 77 117 132 186 148 128 139 170 166 173

1980 184 174 157 181 158 171 168 157 135 113

1990 118 177 205 169 104 129 125 152 70 72

2000 63 81 121 113 172 177 130 167 122 121

2010 134 116 138 147 183 147

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1028A 1896 to 2015 120 years Series 24

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

Lower 2015> -.023 1981< -.018 1900> -.012 2009< -.010 1943> -.010 1988> -.010 Higher 1918 .048 1948 .034

1028A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1896 99 95 103 65

1900 103 74 86 93 83 87 80 71 80 117

1910 109 84 132 130 119 165 140 123 66 118

1920 123 152 150 132 161 156 142 165 160 129

1930 114 113 118 157 156 148 177 182 194 146

1940 147 127 192 238 225 198 229 183 98 177

1950 144 231 250 326 380 400 330 292 324 274

1960 237 295 199 242 245 323 335 357 358 354

1970 255 272 247 333 250 222 181 153 135 137

1980 147 105 103 130 109 133 130 122 130 103

1990 122 96 87 84 75 76 80 73 81 91

2000 77 89 88 58 57 74 48 50 38 34

2010 55 44 55 58 65 59

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1028B 1897 to 2015 119 years Series 25

[B] Entire series, effect on correlation ( .709) is:

Lower 1994> -.018 1974> -.012 1904> -.011 2000> -.010 1926> -.010 1992< -.007 Higher 1918 .037 1948 .017

1028B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1897 113 110 77

1900 56 46 67 96 115 105 80 81 84 118

1910 128 96 114 141 110 123 114 89 40 80

1920 77 104 121 125 160 159 153 162 141 98

1930 86 76 86 104 121 114 116 132 173 137

1940 105 105 145 123 123 119 110 99 48 154

1950 125 193 287 311 355 273 243 297 333 213

1960 145 165 111 146 170 228 235 283 236 190

1970 182 206 162 191 204 154 170 173 140 150

1980 153 134 129 136 132 150 137 105 79 65

1990 74 88 83 80 78 77 72 75 60 73

2000 74 88 84 60 58 73 48 50 42 45

2010 79 64 74 70 97 73

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1029A 1917 to 2015 99 years Series 26

[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 10 -.13 -.24 .04 -.06 .24 -.07 .02 -.11 .05 -.18 .34|-.09 -.01 -.15 .10 -.11 .12 .09 -.10 .05 .38\*

[B] Entire series, effect on correlation ( .547) is:

Lower 1959> -.023 1917> -.023 1954< -.018 2006> -.012 1923< -.012 1972> -.011 Higher 1918 .076 1948 .032

1950 to 1999 segment:

Lower 1959> -.053 1954< -.042 1972> -.025 1985< -.024 1967< -.024 1968< -.019 Higher 1962 .043 1989 .036

1029A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 80 61 67

1920 64 70 59 43 50 59 58 49 48 40

1930 29 24 47 64 67 56 69 44 45 39

1940 20 25 13 20 29 50 54 51 21 43

1950 35 52 43 48 38 50 46 90 105 109

1960 77 143 93 92 108 121 130 128 109 187

1970 267 388 336 358 248 298 343 311 326 409

1980 482 502 499 456 315 251 241 203 177 176

1990 298 350 397 333 285 268 216 250 320 319

2000 300 270 323 289 358 304 315 364 304 387

2010 402 363 467 320 338 145

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1029B 1947 to 2015 69 years Series 27

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

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

1966 2015 0 -.19 .19 .06 -.20 .16 -.06 -.19 -.03 -.10 -.16 .31\* - - - - - - - - - -

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

Lower 1968< -.075 2009< -.029 1987< -.027 1994> -.017 2003> -.014 1967< -.014 Higher 1948 .069 1962 .022

1966 to 2015 segment:

Lower 1968< -.095 2009< -.039 1987< -.034 1967< -.021 2003> -.019 1994> -.016 Higher 2015 .057 2010 .051

1029B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1947 53 32 67

1950 51 79 72 91 101 121 79 110 160 116

1960 79 144 90 106 117 148 167 147 120 187

1970 204 234 209 233 213 226 246 290 279 289

1980 316 372 362 321 272 247 217 141 139 149

1990 256 322 390 384 281 235 240 213 293 263

2000 249 254 273 264 291 218 171 191 222 141

2010 350 231 286 183 197 109

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1032A 1875 to 2015 141 years Series 28

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

Lower 1960> -.033 1918> -.021 1942< -.017 1880< -.013 1893> -.009 1908> -.008 Higher 1948 .028 1994 .023

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

1960 +4.7 SD

1032A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1875 104 111 124 173 168

1880 132 195 257 299 404 359 407 353 279 345

1890 366 458 350 430 355 319 352 341 287 250

1900 294 200 254 274 235 218 214 197 273 252

1910 282 150 173 165 114 148 174 137 144 173

1920 143 205 215 231 210 175 160 135 135 106

1930 141 121 143 163 161 147 154 129 141 121

1940 108 147 85 83 90 112 115 146 90 102

1950 111 118 120 130 144 136 99 165 147 101

1960 218 141 114 139 128 117 94 79 82 97

1970 86 80 61 62 44 57 48 48 43 48

1980 84 80 106 72 82 92 76 76 72 67

1990 96 87 112 99 45 68 67 71 86 94

2000 57 75 83 58 89 92 71 78 64 68

2010 79 62 72 80 86 55

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1032B 1858 to 2015 158 years Series 29

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

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

1858 1907 3 - - - -.36 -.04 .05 .02 .09 .26 .18 .30|-.02 -.02 .31\* .12 .07 .04 .01 -.24 -.04 .23

[B] Entire series, effect on correlation ( .472) is:

Lower 1918> -.034 1899> -.019 1901< -.011 1926> -.011 1867< -.009 1890< -.009 Higher 1994 .021 2010 .011

1858 to 1907 segment:

Lower 1899> -.061 1867< -.027 1890< -.025 1893> -.017 1900> -.014 1859< -.014 Higher 1901 .042 1876 .024

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

1900 1901 -4.4 SD 1917 1918 4.1 SD

1032B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1858 108 76

1860 89 117 223 133 86 100 87 68 52 73

1870 93 167 107 100 110 117 99 130 130 235

1880 315 275 323 386 425 458 525 417 412 497

1890 335 354 270 402 421 390 324 306 314 346

1900 348 199 234 284 249 265 255 212 212 221

1910 319 169 208 196 160 186 194 153 196 193

1920 180 224 261 244 257 262 291 293 210 127

1930 156 178 227 181 187 199 233 168 187 112

1940 90 150 95 83 76 109 85 84 58 85

1950 117 151 159 240 303 202 140 276 216 149

1960 115 123 100 113 103 91 82 73 91 92

1970 95 79 44 59 44 53 70 62 81 79

1980 157 199 285 159 177 252 257 148 89 79

1990 122 157 193 222 61 87 78 87 112 112

2000 65 101 111 59 81 80 58 85 85 143

2010 202 116 142 98 119 60

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1033A 1929 to 2015 87 years Series 30

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

Lower 1929> -.030 1992< -.024 1995< -.024 1999< -.016 1976> -.015 2006> -.009 Higher 2015 .032 2011 .017

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

1929 +3.4 SD

1033A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 69

1930 46 44 50 49 44 56 60 67 69 51

1940 33 37 30 35 56 80 77 62 46 97

1950 58 91 119 129 157 189 172 169 190 139

1960 100 126 67 101 108 125 176 192 205 182

1970 204 282 223 300 233 231 285 263 203 224

1980 275 230 233 205 225 239 221 203 194 171

1990 162 162 148 162 152 137 145 161 188 162

2000 155 193 228 208 196 259 227 277 273 279

2010 318 192 293 229 259 146

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1033B 1884 to 2015 132 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

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

1884 1933 0 .09 .04 .00 -.01 .16 -.03 -.03 .05 -.20 -.12 .33\* .09 -.24 .02 -.05 -.26 -.07 .04 -.10 .07 -.04

[B] Entire series, effect on correlation ( .547) is:

Lower 1884< -.059 1972> -.018 1886< -.016 1959> -.014 1992< -.014 2003> -.012 Higher 1948 .037 1994 .023

1884 to 1933 segment:

Lower 1884< -.151 1886< -.039 1895> -.020 1916< -.020 1932< -.014 1926> -.014 Higher 1911 .057 1901 .038

1033B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1884 26 60 44 56 75 78

1890 92 61 53 94 131 121 121 140 129 75

1900 75 52 85 90 90 101 109 105 77 118

1910 132 71 116 122 76 144 88 41 52 109

1920 152 198 181 134 132 144 123 125 90 59

1930 71 36 31 44 59 74 85 71 79 59

1940 45 58 52 48 79 83 70 67 46 98

1950 71 108 112 114 120 110 95 156 206 161

1960 120 133 84 107 109 126 164 169 183 190

1970 194 308 289 325 222 209 257 231 219 246

1980 266 220 262 265 231 225 212 224 216 179

1990 199 201 170 158 135 153 172 155 145 178

2000 152 197 186 189 196 186 153 198 177 185

2010 221 157 188 204 223 170

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1034A 1886 to 2015 130 years Series 32

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

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

1886 1935 -10 .28\* .22 .01 .09 -.24 -.25 -.23 .01 -.04 -.23 .22|-.06 .08 .15 .18 -.09 -.15 .22 -.26 .04 -.08

[B] Entire series, effect on correlation ( .479) is:

Lower 1886< -.016 1948> -.013 1927< -.010 1897< -.009 1916< -.009 1966< -.008 Higher 2015 .026 1994 .017

1886 to 1935 segment:

Lower 1886< -.050 1897< -.029 1927< -.029 1916< -.027 1887> -.020 1890< -.017 Higher 1918 .086 1911 .071

1034A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 29 142 60 55

1890 59 223 172 214 185 135 168 133 193 146

1900 186 178 201 238 227 238 226 206 219 210

1910 189 128 200 171 117 111 95 97 79 99

1920 78 84 100 131 156 114 89 63 66 106

1930 142 138 155 181 220 211 245 210 217 202

1940 42 33 52 90 115 171 181 200 142 138

1950 127 150 152 175 198 182 160 223 265 187

1960 154 180 185 185 223 232 177 202 222 219

1970 196 189 124 160 166 177 130 163 148 114

1980 210 183 159 166 106 120 200 194 96 71

1990 99 142 153 131 61 72 55 79 101 123

2000 86 159 175 144 192 163 103 137 140 148

2010 161 98 145 91 118 63

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1034B 1891 to 2015 125 years Series 33

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

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

1891 1940 0 .00 -.05 .05 -.10 -.09 -.29 -.03 .08 .03 -.30 .29\* .02 -.04 -.01 .22 -.04 .06 .01 -.07 .02 -.07

1900 1949 0 -.08 .13 -.01 -.17 -.12 -.17 -.04 .04 .04 -.17 .31\* .04 -.01 .20 .14 -.13 -.10 -.03 -.10 -.16 -.13

[B] Entire series, effect on correlation ( .468) is:

Lower 1895< -.029 1901> -.015 1969> -.015 1892> -.013 1967< -.012 1918> -.011 Higher 2015 .020 2006 .017

1891 to 1940 segment:

Lower 1901> -.036 1892> -.027 1913< -.023 1895< -.023 1907> -.022 1927< -.020 Higher 1899 .035 1911 .032

1900 to 1949 segment:

Lower 1901> -.040 1913< -.030 1927< -.030 1907> -.024 1945< -.019 1949< -.015 Higher 1948 .065 1911 .041

1034B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1891 164 206 173 186 134 183 188 197 152

1900 169 195 213 210 143 170 185 180 160 191

1910 186 102 157 94 69 72 74 54 54 54

1920 37 61 60 96 100 97 73 64 76 123

1930 170 192 171 189 185 254 380 342 328 247

1940 184 311 158 157 114 105 109 122 91 109

1950 129 137 136 167 206 206 162 221 208 166

1960 160 185 157 157 123 129 124 100 121 168

1970 142 122 74 97 59 69 60 88 78 70

1980 102 85 91 111 65 55 58 71 70 51

1990 70 99 119 165 83 95 68 128 185 139

2000 76 99 123 98 101 97 53 75 81 77

2010 150 84 108 65 85 42

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1007B 1876 to 2015 140 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

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

1876 1925 3 -.31 .06 -.06 -.12 -.03 .20 -.06 -.02 -.04 .22 .12|-.09 -.18 .44\*-.05 -.21 .12 .14 -.12 .11 .16

1900 1949 3 -.21 .11 .21 -.06 .04 .15 -.08 -.06 -.09 .13 .21|-.29 -.17 .37\*-.01 -.07 .14 -.05 -.19 -.13 .04

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

Lower 1918> -.038 1899> -.022 1923< -.020 1937< -.016 2011> -.012 1908< -.012 Higher 1948 .042 1994 .026

1876 to 1925 segment:

Lower 1918> -.061 1899> -.042 1913< -.022 1919< -.022 1923< -.014 1900> -.014 Higher 1882 .028 1921 .021

1900 to 1949 segment:

Lower 1918> -.075 1937< -.029 1923< -.025 1919< -.022 1913< -.022 1940> -.014 Higher 1948 .167 1921 .021

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

1906 +3.1 SD; 1922 +3.1 SD

1007B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1876 64 51 71 87

1880 104 148 196 210 198 186 200 176 206 195

1890 166 167 112 112 159 135 154 137 132 180

1900 214 183 185 161 124 111 288 210 104 146

1910 188 147 155 126 165 179 259 214 224 146

1920 218 284 394 179 188 184 136 155 166 197

1930 170 153 152 187 226 255 201 121 146 206

1940 237 204 149 145 112 117 193 189 112 203

1950 208 213 275 258 335 366 195 302 327 144

1960 190 171 151 175 169 195 260 285 292 296

1970 219 188 125 171 136 120 130 114 122 128

1980 177 171 222 138 86 131 129 145 82 69

1990 122 113 155 155 64 98 61 70 51 70

2000 51 52 78 48 47 55 39 62 55 73

2010 102 89 97 58 78 43

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PART 7: DESCRIPTIVE STATISTICS: LEMP5\_TSCA\_corr2-50 12:21 Mon 06 Nov 2017 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 1007A 1903 2015 113 4 0 .490 1.10 2.55 .506 .811 .212 2.54 .325 -.021 1

2 1017A 1909 2015 107 4 3 .291 1.62 3.33 .872 .873 .240 2.67 .430 .004 1

3 1017B 1912 2015 104 4 1 .400 1.44 3.21 .698 .820 .219 2.68 .466 -.037 1

4 1018A 1853 2015 163 6 0 .627 1.29 4.36 .852 .844 .293 2.68 .446 -.005 3

5 1018B 1871 2015 145 6 0 .579 1.55 4.52 .855 .843 .247 2.58 .415 -.007 2

6 1019A 1915 2015 101 4 0 .499 1.76 3.75 .845 .858 .239 2.47 .356 -.049 1

7 1019B 1925 2015 91 3 0 .621 1.81 3.62 .888 .901 .221 2.49 .426 -.029 1

8 1020A 1851 2015 165 6 0 .531 1.26 4.29 .758 .846 .268 2.74 .330 -.076 1

9 1020B 1881 2015 135 5 1 .351 1.59 3.67 .902 .859 .263 2.46 .344 -.023 1

10 1021A 1883 2015 133 5 0 .531 1.26 4.56 .774 .876 .260 2.48 .337 -.008 1

11 1021B 1889 2015 127 5 0 .726 1.53 5.30 .891 .874 .229 2.69 .539 -.073 1

12 1022A 1917 2015 99 4 0 .489 2.24 4.40 .938 .700 .261 2.42 .408 -.039 2

13 1022B 1917 2015 99 4 0 .635 1.44 3.12 .773 .806 .356 2.46 .429 -.065 1

14 1023A 1865 2015 151 6 0 .529 1.33 3.84 .693 .817 .245 2.66 .351 -.009 1

15 1023B 1888 2015 128 5 0 .571 1.47 4.13 .734 .814 .206 2.93 .499 -.033 1

16 1024A 1860 2015 156 6 0 .706 1.99 4.97 .883 .767 .217 2.45 .385 -.038 1

17 1024B 1885 2015 131 5 0 .636 1.69 2.60 .448 .448 .224 2.46 .414 -.025 1

18 1025A 1851 2015 165 6 0 .662 1.45 3.31 .547 .695 .203 2.85 .407 -.004 1

19 1025B 1886 2015 130 5 0 .619 1.16 2.76 .549 .764 .259 2.70 .499 -.017 1

20 1026A 1926 2015 90 3 0 .651 1.78 3.60 .634 .566 .263 2.68 .546 -.025 1

21 1026B 1893 2015 123 5 0 .634 1.43 3.23 .603 .803 .213 2.42 .308 -.045 1

22 1027A 1905 2015 111 4 0 .636 1.38 2.69 .459 .772 .186 2.46 .349 -.010 1

23 1027B 1873 2015 143 6 0 .705 1.29 2.79 .573 .836 .192 2.69 .473 .065 1

24 1028A 1896 2015 120 5 0 .637 1.53 4.00 .863 .921 .170 2.45 .350 -.035 1

25 1028B 1897 2015 119 5 0 .709 1.27 3.55 .639 .877 .187 2.58 .444 -.015 2

26 1029A 1917 2015 99 4 1 .547 1.84 5.02 1.438 .941 .218 2.65 .410 -.092 1

27 1029B 1947 2015 69 3 1 .514 2.01 3.90 .896 .826 .221 2.75 .532 -.021 1

28 1032A 1875 2015 141 5 0 .525 1.51 4.58 .934 .918 .186 2.83 .445 -.044 1

29 1032B 1858 2015 158 6 1 .472 1.76 5.25 1.036 .871 .239 2.66 .339 -.072 1

30 1033A 1929 2015 87 3 0 .581 1.60 3.18 .786 .887 .185 2.77 .562 -.066 1

31 1033B 1884 2015 132 5 1 .547 1.36 3.25 .660 .888 .208 2.64 .525 -.036 1

32 1034A 1886 2015 130 5 1 .479 1.49 2.65 .533 .672 .240 2.61 .408 -.002 1

33 1034B 1891 2015 125 5 2 .468 1.31 3.80 .635 .810 .227 2.66 .394 -.092 1

34 1007B 1876 2015 140 5 2 .461 1.59 3.94 .701 .730 .234 2.86 .544 -.062 1

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Total or mean: 4230 162 14 .563 1.51 5.30 .753 .809 .231 2.93 .420 -.032

- = [ COFECHA LEMP5COF ] = -