[] Dendrochronology Program Library Run 180CA Program COF 13:06 Mon 04 Apr 2011 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 27854

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: 180\_CAR\_Corr2-30

File of DATED series: 180\_CAR\_corr2

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 30 years lagged successively by 15 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 .4226

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 1795 to 2010 216 years

Continuous time span is 1795 to 2010 216 years

Portion with two or more series is 1807 to 2010 204 years

>> 583-a 1871 absent in 2 of 13 series, but is not usually narrow: master index is -.054

>> 583-a 1985 absent in 1 of 20 series, but is not usually narrow: master index is -.207

>> 583-b 1871 absent in 2 of 13 series, but is not usually narrow: master index is -.054

>> 585-a 1970 absent in 1 of 20 series, but is not usually narrow: master index is .324

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

\*C\* Number of dated series 20 \*C\*

\*O\* Master series 1795 2010 216 yrs \*O\*

\*F\* Total rings in all series 3145 \*F\*

\*E\* Total dated rings checked 3133 \*E\*

\*C\* Series intercorrelation .589 \*C\*

\*H\* Average mean sensitivity .260 \*H\*

\*A\* Segments, possible problems 31 \*A\*

\*\*\* Mean length of series 157.3 \*\*\*

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

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

583-a 2 absent rings: 1871 1985

583-b 4 absent rings: 1871 1872 1874 1875

585-a 2 absent rings: 1968 1970

585-b 7 absent rings: 1964 1965 1966 1967 1968 1969 1974

586-a 2 absent rings: 1847 1907

17 absent rings .541%

PART 2: TIME PLOT OF TREE-RING SERIES: 180\_CAR\_Corr2-30 13:06 Mon 04 Apr 2011 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

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

. . . . . . . . . . . . . . . . . <============> . 577-a 1 1882 2010 129

. . . . . . . . . . . . . . . . . <===========> . 577-b 2 1894 2010 117

. . . . . . . . . . . . . . . .<===================> . 578-a 3 1810 2010 201

. . . . . . . . . . . . . . . .<===================> . 578-b 4 1817 2010 194

. . . . . . . . . . . . . . . . <===============> . 579-a 5 1856 2010 155

. . . . . . . . . . . . . . . . <===============> . 579-b 6 1852 2010 159

. . . . . . . . . . . . . . . . . <============> . 580-a 7 1886 2010 125

. . . . . . . . . . . . . . . . . <===========> . 580-b 8 1895 2010 116

. . . . . . . . . . . . . . . . <===============> . 581-a 9 1850 2010 161

. . . . . . . . . . . . . . . . <===============> . 581-b 10 1859 2010 152

. . . . . . . . . . . . . . . <=====================> . 582-a 11 1795 2010 216

. . . . . . . . . . . . . . . <====================> . 582-b 12 1807 2010 204

. . . . . . . . . . . . . . . . <=================> . 583-a 13 1839 2010 172

. . . . . . . . . . . . . . . . <=================> . 583-b 14 1835 2010 176

. . . . . . . . . . . . . . . . . <==========> . 584-a 15 1905 2010 106

. . . . . . . . . . . . . . . . . <===========> . 584-b 16 1893 2010 118

. . . . . . . . . . . . . . . . <===============> . 585-a 17 1852 2010 159

. . . . . . . . . . . . . . . . . <============> . 585-b 18 1880 2010 131

. . . . . . . . . . . . . . . . <=================> . 586-a 19 1835 2010 176

. . . . . . . . . . . . . . . . <=================> . 586-b 20 1833 2010 178

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

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: 180\_CAR\_Corr2-30 13:06 Mon 04 Apr 2011 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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1800 .763 1 1850 .042 9 1900 1.291 19 1950 -.766 20 2000 -.919 20

1801 1.035 1 1851 .473 9 1901 -.292 19 1951 .362 20 2001 .508 20

1802 .571 1 1852 -.194 11 1902 -1.013 19 1952 .840 20 2002 .716 20

1803 .300 1 1853 .510 11 1903 .216 19 1953 -.417 20 2003 -.996 20

1804 1.307 1 1854 .750 11 1904 -.235 19 1954 .689 20 2004 -2.763 20

1805 .151 1 1855 1.456 11 1905 -.768 20 1955 1.170 20 2005 -1.620 20

1806 -.608 1 1856 .751 12 1906 .409 20 1956 -.806 20 2006 -.734 20

1807 1.190 2 1857 .781 12 1907 -.513 20 1 1957 .528 20 2007 1.157 20

1808 1.899 2 1858 .829 12 1908 -1.504 20 1958 1.278 20 2008 .401 20

1809 1.720 2 1859 .690 13 1909 -2.060 20 1959 1.081 20 2009 .977 20

1810 -.337 3 1860 1.818 13 1910 -.972 20 1960 -1.029 20 2010 1.636 20

1811 -1.298 3 1861 1.622 13 1911 -1.700 20 1961 1.072 20

1812 -.718 3 1862 .197 13 1912 .057 20 1962 .084 20

1813 -1.150 3 1863 .155 13 1913 .807 20 1963 -.521 20

1814 -1.168 3 1864 -1.103 13 1914 -.137 20 1964 -.782 20 1

1815 -.285 3 1865 -.935 13 1915 1.322 20 1965 -1.025 20 1

1816 .162 3 1866 -.578 13 1916 1.431 20 1966 -1.216 20 1

1817 1.247 4 1867 -.364 13 1917 .671 20 1967 -1.226 20 1

1818 -.008 4 1868 -.806 13 1918 .343 20 1968 -1.742 20 2

1819 .471 4 1869 -1.940 13 1919 .528 20 1969 -.823 20 1

1820 -.201 4 1870 -.679 13 1920 .175 20 1970 .324 20 1<<

1821 -.864 4 1871 -.054 13 2<< 1921 .948 20 1971 1.067 20

1822 .278 4 1872 -.525 13 1 1922 .842 20 1972 .657 20

1823 .972 4 1873 -1.662 13 1923 .063 20 1973 .297 20

1824 .580 4 1874 -1.238 13 1 1924 1.105 20 1974 -1.099 20 1

1825 .874 4 1875 -1.410 13 1 1925 .077 20 1975 .551 20

1826 -.578 4 1876 -1.572 13 1926 .567 20 1976 .475 20

1827 1.282 4 1877 -1.014 13 1927 .666 20 1977 -.103 20

1828 -.380 4 1878 -.632 13 1928 .028 20 1978 .083 20

1829 -.414 4 1879 -.443 13 1929 -.631 20 1979 -.232 20

1830 1.301 4 1880 .188 14 1930 -.787 20 1980 .631 20

1831 -.195 4 1881 1.179 14 1931 -.325 20 1981 -.625 20

1832 -.666 4 1882 1.067 15 1932 .581 20 1982 -.454 20

1833 -.354 5 1883 .257 15 1933 -.096 20 1983 .028 20

1834 -.326 5 1884 .674 15 1934 1.105 20 1984 .062 20

1835 -.656 7 1885 1.145 15 1935 -2.067 20 1985 -.207 20 1<<

1836 1.310 7 1886 2.026 16 1936 -.742 20 1986 -.073 20

1837 -.158 7 1887 -.193 16 1937 -.999 20 1987 .255 20

1838 -.370 7 1888 .737 16 1938 .166 20 1988 .896 20

1839 -1.023 8 1889 .352 16 1939 .550 20 1989 1.049 20

1840 -.105 8 1890 -.505 16 1940 -1.211 20 1990 1.170 20

1841 -1.038 8 1891 -.752 16 1941 2.042 20 1991 1.066 20

1842 -.192 8 1892 -.439 16 1942 .981 20 1992 1.538 20

1843 .728 8 1893 -.673 17 1943 .156 20 1993 1.553 20

1844 -2.060 8 1894 .236 18 1944 .277 20 1994 .297 20

1795 -5.422 1 1845 .737 8 1895 -.420 19 1945 .648 20 1995 .482 20

1796 -1.175 1 1846 .439 8 1896 1.407 19 1946 -.610 20 1996 -1.639 20

1797 -1.287 1 1847 -1.553 8 1 1897 .630 19 1947 -.264 20 1997 -1.326 20

1798 -1.048 1 1848 .946 8 1898 1.199 19 1948 -1.012 20 1998 -1.152 20

1799 .076 1 1849 .766 8 1899 .560 19 1949 .339 20 1999 -.205 20

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PART 4: Master Bar Plot: 180\_CAR\_Corr2-30 13:06 Mon 04 Apr 2011 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

1800--------C 1850-----@ 1900----------E 1950--c 2000-d

1801---------D 1851-------B 1901----a 1951------A 2001-------B

1802-------B 1852----a 1902-d 1952--------C 2002--------C

1803------A 1853-------B 1903------A 1953---b 2003-d

1804----------E 1854--------C 1904----a 1954--------C 2004k

1805-----A 1855----------F 1905--c 1955---------E 2005f

1806--b 1856--------C 1906------B 1956--c 2006--c

1807---------E 1857--------C 1907---b 1957-------B 2007---------E

1808----------H 1858--------C 1908f 1958---------E 2008------B

1809----------G 1859--------C 1909h 1959---------D 2009---------D

1810---a 1860----------G 1910-d 1960-d 2010----------G

1811-e 1861----------F 1911g 1961---------D

1812--c 1862-----A 1912-----@ 1962-----@

1813-e 1863-----A 1913--------C 1963---b

1814-e 1864-d 1914----a 1964--c

1815----a 1865-d 1915----------E 1965-d

1816-----A 1866---b 1916----------F 1966-e

1817---------E 1867---a 1917--------C 1967-e

1818-----@ 1868--c 1918------A 1968g

1819-------B 1869h 1919-------B 1969--c

1820----a 1870--c 1920-----A 1970------A

1821--c 1871-----@ 1921---------D 1971---------D

1822------A 1872---b 1922--------C 1972-------C

1823---------D 1873g 1923-----@ 1973------A

1824-------B 1874-e 1924---------D 1974-d

1825--------C 1875f 1925-----@ 1975-------B

1826---b 1876f 1926-------B 1976-------B

1827----------E 1877-d 1927-------C 1977----@

1828---b 1878--c 1928-----@ 1978-----@

1829---b 1879---b 1929--c 1979----a

1830----------E 1880-----A 1930--c 1980-------C

1831----a 1881---------E 1931---a 1981--b

1832--c 1882---------D 1932-------B 1982---b

1833---a 1883------A 1933----@ 1983-----@

1834---a 1884--------C 1934---------D 1984-----@

1835--c 1885---------E 1935h 1985----a

1836----------E 1886----------H 1936--c 1986----@

1837----a 1887----a 1937-d 1987------A

1838---a 1888--------C 1938-----A 1988--------D

1839-d 1889------A 1939-------B 1989---------D

1840----@ 1890---b 1940-e 1990---------E

1841-d 1891--c 1941----------H 1991---------D

1842----a 1892---b 1942---------D 1992----------F

1843--------C 1893--c 1943-----A 1993----------F

1844h 1894------A 1944------A 1994------A

1795v 1845--------C 1895---b 1945-------C 1995-------B

1796-e 1846------B 1896----------F 1946--b 1996g

1797-e 1847f 1897-------C 1947----a 1997-e

1798-d 1848---------D 1898---------E 1948-d 1998-e

1799-----@ 1849--------C 1899-------B 1949------A 1999----a

PART 5: CORRELATION OF SERIES BY SEGMENTS: 180\_CAR\_Corr2-30 13:06 Mon 04 Apr 2011 Page 5

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Correlations of 30-year dated segments, lagged 15 years

Flags: A = correlation under .4226 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1800 1815 1830 1845 1860 1875 1890 1905 1920 1935 1950 1965 1980 1995

1829 1844 1859 1874 1889 1904 1919 1934 1949 1964 1979 1994 2009 2024

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

1 577-a 1882 2010 .36B .33A .40A .70 .65 .40A .50 .63 .62

2 577-b 1894 2010 .48 .60 .68 .65 .49 .44 .70 .74

3 578-a 1810 2010 .26B .27B .47 .79 .45 .48 .82 .70 .72 .63 .49 .57 .73 .79

4 578-b 1817 2010 .22B .46 .80 .82 .75 .65 .58 .81 .77 .58 .70 .87 .90

5 579-a 1856 2010 .53 .64 .74 .73 .48B .32B .52 .71 .66 .74 .75

6 579-b 1852 2010 .45 .52 .52 .68 .55 .74 .75 .58 .65 .79 .78

7 580-a 1886 2010 .73 .64 .42B .65 .80 .60 .32B .69 .69

8 580-b 1895 2010 .51 .44B .64 .60 .53 .68 .74 .73

9 581-a 1850 2010 .67 .83 .61 .52 .71 .68 .69 .74 .61 .56 .67

10 581-b 1859 2010 .80 .79 .69 .68 .60 .50 .50 .49 .49 .57 .57

11 582-a 1795 2010 .46 .66 .69 .61 .69 .69 .68 .50 .38A .61 .60 .29B .50 .54

12 582-b 1807 2010 .33A .48 .59 .76 .75 .74 .61 .50 .55 .67 .75 .53 .72 .73

13 583-a 1839 2010 .61 .42B .56 .58 .57 .73 .71 .65 .59 .51 .64 .65

14 583-b 1835 2010 .65 .60 .42A .51 .77 .76 .84 .84 .59 .25B .67 .65

15 584-a 1905 2010 .28B .66 .72 .63 .39A .74 .75

16 584-b 1893 2010 .37B .26B .70 .71 .48 .42A .64 .61

17 585-a 1852 2010 .36A .60 .56 .46 .37B .15B .55 .73 .28B .62 .63

18 585-b 1880 2010 .61 .51 .29B .52 .58 .45 .60 .81 .82

19 586-a 1835 2010 .45 .50 .65 .63 .50 .43B .80 .73 .60 .69 .72 .74

20 586-b 1833 2010 .32B .58 .73 .64 .44 .44B .70 .70 .60 .64 .61 .63

Av segment correlation .35 .41 .53 .61 .65 .61 .58 .50 .62 .66 .58 .51 .68 .70

PART 6: POTENTIAL PROBLEMS: 180\_CAR\_Corr2-30 13:06 Mon 04 Apr 2011 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 30-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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577-a 1882 to 2010 129 years Series 1

[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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1882 1911 -2 -.03 -.39 -.01 -.25 .13 -.05 .20 .16 .37\* .22 .36|-.06 -.20 -.06 -.33 -.40 -.07 -.15 -.11 .16 -.05

1890 1919 0 .12 -.14 -.17 -.03 .29 .06 .09 .29 .06 .03 .33\*-.39 -.17 -.06 -.12 -.25 -.04 -.23 .01 .20 -.24

1905 1934 0 .24 -.07 -.02 .22 .35 .02 -.02 .37 .05 .00 .40\*-.42 -.08 -.09 .08 .00 -.05 .00 -.12 .13 -.12

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

1950 1979 0 .22 .11 -.33 .01 .31 -.05 -.25 .06 .01 -.17 .40\* .10 -.11 .32 -.07 -.27 -.23 .29 -.22 -.17 -.19

[B] Entire series, effect on correlation ( .493) is:

Lower 1914< -.042 1960> -.025 1968> -.019 1923> -.015 1887> -.015 1915< -.011 Higher 1935 .040 1996 .018

1882 to 1911 segment:

Lower 1887> -.058 1883> -.049 1894< -.030 1908> -.024 1892< -.022 1893< -.020 Higher 1909 .055 1900 .043

1890 to 1919 segment:

Lower 1914< -.099 1915< -.043 1908> -.033 1894< -.017 1902> -.014 1901> -.010 Higher 1909 .042 1900 .037

1905 to 1934 segment:

Lower 1914< -.111 1923> -.066 1915< -.055 1908> -.038 1921< -.012 1918> -.009 Higher 1909 .045 1934 .037

1950 to 1979 segment:

Lower 1960> -.121 1968> -.102 1976< -.027 1963> -.017 1956> -.011 1973< -.011 Higher 1974 .051 1958 .047

577-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1882 70 95 64 109 91 87 86 63

1890 69 61 40 22 41 52 123 156 162 188

1900 231 172 170 139 164 156 251 205 221 155

1910 174 137 191 250 145 194 255 250 290 285

1920 245 237 258 315 280 231 225 244 191 162

1930 144 128 173 147 228 120 209 119 143 139

1940 91 175 113 97 149 145 99 80 58 112

1950 123 176 246 169 290 293 234 287 307 244

1960 261 227 174 212 190 169 142 155 245 227

1970 258 267 222 199 160 197 181 222 223 227

1980 280 196 320 320 299 260 246 285 382 280

1990 288 255 285 328 236 200 139 169 198 233

2000 222 239 202 148 116 150 179 207 243 351

2010 313

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577-b 1894 to 2010 117 years Series 2

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

Lower 1960> -.039 1903< -.016 1964> -.011 1994> -.010 1920< -.009 1894< -.009 Higher 1996 .025 1935 .017

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

1906 +3.2 SD

577-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 93 81 151 147 191 219

1900 205 159 182 145 205 180 337 220 209 177

1910 212 153 254 282 201 287 243 246 276 239

1920 200 257 316 243 282 262 249 253 189 214

1930 175 162 234 178 258 142 157 138 148 201

1940 166 323 281 173 250 229 177 163 151 180

1950 136 185 257 222 230 270 170 214 378 278

1960 292 307 231 224 290 230 221 202 212 198

1970 232 288 256 259 197 226 226 207 230 296

1980 265 257 335 309 258 331 402 482 474 450

1990 456 370 360 347 367 293 160 200 213 286

2000 201 259 234 138 130 163 233 236 253 305

2010 309

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578-a 1810 to 2010 201 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

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1810 1839 3 .00 -.13 .11 -.01 -.20 .09 -.13 -.05 .12 -.30 .26|-.12 .29 .37\*-.02 -.07 .14 .19 .03 -.01 .19

1815 1844 3 .13 -.08 -.10 .01 -.05 .05 -.11 -.02 .17 -.33 .27|-.23 .20 .36\*-.17 -.06 .18 .12 .11 .06 .15

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

Lower 1876> -.028 1832> -.020 1960> -.016 1825< -.009 1812> -.007 1820> -.006 Higher 1935 .042 1887 .009

1810 to 1839 segment:

Lower 1832> -.118 1825< -.053 1812> -.041 1820> -.031 1833> -.015 1834< -.012 Higher 1827 .058 1817 .057

1815 to 1844 segment:

Lower 1832> -.094 1825< -.045 1820> -.026 1841> -.012 1833> -.012 1843< -.012 Higher 1844 .057 1817 .041

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

1831 1832 4.1 SD

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

1876 +4.6 SD

578-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1810 32 35 64 46 49 65 76 107 69 81

1820 86 73 71 71 63 49 35 93 63 43

1830 52 36 69 65 46 40 56 42 45 36

1840 74 70 72 71 62 100 84 63 113 113

1850 87 117 83 119 119 123 108 124 114 108

1860 118 101 63 66 44 32 28 21 18 15

1870 16 17 21 12 9 8 23 15 14 15

1880 15 16 18 19 25 28 47 28 32 29

1890 29 33 58 69 73 57 111 102 123 133

1900 172 124 92 126 112 100 145 118 104 89

1910 117 91 124 136 125 183 183 149 154 134

1920 138 167 139 138 154 122 149 147 150 169

1930 172 188 225 230 328 133 170 209 263 229

1940 188 285 323 257 436 385 332 418 370 351

1950 315 277 253 163 205 339 254 367 402 501

1960 432 533 455 276 211 238 202 183 183 167

1970 276 406 356 431 196 263 201 181 179 198

1980 159 146 136 150 184 214 158 279 335 333

1990 310 267 227 250 205 261 127 125 103 178

2000 96 183 167 115 67 101 111 167 149 138

2010 235

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578-b 1817 to 2010 194 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

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

1817 1846 -9 -.02 .30\* .14 .08 -.04 .02 -.34 -.04 .14 -.23 .22|-.22 -.17 .00 .14 .19 .12 .12 .01 -.15 .27

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

Lower 1827< -.027 1844> -.022 1960> -.018 1914< -.013 1831> -.013 1832> -.010 Higher 1935 .032 2004 .009

1817 to 1846 segment:

Lower 1827< -.123 1831> -.052 1832> -.041 1833< -.019 1841> -.016 1821< -.015 Higher 1830 .050 1817 .043

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

1832 +3.0 SD

578-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1817 151 84 85

1820 57 29 42 58 53 65 37 29 24 43

1830 67 61 63 33 32 40 53 36 39 40

1840 56 66 95 105 86 126 97 78 147 110

1850 84 115 82 94 102 124 99 109 93 86

1860 96 109 65 70 42 43 29 26 17 11

1870 20 17 20 10 7 7 6 6 12 13

1880 22 37 50 37 58 74 96 56 83 74

1890 57 58 97 89 106 74 111 109 129 107

1900 148 108 116 145 98 96 129 123 93 106

1910 106 87 139 170 92 147 154 151 154 185

1920 192 205 166 173 171 152 167 186 179 189

1930 195 198 199 199 326 137 204 175 257 236

1940 198 325 244 269 310 332 239 284 238 262

1950 206 270 293 234 287 346 243 425 439 417

1960 376 399 330 236 193 207 173 177 136 95

1970 135 145 126 105 78 117 78 74 71 60

1980 66 56 62 67 79 64 76 102 126 137

1990 141 159 149 153 111 121 78 94 105 132

2000 83 126 119 92 64 84 88 131 116 137

2010 156

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579-a 1856 to 2010 155 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

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

1905 1934 6 -.12 .05 -.41 .04 .16 -.29 .02 -.03 .07 .28 .48| .09 -.04 -.11 -.02 -.07 .49\*-.10 .10 -.21 .09

1920 1949 6 -.27 .14 -.32 .32 -.05 -.28 -.02 -.13 .05 -.04 .32|-.02 -.15 -.12 .15 -.28 .52\*-.07 .03 -.26 .19

[B] Entire series, effect on correlation ( .582) is:

Lower 1935> -.039 1929< -.028 1874> -.010 1942< -.009 2003> -.008 1933> -.007 Higher 2004 .017 1941 .015

1905 to 1934 segment:

Lower 1929< -.068 1933> -.045 1905> -.033 1924< -.028 1914> -.027 1928> -.011 Higher 1909 .042 1908 .029

1920 to 1949 segment:

Lower 1935> -.147 1929< -.029 1933> -.024 1942< -.020 1940> -.015 1949< -.013 Higher 1941 .111 1946 .029

579-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1856 203 208 209 208

1860 198 207 155 150 134 146 159 143 124 105

1870 120 153 95 75 119 114 68 85 93 76

1880 82 99 106 80 90 99 133 75 88 91

1890 72 72 88 65 83 77 137 128 152 149

1900 173 123 127 146 141 150 135 100 78 63

1910 84 93 149 203 214 267 319 271 223 245

1920 209 225 304 216 212 194 232 235 233 174

1930 202 223 219 247 234 215 185 177 218 222

1940 191 302 173 161 152 209 116 97 104 95

1950 87 115 137 116 141 106 76 85 74 98

1960 39 63 41 33 23 30 33 42 30 44

1970 60 86 99 90 78 116 99 72 81 63

1980 82 73 57 69 75 63 55 54 74 102

1990 93 98 126 123 76 83 55 54 60 66

2000 52 85 102 86 46 72 72 123 92 79

2010 126

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579-b 1852 to 2010 159 years Series 6

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

Lower 1876< -.041 1974> -.012 1874> -.012 1958< -.011 1956> -.010 1924< -.008 Higher 1935 .037 1996 .014

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

1874 +3.0 SD

579-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1852 121 170 133 176 189 203 214 197

1860 222 160 134 104 67 84 102 101 79 55

1870 70 85 75 66 91 86 51 71 74 78

1880 82 89 96 71 77 84 103 83 100 98

1890 80 73 86 69 71 80 117 110 118 129

1900 161 143 114 161 153 155 193 113 88 75

1910 86 80 147 194 229 303 265 225 183 198

1920 161 168 144 116 117 125 120 139 161 140

1930 148 187 175 146 195 117 114 106 143 193

1940 167 255 184 183 173 203 157 184 170 200

1950 183 208 219 164 172 163 136 113 83 100

1960 46 62 47 34 25 26 34 39 22 31

1970 52 59 60 64 65 74 67 53 54 46

1980 55 46 45 53 69 63 64 73 84 90

1990 81 97 129 163 94 95 53 67 69 78

2000 52 73 84 76 52 70 59 94 89 106

2010 105

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580-a 1886 to 2010 125 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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1905 1934 10 -.21 -.04 .06 .04 .03 -.13 -.10 -.03 .02 -.17 .42| .12 .02 .04 -.04 -.01 -.05 -.03 -.14 -.20 .51\*

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

1965 1994 -2 -.07 -.08 -.05 .12 -.03 .13 .19 .28 .54\* .14 .32| .16 .00 -.01 -.20 .07 -.09 .23 -.19 -.16 -.17

[B] Entire series, effect on correlation ( .645) is:

Lower 1925< -.028 1953> -.017 1918< -.015 1994> -.013 1887> -.008 1922< -.008 Higher 1935 .035 1960 .017

1905 to 1934 segment:

Lower 1925< -.054 1918< -.040 1934< -.035 1911> -.034 1922< -.030 1914> -.028 Higher 1908 .054 1915 .034

1965 to 1994 segment:

Lower 1994> -.080 1977> -.045 1990< -.025 1970< -.024 1989< -.022 1973> -.021 Higher 1968 .050 1981 .040

580-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 71 43 50 39

1890 26 24 25 61 104 103 123 113 165 130

1900 151 121 98 140 122 134 206 156 122 124

1910 143 180 219 232 244 289 271 247 174 266

1920 238 267 208 218 267 174 209 230 213 195

1930 188 198 182 153 137 89 108 100 123 123

1940 88 139 131 75 65 62 53 46 32 69

1950 49 42 38 46 49 45 22 32 35 38

1960 18 43 35 34 48 33 24 16 24 34

1970 46 70 72 114 98 124 104 135 154 141

1980 168 121 120 107 105 128 155 154 159 117

1990 97 95 114 99 119 97 29 38 42 54

2000 42 82 107 81 50 77 104 181 144 180

2010 238

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580-b 1895 to 2010 116 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

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1905 1934 10 .00 -.04 .02 .04 -.02 -.08 -.09 -.20 -.11 -.07 .44|-.04 .03 -.12 -.05 .27 -.10 .12 -.24 -.20 .49\*

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

Lower 1918< -.034 1956> -.020 1911> -.018 1940> -.013 1953> -.012 2002< -.009 Higher 1960 .020 1996 .020

1905 to 1934 segment:

Lower 1918< -.132 1911> -.086 1922< -.011 1913< -.009 1928> -.008 1905> -.005 Higher 1924 .037 1909 .034

580-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1895 80 128 125 159 149

1900 140 98 100 127 118 135 194 140 141 130

1910 166 227 281 239 214 230 285 261 172 213

1920 220 236 210 193 253 184 210 246 216 185

1930 143 175 187 156 154 101 100 81 110 112

1940 110 189 131 66 55 59 55 64 56 84

1950 57 74 63 62 69 54 56 55 56 62

1960 37 57 39 54 50 41 35 35 54 65

1970 87 131 162 155 90 106 86 86 84 71

1980 99 74 83 102 104 90 118 117 113 134

1990 152 138 153 151 133 111 62 115 124 137

2000 109 156 117 81 84 127 146 225 183 202

2010 197

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581-a 1850 to 2010 161 years Series 9

[B] Entire series, effect on correlation ( .663) is:

Lower 1898< -.022 1980< -.015 1996> -.008 1963> -.007 1851< -.006 1962> -.006 Higher 1941 .013 1887 .011

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

1940 -5.5 SD

581-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1850 18 23 21 41 65 105 74 86 77 55

1860 89 67 26 28 16 12 12 12 13 9

1870 14 15 16 10 20 14 22 47 71 70

1880 118 117 104 76 94 98 110 46 60 54

1890 39 39 42 33 35 27 42 31 26 22

1900 36 29 29 54 76 77 109 96 70 75

1910 71 92 147 197 225 297 294 262 195 262

1920 225 245 227 198 235 237 275 232 219 181

1930 171 203 230 217 262 183 206 165 141 144

1940 87 186 127 138 115 106 78 77 62 81

1950 60 79 87 58 74 65 35 57 67 85

1960 64 93 98 102 67 50 45 38 45 55

1970 99 139 130 100 50 84 89 93 103 85

1980 59 56 55 79 131 131 142 111 127 98

1990 94 83 150 126 76 99 56 37 29 61

2000 54 75 76 66 55 59 69 173 141 185

2010 246

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581-b 1859 to 2010 152 years Series 10

[B] Entire series, effect on correlation ( .564) is:

Lower 1963> -.013 1968> -.011 2001< -.010 1955< -.010 1953> -.009 1940> -.008 Higher 1941 .009 1960 .009

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

1960 1961 4.1 SD

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

1960 -6.4 SD

581-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1859 60

1860 86 80 30 40 21 20 14 14 12 13

1870 20 27 22 14 14 13 15 27 37 65

1880 79 97 145 133 140 182 225 123 145 81

1890 43 41 41 23 31 24 44 27 29 26

1900 53 33 31 75 58 62 134 114 91 88

1910 120 111 194 182 195 253 260 189 210 253

1920 232 298 236 227 314 247 260 181 199 153

1930 135 127 113 99 111 83 71 108 136 131

1940 106 125 93 85 65 73 55 55 48 47

1950 41 58 50 50 55 44 38 39 40 43

1960 23 60 56 67 47 47 45 42 57 60

1970 53 87 91 65 47 43 56 46 48 49

1980 81 46 58 62 51 34 37 36 45 36

1990 35 38 46 48 34 36 28 32 28 35

2000 32 32 44 43 40 51 86 117 80 86

2010 98

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582-a 1795 to 2010 216 years Series 11

[\*] Early part of series cannot be checked from 1795 to 1806 -- 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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1920 1949 0 .13 -.30 .15 -.33 -.19 .24 -.18 .15 .10 -.04 .38\* .10 .14 -.09 -.13 .14 -.05 -.07 .30 -.46 .13

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1965 1994 -8 -.22 .02 .40\*-.14 -.13 .17 -.15 -.06 -.04 .01 .29| .19 .08 -.07 .17 .22 .38 -.08 -.03 .09 -.04

[B] Entire series, effect on correlation ( .568) is:

Lower 1935> -.018 1968< -.016 1848< -.012 1992< -.010 1807> -.010 1934< -.009 Higher 1844 .028 1847 .010

1920 to 1949 segment:

Lower 1934< -.074 1935> -.041 1944> -.025 1945< -.020 1932< -.011 1942> -.011 Higher 1941 .113 1946 .014

1965 to 1994 segment:

Lower 1992< -.064 1985> -.059 1966> -.036 1993< -.024 1975< -.014 1982> -.013 Higher 1968 .107 1974 .029

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

1967 1968 -4.1 SD

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

1968 -4.9 SD

582-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1795 41 55 55 58 72

1800 87 97 89 84 116 81 61 183 169 127

1810 90 48 39 28 32 27 26 27 32 34

1820 28 33 67 77 65 87 59 129 67 72

1830 66 50 41 52 50 51 90 47 38 33

1840 36 30 36 38 23 41 49 33 35 40

1850 42 50 43 49 58 62 59 59 43 40

1860 67 65 59 51 36 47 46 48 41 27

1870 38 34 34 27 26 37 12 16 48 91

1880 212 304 239 213 227 224 261 175 193 287

1890 220 241 297 280 339 264 338 278 281 212

1900 281 189 157 188 168 174 184 147 136 96

1910 89 66 77 121 90 108 155 131 188 177

1920 185 175 176 140 150 126 170 130 104 87

1930 75 76 74 66 50 53 54 69 69 91

1940 87 184 194 163 225 146 115 115 55 86

1950 58 71 69 68 67 74 42 57 65 72

1960 46 82 63 50 42 33 38 26 8 20

1970 33 35 25 18 14 17 20 16 23 18

1980 30 27 40 53 61 109 102 94 75 77

1990 69 54 32 26 22 22 16 14 14 19

2000 18 28 31 23 8 17 23 61 39 38

2010 110

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582-b 1807 to 2010 204 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

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1807 1836 0 -.09 -.02 .11 .01 .11 -.16 -.12 .00 -.09 .23 .33\*-.05 .08 -.03 -.30 -.11 .19 -.03 -.04 .23 .02

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

Lower 1832< -.029 1807< -.018 1968< -.015 1935> -.013 1864> -.007 1826> -.007 Higher 1844 .023 1956 .008

1807 to 1836 segment:

Lower 1832< -.163 1807< -.078 1826> -.036 1833> -.025 1812< -.011 1834> -.010 Higher 1811 .039 1808 .038

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

1967 1968 -4.1 SD

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

1832 -5.2 SD; 1968 -5.3 SD

582-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1807 80 154 164

1810 79 36 29 43 38 59 67 68 54 60

1820 48 48 58 65 60 65 60 60 46 43

1830 74 51 32 49 55 52 62 59 46 39

1840 50 54 75 59 33 72 77 54 87 84

1850 59 62 55 62 71 86 67 70 76 70

1860 91 67 58 60 61 51 49 56 46 27

1870 42 50 43 41 36 47 19 21 57 128

1880 252 279 257 260 272 266 340 179 228 255

1890 250 230 168 154 225 211 243 212 223 159

1900 209 136 105 136 146 149 171 109 97 45

1910 52 28 39 82 66 85 97 98 93 136

1920 145 149 116 100 147 166 162 124 93 73

1930 59 62 67 73 81 69 82 83 86 139

1940 101 180 160 111 133 125 120 131 105 146

1950 110 97 98 80 83 94 55 77 84 83

1960 39 66 54 41 38 30 22 26 12 15

1970 16 16 15 12 8 11 11 9 9 10

1980 12 10 16 12 12 9 13 12 21 24

1990 15 23 25 32 20 30 13 13 11 19

2000 15 25 51 19 8 18 54 132 113 206

2010 263

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583-a 1839 to 2010 172 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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1845 1874 5 -.02 -.30 .01 -.01 -.07 .24 -.42 -.17 .20 .06 .42| .01 -.01 .22 .23 .45\* .05 -.08 -.03 .16 .33

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

Lower 1871< -.015 1996> -.011 1993< -.010 1956> -.009 1948> -.009 1985< -.009 Higher 1844 .029 1935 .015

1845 to 1874 segment:

Lower 1871< -.066 1850> -.043 1868> -.034 1854< -.027 1872> -.026 1847> -.019 Higher 1860 .052 1864 .052

[D] 2 Absent rings: Year Master N series Absent

1871 -.054 13 2 >> WARNING: Ring is not usually narrow

1985 -.207 20 1 >> WARNING: Ring is not usually narrow

583-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1839 55

1840 54 42 51 94 45 59 59 52 67 56

1850 71 85 57 59 41 56 45 34 31 26

1860 31 20 18 9 2 4 6 6 7 4

1870 4 0 10 4 4 6 12 19 29 35

1880 59 82 87 107 130 126 166 135 174 176

1890 155 195 183 176 212 204 221 223 270 233

1900 216 200 205 227 165 146 129 104 70 67

1910 98 71 109 113 121 126 174 131 120 133

1920 152 199 183 144 179 150 132 120 77 64

1930 67 59 71 73 89 52 62 45 68 83

1940 69 106 86 96 84 93 80 110 126 134

1950 125 135 141 59 93 98 84 86 124 67

1960 31 44 26 20 10 15 17 18 12 9

1970 12 10 8 10 4 19 13 17 13 16

1980 34 18 7 18 18 0 12 14 23 37

1990 45 71 118 64 49 60 53 54 55 47

2000 62 87 90 39 13 18 41 94 66 87

2010 124

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583-b 1835 to 2010 176 years Series 14

[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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1860 1889 0 -.31 -.28 -.04 -.03 .09 -.12 -.20 .14 .34 .11 .42\* .17 -.07 .00 .11 .20 -.06 -.17 .11 .05 .24

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1965 1994 -8 -.26 .11 .30\*-.12 .01 .25 .23 .04 -.21 .07 .25|-.05 .03 .09 -.21 -.15 -.33 -.26 -.21 .17 .21

[B] Entire series, effect on correlation ( .647) is:

Lower 1841> -.017 1887> -.017 1871< -.010 1971< -.010 1835< -.009 1869> -.009 Higher 1935 .036 1844 .024

1860 to 1889 segment:

Lower 1887> -.109 1871< -.083 1869> -.050 1883> -.014 1876> -.014 1868> -.013 Higher 1860 .055 1864 .042

1965 to 1994 segment:

Lower 1971< -.083 1977> -.042 1966> -.033 1981> -.031 1967> -.025 1993< -.022 Higher 1974 .044 1994 .041

[D] 4 Absent rings: Year Master N series Absent

1871 -.054 13 2 >> WARNING: Ring is not usually narrow

1872 -.525 13 1

1874 -1.238 13 1

1875 -1.410 13 1

583-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1835 20 63 51 52 37

1840 38 62 81 81 43 67 61 49 88 71

1850 80 72 49 64 56 76 62 43 39 36

1860 38 33 20 17 4 3 5 5 5 6

1870 4 0 0 4 0 0 11 15 26 30

1880 60 83 94 116 140 164 170 180 233 204

1890 166 163 160 161 220 195 256 240 260 245

1900 220 204 168 209 153 126 143 131 92 88

1910 112 94 121 140 134 184 181 180 189 182

1920 213 247 243 197 246 182 165 141 98 99

1930 91 112 131 119 129 77 115 117 132 126

1940 86 159 140 151 136 191 132 159 122 142

1950 136 114 131 68 90 84 50 58 84 62

1960 33 52 31 22 17 22 26 26 23 16

1970 22 13 10 9 7 20 24 34 31 32

1980 57 44 15 28 19 5 13 14 33 39

1990 54 75 76 57 37 44 34 33 29 46

2000 69 93 131 60 20 33 78 173 151 190

2010 170

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584-a 1905 to 2010 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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1905 1934 4 .23 -.13 .31 -.21 -.09 -.15 -.19 -.07 .07 -.12 .28|-.35 .16 .11 .33\* .02 .12 .06 -.17 .15 -.06

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1965 1994 0 .09 .09 -.16 -.13 -.01 .20 .01 .03 -.30 -.06 .39\* .11 .18 -.01 .28 .05 -.03 .15 .11 .09 -.30

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

Lower 1919< -.035 1964> -.013 1908> -.012 1985> -.009 1968> -.008 1923> -.007 Higher 1960 .025 1996 .023

1905 to 1934 segment:

Lower 1919< -.127 1908> -.050 1923> -.030 1916< -.027 1931< -.018 1906< -.014 Higher 1924 .060 1934 .055

1965 to 1994 segment:

Lower 1985> -.052 1968> -.045 1986> -.023 1992< -.023 1987< -.023 1978< -.016 Higher 1981 .069 1975 .030

584-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1905 26 48 57 106 97

1910 175 154 246 274 224 228 179 167 166 105

1920 114 192 195 238 343 264 240 218 204 165

1930 139 110 141 112 202 117 154 139 163 145

1940 77 151 113 57 58 52 50 30 22 49

1950 43 53 93 68 65 84 44 63 125 65

1960 20 63 34 20 53 31 21 22 29 32

1970 43 40 29 16 17 51 94 38 21 19

1980 40 15 44 98 106 149 180 93 98 81

1990 78 74 68 98 71 99 44 30 45 49

2000 67 110 117 54 21 25 42 90 72 98

2010 120

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584-b 1893 to 2010 118 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

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1893 1922 3 .07 .01 .04 -.15 .00 -.23 -.18 -.22 -.17 -.22 .37| .08 .41 .56\* .25 .17 .36 .00 -.02 .15 .00

1905 1934 4 -.18 -.06 -.02 -.34 .11 -.10 -.20 .06 -.16 .01 .26|-.33 .26 -.08 .30\* .19 .10 .23 -.32 .17 -.21

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1965 1994 0 .10 .09 -.24 -.07 .02 .27 .09 .24 -.12 .13 .42\* .11 .22 .00 .01 -.13 -.10 -.33 -.06 .00 .07

[B] Entire series, effect on correlation ( .560) is:

Lower 1923< -.020 1931< -.020 1956> -.017 1996> -.012 1953> -.009 1984< -.009 Higher 1935 .081 2004 .020

1893 to 1922 segment:

Lower 1906< -.066 1914> -.040 1900< -.040 1916< -.028 1909> -.021 1895> -.020 Higher 1901 .052 1902 .041

1905 to 1934 segment:

Lower 1931< -.058 1906< -.040 1914> -.026 1929> -.023 1925> -.020 1916< -.020 Higher 1934 .057 1921 .032

1965 to 1994 segment:

Lower 1981> -.054 1984< -.051 1991< -.045 1971< -.033 1976> -.024 1982> -.016 Higher 1994 .046 1993 .029

584-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1893 111 171 138 135 103 104 67

1900 63 36 28 59 39 22 24 39 52 77

1910 139 125 191 227 220 194 171 154 176 169

1920 190 219 192 129 176 174 154 189 148 155

1930 132 97 148 125 161 78 111 79 102 91

1940 43 81 63 45 35 33 34 28 19 29

1950 40 59 64 56 55 87 60 49 61 30

1960 16 35 24 15 16 12 8 12 11 19

1970 29 34 46 26 45 109 236 126 154 154

1980 187 171 175 128 77 97 118 191 181 205

1990 179 127 155 171 97 103 90 58 63 61

2000 52 91 144 72 36 52 114 188 119 178

2010 141

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585-a 1852 to 2010 159 years Series 17

[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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1852 1881 0 .07 -.13 -.40 -.05 -.17 -.04 .04 .07 -.19 .13 .36\* .13 -.06 .09 .14 .16 -.15 .35 .13 .03 -.02

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1905 1934 -3 -.11 .00 -.17 .01 .23 -.01 .05 .38\*-.24 -.05 .37|-.03 .23 .08 -.03 -.19 .05 -.22 -.25 .21 .17

1920 1949 10 -.06 .03 -.05 -.16 -.09 .20 -.17 .21 -.29 -.17 .15|-.31 .47 -.08 .03 -.19 -.13 .04 -.13 -.03 .51\*

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1965 1994 9 .08 .12 .08 .02 -.16 .39 -.12 -.08 -.16 .16 .28| .03 .19 -.14 -.01 -.04 -.10 .15 .18 .40\*-.16

[B] Entire series, effect on correlation ( .433) is:

Lower 1970< -.053 1935> -.044 1981> -.009 1864> -.009 1895> -.009 1855< -.008 Higher 1960 .029 1887 .014

1852 to 1881 segment:

Lower 1864> -.067 1855< -.052 1852> -.047 1857< -.027 1870> -.022 1859< -.015 Higher 1869 .116 1881 .075

1905 to 1934 segment:

Lower 1929> -.057 1911> -.051 1930> -.048 1907> -.026 1934< -.025 1926< -.024 Higher 1908 .094 1915 .062

1920 to 1949 segment:

Lower 1935> -.144 1926< -.029 1929> -.029 1930> -.028 1949< -.028 1934< -.022 Higher 1940 .079 1941 .064

1965 to 1994 segment:

Lower 1970< -.215 1981> -.059 1966> -.025 1988< -.025 1985> -.016 1984> -.014 Higher 1968 .108 1971 .044

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

1934 1935 4.0 SD 1969 1970 -4.6 SD

[D] 2 Absent rings: Year Master N series Absent

1968 -1.742 20 2

1970 .324 20 1 >> WARNING: Ring is not usually narrow

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

1970 -5.5 SD

585-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1852 168 162 135 87 59 45 60 49

1860 70 60 41 41 49 32 35 46 46 34

1870 69 78 78 73 73 80 88 105 95 116

1880 136 222 219 184 173 192 217 168 217 208

1890 225 213 205 224 250 308 433 258 257 247

1900 249 225 187 192 224 172 199 209 143 159

1910 173 210 204 197 152 314 337 280 303 298

1920 269 318 417 315 296 226 221 252 292 370

1930 454 480 479 318 303 337 352 365 309 343

1940 249 289 299 248 231 218 160 156 134 107

1950 65 87 81 64 95 140 69 83 85 72

1960 11 36 21 16 9 6 14 8 0 15

1970 0 23 17 13 18 25 41 30 54 40

1980 70 88 66 90 158 145 109 79 57 73

1990 142 108 126 119 82 80 31 19 17 28

2000 29 83 106 30 12 16 33 71 56 95

2010 177

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585-b 1880 to 2010 131 years Series 18

[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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1905 1934 -10 .30\* .16 -.28 -.14 -.09 -.44 -.02 .02 -.17 -.04 .29|-.15 .11 -.10 -.22 -.11 .24 -.06 .11 -.02 .03

[B] Entire series, effect on correlation ( .604) is:

Lower 1960> -.019 1921< -.014 1961< -.011 1880< -.011 1956> -.010 1920< -.010 Higher 1935 .022 1996 .017

1905 to 1934 segment:

Lower 1921< -.095 1920< -.054 1914> -.048 1906< -.045 1930> -.037 1919< -.019 Higher 1915 .069 1911 .043

[D] 7 Absent rings: Year Master N series Absent

1964 -.782 20 1

1965 -1.025 20 1

1966 -1.216 20 1

1967 -1.226 20 1

1968 -1.742 20 2

1969 -.823 20 1

1974 -1.099 20 1

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

1921 -5.0 SD

585-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1880 161 209 176 165 169 194 201 149 166 170

1890 163 163 136 137 147 132 185 178 192 194

1900 210 141 124 122 162 125 107 106 106 109

1910 153 113 112 156 190 248 255 170 127 107

1920 63 63 123 109 162 160 188 185 190 145

1930 203 242 260 230 212 130 135 180 198 159

1940 122 152 108 111 101 100 72 80 86 98

1950 70 79 97 65 84 132 86 74 59 43

1960 37 20 9 11 0 0 0 0 0 0

1970 6 11 9 17 0 19 21 18 19 20

1980 32 14 16 18 21 16 10 15 36 52

1990 62 56 69 70 60 82 32 47 33 69

2000 66 90 79 25 5 15 32 73 55 58

2010 109

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586-a 1835 to 2010 176 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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1905 1934 2 .05 -.25 .16 -.03 -.18 .06 -.03 .15 .05 .02 .43|-.09 .47\*-.02 .12 .04 -.05 .36 -.17 .11 -.32

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

Lower 1960> -.022 1839> -.011 1852> -.008 1873> -.007 1838> -.006 1842< -.006 Higher 1935 .033 1941 .011

1905 to 1934 segment:

Lower 1906< -.069 1916< -.054 1923> -.047 1911> -.031 1925> -.031 1928< -.017 Higher 1915 .045 1934 .043

[D] 2 Absent rings: Year Master N series Absent

1847 -1.553 8 1

1907 -.513 20 1

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

1839 +3.0 SD; 1847 -6.7 SD

586-a Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1835 118 158 107 131 152

1840 111 35 33 140 82 82 68 0 70 89

1850 65 49 84 72 96 85 77 78 77 77

1860 92 113 71 55 46 37 29 25 16 13

1870 19 19 13 17 13 9 12 10 8 8

1880 8 13 16 11 28 32 52 30 42 38

1890 39 25 37 44 48 42 64 39 55 34

1900 32 21 11 34 13 9 10 0 24 26

1910 61 81 102 137 132 173 147 145 169 176

1920 202 196 212 232 244 238 230 216 147 143

1930 150 148 185 148 211 76 93 108 132 156

1940 129 295 334 199 185 219 188 206 167 209

1950 138 163 148 94 123 133 59 105 145 126

1960 132 143 143 62 54 61 49 49 53 72

1970 105 124 89 59 49 81 84 56 76 58

1980 77 62 52 80 73 96 92 123 127 218

1990 361 329 283 262 110 107 69 45 56 74

2000 70 106 111 83 66 64 66 137 138 168

2010 198

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586-b 1833 to 2010 178 years Series 20

[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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1833 1862 -3 .04 .29 -.18 .15 .17 -.15 .04 .35\*-.03 .05 .32|-.13 -.13 .26 -.13 .06 .15 -.17 -.28 -.02 -.19

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1905 1934 2 -.03 -.13 -.03 -.26 -.08 .05 .09 .03 .02 .08 .44|-.05 .44\* .04 -.14 .01 .28 .20 -.29 -.12 .09

[B] Entire series, effect on correlation ( .557) is:

Lower 1960> -.018 1844> -.016 1893> -.009 1852> -.008 1853< -.008 1996> -.008 Higher 1935 .044 1887 .014

1833 to 1862 segment:

Lower 1852> -.035 1853< -.033 1839> -.032 1838> -.023 1844> -.022 1843< -.018 Higher 1847 .109 1860 .050

1905 to 1934 segment:

Lower 1925> -.061 1914> -.044 1906< -.043 1931> -.020 1928> -.019 1933< -.019 Higher 1929 .043 1915 .039

586-b Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1833 44 92 102 153 122 133 136

1840 109 26 15 17 16 32 39 4 33 42

1850 52 40 74 44 75 84 107 76 64 65

1860 101 87 64 58 41 32 34 26 18 13

1870 9 15 13 4 7 7 27 41 54 54

1880 65 82 97 59 80 80 133 69 91 75

1890 61 45 71 119 130 110 106 60 93 68

1900 69 39 23 40 14 15 13 7 15 32

1910 58 74 125 145 207 281 286 248 291 239

1920 256 298 290 228 289 334 285 274 277 187

1930 144 234 245 154 199 99 116 114 112 121

1940 115 208 218 230 169 216 198 163 151 169

1950 113 154 189 118 161 271 159 232 224 186

1960 193 203 182 97 102 89 70 67 49 214

1970 225 210 182 260 159 168 164 144 166 142

1980 166 79 48 49 33 28 36 62 73 156

1990 233 249 222 167 88 101 90 64 103 93

2000 84 97 95 85 66 82 81 128 168 231

2010 329

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PART 7: DESCRIPTIVE STATISTICS: 180\_CAR\_Corr2-30 13:06 Mon 04 Apr 2011 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 ()

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1 577-a 1882 2010 129 9 4 .493 1.92 3.82 .749 .794 .222 2.64 .385 .024 4

2 577-b 1894 2010 117 8 0 .589 2.38 4.82 .753 .706 .197 2.87 .518 -.018 1

3 578-a 1810 2010 201 14 2 .581 1.45 5.33 1.101 .899 .228 2.55 .302 -.043 1

4 578-b 1817 2010 194 13 1 .634 1.25 4.39 .877 .907 .227 2.65 .283 -.041 2

5 579-a 1856 2010 155 11 2 .582 1.25 3.19 .645 .883 .202 2.78 .402 -.005 1

6 579-b 1852 2010 159 11 0 .632 1.13 3.03 .560 .881 .187 2.63 .357 -.070 1

7 580-a 1886 2010 125 9 2 .645 1.14 2.89 .686 .902 .241 2.58 .455 -.008 1

8 580-b 1895 2010 116 8 1 .603 1.26 2.85 .608 .867 .195 2.73 .417 -.017 1

9 581-a 1850 2010 161 11 0 .663 .97 2.97 .690 .910 .252 2.88 .435 -.047 4

10 581-b 1859 2010 152 11 0 .564 .81 3.14 .660 .918 .227 2.63 .336 -.105 1

11 582-a 1795 2010 216 14 2 .568 .87 3.39 .729 .910 .250 2.80 .372 .030 2

12 582-b 1807 2010 204 14 1 .598 .84 3.40 .675 .903 .257 2.63 .366 -.039 1

13 583-a 1839 2010 172 12 1 .601 .77 2.70 .615 .934 .327 2.77 .395 .000 2

14 583-b 1835 2010 176 12 2 .647 .90 2.60 .691 .931 .307 2.58 .437 -.017 2

15 584-a 1905 2010 106 7 2 .603 .97 3.43 .693 .849 .363 2.92 .605 .053 1

16 584-b 1893 2010 118 8 3 .560 1.00 2.36 .618 .836 .302 2.62 .385 -.057 2

17 585-a 1852 2010 159 11 4 .433 1.48 4.80 1.136 .933 .308 2.88 .425 -.085 1

18 585-b 1880 2010 131 9 1 .604 1.00 2.60 .692 .921 .304 2.70 .446 -.063 1

19 586-a 1835 2010 176 12 1 .610 .98 3.61 .724 .865 .305 2.56 .302 -.043 1

20 586-b 1833 2010 178 12 2 .557 1.18 3.34 .816 .875 .302 2.69 .441 -.124 1

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Total or mean: 3145 216 31 .589 1.15 5.33 .746 .887 .260 2.92 .394 -.035

- = [ COFECHA 180CACOF ] = -