[] Dendrochronology Program Library Run FAGR Program COF 10:07 Tue 19 Sep 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30214

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: FAGR\_CORR1-50

File of DATED series: FAGR\_RR\_CORR1

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 1826 to 2016 191 years

Continuous time span is 1826 to 2016 191 years

Portion with two or more series is 1827 to 2016 190 years

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

\*C\* Number of dated series 31 \*C\*

\*O\* Master series 1826 2016 191 yrs \*O\*

\*F\* Total rings in all series 3440 \*F\*

\*E\* Total dated rings checked 3439 \*E\*

\*C\* Series intercorrelation .578 \*C\*

\*H\* Average mean sensitivity .267 \*H\*

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

\*\*\* Mean length of series 111.0 \*\*\*

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

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

1877B 1 absent rings: 1949

1887B 1 absent rings: 2000

2 absent rings .058%

1850 -.179 8 1900 -1.034 13 1950 -2.424 27 2000 -2.372 30 1

1851 1.465 8 1901 .636 14 1951 -.447 27 2001 -.128 30

1852 .397 8 1902 1.610 14 1952 -.512 27 2002 -.428 30

1853 .468 8 1903 1.321 14 1953 -2.007 27 2003 -.903 30

1854 -.035 8 1904 .604 14 1954 -.952 27 2004 -.116 30

1855 -.443 8 1905 .371 14 1955 1.387 27 2005 .464 30

1856 .010 8 1906 1.515 14 1956 1.239 27 2006 .026 30

1857 1.546 8 1907 .402 14 1957 1.514 28 2007 .931 30

1858 .913 8 1908 .033 14 1958 1.304 28 2008 .515 30

1859 -1.017 8 1909 -1.282 14 1959 .061 28 2009 2.252 30

1860 -1.998 8 1910 .094 14 1960 -.362 28 2010 .886 30

1861 -.268 8 1911 -.301 14 1961 1.159 28 2011 -.041 30

1862 .652 8 1912 -1.049 14 1962 .676 30 2012 .057 30

1863 1.589 8 1913 -.211 14 1963 -.512 30 2013 -1.023 30

1864 -.011 8 1914 -2.160 14 1964 .609 30 2014 .777 30

1865 1.070 8 1915 -.418 14 1965 -.081 30 2015 1.051 30

1866 1.126 8 1916 .507 14 1966 -1.545 30 2016 -1.317 30

1867 -.204 8 1917 -1.111 14 1967 -.152 30

1868 -.049 8 1918 .712 14 1968 .666 30

1869 -.696 8 1919 -.509 14 1969 .935 30

1870 -1.525 8 1920 -.191 14 1970 -.170 30

1871 -2.240 8 1921 .539 14 1971 -1.218 30

1872 -.802 8 1922 -1.571 14 1972 1.207 30

1873 .963 8 1923 -.227 14 1973 1.157 30

1874 1.913 8 1924 -1.496 14 1974 .296 30

1875 2.304 8 1925 -1.109 14 1975 -1.068 30

1826 -1.646 1 1876 .670 8 1926 .952 14 1976 -.312 30

1827 -.766 3 1877 -.924 8 1927 .980 17 1977 -3.221 30

1828 2.374 4 1878 -.310 8 1928 .960 17 1978 -.154 30

1829 .534 4 1879 .275 8 1929 .736 17 1979 -.778 30

1830 .725 4 1880 -.606 8 1930 .399 17 1980 -.765 30

1831 -.473 4 1881 -1.095 8 1931 .313 16 1981 .196 30

1832 -.488 4 1882 -.315 8 1932 1.192 17 1982 .801 30

1833 .750 5 1883 -.253 8 1933 .186 18 1983 -.149 30

1834 -2.766 6 1884 -1.234 8 1934 -1.336 18 1984 .548 30

1835 -.504 6 1885 -.910 9 1935 -.163 18 1985 .879 30

1836 .189 6 1886 .476 9 1936 .814 19 1986 1.053 30

1837 .335 6 1887 .039 9 1937 .696 22 1987 1.661 30

1838 -.163 6 1888 -.163 11 1938 .061 23 1988 -.540 30

1839 .708 6 1889 1.882 11 1939 .889 25 1989 .297 30

1840 -1.238 6 1890 .295 11 1940 .605 25 1990 .817 30

1841 .348 6 1891 -1.004 11 1941 -.312 26 1991 .019 30

1842 .637 6 1892 .700 11 1942 -.548 26 1992 -.031 30

1843 -.738 6 1893 -.482 11 1943 .193 26 1993 .682 30

1844 .916 6 1894 -.033 12 1944 .904 26 1994 .455 30

1845 -1.453 7 1895 -1.052 12 1945 .411 26 1995 -1.422 30

1846 -1.251 7 1896 .055 12 1946 -.036 27 1996 -1.083 30

1847 .614 7 1897 .993 12 1947 .767 27 1997 -.021 30

1848 .825 8 1898 .573 12 1948 -.039 27 1998 .279 30

1849 -1.455 8 1899 -.295 12 1949 -2.032 27 1 1999 -1.110 30

PART 5: CORRELATION OF SERIES BY SEGMENTS: FAGR\_CORR1-50 10:07 Tue 19 Sep 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 1825 1850 1875 1900 1925 1950 1975

1874 1899 1924 1949 1974 1999 2024

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

1 1A1 1938 2016 .76 .70 .74

2 1A2 1848 1930 .55 .53 .57 .56

3 1B 1845 2016 .51 .58 .69 .70 .70 .79 .82

4 1872A 1828 2016 .65 .50 .39 .43 .29B .26B .26A

5 1872B 1826 2016 .68 .49 .46 .54 .47 .27B .25A

6 1874A 1900 2016 .64 .63 .61 .67

7 1874B 1885 2016 .65 .71 .70 .73 .71

8 1875A 1937 2016 .71 .79 .80

9 1875B 1941 2016 .88 .84 .76

10 1876A 1927 2016 .52 .77 .67

11 1876B 1927 2016 .50 .77 .81

12 1877A 1933 2016 .76 .85 .80

13 1877B 1932 2016 .70 .77 .77

14 1878A 1939 2016 .76 .77 .76

15 1878B 1939 2016 .78 .79 .78

16 1879A 1936 2016 .59 .59 .66

17 1879B 1946 2016 .71 .66 .66

18 1881A 1888 2016 .33B .44 .36B .35 .51

19 1881B 1888 2016 .35B .38 .31B .31A .41

20 1882A 1894 2016 .31A .37 .35 .32A .47

21 1882B 1901 2016 .46 .45 .21B .31B

22 1883A 1937 2016 .42 .51 .44

23 1883B 1937 2016 .47 .66 .66

24 1884A 1962 2016 .46 .50

25 1884B 1962 2016 .54 .53

26 1885A 1827 2016 .60 .67 .66 .66 .52 .55 .61

27 1885B 1834 2016 .68 .66 .53 .49 .51 .50 .37

28 1886A 1957 2016 .47 .57

29 1886B 1927 2016 .56 .86 .83

30 1887A 1827 2016 .59 .61 .64 .61 .78 .80 .65

31 1887B 1833 2016 .64 .68 .61 .62 .78 .69 .49

Av segment correlation .61 .59 .52 .54 .59 .61 .61

PART 6: POTENTIAL PROBLEMS: FAGR\_CORR1-50 10:07 Tue 19 Sep 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

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1A1 1938 to 2016 79 years Series 1

[B] Entire series, effect on correlation ( .739) is:

Lower 1998< -.034 1996> -.017 1974> -.014 1954> -.009 1938> -.008 1958< -.007 Higher 1977 .060 1949 .013

1A1 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 257 274

1940 258 194 134 190 210 199 191 233 180 74

1950 58 102 184 120 246 348 398 316 210 199

1960 203 280 212 113 146 159 103 132 158 161

1970 140 131 182 175 255 179 196 90 204 119

1980 171 188 213 145 255 186 241 239 170 204

1990 287 147 194 223 212 78 206 160 29 30

2000 34 84 96 90 117 120 128 174 148 225

2010 168 123 120 100 119 140 92

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1A2 1848 to 1930 83 years Series 2

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

Lower 1857< -.025 1856< -.025 1914> -.019 1901< -.018 1885> -.016 1924< -.014 Higher 1917 .015 1875 .015

1A2 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1848 293 203

1850 326 320 244 202 183 243 140 131 169 118

1860 109 185 209 208 123 138 147 131 164 144

1870 128 115 122 149 183 204 166 137 112 122

1880 98 132 142 148 133 184 221 185 126 195

1890 153 116 178 127 126 88 171 217 203 122

1900 95 84 143 254 186 155 216 231 134 75

1910 105 100 68 86 100 100 107 74 115 101

1920 99 162 110 126 67 108 152 157 184 262

1930 168

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1B 1845 to 2016 172 years Series 3

[B] Entire series, effect on correlation ( .692) is:

Lower 1914> -.018 1846> -.016 1878< -.008 1845> -.007 1996> -.007 1869> -.007 Higher 1977 .021 2000 .010

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

1846 +3.4 SD

1B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1845 175 257 212 182 129

1850 158 261 219 182 161 232 168 247 247 194

1860 111 144 141 198 142 320 324 167 202 252

1870 170 169 219 321 278 245 174 141 100 146

1880 113 92 178 141 135 173 237 207 160 294

1890 200 190 276 179 179 140 241 279 240 183

1900 115 157 298 330 217 261 307 251 149 100

1910 142 120 111 153 147 133 159 79 168 116

1920 112 147 84 98 63 104 157 142 202 225

1930 171 132 213 131 127 143 184 200 220 298

1940 244 260 136 203 237 239 196 271 209 95

1950 79 169 233 132 128 193 148 185 190 186

1960 170 216 234 145 213 193 113 114 127 149

1970 139 105 170 186 190 141 140 71 152 94

1980 92 139 152 125 197 221 224 192 93 123

1990 193 102 95 135 158 71 146 127 96 71

2000 28 59 56 59 89 95 98 115 126 202

2010 152 131 132 114 125 152 80

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1872A 1828 to 2016 189 years Series 4

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

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1925 1974 3 -.08 .00 .26 -.07 -.07 -.16 -.04 .04 -.40 .12 .29| .13 -.01 .61\* .11 .06 .12 -.02 -.05 -.05 -.06

1950 1999 3 -.09 -.06 .11 -.08 -.01 -.18 -.04 .12 -.22 -.06 .26| .20 -.15 .50\* .03 .14 .04 -.10 -.04 .06 -.11

1967 2016 0 -.15 -.20 .16 -.23 -.02 -.10 .03 .23 -.21 -.09 .26\* - - - - - - - - - -

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

Lower 1974< -.057 2000> -.014 1977> -.010 1902< -.009 1954> -.006 1895> -.006 Higher 1834 .037 1828 .011

1925 to 1974 segment:

Lower 1974< -.175 1953> -.026 1954> -.025 1965> -.019 1947< -.017 1933> -.012 Higher 1950 .030 1949 .029

1950 to 1999 segment:

Lower 1974< -.165 1977> -.023 1954> -.017 1975> -.016 1953> -.016 1990< -.014 Higher 1995 .041 1950 .025

1967 to 2016 segment:

Lower 1974< -.143 2000> -.046 1977> -.030 1975> -.018 1990< -.012 2013> -.008 Higher 2009 .040 1995 .037

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

1973 1974 -4.4 SD 1974 1975 5.6 SD

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

1834 -5.3 SD; 1974 -7.5 SD

1872A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1828 131 79

1830 80 75 64 62 12 33 57 49 53 79

1840 57 53 58 40 85 60 79 71 79 53

1850 51 182 120 126 116 102 133 146 83 72

1860 74 93 112 117 100 99 91 84 95 93

1870 92 58 68 96 100 105 81 65 71 71

1880 70 63 56 58 32 38 60 47 58 81

1890 65 63 76 65 71 68 72 72 52 54

1900 56 66 54 52 55 54 57 49 64 50

1910 48 46 42 52 45 52 43 40 49 44

1920 59 51 30 34 29 21 49 45 37 43

1930 36 33 40 44 28 30 47 57 41 37

1940 47 40 33 43 66 30 43 38 31 32

1950 32 93 123 135 245 252 170 259 172 181

1960 124 218 213 185 225 258 186 146 182 184

1970 172 123 150 188 69 148 113 127 171 145

1980 120 142 136 119 233 175 159 186 155 165

1990 126 106 173 219 188 97 145 196 183 129

2000 197 170 198 75 167 158 261 288 239 346

2010 120 205 119 168 163 259 50

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1872B 1826 to 2016 191 years Series 5

[\*] Early part of series cannot be checked from 1826 to 1826 -- not matched by another series

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

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1950 1999 1 -.03 -.34 .10 -.11 .04 -.14 .01 -.12 .11 .05 .27| .32\*-.16 .20 .16 .01 .02 -.11 -.14 -.10 .16

1967 2016 0 .06 -.44 .17 -.17 .06 -.08 .04 -.05 .09 -.09 .25\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .459) is:

Lower 1990< -.026 2000> -.015 1976< -.014 1977> -.011 1967< -.011 2010< -.009 Higher 1834 .034 2016 .011

1950 to 1999 segment:

Lower 1990< -.079 1976< -.035 1967< -.029 1977> -.029 1975> -.029 1985< -.021 Higher 1995 .034 1955 .031

1967 to 2016 segment:

Lower 1990< -.062 2000> -.049 1977> -.033 1975> -.028 1976< -.025 1967< -.022 Higher 2016 .050 2009 .032

1872B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1826 27 57 120 77

1830 86 70 70 57 16 37 53 51 59 81

1840 62 73 58 46 118 80 99 93 89 60

1850 84 172 146 171 160 152 135 141 110 95

1860 82 108 129 133 123 132 104 97 91 86

1870 73 65 80 88 102 99 78 70 74 68

1880 58 62 52 35 24 26 34 34 36 58

1890 61 57 71 66 64 53 68 58 47 54

1900 46 54 62 59 62 55 56 40 46 35

1910 37 37 39 50 37 50 44 32 38 42

1920 52 43 29 40 30 22 40 37 29 27

1930 32 27 38 48 29 39 49 65 48 54

1940 65 50 44 70 84 43 51 37 36 37

1950 28 96 132 130 290 412 302 341 244 296

1960 259 322 300 263 331 268 201 142 237 268

1970 247 148 204 155 121 180 93 111 131 108

1980 137 88 138 89 203 109 171 183 119 156

1990 60 143 177 170 109 67 85 124 96 80

2000 127 150 118 66 133 128 160 213 166 211

2010 90 153 93 132 205 215 60

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1874A 1900 to 2016 117 years Series 6

[B] Entire series, effect on correlation ( .650) is:

Lower 1919< -.024 1904< -.014 1968< -.014 1929< -.012 1998< -.011 1954> -.011 Higher 1949 .017 1922 .017

1874A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1900 177 306 313 296 173 243 270 238 202 162

1910 199 148 154 135 111 135 141 120 140 85

1920 106 129 81 85 85 93 107 98 131 97

1930 131 140 174 118 103 136 148 154 122 168

1940 208 166 180 239 252 234 206 229 215 93

1950 90 148 211 158 346 314 299 345 328 260

1960 300 370 351 261 285 271 170 219 153 163

1970 147 110 146 152 120 90 141 102 112 122

1980 143 136 117 102 137 131 139 148 97 146

1990 148 109 129 123 109 69 53 76 40 33

2000 33 73 102 94 95 115 109 186 135 189

2010 128 107 155 112 176 212 94

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1874B 1885 to 2016 132 years Series 7

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

Lower 1938< -.018 1968< -.013 1925> -.010 1924> -.010 1887< -.010 1896< -.009 Higher 1949 .013 1922 .010

1874B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1885 116 138 92 93 237

1890 172 149 238 141 145 179 144 234 185 194

1900 148 229 282 279 220 257 297 290 252 195

1910 200 166 176 158 117 131 140 106 122 91

1920 133 133 78 92 100 129 146 140 132 108

1930 120 117 151 112 87 99 104 144 91 141

1940 154 134 135 180 229 180 159 217 152 73

1950 77 136 168 127 265 273 285 400 359 261

1960 224 300 270 185 245 188 143 173 128 162

1970 143 102 194 191 158 123 163 98 113 99

1980 100 101 84 82 124 127 148 159 77 114

1990 134 95 104 114 121 79 74 91 54 35

2000 30 62 95 79 99 99 109 139 145 179

2010 131 98 106 67 104 93 86

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1875A 1937 to 2016 80 years Series 8

[B] Entire series, effect on correlation ( .756) is:

Lower 1941< -.045 1972< -.009 1998> -.009 1996> -.008 1960> -.007 1969< -.006 Higher 2009 .013 2016 .013

1875A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 151 123 243

1940 214 63 132 156 159 163 138 136 167 18

1950 36 145 98 48 201 294 362 395 388 245

1960 343 428 306 181 264 212 153 293 266 192

1970 171 100 150 165 174 112 125 80 140 98

1980 123 146 162 131 188 188 226 220 86 142

1990 154 108 72 125 137 70 114 105 161 66

2000 44 79 65 78 76 96 93 106 96 207

2010 145 116 103 93 129 141 60

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1875B 1941 to 2016 76 years Series 9

[B] Entire series, effect on correlation ( .798) is:

Lower 1998> -.015 2000> -.011 1971> -.009 1996> -.009 2004< -.008 2007< -.007 Higher 1977 .039 1949 .014

1875B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 57 111 112 169 164 123 127 97 9

1950 40 148 122 39 162 270 302 253 251 156

1960 210 256 181 138 223 188 118 212 219 196

1970 153 170 197 217 201 127 180 68 133 122

1980 114 129 142 103 106 156 156 161 62 121

1990 138 90 66 123 142 68 105 99 160 81

2000 60 111 79 72 66 84 69 79 80 118

2010 104 96 76 73 104 119 66

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1876A 1927 to 2016 90 years Series 10

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

Lower 2010< -.026 1932< -.021 1947< -.018 2000> -.015 1998> -.014 1970> -.014 Higher 1977 .082 2009 .013

1876A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 196 145 118

1930 133 111 73 66 45 50 100 92 115 81

1940 106 101 29 55 39 55 42 26 46 26

1950 13 69 83 34 138 148 166 150 166 137

1960 133 130 84 84 103 81 69 109 127 137

1970 158 87 131 114 122 68 96 39 73 77

1980 70 94 116 76 91 108 99 110 50 81

1990 100 53 41 66 51 39 71 56 121 67

2000 62 92 59 71 50 76 85 79 105 129

2010 56 80 59 70 102 120 71

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1876B 1927 to 2016 90 years Series 11

[B] Entire series, effect on correlation ( .680) is:

Lower 1954> -.017 1992< -.015 1935< -.013 1928< -.012 1933> -.012 1947< -.011 Higher 1977 .069 2009 .018

1876B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 139 96 101

1930 102 87 96 119 67 54 79 119 105 68

1940 100 104 34 71 58 93 73 55 63 46

1950 22 85 83 39 263 256 292 241 219 156

1960 167 206 134 89 129 135 111 172 191 168

1970 166 131 181 165 148 88 114 52 90 94

1980 119 108 120 86 85 120 91 103 56 97

1990 90 64 50 81 93 60 81 85 132 71

2000 63 128 93 107 101 141 106 141 159 268

2010 114 136 120 121 152 147 73

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1877A 1933 to 2016 84 years Series 12

[B] Entire series, effect on correlation ( .751) is:

Lower 1934> -.021 2007< -.014 1941< -.010 2002> -.008 2013> -.008 2000> -.007 Higher 1977 .054 1949 .014

1877A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 49 73 110 101 121 65 91

1940 88 37 76 57 76 87 83 100 104 10

1950 30 107 94 49 124 244 330 298 209 150

1960 161 168 135 112 176 123 120 235 202 217

1970 165 150 193 187 163 103 188 58 133 109

1980 126 113 160 128 142 181 227 189 69 128

1990 162 80 76 135 123 62 67 70 92 44

2000 50 65 106 87 118 135 101 78 76 167

2010 114 125 96 101 117 130 58

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1877B 1932 to 2016 85 years Series 13

[B] Entire series, effect on correlation ( .704) is:

Lower 1954> -.017 1932< -.015 2002> -.010 1980> -.010 2007< -.007 1940> -.007 Higher 1977 .065 2016 .011

[D] 1 Absent rings: Year Master N series Absent

1949 -2.032 27 1

1877B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 61 53 58 105 130 132 84 146

1940 194 54 86 103 121 77 54 124 68 0

1950 24 80 55 43 330 384 381 337 216 160

1960 243 260 193 134 241 193 160 272 238 192

1970 158 123 234 253 181 102 144 53 102 139

1980 183 164 176 122 185 149 134 159 91 202

1990 212 91 84 144 152 60 78 94 119 87

2000 59 114 173 154 175 189 177 115 73 165

2010 107 91 74 74 101 117 66

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1878A 1939 to 2016 78 years Series 14

[B] Entire series, effect on correlation ( .744) is:

Lower 1970< -.015 2002> -.009 1965> -.009 2012< -.009 1998> -.008 1943< -.008 Higher 1977 .058 1953 .011

1878A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 48

1940 45 27 30 19 54 29 47 68 49 34

1950 55 119 83 50 121 143 220 206 187 108

1960 120 143 148 108 180 184 131 168 143 156

1970 104 119 151 165 153 114 160 84 158 109

1980 116 117 118 102 158 143 144 141 106 105

1990 122 97 85 125 142 73 83 96 173 88

2000 76 109 162 140 187 151 133 202 225 265

2010 178 122 102 97 157 200 134

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1878B 1939 to 2016 78 years Series 15

[B] Entire series, effect on correlation ( .757) is:

Lower 1998> -.012 1991< -.010 2002> -.009 1968< -.008 1944< -.007 1940> -.007 Higher 1977 .055 2009 .010

1878B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 46

1940 69 57 58 49 48 46 53 72 80 44

1950 60 100 73 48 130 197 301 276 224 142

1960 168 198 216 152 223 173 138 185 149 214

1970 149 114 163 144 135 115 150 79 128 89

1980 117 107 126 108 108 171 147 148 112 119

1990 114 82 117 145 128 80 113 123 204 114

2000 85 184 178 130 189 170 141 149 146 220

2010 150 92 98 98 140 127 88

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1879A 1936 to 2016 81 years Series 16

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

Lower 1937< -.060 1950> -.020 1955< -.015 1986< -.015 1975> -.013 1984< -.012 Higher 1977 .074 1949 .024

1879A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 91 69 128 137

1940 123 110 112 171 207 171 191 237 254 128

1950 158 218 185 109 190 195 233 282 252 184

1960 175 245 213 176 213 166 142 155 173 206

1970 180 157 189 233 212 166 149 100 152 115

1980 131 129 126 101 92 104 98 104 96 117

1990 118 134 150 182 134 87 84 87 136 112

2000 59 139 91 68 65 90 87 91 106 143

2010 102 73 91 71 86 95 64

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1879B 1946 to 2016 71 years Series 17

[B] Entire series, effect on correlation ( .676) is:

Lower 1997< -.016 2016> -.015 2002> -.012 1994< -.011 1950> -.010 2008< -.008 Higher 2000 .026 1949 .015

1879B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 277 298 265 123

1950 136 267 182 130 182 311 304 422 404 224

1960 186 242 252 172 259 211 140 206 241 272

1970 209 203 254 316 258 203 209 182 223 184

1980 179 206 232 226 223 218 213 238 151 115

1990 153 153 134 187 115 64 49 55 102 91

2000 38 104 126 67 56 53 48 68 57 87

2010 96 59 56 54 77 95 74

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1881A 1888 to 2016 129 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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1888 1937 -5 -.13 .03 -.11 .02 .00 .45\*-.06 .05 .09 -.15 .33|-.06 .01 .23 -.07 .38 -.14 -.02 .22 -.08 .37

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

1925 1974 -4 -.24 -.20 .04 .05 .00 .26 .50\* .15 -.10 .22 .36|-.17 -.42 -.23 -.06 -.08 -.03 .05 .10 .18 .06

[B] Entire series, effect on correlation ( .398) is:

Lower 1954< -.044 1977> -.034 1889< -.021 1895> -.016 1922> -.010 1934> -.010 Higher 1914 .033 2000 .013

1888 to 1937 segment:

Lower 1889< -.055 1895> -.040 1934> -.023 1922> -.023 1926< -.022 1892< -.016 Higher 1914 .115 1902 .026

1925 to 1974 segment:

Lower 1954< -.119 1934> -.031 1949> -.029 1926< -.023 1959> -.009 1948> -.009 Higher 1953 .042 1966 .034

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

1953 1954 -4.8 SD

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

1954 -7.3 SD

1881A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1888 163 59

1890 15 75 72 55 156 218 168 177 184 195

1900 147 217 267 274 170 159 202 166 173 177

1910 217 179 111 157 102 130 149 143 157 125

1920 141 154 158 200 168 165 155 168 169 162

1930 160 218 277 235 220 260 258 218 187 179

1940 152 115 99 127 158 159 135 203 183 150

1950 127 159 129 92 41 133 133 136 151 159

1960 138 180 177 142 157 151 102 111 126 122

1970 91 102 138 113 103 88 80 99 108 108

1980 74 106 96 116 115 111 114 122 70 64

1990 99 113 78 100 76 80 56 71 84 77

2000 57 103 68 68 72 98 80 104 98 125

2010 78 70 78 50 109 101 53

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

1881B 1888 to 2016 129 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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1888 1937 5 -.05 .12 -.10 .01 .05 .19 -.12 .04 .08 -.29 .35| .12 -.17 .29 .11 .39\*-.25 -.20 .20 .14 .17

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

1925 1974 -4 -.24 -.12 -.04 -.17 -.21 .13 .48\* .13 -.10 .20 .31|-.07 -.19 -.14 -.13 -.20 -.12 -.08 -.07 .04 -.15

1950 1999 0 -.16 -.20 -.09 -.26 -.13 .16 .24 .05 -.16 .16 .31\*-.07 -.05 -.02 -.15 -.16 .10 -.01 -.07 .06 -.16

[B] Entire series, effect on correlation ( .347) is:

Lower 1954< -.036 1964< -.028 1917> -.016 1977> -.016 1934> -.016 1979> -.011 Higher 1914 .028 2016 .015

1888 to 1937 segment:

Lower 1917> -.047 1934> -.045 1890< -.035 1895> -.028 1937< -.022 1922> -.020 Higher 1914 .085 1902 .029

1925 to 1974 segment:

Lower 1964< -.059 1954< -.053 1934> -.045 1949> -.024 1926< -.016 1937< -.015 Higher 1953 .041 1972 .032

1950 to 1999 segment:

Lower 1954< -.073 1964< -.058 1977> -.048 1979> -.026 1994< -.021 1971> -.012 Higher 1972 .033 1953 .032

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

1954 1955 5.9 SD

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

1954 -7.3 SD

1881B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1888 107 170

1890 18 48 73 91 126 157 133 161 184 145

1900 120 236 250 188 129 112 117 88 87 76

1910 97 104 96 93 57 66 78 92 96 67

1920 55 65 74 100 78 83 82 94 104 104

1930 110 122 163 109 130 165 142 95 65 110

1940 122 109 92 98 115 106 93 105 90 85

1950 70 85 74 53 21 101 93 83 96 108

1960 83 155 102 93 57 105 79 93 96 106

1970 109 115 154 145 135 117 117 111 116 127

1980 107 111 106 98 110 97 95 92 59 95

1990 90 86 71 54 33 40 30 48 56 60

2000 69 95 93 90 94 102 91 97 108 119

2010 95 79 98 68 89 65 43

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

1882A 1894 to 2016 123 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

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

1894 1943 0 .04 .13 -.05 .05 .01 .15 .12 -.04 .01 -.08 .31\* .16 -.09 .14 .14 .22 -.24 -.30 -.06 -.03 .00

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

1950 1999 0 .09 -.10 -.09 -.02 .00 -.14 .01 .00 -.07 .27 .32\* .04 -.02 .16 -.03 -.05 .13 -.11 -.28 -.28 -.01

[B] Entire series, effect on correlation ( .406) is:

Lower 1897< -.018 1995> -.018 1960< -.014 1940< -.013 1924> -.012 1921< -.011 Higher 2000 .039 2016 .013

1894 to 1943 segment:

Lower 1897< -.050 1940< -.033 1924> -.031 1921< -.030 1899> -.030 1937< -.024 Higher 1914 .050 1895 .032

1950 to 1999 segment:

Lower 1995> -.042 1960< -.039 1991> -.021 1963> -.016 1979> -.013 1970> -.013 Higher 1977 .051 1953 .036

1882A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 205 128 183 148 187 247

1900 192 246 259 222 212 232 257 214 165 154

1910 149 172 145 140 110 140 157 134 114 85

1920 88 78 80 77 100 94 118 140 133 121

1930 106 128 168 141 137 191 194 136 145 152

1940 108 129 121 133 128 174 148 210 157 130

1950 116 135 104 90 74 131 122 159 153 141

1960 89 126 119 148 164 146 135 148 168 194

1970 187 155 137 114 83 85 67 59 78 100

1980 83 90 111 98 104 117 110 119 93 69

1990 61 96 65 54 51 65 42 68 47 47

2000 19 39 26 28 28 37 34 49 47 64

2010 51 42 79 47 51 40 24

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1882B 1901 to 2016 116 years Series 21

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

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1950 1999 -3 .02 -.07 -.12 -.13 .11 .19 .38 .39\* .00 .16 .21|-.20 -.19 -.06 -.23 -.16 -.06 -.19 -.03 -.08 -.08

1967 2016 -3 .00 -.02 -.11 -.20 .11 .22 .23 .44\* .04 .04 .31| - - - - - - - - - -

[B] Entire series, effect on correlation ( .366) is:

Lower 1977> -.033 1980< -.026 1954< -.019 1995> -.017 1907< -.016 1956< -.012 Higher 2000 .027 1922 .023

1950 to 1999 segment:

Lower 1977> -.058 1995> -.032 1956< -.022 1980< -.019 1975> -.019 1991> -.018 Higher 1961 .024 1972 .022

1967 to 2016 segment:

Lower 1977> -.070 1980< -.064 1995> -.036 1991> -.023 1975> -.020 1981< -.011 Higher 2000 .069 2009 .034

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

1977 +3.4 SD; 1980 -4.5 SD

1882B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1901 246 239 296 280 259 244 188 222 208

1910 225 238 210 235 202 248 249 219 241 216

1920 211 203 173 236 215 259 244 257 239 236

1930 187 235 246 167 120 169 193 176 127 150

1940 133 159 110 120 117 157 112 163 134 111

1950 85 99 79 77 38 103 80 111 141 155

1960 109 178 153 135 139 177 128 162 203 178

1970 133 124 197 202 135 168 185 153 198 110

1980 42 77 130 93 112 97 104 105 86 80

1990 76 116 77 65 58 71 53 71 34 46

2000 19 34 24 32 34 40 29 65 55 76

2010 75 51 73 46 56 51 47

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1883A 1937 to 2016 80 years Series 22

[B] Entire series, effect on correlation ( .383) is:

Lower 1939< -.099 1998< -.061 1978< -.014 1938> -.012 1988> -.012 1989< -.010 Higher 1977 .069 2009 .023

1883A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 79 118 60

1940 94 109 131 136 142 134 107 114 84 72

1950 57 69 71 69 46 319 305 326 330 193

1960 162 248 271 219 263 161 164 164 218 187

1970 165 191 212 248 236 202 219 166 162 174

1980 179 215 238 198 190 181 191 196 182 141

1990 158 169 184 160 147 95 94 179 59 67

2000 64 93 94 106 140 148 79 131 92 171

2010 185 72 102 62 75 100 86

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1883B 1937 to 2016 80 years Series 23

[B] Entire series, effect on correlation ( .548) is:

Lower 1940< -.145 1983> -.013 1988> -.011 1993< -.010 1991< -.009 1949> -.008 Higher 2000 .023 2009 .022

1883B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 118 127 144

1940 87 91 115 131 171 135 119 177 135 104

1950 80 105 127 91 98 295 280 220 188 125

1960 104 185 145 84 132 102 65 91 167 182

1970 127 109 161 169 199 157 141 114 163 144

1980 137 176 215 278 306 293 214 216 194 168

1990 191 116 126 115 159 108 74 135 147 129

2000 75 98 91 86 91 121 87 139 137 226

2010 228 154 147 73 104 131 93

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1884A 1962 to 2016 55 years Series 24

[B] Entire series, effect on correlation ( .491) is:

Lower 1999> -.029 1988> -.025 1983> -.022 1993< -.019 1977> -.017 2008< -.015 Higher 2000 .068 2009 .029

1884A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1962 245 119 103 78 84 129 144 206

1970 187 135 173 150 172 103 106 78 92 101

1980 127 171 384 450 329 185 167 178 188 123

1990 135 85 87 59 57 51 35 54 92 103

2000 47 84 86 84 77 100 85 120 85 133

2010 157 108 91 64 114 141 112

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1884B 1962 to 2016 55 years Series 25

[B] Entire series, effect on correlation ( .551) is:

Lower 1977> -.090 1988> -.042 2016> -.022 1973< -.020 1971> -.020 1998> -.009 Higher 2000 .051 2009 .028

1884B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1962 145 110 129 81 64 95 131 127

1970 115 116 137 92 110 68 66 85 94 83

1980 87 110 111 85 116 116 166 208 183 116

1990 124 99 129 97 111 71 55 85 129 79

2000 49 76 71 52 78 92 79 87 79 121

2010 78 72 71 54 105 103 87

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1885A 1827 to 2016 190 years Series 26

[B] Entire series, effect on correlation ( .578) is:

Lower 1834> -.024 1959< -.019 1984< -.016 1832< -.010 1949> -.009 1838< -.008 Higher 1977 .015 1914 .010

1885A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1827 254 448 243

1830 192 150 116 177 179 172 155 172 132 192

1840 164 217 205 182 182 136 135 244 289 211

1850 188 259 217 235 213 179 231 300 235 142

1860 130 188 206 253 166 197 198 146 114 66

1870 47 53 101 160 190 230 158 95 136 131

1880 141 98 123 145 145 116 126 138 131 184

1890 151 89 125 119 116 91 126 140 166 124

1900 137 180 178 133 139 120 202 159 101 88

1910 119 102 106 111 71 72 95 68 139 114

1920 89 94 69 95 61 73 120 113 151 108

1930 96 105 129 155 79 94 116 168 90 141

1940 86 79 87 114 113 102 114 124 92 89

1950 57 63 85 79 78 145 110 118 133 73

1960 82 127 139 135 178 176 142 155 185 193

1970 106 94 168 164 131 103 110 75 107 109

1980 88 137 140 119 60 79 76 109 71 79

1990 94 92 73 80 63 41 42 53 24 12

2000 6 19 9 12 11 17 32 39 37 40

2010 33 34 37 35 36 34 30

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1885B 1834 to 2016 183 years Series 27

[B] Entire series, effect on correlation ( .518) is:

Lower 1949> -.018 1984< -.017 2016> -.015 1956< -.014 1884> -.012 1834> -.011 Higher 1845 .011 2000 .010

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

1835 +3.6 SD

1885B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1834 154 218 173 182 165 187

1840 133 163 177 159 181 122 144 247 244 151

1850 211 265 200 218 197 172 210 248 240 134

1860 98 118 161 197 146 174 180 124 101 62

1870 63 68 107 189 199 202 132 99 103 110

1880 101 75 76 74 128 117 129 148 130 170

1890 163 95 128 127 149 133 182 264 265 153

1900 138 181 257 263 229 181 285 277 205 115

1910 120 141 115 108 101 113 125 59 101 111

1920 73 93 64 74 61 60 92 88 115 86

1930 70 85 96 89 50 55 60 95 59 84

1940 58 68 61 50 69 52 69 82 59 79

1950 49 67 68 64 54 118 71 87 148 96

1960 101 161 119 113 115 85 91 87 117 98

1970 84 69 101 99 76 55 54 47 78 76

1980 62 83 91 75 39 43 55 78 65 64

1990 81 91 73 80 53 50 49 57 21 5

2000 3 4 17 20 33 25 24 23 22 25

2010 26 30 37 40 56 48 50

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1886A 1957 to 2016 60 years Series 28

[B] Entire series, effect on correlation ( .541) is:

Lower 2000> -.065 1961< -.029 1963> -.027 1977> -.020 1971> -.011 1993< -.010 Higher 2016 .037 1995 .018

1886A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 290 316 246

1960 205 181 208 270 203 153 113 147 227 202

1970 161 143 176 120 94 62 70 68 101 84

1980 81 109 83 66 80 80 79 101 70 74

1990 71 49 66 56 77 35 37 51 114 68

2000 113 123 102 93 160 180 127 163 120 179

2010 163 128 126 117 177 175 87

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1886B 1927 to 2016 90 years Series 29

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

Lower 1937< -.039 1934> -.020 1938> -.012 1931< -.011 1928< -.010 1993< -.009 Higher 1977 .062 2016 .011

1886B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 78 73 110

1930 108 73 84 84 88 87 111 60 107 96

1940 84 82 100 100 136 131 85 89 83 42

1950 46 89 96 58 164 299 338 291 258 188

1960 202 255 219 150 216 206 162 220 204 188

1970 143 106 231 154 143 89 131 65 101 89

1980 86 88 97 81 66 88 84 104 58 74

1990 90 57 66 58 83 45 66 61 145 67

2000 48 114 138 132 266 246 211 204 147 236

2010 228 146 162 91 162 197 101

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1887A 1827 to 2016 190 years Series 30

[B] Entire series, effect on correlation ( .643) is:

Lower 2002< -.018 1855< -.016 1827< -.013 1851< -.010 1984< -.008 1932< -.007 Higher 1834 .019 1977 .012

1887A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1827 82 236 169

1830 210 113 165 243 109 146 179 179 194 144

1840 109 120 169 137 135 76 47 97 102 58

1850 79 58 52 59 61 15 51 142 134 70

1860 53 73 82 133 75 92 109 61 49 41

1870 30 29 30 43 74 81 45 26 49 61

1880 51 41 66 72 52 45 70 72 67 101

1890 54 36 59 27 29 21 36 78 64 30

1900 41 60 96 50 65 37 42 52 33 29

1910 46 27 27 25 17 28 43 33 44 52

1920 57 78 56 70 66 61 121 95 112 117

1930 108 81 74 79 54 64 101 117 110 125

1940 136 119 133 134 199 160 126 225 153 106

1950 90 134 183 91 168 224 260 294 272 187

1960 152 294 208 151 162 131 113 143 225 236

1970 176 113 249 240 167 141 137 81 111 97

1980 95 107 112 106 76 130 116 156 70 81

1990 112 82 76 100 78 53 49 50 47 36

2000 22 30 12 17 15 27 38 33 38 47

2010 44 36 44 32 48 49 42

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1887B 1833 to 2016 184 years Series 31

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

Lower 1903< -.024 2016> -.018 1851< -.013 1919> -.009 1834> -.008 2005< -.007 Higher 1914 .011 1977 .011

[D] 1 Absent rings: Year Master N series Absent

2000 -2.372 30 1

1887B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1833 156 82 80 117 118 93 70

1840 50 98 112 77 81 55 31 54 75 52

1850 65 49 48 48 34 21 48 148 110 55

1860 41 58 85 114 73 86 107 72 69 48

1870 33 29 42 59 92 109 74 41 62 79

1880 47 46 51 72 56 47 52 61 60 91

1890 79 51 74 64 67 39 35 73 66 38

1900 41 58 110 56 57 42 54 35 35 29

1910 52 38 28 25 16 23 36 40 42 51

1920 48 56 39 44 40 36 83 95 108 99

1930 106 123 125 95 66 83 113 136 115 132

1940 166 136 166 193 253 219 207 237 204 118

1950 83 143 197 122 176 272 370 393 293 205

1960 144 234 199 177 210 160 162 193 261 221

1970 167 109 181 174 123 90 78 58 68 83

1980 62 73 71 62 58 65 66 84 57 66

1990 73 84 76 59 53 41 34 39 25 23

2000 0 5 9 7 14 10 9 18 19 19

2010 23 18 21 20 23 22 24

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PART 7: DESCRIPTIVE STATISTICS: FAGR\_CORR1-50 10:07 Tue 19 Sep 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 1A1 1938 2016 79 3 0 .739 1.72 3.98 .699 .600 .303 2.57 .423 -.068 1

2 1A2 1848 1930 83 4 0 .529 1.54 3.26 .552 .610 .251 2.53 .389 -.057 2

3 1B 1845 2016 172 7 0 .692 1.68 3.30 .616 .573 .281 2.71 .475 .016 1

4 1872A 1828 2016 189 7 3 .425 1.01 3.45 .648 .767 .254 2.56 .322 .002 1

5 1872B 1826 2016 191 7 2 .459 1.02 4.12 .735 .846 .266 2.59 .440 -.021 1

6 1874A 1900 2016 117 4 0 .650 1.60 3.70 .741 .809 .225 2.58 .493 -.004 1

7 1874B 1885 2016 132 5 0 .688 1.50 4.00 .661 .779 .231 2.73 .490 -.035 1

8 1875A 1937 2016 80 3 0 .756 1.56 4.28 .850 .708 .354 2.82 .520 -.021 1

9 1875B 1941 2016 76 3 0 .798 1.32 3.02 .596 .631 .346 2.51 .379 -.033 2

10 1876A 1927 2016 90 3 0 .601 .88 1.96 .369 .598 .339 2.69 .444 -.066 1

11 1876B 1927 2016 90 3 0 .680 1.14 2.92 .534 .635 .310 2.79 .412 -.007 1

12 1877A 1933 2016 84 3 0 .751 1.21 3.30 .584 .642 .348 2.57 .417 -.053 1

13 1877B 1932 2016 85 3 0 .704 1.41 3.84 .766 .660 .399 2.48 .368 -.004 2

14 1878A 1939 2016 78 3 0 .744 1.22 2.65 .510 .684 .288 2.56 .440 -.076 1

15 1878B 1939 2016 78 3 0 .757 1.30 3.01 .541 .675 .265 2.55 .398 -.061 1

16 1879A 1936 2016 81 3 0 .601 1.42 2.82 .532 .746 .215 2.67 .530 -.090 2

17 1879B 1946 2016 71 3 0 .676 1.73 4.22 .883 .805 .255 2.69 .596 -.009 2

18 1881A 1888 2016 129 5 2 .398 1.33 2.77 .527 .787 .225 2.40 .365 .014 1

19 1881B 1888 2016 129 5 3 .347 .99 2.50 .359 .664 .220 2.62 .370 .032 1

20 1882A 1894 2016 123 5 2 .406 1.18 2.59 .552 .880 .200 2.64 .406 -.057 1

21 1882B 1901 2016 116 4 2 .366 1.41 2.96 .716 .892 .234 2.57 .402 .033 1

22 1883A 1937 2016 80 3 0 .383 1.53 3.30 .685 .721 .227 2.52 .472 -.061 1

23 1883B 1937 2016 80 3 0 .548 1.45 3.06 .550 .657 .254 2.63 .391 -.055 2

24 1884A 1962 2016 55 2 0 .491 1.30 4.50 .773 .763 .271 2.68 .499 -.095 1

25 1884B 1962 2016 55 2 0 .551 .99 2.08 .317 .592 .240 2.79 .657 .035 1

26 1885A 1827 2016 190 7 0 .578 1.24 4.48 .631 .786 .242 2.78 .515 .001 2

27 1885B 1834 2016 183 7 0 .518 1.10 2.85 .630 .851 .238 2.67 .437 .005 1

28 1886A 1957 2016 60 2 0 .541 1.27 3.15 .637 .823 .248 2.57 .504 .112 1

29 1886B 1927 2016 90 3 0 .706 1.29 3.38 .673 .756 .283 2.65 .424 -.060 1

30 1887A 1827 2016 190 7 0 .643 .94 2.94 .614 .792 .305 2.72 .505 .027 1

31 1887B 1833 2016 184 7 0 .621 .86 3.93 .669 .889 .285 2.78 .381 .009 2

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Total or mean: 3440 129 14 .578 1.26 4.50 .622 .747 .267 2.82 .441 -.015

- = [ COFECHA FAGR COF ] = -