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[] P R O G R A M C O F E C H A Version 6.06P 30363

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: QURU\_HHSB13H02\_EWLW\_ORIGINAL-50

File of DATED series: QURU\_HHSB13H02\_EWLW

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 1887 to 2015 129 years

Continuous time span is 1887 to 2015 129 years

Portion with two or more series is 1892 to 2015 124 years

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

\*C\* Number of dated series 39 \*C\*

\*O\* Master series 1887 2015 129 yrs \*O\*

\*F\* Total rings in all series 3668 \*F\*

\*E\* Total dated rings checked 3663 \*E\*

\*C\* Series intercorrelation .787 \*C\*

\*H\* Average mean sensitivity .201 \*H\*

\*A\* Segments, possible problems 0 \*A\*

\*\*\* Mean length of series 94.1 \*\*\*

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

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

No ring measurements of zero value

1900 -2.456 5 1950 -.397 35 2000 .849 38

1901 -.761 5 1951 .014 35 2001 .905 38

1902 1.244 5 1952 .241 35 2002 -.530 38

1903 .381 5 1953 .201 36 2003 -1.515 38

1904 1.312 6 1954 -2.315 36 2004 -.235 38

1905 1.246 6 1955 -1.722 37 2005 -2.792 38

1906 .523 7 1956 -1.063 38 2006 -.384 38

1907 .615 7 1957 -.143 38 2007 -.023 38

1908 .136 9 1958 .323 38 2008 .761 38

1909 -2.084 9 1959 .103 38 2009 1.629 38

1910 -.905 10 1960 .439 38 2010 .168 38

1911 -.451 11 1961 1.088 38 2011 .258 38

1912 -.113 13 1962 -.516 38 2012 .310 38

1913 -.205 13 1963 -.377 38 2013 .905 38

1914 -.777 13 1964 -.237 38 2014 .937 38

1915 .842 14 1965 -1.575 38 2015 -2.121 38

1916 1.373 16 1966 -.921 38

1917 .551 17 1967 -.354 38

1918 -.060 18 1968 1.049 38

1919 -.254 21 1969 1.121 38

1920 .540 22 1970 .025 38

1921 -1.502 23 1971 -.287 38

1922 -1.006 24 1972 1.638 38

1923 -.690 24 1973 1.409 38

1924 .025 24 1974 .698 38

1925 .243 25 1975 .833 38

1926 .761 26 1976 .982 38

1927 1.569 29 1977 -.993 38

1928 .552 30 1978 -1.554 38

1929 .111 30 1979 -.736 38

1930 -.233 30 1980 -.568 38

1931 .729 32 1981 .285 38

1932 .977 33 1982 .775 38

1933 -1.426 33 1983 -.748 38

1934 -.209 34 1984 .132 38

1935 .847 34 1985 .116 38

1936 -1.581 34 1986 .871 38

1887 -2.103 1 1937 -.418 34 1987 1.306 38

1888 .238 1 1938 -1.021 34 1988 -.070 38

1889 1.123 1 1939 .367 34 1989 -2.393 38

1890 -.229 1 1940 .172 34 1990 -1.694 38

1891 2.508 1 1941 -.716 34 1991 -1.307 38

1892 .822 2 1942 .826 34 1992 .106 38

1893 -.736 3 1943 .075 34 1993 .002 38

1894 .851 3 1944 1.331 34 1994 .237 38

1895 -.052 3 1945 .302 34 1995 -.387 38

1896 .100 3 1946 .401 35 1996 1.235 38

1897 .537 3 1947 1.521 36 1997 .469 38

1898 -.027 4 1948 .474 35 1998 1.701 38

1899 -.474 4 1949 -1.536 35 1999 -.361 38

PART 5: CORRELATION OF SERIES BY SEGMENTS: QURU\_HHSB13H02\_EWLW\_ORIGINAL-50 08:07 Thu 15 Feb 2018 Page 5

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Correlations of 50-year dated segments, lagged 25 years

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

Seq Series Time\_span 1875 1900 1925 1950 1975

1924 1949 1974 1999 2024

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

1 5A 1921 2015 .73 .72 .68 .89

2 5B 1953 2015 .70 .86

3 8A 1947 2015 .78 .78 .79

4 8B 1928 2015 .69 .75 .81

5 15A 1892 2015 .81 .88 .80 .62 .70

6 15B 1893 2015 .75 .85 .78 .59 .77

7 111A 1931 2015 .71 .79 .84

8 111B 1908 2015 .41 .60 .75 .84

9 112A 1927 2015 .78 .85 .87

10 112B 1916 2015 .63 .69 .76 .81

11 113A 1898 2015 .86 .87 .84 .82 .89

12 113B 1887 2015 .81 .85 .88 .85 .79

13 131A 1918 2015 .69 .70 .71 .84

14 131B 1910 2015 .54 .60 .66 .75

15 133A 1915 2015 .75 .77 .82 .88

16 133B 1904 2015 .73 .76 .84 .89

17 135A 1927 2015 .90 .85 .86

18 135B 1917 2015 .75 .86 .84 .87

19 136A 1922 2015 .85 .87 .81 .86

20 136B 1908 2015 .83 .88 .79 .85

21 140A 1911 2015 .78 .72 .67 .76

22 140B 1916 2015 .82 .79 .74 .81

23 163A 1912 2015 .75 .80 .80 .79

24 163B 1900 2015 .68 .85 .84 .87

25 168A 1946 2015 .83 .85 .87

26 168B 1912 2015 .69 .79 .83 .83

27 170A1 1955 2015 .72 .82

28 170A2 1919 1947 .83

29 170B 1906 2015 .57 .80 .78 .85

30 179A 1932 2015 .83 .88 .91

31 179B 1926 2015 .85 .87 .92

32 227A 1920 2015 .70 .78 .82 .89

33 227B 1934 2015 .39 .72 .85

34 344A 1956 2015 .85 .88

35 344B 1919 2015 .67 .68 .77 .78

36 345A 1931 2015 .88 .83 .91

37 345B 1919 2015 .76 .79 .83 .85

38 419A 1927 2015 .71 .82 .89

39 419B 1925 2015 .78 .87 .81

Av segment correlation .81 .73 .77 .78 .84

PART 6: POTENTIAL PROBLEMS: QURU\_HHSB13H02\_EWLW\_ORIGINAL-50 08:07 Thu 15 Feb 2018 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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5A 1921 to 2015 95 years Series 1

[B] Entire series, effect on correlation ( .806) is:

Lower 1959< -.024 1957< -.014 1936< -.010 1954> -.008 1987< -.007 1932< -.006 Higher 2005 .025 2015 .020

5A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 130 143 164 161 181 182 219 190 193

1930 176 205 158 117 133 183 97 152 125 139

1940 124 105 123 102 125 106 121 139 98 68

1950 85 95 110 102 58 52 52 38 52 33

1960 64 59 47 55 69 56 70 81 91 114

1970 93 86 119 118 96 108 119 93 86 83

1980 76 118 153 121 173 216 219 142 111 59

1990 69 79 125 145 157 130 198 123 212 131

2000 168 176 120 109 133 71 135 165 168 185

2010 160 158 137 165 166 91

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5B 1953 to 2015 63 years Series 2

[B] Entire series, effect on correlation ( .810) is:

Lower 1955> -.012 1953> -.011 2013< -.011 1957< -.011 1970> -.010 1973< -.010 Higher 2005 .041 2015 .034

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

1954 +3.1 SD; 1955 +3.1 SD

5B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1953 148 62 78 58 36 49 53

1960 50 62 44 57 67 64 72 101 119 153

1970 157 140 145 109 105 97 90 75 65 76

1980 79 102 120 110 118 116 184 188 112 69

1990 93 93 138 141 154 130 151 114 165 104

2000 128 143 102 82 109 58 114 136 154 178

2010 129 126 116 97 121 64

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8A 1947 to 2015 69 years Series 3

[B] Entire series, effect on correlation ( .767) is:

Lower 1983< -.018 1962< -.017 2005> -.010 2007< -.008 1958< -.008 1997< -.007 Higher 1989 .022 2015 .008

8A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1947 165 110 44

1950 37 41 62 50 32 45 44 67 53 55

1960 65 94 61 72 70 62 72 74 125 140

1970 138 124 217 240 220 210 216 130 133 148

1980 177 149 155 95 124 124 196 209 135 90

1990 103 106 149 146 151 135 187 128 188 123

2000 207 193 152 101 94 72 86 76 103 128

2010 121 111 115 158 131 93

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8B 1928 to 2015 88 years Series 4

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

Lower 1954> -.027 1943> -.010 1936> -.010 1946< -.006 1930< -.006 1928> -.005 Higher 1989 .013 2015 .009

8B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 226 197

1930 153 199 209 111 127 171 140 202 117 215

1940 199 177 182 254 286 170 101 182 97 49

1950 48 50 50 54 51 40 48 62 74 86

1960 86 111 90 87 90 76 95 107 177 221

1970 164 176 327 265 262 210 211 153 137 160

1980 179 166 162 102 129 131 222 242 145 93

1990 127 123 171 153 192 182 249 185 297 135

2000 232 183 151 105 107 76 138 119 192 259

2010 201 197 174 259 194 126

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15A 1892 to 2015 124 years Series 5

[B] Entire series, effect on correlation ( .736) is:

Lower 1989> -.021 1892> -.017 2005> -.012 1956< -.010 1958< -.008 1895< -.007 Higher 1900 .015 1936 .013

15A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1892 213 160 209 155 174 225 218 166

1900 67 159 317 230 301 313 317 324 189 69

1910 114 111 162 129 115 207 302 224 186 169

1920 161 124 135 123 152 180 222 235 161 181

1930 173 202 231 131 156 190 129 145 139 183

1940 158 114 158 154 190 165 165 197 137 87

1950 120 117 125 122 77 87 63 77 70 65

1960 75 104 89 78 87 81 79 78 116 125

1970 115 112 191 184 150 171 211 132 134 153

1980 130 157 167 120 119 130 144 171 114 100

1990 81 79 102 98 87 83 107 122 147 125

2000 165 188 139 103 105 102 143 143 195 213

2010 180 165 154 227 200 131

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15B 1893 to 2015 123 years Series 6

[B] Entire series, effect on correlation ( .738) is:

Lower 1895> -.019 1954> -.017 1898< -.009 2003< -.008 1996< -.008 1980< -.007 Higher 2015 .023 2005 .018

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

1895 +3.0 SD

15B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1893 226 279 297 238 209 110 109

1900 53 99 226 202 297 330 284 277 197 68

1910 102 95 124 115 116 170 259 231 197 197

1920 145 110 131 112 145 132 171 172 140 157

1930 159 189 197 126 158 177 118 149 117 170

1940 160 114 159 138 186 156 167 162 113 72

1950 102 80 89 89 80 74 73 98 82 81

1960 87 115 100 85 90 79 88 90 118 128

1970 99 105 172 160 108 125 168 102 113 119

1980 88 126 128 107 105 116 118 154 109 87

1990 70 83 89 91 84 91 93 106 127 103

2000 127 126 131 97 125 101 150 142 178 186

2010 151 169 153 183 222 133

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111A 1931 to 2015 85 years Series 7

[B] Entire series, effect on correlation ( .784) is:

Lower 1933> -.027 1962> -.012 1976< -.010 1941> -.010 1937< -.007 1988> -.006 Higher 2005 .033 1954 .025

111A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 115 102 101 121 118 53 58 94 112

1940 141 152 177 114 153 98 104 154 157 101

1950 98 111 146 210 71 99 151 173 205 251

1960 266 281 280 273 276 213 233 248 274 282

1970 235 237 328 275 341 373 242 154 148 164

1980 189 228 266 231 220 260 312 276 274 149

1990 149 145 198 202 207 212 284 233 339 261

2000 291 336 284 257 347 164 210 269 300 279

2010 227 270 295 310 339 140

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111B 1908 to 2015 108 years Series 8

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

Lower 1909> -.031 1917< -.028 1944< -.009 1933> -.009 1916< -.008 1988> -.007 Higher 2005 .052 1954 .029

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

1909 +3.6 SD; 1910 +3.4 SD; 1917 -5.0 SD

111B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1908 117 118

1910 127 103 131 116 105 113 97 67 70 69

1920 106 89 99 92 129 106 104 93 75 59

1930 76 104 99 79 107 109 67 56 77 103

1940 88 100 111 82 82 86 81 130 111 74

1950 103 112 197 259 115 138 229 278 316 351

1960 328 299 295 273 274 191 181 213 296 307

1970 273 338 378 303 593 569 346 161 123 146

1980 173 199 208 219 214 205 246 219 233 125

1990 112 126 165 168 197 172 212 187 247 197

2000 200 261 216 177 231 127 177 233 285 269

2010 203 205 251 260 289 130

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112A 1927 to 2015 89 years Series 9

[B] Entire series, effect on correlation ( .840) is:

Lower 1937< -.011 1933> -.011 1949> -.010 1974< -.008 1941> -.006 1980< -.005 Higher 2005 .021 2015 .019

112A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 129 119 111

1930 104 140 156 113 98 93 63 53 62 95

1940 90 109 143 108 162 124 145 189 143 124

1950 141 192 181 208 83 61 85 119 168 177

1960 228 258 190 193 231 203 262 303 372 460

1970 331 330 382 346 269 298 324 272 209 267

1980 211 232 258 231 263 249 275 277 239 123

1990 90 112 166 164 200 188 298 218 272 206

2000 279 216 185 136 180 101 144 163 185 214

2010 151 195 219 192 214 117

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112B 1916 to 2015 100 years Series 10

[B] Entire series, effect on correlation ( .696) is:

Lower 1933> -.023 1922> -.013 1983> -.011 1926< -.008 1916< -.008 1949> -.008 Higher 1954 .034 2015 .030

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

1933 +3.1 SD

112B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 182 219 224 173

1920 155 104 164 184 150 145 124 144 124 122

1930 137 167 147 128 104 102 57 63 75 102

1940 106 98 142 98 143 127 133 153 115 111

1950 145 176 190 224 95 58 80 131 200 224

1960 252 279 240 258 324 284 333 402 454 496

1970 338 372 396 382 300 366 359 285 232 215

1980 212 205 242 281 376 308 307 265 223 124

1990 132 120 183 182 279 227 325 274 341 249

2000 278 289 252 160 208 130 164 197 285 296

2010 217 262 304 304 336 143

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113A 1898 to 2015 118 years Series 11

[B] Entire series, effect on correlation ( .868) is:

Lower 1903> -.007 1939< -.005 2001< -.005 1958< -.004 1898> -.004 1956> -.003 Higher 2005 .015 2015 .013

113A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1898 198 166

1900 55 107 207 234 240 193 172 155 106 47

1910 62 78 93 94 107 129 187 180 139 117

1920 159 105 91 89 105 122 144 202 177 132

1930 122 145 132 82 116 116 75 89 99 96

1940 106 80 121 129 188 154 153 321 205 120

1950 127 158 172 128 80 84 118 145 114 121

1960 156 137 104 107 110 86 85 106 163 147

1970 132 162 221 206 180 214 175 109 116 151

1980 152 196 176 141 175 182 187 191 161 104

1990 104 88 117 100 113 99 146 124 183 135

2000 149 121 101 81 126 78 137 124 151 168

2010 122 156 145 202 185 91

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113B 1887 to 2015 129 years Series 12

[\*] Early part of series cannot be checked from 1887 to 1891 -- not matched by another series

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

Lower 1892< -.018 2015> -.012 1900< -.008 1988> -.005 1991< -.005 1956> -.004 Higher 1954 .018 1989 .010

113B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 96 170 206

1890 149 268 166 113 169 128 145 161 145 131

1900 46 94 165 146 175 164 160 125 107 49

1910 72 81 95 108 113 138 173 169 153 156

1920 167 94 89 93 103 133 170 204 158 128

1930 126 141 144 102 132 123 90 112 97 127

1940 115 90 132 109 139 107 126 187 167 107

1950 129 125 121 111 64 67 101 120 110 89

1960 92 96 86 92 109 81 81 93 129 131

1970 104 94 162 151 126 117 134 93 90 112

1980 122 152 146 114 124 118 127 128 122 81

1990 83 70 100 93 91 80 101 106 113 93

2000 124 97 81 63 75 58 74 78 92 123

2010 116 146 139 139 111 75

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131A 1918 to 2015 98 years Series 13

[B] Entire series, effect on correlation ( .776) is:

Lower 1962< -.028 1936> -.020 1966> -.016 1935< -.009 1983> -.008 1948< -.005 Higher 2005 .031 1933 .013

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

1966 +4.1 SD

131A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 156 124

1920 168 111 68 84 105 114 173 175 133 87

1930 86 94 124 76 91 82 80 84 70 90

1940 86 63 100 87 120 84 70 109 74 50

1950 52 71 104 101 61 50 73 93 110 109

1960 130 141 80 105 136 133 238 197 237 241

1970 178 135 189 215 158 171 185 146 120 118

1980 114 199 261 205 192 172 181 167 106 63

1990 81 78 107 111 121 114 152 159 191 122

2000 95 111 89 76 103 59 76 100 112 194

2010 148 105 114 150 143 75

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131B 1910 to 2015 106 years Series 14

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

Lower 1936> -.030 1983< -.023 1989> -.021 1940< -.013 1910< -.010 1929< -.009 Higher 2005 .030 2015 .025

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

1936 +3.7 SD

131B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 36 55 63 75 53 81 127 89 84 55

1920 64 48 37 49 46 48 61 99 97 56

1930 54 89 82 64 82 99 92 95 75 101

1940 69 71 81 73 78 72 64 66 50 30

1950 42 65 66 82 56 38 52 78 109 123

1960 109 115 79 98 111 99 99 105 124 124

1970 113 107 139 152 127 141 121 101 81 84

1980 80 100 114 64 69 80 96 109 75 73

1990 71 74 97 106 118 105 140 145 154 107

2000 109 122 88 82 98 66 84 110 116 171

2010 141 103 118 135 138 85

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133A 1915 to 2015 101 years Series 15

[B] Entire series, effect on correlation ( .823) is:

Lower 1984< -.017 1949> -.011 1921< -.009 1983> -.008 1929< -.006 1942< -.005 Higher 2005 .019 1989 .015

133A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 201 221 187 157 157

1920 198 117 137 155 165 158 189 181 171 122

1930 143 145 164 114 122 171 99 121 121 133

1940 146 98 128 122 164 129 145 268 244 171

1950 232 220 204 201 100 129 135 133 173 154

1960 229 204 178 185 178 134 165 187 213 191

1970 178 182 268 265 238 245 272 187 165 185

1980 200 213 225 204 159 190 190 203 170 126

1990 164 155 204 185 184 150 230 212 291 175

2000 177 204 169 129 168 107 206 195 197 222

2010 168 175 177 206 231 116

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133B 1904 to 2015 112 years Series 16

[B] Entire series, effect on correlation ( .835) is:

Lower 1931< -.010 1949> -.009 1945< -.006 1990> -.005 1948> -.005 1944< -.004 Higher 2005 .022 1989 .013

133B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1904 196 189 162 141 118 54

1910 94 122 138 134 127 190 210 165 162 144

1920 198 128 161 172 190 171 184 194 150 142

1930 143 140 182 140 154 232 140 232 192 216

1940 225 159 235 205 200 144 190 245 262 192

1950 263 240 178 172 102 103 134 152 190 198

1960 221 198 176 183 187 139 165 175 248 246

1970 226 203 298 287 285 261 275 189 136 158

1980 167 196 256 188 176 203 232 234 192 130

1990 171 175 186 191 158 149 185 175 175 130

2000 159 172 147 118 149 95 193 181 168 244

2010 166 166 162 186 177 113

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135A 1927 to 2015 89 years Series 17

[B] Entire series, effect on correlation ( .864) is:

Lower 1945< -.008 1989> -.007 1999> -.007 1938> -.005 1983< -.004 1941> -.004 Higher 2005 .013 1954 .013

135A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 195 164 150

1930 152 210 203 104 135 180 109 132 136 159

1940 133 124 155 126 133 92 128 128 112 67

1950 91 106 138 133 70 94 114 146 146 150

1960 143 190 156 159 156 122 150 185 235 237

1970 208 179 305 273 208 231 224 170 157 179

1980 161 169 184 117 126 129 151 178 127 103

1990 106 125 156 143 160 147 225 166 226 182

2000 211 210 118 121 176 99 210 211 286 326

2010 218 201 201 272 214 118

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135B 1917 to 2015 99 years Series 18

[B] Entire series, effect on correlation ( .809) is:

Lower 1922< -.048 1948< -.013 1979> -.004 1937< -.004 1955> -.004 1997< -.003 Higher 2005 .026 1954 .019

135B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 169 162 130

1920 160 111 47 104 157 158 234 254 227 185

1930 202 220 211 112 167 219 118 106 121 198

1940 205 139 184 132 141 119 131 149 96 80

1950 101 140 145 136 82 115 125 137 200 177

1960 182 230 161 167 157 118 154 172 223 231

1970 216 175 336 342 283 280 326 221 190 248

1980 198 184 186 132 149 152 164 177 141 118

1990 123 123 158 159 175 175 184 151 221 176

2000 179 196 141 151 201 118 232 226 271 337

2010 212 200 226 268 248 115

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136A 1922 to 2015 94 years Series 19

[B] Entire series, effect on correlation ( .856) is:

Lower 1986< -.009 1938< -.007 1991> -.006 1924< -.005 1977> -.005 1990> -.004 Higher 2005 .016 1933 .007

136A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1922 143 180 153 212 227 248 186 187

1930 164 179 196 130 148 168 128 151 113 166

1940 161 139 182 146 169 171 163 180 151 103

1950 108 137 134 132 91 100 100 122 140 138

1960 147 200 137 120 142 127 117 129 205 180

1970 162 148 195 206 160 201 199 150 107 122

1980 147 165 149 112 137 131 123 148 129 98

1990 126 139 130 144 128 128 175 150 171 135

2000 153 157 138 121 141 103 143 138 163 182

2010 144 137 165 186 196 94

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136B 1908 to 2015 108 years Series 20

[B] Entire series, effect on correlation ( .841) is:

Lower 1986< -.020 1908> -.008 1911> -.006 1956< -.006 1990> -.006 1982< -.006 Higher 2005 .020 1989 .012

136B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1908 207 72

1910 102 170 144 125 105 123 167 137 106 123

1920 191 122 100 128 155 206 211 235 207 192

1930 168 199 200 125 149 166 110 124 108 131

1940 113 93 124 123 128 115 116 145 113 78

1950 86 87 90 86 63 63 63 78 92 92

1960 102 123 90 88 106 96 96 116 147 149

1970 130 123 152 177 125 145 139 81 78 93

1980 99 110 92 84 87 79 72 97 83 65

1990 80 85 92 81 86 83 97 92 91 86

2000 103 103 90 89 105 81 104 104 127 149

2010 109 116 112 131 123 77

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140A 1911 to 2015 105 years Series 21

[B] Entire series, effect on correlation ( .765) is:

Lower 1969< -.021 2000< -.021 1973< -.006 1951< -.005 1999> -.004 1963< -.004 Higher 2015 .030 2005 .018

140A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1911 147 126 133 126 181 183 134 100 86

1920 112 76 75 68 94 80 117 153 145 134

1930 123 116 122 73 101 112 74 78 67 82

1940 77 71 104 85 75 69 84 80 65 48

1950 45 35 33 34 23 26 23 28 33 38

1960 38 55 42 38 54 49 54 61 90 66

1970 64 78 119 92 79 84 104 84 80 68

1980 74 116 114 81 131 146 140 144 99 72

1990 81 63 102 100 101 98 102 114 139 112

2000 85 93 79 73 109 73 87 121 121 149

2010 102 101 102 112 116 70

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140B 1916 to 2015 100 years Series 22

[B] Entire series, effect on correlation ( .807) is:

Lower 1989> -.013 1962< -.008 2000< -.007 1974< -.006 1999> -.005 1945< -.004 Higher 2015 .023 1921 .008

140B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 170 137 115 126

1920 128 102 110 120 138 146 175 147 135 136

1930 127 121 138 104 120 159 89 137 97 115

1940 100 89 141 117 131 81 100 107 99 59

1950 65 58 72 71 49 44 55 61 72 80

1960 77 107 69 95 100 82 104 131 160 164

1970 161 143 181 159 119 147 180 121 113 109

1980 115 170 209 131 194 187 210 251 155 127

1990 122 126 133 160 155 147 178 197 195 173

2000 159 188 144 140 176 132 165 218 258 277

2010 238 233 203 212 226 124

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163A 1912 to 2015 104 years Series 23

[B] Entire series, effect on correlation ( .761) is:

Lower 1989> -.019 1922< -.011 2005> -.010 1936> -.008 1914< -.007 1913> -.006 Higher 1954 .024 1933 .007

163A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1912 110 142 87 130 177 126 118 118

1920 153 98 60 91 139 173 218 272 193 169

1930 146 149 152 97 109 137 112 132 102 137

1940 155 111 184 136 173 118 116 107 80 52

1950 86 95 121 102 67 90 116 134 128 126

1960 112 153 111 140 139 117 156 162 213 203

1970 174 135 287 267 221 215 245 136 147 181

1980 202 218 217 140 172 174 152 191 130 131

1990 135 123 150 152 135 125 163 136 207 118

2000 177 172 133 97 107 88 120 123 186 248

2010 174 162 158 189 191 115

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163B 1900 to 2015 116 years Series 24

[B] Entire series, effect on correlation ( .770) is:

Lower 1900> -.042 1909< -.021 1903< -.010 1922< -.005 1933> -.005 1975< -.004 Higher 1954 .010 2015 .009

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

1900 +3.9 SD

163B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1900 261 279 360 185 260 250 218 193 141 36

1910 87 132 119 142 96 158 173 126 108 106

1920 143 92 60 82 129 145 191 214 175 163

1930 121 137 151 113 135 176 98 125 101 124

1940 157 103 159 119 152 118 121 125 98 64

1950 103 118 137 112 72 87 89 111 111 94

1960 124 129 94 113 101 91 125 133 203 177

1970 154 131 248 238 181 155 202 130 145 161

1980 163 172 178 122 146 145 159 171 104 90

1990 86 99 118 124 106 95 114 111 153 92

2000 121 150 108 79 97 73 117 129 152 207

2010 149 140 143 179 171 94

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168A 1946 to 2015 70 years Series 25

[B] Entire series, effect on correlation ( .847) is:

Lower 1956> -.012 1988> -.010 1951< -.009 2005> -.008 1983> -.005 1965< -.005 Higher 1954 .019 1989 .018

168A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 168 176 141 99

1950 138 107 130 172 92 114 191 230 227 189

1960 201 222 183 216 222 158 230 282 329 340

1970 290 251 363 401 342 355 300 208 194 232

1980 240 246 237 225 273 246 274 268 274 137

1990 144 134 157 207 264 223 299 197 280 172

2000 210 199 154 108 147 96 133 191 192 226

2010 139 187 207 218 233 96

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168B 1912 to 2015 104 years Series 26

[B] Entire series, effect on correlation ( .758) is:

Lower 1922> -.017 1952< -.013 1916< -.011 1930< -.008 1933> -.006 1988> -.006 Higher 1954 .021 1989 .021

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

1922 +3.9 SD

168B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1912 143 150 129 176 133 154 114 96

1920 112 96 136 113 131 100 86 103 84 80

1930 65 71 82 67 75 88 56 66 59 67

1940 67 57 84 70 90 70 81 112 96 79

1950 100 127 87 111 65 75 138 223 252 195

1960 272 270 201 214 197 161 243 308 366 384

1970 271 261 304 302 301 275 231 152 124 167

1980 177 197 192 171 218 207 199 223 223 104

1990 108 121 165 183 242 212 309 255 319 214

2000 246 255 171 112 145 94 147 163 185 245

2010 155 198 294 266 287 110

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170A1 1955 to 2015 61 years Series 27

[B] Entire series, effect on correlation ( .767) is:

Lower 2005> -.022 1991> -.017 1956> -.015 1985< -.012 1955> -.010 1990< -.008 Higher 2015 .048 1989 .034

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

1956 +3.3 SD

170A1 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 77 90 102 85 89

1960 82 114 74 95 90 86 83 106 111 155

1970 119 148 177 202 169 214 187 140 133 133

1980 144 133 146 125 130 110 123 133 111 92

1990 86 118 128 116 134 103 141 120 139 117

2000 135 136 100 90 94 83 108 115 122 159

2010 120 132 140 141 167 99

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170A2 1919 to 1947 29 years Series 28

[B] Entire series, effect on correlation ( .826) is:

Lower 1922> -.020 1919< -.008 1929> -.007 1925> -.007 1930< -.007 1935< -.006 Higher 1933 .034 1921 .026

170A2 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 300

1920 363 271 329 323 380 429 411 419 374 371

1930 276 311 307 188 228 239 187 188 191 221

1940 213 195 244 235 247 208 254 290

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170B 1906 to 2015 110 years Series 29

[B] Entire series, effect on correlation ( .716) is:

Lower 1913< -.035 1906< -.024 1909> -.022 1999< -.014 1910> -.007 1953< -.007 Higher 2005 .028 1954 .018

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

1909 +3.5 SD; 1910 +3.7 SD

170B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 166 216 248 223

1910 262 237 238 180 201 259 251 239 233 260

1920 308 196 261 232 284 257 271 332 267 261

1930 275 329 235 135 174 210 138 178 191 186

1940 215 170 188 210 252 258 263 301 229 173

1950 179 187 155 119 84 131 152 172 171 168

1960 176 185 134 135 151 121 113 144 214 197

1970 188 179 233 238 253 260 224 151 162 185

1980 187 177 196 144 159 142 162 210 171 124

1990 133 164 174 169 155 146 176 161 210 123

2000 185 173 156 129 148 104 154 160 173 209

2010 174 167 196 202 215 103

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179A 1932 to 2015 84 years Series 30

[B] Entire series, effect on correlation ( .885) is:

Lower 1953< -.006 1942< -.006 1948> -.004 1988< -.004 1938> -.004 1949< -.004 Higher 2005 .013 2015 .006

179A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 230 132 173 261 141 202 166 187

1940 155 122 141 138 189 148 135 190 159 74

1950 109 110 108 87 67 77 96 122 128 123

1960 114 143 96 91 109 84 97 105 157 160

1970 107 120 163 176 181 148 180 125 114 131

1980 133 144 142 106 128 121 141 129 94 74

1990 103 99 128 109 130 107 143 112 150 80

2000 129 123 91 91 105 65 151 126 142 189

2010 121 128 117 134 152 78

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179B 1926 to 2015 90 years Series 31

[B] Entire series, effect on correlation ( .894) is:

Lower 1941> -.007 1953< -.007 1942< -.007 2003> -.005 1926< -.005 1948> -.004 Higher 2005 .015 1954 .011

179B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1926 275 377 266 276

1930 234 340 330 177 208 304 164 225 203 224

1940 213 232 200 190 281 225 203 282 238 133

1950 177 185 145 119 78 120 135 184 170 166

1960 141 165 131 128 125 117 123 135 180 171

1970 146 174 206 201 235 219 262 153 155 193

1980 178 213 193 119 164 147 198 182 124 90

1990 125 134 177 150 151 143 215 176 257 131

2000 213 184 131 137 135 75 182 157 219 221

2010 155 187 157 176 193 91

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227A 1920 to 2015 96 years Series 32

[B] Entire series, effect on correlation ( .778) is:

Lower 1920< -.015 1933> -.014 1922> -.013 1921> -.011 1937< -.007 1962> -.006 Higher 2005 .026 1954 .020

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

1922 +3.1 SD

227A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 158 161 197 181 169 185 169 207 203 198

1930 147 177 169 150 155 173 93 100 110 160

1940 174 163 189 175 247 176 192 255 226 156

1950 170 197 192 170 73 144 128 153 218 215

1960 212 230 212 183 194 147 124 163 225 283

1970 241 176 272 263 263 200 157 125 98 127

1980 154 154 175 131 162 169 187 191 166 123

1990 124 146 203 202 172 155 203 173 191 136

2000 171 162 140 131 159 103 127 153 197 179

2010 162 155 168 169 173 99

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227B 1934 to 2015 82 years Series 33

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

Lower 1936> -.048 1946< -.037 1947< -.016 1949> -.012 1998< -.010 1938> -.010 Higher 2005 .057 2015 .045

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

1936 +3.9 SD; 1947 -4.6 SD; 1989 -5.3 SD

227B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1934 256 258 263 261 252 247

1940 223 190 223 162 175 193 95 107 134 156

1950 209 229 211 236 113 165 161 189 666 615

1960 551 461 308 248 223 164 169 187 280 356

1970 252 214 324 282 284 338 246 159 131 182

1980 180 182 199 167 179 174 164 177 143 90

1990 106 131 150 150 142 148 174 176 163 148

2000 252 210 162 158 197 112 152 184 193 187

2010 178 183 175 180 174 103

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344A 1956 to 2015 60 years Series 34

[B] Entire series, effect on correlation ( .856) is:

Lower 1983> -.021 1956< -.011 2008< -.010 1988> -.010 1962> -.009 1957< -.003 Higher 2005 .035 2015 .021

344A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 226 250 312 295

1960 353 377 343 356 347 276 317 326 396 499

1970 358 326 385 386 324 324 318 230 159 209

1980 226 243 307 329 357 317 394 333 336 154

1990 146 213 283 309 285 264 371 329 371 255

2000 333 332 251 198 264 137 213 250 216 248

2010 209 234 229 238 303 155

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344B 1919 to 2015 97 years Series 35

[B] Entire series, effect on correlation ( .730) is:

Lower 1978< -.020 1929> -.014 1977> -.007 1919> -.007 1975< -.006 1925< -.006 Higher 2005 .034 1954 .029

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

1929 +3.3 SD

344B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 114

1920 88 52 67 72 64 48 88 138 100 239

1930 194 144 125 84 107 124 88 92 115 123

1940 184 158 167 144 212 263 282 291 277 202

1950 211 245 320 310 141 193 235 252 334 363

1960 472 494 385 353 360 309 378 417 483 475

1970 336 308 355 344 335 294 279 277 182 230

1980 265 284 313 248 271 261 280 246 256 111

1990 125 147 201 224 252 227 296 257 270 200

2000 240 267 211 167 241 120 171 153 198 228

2010 156 183 233 211 279 137

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345A 1931 to 2015 85 years Series 36

[B] Entire series, effect on correlation ( .889) is:

Lower 1945> -.007 1955< -.005 1983> -.003 1963> -.003 2014< -.003 1951> -.003 Higher 2005 .016 2015 .008

345A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 292 376 219 292 309 185 240 208 285

1940 235 216 297 236 385 342 241 270 207 141

1950 195 236 185 181 115 95 100 127 152 144

1960 181 215 157 185 152 108 119 165 211 224

1970 185 173 293 282 242 227 233 148 168 159

1980 158 186 315 225 240 199 257 275 228 173

1990 196 204 251 213 271 206 281 220 285 207

2000 256 230 187 157 181 126 188 232 285 284

2010 242 247 256 316 244 142

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345B 1919 to 2015 97 years Series 37

[B] Entire series, effect on correlation ( .819) is:

Lower 1966< -.014 1928< -.012 1919> -.008 1926< -.006 1927< -.005 1978> -.004 Higher 1989 .013 1954 .011

345B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 256

1920 241 162 188 168 177 192 172 184 151 155

1930 183 199 244 146 198 230 168 213 182 219

1940 196 182 210 184 261 236 202 259 217 124

1950 185 178 145 152 102 103 132 129 138 145

1960 159 171 135 159 148 109 103 127 154 171

1970 159 167 237 206 198 192 232 155 186 195

1980 178 240 306 215 225 209 255 290 233 142

1990 174 172 216 178 188 149 224 187 219 151

2000 173 175 128 120 151 109 165 177 212 242

2010 204 201 213 263 211 104

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419A 1927 to 2015 89 years Series 38

[B] Entire series, effect on correlation ( .802) is:

Lower 1938< -.036 1936> -.015 1979< -.008 1962> -.006 1942< -.005 1990> -.005 Higher 2015 .026 1933 .012

419A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 315 277 224

1930 204 239 231 152 157 192 164 186 109 129

1940 118 124 123 138 195 173 133 151 136 90

1950 80 90 85 75 59 73 71 89 92 93

1960 100 128 117 116 104 83 104 112 165 177

1970 134 115 191 189 138 129 144 126 100 86

1980 99 147 171 124 146 150 231 229 182 112

1990 145 149 186 171 205 179 243 199 240 154

2000 255 256 174 153 188 134 158 185 211 326

2010 252 220 214 232 206 122

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419B 1925 to 2015 91 years Series 39

[B] Entire series, effect on correlation ( .794) is:

Lower 2005> -.024 1936> -.021 1938< -.010 1971< -.006 2008< -.005 2010> -.004 Higher 2015 .028 1954 .017

419B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 163 150 218 173 135

1930 119 132 134 99 119 147 124 149 91 123

1940 115 99 134 129 203 144 112 131 117 83

1950 91 91 103 96 69 82 83 119 132 129

1960 123 123 106 112 117 103 125 121 157 149

1970 136 124 203 209 185 182 224 161 159 171

1980 190 194 188 140 219 195 224 227 164 128

1990 136 135 164 171 192 174 212 212 245 161

2000 222 221 157 178 231 178 227 194 188 264

2010 237 218 183 216 248 124

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[\*] All segments correlate highest as dated with correlation with master series over .3281

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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 5A 1921 2015 95 4 0 .806 1.22 2.19 .458 .733 .220 2.46 .418 -.081 1

2 5B 1953 2015 63 2 0 .810 1.06 1.88 .377 .674 .224 2.64 .513 -.098 1

3 8A 1947 2015 69 3 0 .767 1.19 2.40 .527 .773 .223 2.74 .604 -.016 1

4 8B 1928 2015 88 3 0 .739 1.55 3.27 .654 .655 .252 2.78 .461 -.041 1

5 15A 1892 2015 124 5 0 .736 1.51 3.24 .569 .703 .209 2.64 .446 -.048 2

6 15B 1893 2015 123 5 0 .738 1.39 3.30 .549 .762 .202 2.74 .545 -.083 1

7 111A 1931 2015 85 3 0 .784 2.09 3.73 .792 .751 .203 2.41 .422 .015 1

8 111B 1908 2015 108 4 0 .644 1.79 5.93 .982 .828 .203 2.63 .415 .049 1

9 112A 1927 2015 89 3 0 .840 1.91 4.60 .815 .825 .218 2.59 .493 .038 1

10 112B 1916 2015 100 4 0 .696 2.13 4.96 .955 .848 .203 2.48 .436 .043 1

11 113A 1898 2015 118 5 0 .868 1.37 3.21 .443 .577 .228 2.94 .477 .019 1

12 113B 1887 2015 129 5 0 .798 1.19 2.68 .346 .581 .199 2.68 .409 -.009 2

13 131A 1918 2015 98 4 0 .776 1.22 2.61 .479 .729 .235 2.72 .507 .000 2

14 131B 1910 2015 106 4 0 .663 .90 1.71 .296 .740 .199 2.60 .450 .015 2

15 133A 1915 2015 101 4 0 .823 1.77 2.91 .416 .483 .182 2.69 .473 -.035 1

16 133B 1904 2015 112 4 0 .835 1.80 2.98 .445 .574 .185 2.64 .452 -.012 1

17 135A 1927 2015 89 3 0 .864 1.63 3.26 .510 .629 .206 2.67 .483 -.019 2

18 135B 1917 2015 99 4 0 .809 1.77 3.42 .574 .644 .214 2.60 .515 .016 1

19 136A 1922 2015 94 4 0 .856 1.50 2.48 .311 .497 .166 2.60 .458 -.005 1

20 136B 1908 2015 108 4 0 .841 1.16 2.35 .372 .703 .166 2.61 .440 -.006 2

21 140A 1911 2015 105 4 0 .765 .90 1.83 .344 .797 .186 2.71 .437 -.007 1

22 140B 1916 2015 100 4 0 .807 1.37 2.77 .489 .796 .178 2.59 .491 -.089 1

23 163A 1912 2015 104 4 0 .761 1.47 2.87 .454 .599 .222 2.66 .479 .012 1

24 163B 1900 2015 116 4 0 .770 1.38 3.60 .492 .649 .235 2.54 .390 .042 1

25 168A 1946 2015 70 3 0 .847 2.10 4.01 .698 .716 .214 2.49 .492 -.013 1

26 168B 1912 2015 104 4 0 .758 1.65 3.84 .802 .835 .216 2.60 .498 .017 1

27 170A1 1955 2015 61 2 0 .767 1.22 2.14 .305 .682 .158 2.55 .560 .089 2

28 170A2 1919 1947 29 1 0 .826 2.82 4.28 .762 .811 .130 2.42 .517 -.134 1

29 170B 1906 2015 110 4 0 .716 1.93 3.32 .509 .695 .164 2.58 .519 -.048 1

30 179A 1932 2015 84 3 0 .885 1.29 2.61 .361 .408 .224 2.59 .507 .018 1

31 179B 1926 2015 90 3 0 .894 1.84 3.77 .572 .544 .225 2.60 .543 .007 1

32 227A 1920 2015 96 4 0 .778 1.72 2.83 .400 .566 .175 2.48 .420 .028 1

33 227B 1934 2015 82 3 0 .663 2.11 6.66 1.005 .743 .185 2.67 .384 .088 1

34 344A 1956 2015 60 2 0 .856 2.89 4.99 .733 .609 .184 2.56 .435 -.015 1

35 344B 1919 2015 97 4 0 .730 2.27 4.94 1.011 .850 .212 2.64 .408 -.007 1

36 345A 1931 2015 85 3 0 .889 2.18 3.85 .609 .542 .215 2.74 .563 .011 1

37 345B 1919 2015 97 4 0 .819 1.84 3.06 .430 .518 .181 2.59 .496 -.021 1

38 419A 1927 2015 89 3 0 .802 1.58 3.25 .571 .750 .186 2.71 .520 -.046 2

39 419B 1925 2015 91 3 0 .794 1.57 2.64 .464 .694 .170 2.86 .506 -.027 1

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Total or mean: 3668 139 0 .787 1.61 6.66 .553 .678 .201 2.94 .473 -.008

- = [ COFECHA QURU COF ] = -