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[] P R O G R A M C O F E C H A Version 6.06P 30277

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: FAGR\_STAL\_CORR1-50

File of DATED series: FAGR\_STAL\_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 1906 to 2016 111 years

Continuous time span is 1906 to 2016 111 years

Portion with two or more series is 1910 to 2016 107 years

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

\*C\* Number of dated series 29 \*C\*

\*O\* Master series 1906 2016 111 yrs \*O\*

\*F\* Total rings in all series 2624 \*F\*

\*E\* Total dated rings checked 2620 \*E\*

\*C\* Series intercorrelation .536 \*C\*

\*H\* Average mean sensitivity .253 \*H\*

\*A\* Segments, possible problems 11 \*A\*

\*\*\* Mean length of series 90.5 \*\*\*

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

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

No ring measurements of zero value

1950 -1.098 29 2000 -1.572 29

1951 .734 29 2001 .206 29

1952 .032 29 2002 -1.429 29

1953 -.757 29 2003 -1.033 29

1954 .807 29 2004 1.171 29

1955 1.160 29 2005 .200 29

1906 1.407 1 1956 .573 29 2006 -.735 29

1907 -1.399 1 1957 -.971 29 2007 -1.211 29

1908 -1.582 1 1958 1.530 29 2008 .909 29

1909 -1.250 1 1959 .210 29 2009 1.281 29

1910 1.050 3 1960 -.329 29 2010 .361 29

1911 .334 3 1961 .359 29 2011 -.612 29

1912 1.774 3 1962 1.050 29 2012 .303 29

1913 1.093 4 1963 -.049 29 2013 -.679 29

1914 1.145 4 1964 .083 29 2014 .623 29

1915 .818 5 1965 .658 29 2015 1.796 29

1916 1.204 7 1966 -1.729 29 2016 -1.088 29

1917 .503 8 1967 -.182 29

1918 .785 11 1968 .259 29

1919 -1.343 11 1969 .608 29

1920 .705 12 1970 -.037 29

1921 -.222 13 1971 .772 29

1922 -.633 13 1972 1.748 29

1923 -.656 13 1973 .508 29

1924 -.187 13 1974 -2.234 29

1925 -.422 14 1975 -1.286 29

1926 -1.106 14 1976 -2.160 29

1927 -.441 15 1977 -.071 29

1928 -.409 15 1978 .252 29

1929 -.475 15 1979 -.940 29

1930 -1.159 15 1980 -.697 29

1931 .331 16 1981 .347 29

1932 1.335 16 1982 1.331 29

1933 -1.089 19 1983 -1.235 29

1934 -.289 20 1984 .378 29

1935 1.328 21 1985 1.149 29

1936 -3.354 23 1986 .973 29

1937 .962 25 1987 .529 29

1938 .410 25 1988 -.526 29

1939 1.021 25 1989 .260 29

1940 -.287 26 1990 1.115 29

1941 -.258 26 1991 1.080 29

1942 .844 28 1992 .800 29

1943 .629 28 1993 .655 29

1944 -.647 28 1994 .044 29

1945 .593 28 1995 -1.023 29

1946 -.976 28 1996 -1.563 29

1947 .342 28 1997 .207 29

1948 -.022 28 1998 -.015 29

1949 -2.117 28 1999 -.091 29

PART 5: CORRELATION OF SERIES BY SEGMENTS: FAGR\_STAL\_CORR1-50 08:30 Tue 21 Nov 2017 Page 5

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Correlations of 50-year dated segments, lagged 25 years

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

Seq Series Time\_span 1900 1925 1950 1975

1949 1974 1999 2024

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

1 1645A 1917 2016 .71 .69 .52 .52

2 1645B 1916 2016 .49 .70 .66 .58

3 1646A 1936 2016 .67 .72 .65

4 1646B 1921 2016 .72 .78 .61 .60

5 1647A 1916 2016 .77 .81 .78 .67

6 1647B 1927 2016 .78 .63 .67

7 1648A 1940 2016 .63 .55 .54

8 1648B 1920 2016 .42 .49 .43 .48

9 1649A 1925 2016 .73 .64 .68

10 1649B 1918 2016 .74 .74 .60 .64

11 1650A 1936 2016 .63 .52 .64

12 1650B 1950 2016 .45 .47

13 1755A 1942 2016 .60 .61 .64

14 1755B 1937 2016 .55 .48 .36

15 1756A 1942 2016 .53 .54 .57

16 1756B 1933 2016 .66 .46 .41

17 1757A 1937 2016 .29A .42 .44

18 1757B 1913 2016 .61 .71 .66 .70

19 1758A 1918 2016 .73 .72 .56 .63

20 1758B 1933 2016 .67 .49 .55

21 1759A 1931 2016 .14B .25B .44

22 1759B 1935 2016 .34 .21B .20B

23 1760A 1933 2016 .16B .28A .39

24 1760B 1934 2016 .25A .16B .36

25 1762B 1918 2016 .55 .58 .45 .51

26 1763A 1910 2016 .47 .48 .37 .33A

27 1763B 1910 2016 .47 .49 .35 .35

28 1765A 1906 2016 .67 .64 .36 .25B

29 1765B 1915 2016 .68 .59 .54 .58

Av segment correlation .62 .57 .49 .51

PART 6: POTENTIAL PROBLEMS: FAGR\_STAL\_CORR1-50 08:30 Tue 21 Nov 2017 Page 5

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For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 50-year segments of series filtered with 32-year spline,

at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

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1645A 1917 to 2016 100 years Series 1

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

Lower 2011> -.023 1974> -.021 1945< -.019 1995> -.010 1960< -.010 1966> -.009 Higher 1936 .098 1976 .016

1645A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 245 202 137

1920 154 155 152 155 130 128 103 140 141 145

1930 115 167 154 96 117 133 24 160 132 137

1940 123 128 140 136 79 59 70 122 131 89

1950 108 153 138 82 95 136 98 66 121 117

1960 76 106 131 140 154 186 135 146 172 193

1970 140 123 200 161 119 96 49 86 101 72

1980 46 89 89 49 52 60 51 56 54 73

1990 78 62 42 71 53 56 34 59 36 48

2000 24 40 17 18 29 29 19 26 30 35

2010 35 84 93 30 46 52 37

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

1645B 1916 to 2016 101 years Series 2

[B] Entire series, effect on correlation ( .555) is:

Lower 1922< -.081 1945< -.020 1919> -.020 1974> -.014 1935< -.013 2011> -.012 Higher 1936 .052 1966 .020

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

1922 -5.6 SD

1645B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 208 192 184 180

1920 204 160 53 89 148 128 137 144 138 123

1930 84 145 193 84 103 99 40 170 118 214

1940 129 130 184 176 114 87 139 166 180 131

1950 164 265 202 189 226 246 210 183 283 239

1960 186 199 178 175 171 188 127 182 187 184

1970 147 142 236 172 119 117 75 141 156 127

1980 69 117 148 95 77 112 94 94 82 92

1990 87 91 55 86 68 44 23 53 37 44

2000 38 39 15 26 54 38 19 37 79 61

2010 76 126 156 108 103 126 63

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1646A 1936 to 2016 81 years Series 3

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

Lower 1947< -.013 2016> -.012 2011> -.012 2006< -.012 1961< -.009 2000> -.008 Higher 1966 .015 1983 .011

1646A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 28 124 89 145

1940 146 140 171 236 115 177 123 138 193 156

1950 196 248 194 215 278 227 280 211 252 195

1960 241 208 269 240 252 317 166 268 233 271

1970 235 282 255 223 76 186 164 212 239 182

1980 123 177 192 116 199 162 186 169 151 168

1990 234 186 159 116 138 105 66 121 132 134

2000 109 152 82 128 197 126 50 77 147 126

2010 130 174 182 127 137 189 146

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1646B 1921 to 2016 96 years Series 4

[B] Entire series, effect on correlation ( .664) is:

Lower 1989< -.020 2000> -.019 1921> -.015 2003< -.012 1955< -.010 1964< -.010 Higher 1936 .091 1974 .018

1646B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 169 83 61 103 132 108 104 115 120

1930 77 129 186 103 133 153 34 166 129 173

1940 130 130 189 211 143 218 169 159 220 145

1950 209 270 207 160 188 189 224 142 254 249

1960 229 199 216 217 175 210 174 250 236 253

1970 220 229 311 227 110 168 193 261 239 177

1980 173 219 233 144 213 198 191 147 147 116

1990 161 272 194 132 165 151 119 160 127 116

2000 123 91 71 55 126 75 96 84 168 116

2010 90 95 155 103 179 207 85

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1647A 1916 to 2016 101 years Series 5

[B] Entire series, effect on correlation ( .715) is:

Lower 2016> -.018 1930> -.017 1919> -.013 2006< -.011 1988> -.010 1961< -.009 Higher 1936 .058 1974 .020

1647A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 273 249 217 187

1920 241 120 95 73 72 101 113 97 129 154

1930 199 220 182 96 153 162 43 149 148 151

1940 111 115 115 147 122 122 118 128 126 79

1950 122 172 169 131 188 189 185 110 230 183

1960 148 114 145 120 122 171 117 106 158 167

1970 118 149 161 98 49 102 50 97 99 79

1980 75 108 125 68 117 104 103 79 109 117

1990 136 144 107 73 81 74 38 84 75 60

2000 53 45 45 56 99 72 27 36 64 64

2010 60 64 80 38 52 74 61

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1647B 1927 to 2016 90 years Series 6

[B] Entire series, effect on correlation ( .715) is:

Lower 2015< -.022 1957< -.020 1992< -.011 1956< -.010 2011> -.009 1988> -.007 Higher 1936 .077 1974 .012

1647B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 237 191 175

1930 146 227 219 158 205 216 75 245 195 220

1940 178 164 219 243 174 178 151 173 194 118

1950 170 266 198 137 147 150 119 81 156 166

1960 154 154 196 177 188 207 147 169 160 189

1970 165 195 245 254 112 156 107 190 197 140

1980 133 194 228 132 241 178 185 166 168 191

1990 190 140 100 97 106 91 56 121 110 101

2000 71 89 44 55 89 113 55 79 115 103

2010 99 99 103 52 89 51 43

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1648A 1940 to 2016 77 years Series 7

[B] Entire series, effect on correlation ( .594) is:

Lower 1988< -.043 2008< -.028 1990< -.025 1954< -.019 1957> -.018 2005> -.011 Higher 1974 .031 1966 .031

1648A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1940 243 258 348 353 204 297 223 256 208 157

1950 161 229 198 202 187 207 210 240 291 242

1960 227 256 259 258 258 268 156 204 244 286

1970 239 257 277 230 121 131 143 202 178 116

1980 168 203 165 122 115 141 95 105 36 66

1990 52 93 77 93 93 66 30 74 61 59

2000 42 46 26 27 41 62 26 19 20 47

2010 39 40 46 40 72 82 35

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1648B 1920 to 2016 97 years Series 8

[B] Entire series, effect on correlation ( .442) is:

Lower 1984< -.046 1956< -.033 2016> -.023 1936> -.018 1921> -.012 1990< -.009 Higher 1976 .021 1974 .015

1648B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 198 213 177 169 147 156 132 142 161 152

1930 160 191 222 86 155 232 124 155 130 116

1940 95 74 110 122 103 182 122 137 107 80

1950 90 105 104 71 111 135 79 108 146 155

1960 114 137 134 137 138 123 94 104 153 182

1970 125 171 169 120 75 84 76 110 132 110

1980 119 137 110 84 62 121 111 102 69 109

1990 91 92 91 104 133 85 56 101 81 86

2000 70 101 65 84 114 110 83 30 67 86

2010 40 44 44 24 60 98 85

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1649A 1925 to 2016 92 years Series 9

[B] Entire series, effect on correlation ( .682) is:

Lower 1976> -.015 1938< -.012 1979> -.011 2012< -.010 1930> -.010 1934< -.008 Higher 1936 .027 1974 .023

1649A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 232 164 173 200 215

1930 205 184 288 139 85 119 49 92 61 97

1940 81 101 179 174 131 172 132 200 167 133

1950 134 183 232 216 263 251 215 219 293 260

1960 232 239 267 207 211 204 155 167 160 165

1970 131 180 206 123 67 62 100 99 134 149

1980 122 102 114 110 117 158 179 208 130 104

1990 160 142 134 122 110 79 78 119 96 135

2000 92 140 108 105 177 148 124 82 158 170

2010 137 138 123 128 192 261 178

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1649B 1918 to 2016 99 years Series 10

[B] Entire series, effect on correlation ( .686) is:

Lower 1983> -.023 1986< -.018 1934< -.015 2003> -.015 1979> -.011 1937< -.011 Higher 1936 .041 1974 .022

1649B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 288 188

1920 290 182 182 201 158 186 111 131 157 165

1930 123 146 196 92 55 106 42 73 69 105

1940 71 77 134 135 114 148 115 146 153 98

1950 121 187 147 159 254 271 229 227 279 226

1960 194 279 314 262 260 278 185 160 135 137

1970 119 197 199 147 55 86 99 109 139 163

1980 146 157 164 144 119 143 86 143 88 106

1990 130 112 115 100 70 66 54 89 75 81

2000 36 75 48 102 111 85 57 48 95 118

2010 89 75 89 88 224 199 110

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1650A 1936 to 2016 81 years Series 11

[B] Entire series, effect on correlation ( .612) is:

Lower 1990< -.017 1952< -.016 1964< -.016 1975> -.015 1960> -.011 1987< -.009 Higher 1974 .021 2016 .020

1650A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 96 164 206 221

1940 212 203 206 212 127 214 154 162 156 134

1950 148 201 136 133 157 185 176 172 199 190

1960 241 246 249 205 144 153 138 181 215 213

1970 172 198 269 236 132 184 133 141 150 132

1980 113 159 157 63 101 137 128 86 98 102

1990 78 151 187 141 154 134 104 99 138 105

2000 65 94 85 75 143 153 143 156 206 243

2010 305 212 281 286 247 314 161

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1650B 1950 to 2016 67 years Series 12

[B] Entire series, effect on correlation ( .446) is:

Lower 1970< -.053 1997< -.029 2007> -.024 1955< -.021 1983> -.019 2009< -.015 Higher 1974 .084 2000 .022

1650B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 273 294 211 219 215 177 199 162 217 200

1960 239 160 237 235 211 214 135 162 166 156

1970 70 152 174 137 62 128 111 147 173 150

1980 132 198 274 249 270 320 332 296 263 402

1990 349 277 346 299 250 235 228 174 255 223

2000 170 218 197 147 223 199 210 239 275 174

2010 199 101 156 147 145 245 165

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1755A 1942 to 2016 75 years Series 13

[B] Entire series, effect on correlation ( .563) is:

Lower 1949> -.036 1958< -.025 1987< -.011 2006> -.011 2013> -.011 1975> -.011 Higher 1974 .047 1976 .023

1755A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 139 137 107 168 118 225 227 213

1950 209 223 173 167 192 204 227 211 186 192

1960 208 241 231 208 175 182 149 180 187 205

1970 179 169 219 194 97 171 121 175 200 176

1980 188 209 254 147 193 189 178 126 151 197

1990 235 221 150 133 117 124 150 139 176 146

2000 115 158 132 162 253 243 235 204 202 204

2010 244 143 225 257 248 288 183

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1755B 1937 to 2016 80 years Series 14

[B] Entire series, effect on correlation ( .374) is:

Lower 2009< -.052 1996> -.023 2014< -.022 2016> -.021 1958< -.018 1941< -.017 Higher 1974 .039 2000 .017

1755B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 174 142 156

1940 132 92 121 144 148 188 121 188 224 192

1950 203 225 231 263 282 315 329 227 231 191

1960 220 205 258 282 280 263 221 283 284 245

1970 253 252 240 215 168 175 158 188 207 199

1980 170 202 284 200 264 254 258 198 165 213

1990 196 199 186 186 147 174 225 236 248 283

2000 192 223 188 190 216 206 215 207 274 161

2010 232 129 243 209 165 258 220

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1756A 1942 to 2016 75 years Series 15

[B] Entire series, effect on correlation ( .584) is:

Lower 1983> -.030 1974> -.029 1975< -.026 1943< -.025 1997< -.019 1949> -.014 Higher 2016 .027 2000 .026

1756A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 169 133 155 186 146 235 205 196

1950 212 357 261 167 276 289 262 185 257 174

1960 186 221 235 223 206 227 165 226 201 173

1970 205 169 230 164 143 64 83 140 173 91

1980 87 113 153 154 188 175 159 153 71 134

1990 137 130 133 153 116 93 83 66 69 103

2000 49 119 108 120 195 140 129 103 132 200

2010 154 126 116 89 118 134 69

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1756B 1933 to 2016 84 years Series 16

[B] Entire series, effect on correlation ( .572) is:

Lower 1974> -.036 1996> -.023 2002> -.017 1991< -.015 1980> -.015 1985< -.011 Higher 1936 .051 1966 .023

1756B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 202 317 325 156 289 261 326

1940 243 314 306 275 239 295 239 284 320 223

1950 291 365 292 171 265 307 293 189 260 249

1960 250 346 320 293 195 244 170 261 256 322

1970 272 287 266 282 246 166 108 196 234 208

1980 299 225 231 140 158 174 221 207 140 143

1990 198 163 208 322 217 159 225 178 181 177

2000 166 202 207 143 224 180 145 142 195 254

2010 217 141 132 141 124 181 114

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1757A 1937 to 2016 80 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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1937 1986 0 .21 .05 -.27 .10 -.11 -.28 .05 .03 .11 -.02 .29\* .03 -.09 .20 .00 -.09 -.08 .13 -.30 -.27 .21

[B] Entire series, effect on correlation ( .338) is:

Lower 1974> -.060 2002> -.033 2010< -.026 1975> -.019 1947< -.018 1957> -.017 Higher 1976 .062 1983 .028

1937 to 1986 segment:

Lower 1974> -.099 1975> -.031 1957> -.028 1947< -.026 1964< -.021 1966> -.019 Higher 1976 .126 1983 .049

1757A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 167 177 178

1940 165 199 199 161 149 111 89 57 104 99

1950 85 127 175 154 208 229 181 180 144 99

1960 98 80 106 53 32 62 75 106 85 92

1970 86 118 141 94 129 149 73 108 91 84

1980 86 118 136 87 132 145 150 281 154 144

1990 198 199 193 141 110 76 41 63 52 61

2000 77 98 130 66 100 99 88 66 103 95

2010 33 32 42 44 64 79 50

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1757B 1913 to 2016 104 years Series 18

[B] Entire series, effect on correlation ( .658) is:

Lower 1932< -.020 1976> -.018 1983> -.015 1931< -.015 2007> -.013 1925< -.013 Higher 1936 .056 1974 .021

1757B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1913 178 260 254 226 195 178 106

1920 108 59 90 49 77 27 32 48 27 26

1930 49 27 27 35 63 131 29 201 177 202

1940 231 183 203 242 184 471 249 229 152 133

1950 139 248 229 185 249 274 261 239 246 187

1960 137 151 182 145 188 187 123 136 140 169

1970 164 201 203 151 56 57 95 91 74 63

1980 68 112 179 161 252 281 247 223 137 124

1990 124 139 127 146 89 84 75 111 124 120

2000 85 152 108 84 134 146 131 159 215 228

2010 184 157 146 185 225 284 160

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1758A 1918 to 2016 99 years Series 19

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

Lower 1996> -.023 1989< -.013 1951< -.011 1952> -.009 1921< -.008 1974> -.008 Higher 1936 .080 1983 .010

1758A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 278 147

1920 244 103 123 128 149 147 121 147 156 132

1930 101 108 140 57 61 98 11 82 99 76

1940 56 57 105 85 80 90 57 52 58 50

1950 32 48 117 76 108 92 100 79 137 68

1960 74 83 113 86 145 110 75 104 164 154

1970 184 193 194 168 118 86 77 205 209 162

1980 134 204 186 96 178 185 241 182 150 120

1990 165 166 175 168 134 129 178 196 171 157

2000 103 128 53 83 91 78 56 58 89 98

2010 104 76 74 74 121 102 45

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1758B 1933 to 2016 84 years Series 20

[B] Entire series, effect on correlation ( .618) is:

Lower 2000> -.036 1996> -.023 1966> -.015 1974> -.014 1951< -.012 2004< -.012 Higher 1936 .101 1976 .019

1758B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 83 83 120 13 82 131 147

1940 67 52 121 123 94 122 62 119 75 65

1950 32 43 52 39 62 101 93 107 170 107

1960 57 79 131 112 185 157 130 144 210 155

1970 138 111 140 142 114 97 38 89 108 104

1980 107 172 252 114 215 243 244 190 104 99

1990 139 147 203 149 131 86 156 132 121 146

2000 156 155 60 70 78 69 96 72 129 104

2010 113 85 72 56 97 93 42

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1759A 1931 to 2016 86 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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1931 1980 1 .15 -.09 -.06 -.07 .01 -.14 -.10 .16 .27 -.25 .14| .35\*-.17 -.17 -.05 -.05 -.11 -.04 -.05 .02 -.09

1950 1999 1 .02 -.34 -.11 .04 .02 -.27 -.17 .22 .07 -.17 .25| .34\* .05 .00 .00 .11 -.06 .10 -.07 -.07 -.16

[B] Entire series, effect on correlation ( .238) is:

Lower 1935< -.041 1933> -.024 1988> -.015 1962< -.015 1953> -.013 1983> -.013 Higher 2016 .038 1974 .036

1931 to 1980 segment:

Lower 1935< -.059 1933> -.035 1962< -.022 1953> -.019 1939< -.016 1951< -.014 Higher 1974 .064 1958 .043

1950 to 1999 segment:

Lower 1988> -.033 1983> -.031 1953> -.029 1976> -.027 1962< -.026 1951< -.017 Higher 1974 .070 1958 .044

1759A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 149 121 186 129 19 22 41 11 16

1940 18 34 49 54 73 65 59 100 60 62

1950 80 60 41 98 103 105 96 84 149 87

1960 85 113 83 59 116 102 87 104 112 113

1970 134 153 149 112 78 86 104 81 83 89

1980 133 97 141 138 133 160 171 135 184 181

1990 116 106 161 101 73 57 88 111 127 109

2000 138 174 155 178 229 197 182 157 307 282

2010 224 217 256 213 241 239 214

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1759B 1935 to 2016 82 years Series 22

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

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

1950 1999 7 -.05 -.11 -.10 -.14 -.13 .05 .09 .16 .17 .00 .21| .19 -.12 -.14 -.14 .19 -.18 .31\* .15 -.03 -.18

1967 2016 -3 -.05 -.10 -.19 -.15 -.15 .17 .07 .23\* .08 -.05 .20| - - - - - - - - - -

[B] Entire series, effect on correlation ( .282) is:

Lower 1978< -.027 2000> -.026 1996> -.016 1953> -.015 1974> -.014 1999< -.014 Higher 1949 .034 1936 .020

1950 to 1999 segment:

Lower 1978< -.037 1996> -.029 1953> -.027 1974> -.025 1999< -.016 1951< -.014 Higher 1982 .033 1995 .029

1967 to 2016 segment:

Lower 2000> -.043 1978< -.036 1996> -.027 1974> -.024 2007> -.021 1999< -.017 Higher 1982 .034 2015 .022

1759B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1935 228 28 45 28 31

1940 31 44 47 34 49 73 64 121 57 39

1950 76 76 98 153 140 136 158 118 129 105

1960 148 166 206 170 199 192 151 130 109 114

1970 158 188 175 189 156 140 121 158 100 88

1980 139 131 195 145 156 147 145 137 148 141

1990 172 147 169 158 164 118 166 175 190 134

2000 185 167 159 168 183 138 193 238 292 301

2010 245 216 214 212 275 314 256

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

1760A 1933 to 2016 84 years Series 23

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

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

1933 1982 8 .13 -.19 -.11 -.04 .01 -.06 .22 .18 .07 -.18 .16|-.18 -.27 .12 .18 -.18 -.05 .22 .29\* .04 -.02

1950 1999 0 -.16 .15 -.02 .05 -.05 -.07 .16 .25 -.01 -.10 .28\*-.07 -.27 .00 .21 .02 -.09 .09 .09 -.05 -.14

[B] Entire series, effect on correlation ( .350) is:

Lower 1936> -.081 1974> -.057 1991< -.019 2002> -.016 1968< -.011 1957> -.010 Higher 2016 .037 1983 .031

1933 to 1982 segment:

Lower 1936> -.103 1974> -.094 1968< -.020 1967< -.018 1957> -.016 1972< -.013 Higher 1958 .039 1966 .035

1950 to 1999 segment:

Lower 1974> -.123 1991< -.035 1957> -.021 1968< -.018 1972< -.018 1967< -.016 Higher 1983 .115 1958 .032

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

1936 +4.0 SD; 1974 +4.0 SD

1760A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 313 361 509 468 444 380 357

1940 306 335 341 325 325 372 340 413 354 331

1950 354 397 335 321 327 324 308 311 345 311

1960 290 330 262 214 205 206 165 132 114 151

1970 139 137 134 194 216 153 142 123 124 109

1980 116 149 170 92 158 189 225 233 223 232

1990 275 184 185 186 183 176 165 188 197 191

2000 156 195 232 259 316 208 182 205 266 357

2010 304 191 263 269 288 316 182

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

1760B 1934 to 2016 83 years Series 24

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

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

1934 1983 0 .03 -.16 .03 .06 -.20 .13 .20 .22 .14 -.19 .25\*-.26 -.06 -.26 -.01 .11 .21 .13 .06 -.03 -.01

1950 1999 -2 -.19 -.07 -.11 .09 -.16 .09 .23 .27 .28\*-.10 .16|-.04 -.07 -.23 -.08 .18 .20 .11 .06 -.04 -.01

[B] Entire series, effect on correlation ( .375) is:

Lower 1968< -.033 1974> -.023 1951< -.020 1936> -.019 1969< -.017 1978< -.011 Higher 2000 .036 2016 .025

1934 to 1983 segment:

Lower 1968< -.052 1951< -.030 1974> -.030 1969< -.026 1978< -.018 1981< -.017 Higher 1958 .028 1949 .027

1950 to 1999 segment:

Lower 1968< -.047 1951< -.034 1974> -.034 1969< -.027 1981< -.017 1978< -.016 Higher 1983 .040 1958 .036

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

1989 +3.2 SD

1760B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1934 384 471 391 441 404 414

1940 340 317 342 278 257 295 274 340 257 205

1950 177 170 168 210 213 242 212 202 274 239

1960 222 266 269 238 291 289 218 202 135 137

1970 147 182 196 198 196 198 194 193 171 160

1980 215 189 222 196 234 228 236 221 238 317

1990 262 269 244 246 217 199 218 209 226 263

2000 168 262 226 252 304 197 205 221 264 290

2010 237 178 191 214 246 262 160

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1762B 1918 to 2016 99 years Series 25

[B] Entire series, effect on correlation ( .530) is:

Lower 1992< -.030 1974> -.020 1980< -.020 2007> -.018 1926> -.015 1931< -.011 Higher 1936 .038 1949 .020

1762B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 254 169

1920 142 102 126 138 121 139 149 113 113 97

1930 73 70 85 67 89 135 75 163 144 170

1940 131 126 176 158 118 115 102 90 156 95

1950 110 154 208 144 140 147 141 121 177 166

1960 116 135 127 114 102 104 99 130 155 206

1970 191 186 239 173 162 150 129 204 188 146

1980 100 121 182 141 187 253 226 265 209 181

1990 217 205 152 183 225 192 135 209 213 214

2000 156 204 136 141 205 263 225 271 285 248

2010 140 120 114 73 155 211 110

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1763A 1910 to 2016 107 years Series 26

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

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

1967 2016 0 .03 -.20 .00 .05 -.10 -.09 -.01 .11 -.14 -.26 .33\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .386) is:

Lower 1999< -.022 2000> -.020 1973< -.019 1976> -.018 1998< -.015 1947< -.013 Higher 1974 .031 1949 .021

1967 to 2016 segment:

Lower 2000> -.041 1999< -.039 1976> -.036 1973< -.033 1998< -.024 2008< -.023 Higher 1974 .067 2016 .039

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

1999 2000 4.4 SD

1763A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 190 127 177 124 80 59 48 25 16 13

1920 44 67 63 57 53 32 13 7 3 7

1930 8 118 202 172 238 296 133 266 268 268

1940 228 264 236 187 172 177 147 77 86 46

1950 63 81 77 91 150 136 121 53 104 95

1960 106 123 111 63 86 92 77 94 90 70

1970 70 80 100 67 59 108 116 133 127 117

1980 154 135 186 120 151 144 121 89 99 95

1990 155 140 150 119 99 115 73 121 70 54

2000 88 88 74 86 83 93 110 94 88 127

2010 114 115 173 118 132 200 131

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1763B 1910 to 2016 107 years Series 27

[B] Entire series, effect on correlation ( .389) is:

Lower 1998< -.029 1973< -.017 1975> -.015 2000> -.015 2004< -.012 1947< -.011 Higher 1974 .026 1949 .025

1763B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 185 134 171 126 78 60 49 25 18 13

1920 40 65 64 58 56 28 12 5 5 8

1930 6 120 202 171 251 297 132 267 268 273

1940 230 271 224 192 181 168 140 81 84 42

1950 76 72 78 96 150 125 119 62 97 96

1960 109 130 105 78 71 91 81 87 92 77

1970 66 72 101 68 60 116 108 135 130 112

1980 158 133 185 117 148 133 131 89 99 98

1990 149 135 149 123 107 108 73 123 67 55

2000 82 89 77 87 79 95 115 87 89 131

2010 109 119 175 128 127 197 127

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

1765A 1906 to 2016 111 years Series 28

[\*] Early part of series cannot be checked from 1906 to 1909 -- not matched by another series

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

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

1967 2016 -5 .16 .09 .09 .08 .26 .37\*-.11 .01 -.16 .23 .25| - - - - - - - - - -

[B] Entire series, effect on correlation ( .482) is:

Lower 1982< -.040 1996> -.021 2002> -.020 2001< -.018 1974> -.015 2008< -.011 Higher 1936 .038 1966 .021

1967 to 2016 segment:

Lower 1982< -.094 2001< -.040 1996> -.039 2002> -.037 2008< -.025 2012< -.018 Higher 2000 .054 2016 .042

1765A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 80 39 39 46

1910 60 63 100 154 162 121 165 113 117 42

1920 97 75 131 90 132 84 123 142 96 96

1930 67 106 211 120 161 503 151 595 507 538

1940 400 441 421 359 308 285 201 295 215 226

1950 218 299 315 259 376 353 272 281 340 301

1960 256 278 311 316 300 346 212 273 328 346

1970 384 355 395 358 301 207 227 272 270 223

1980 228 210 168 176 186 210 184 189 198 186

1990 222 226 215 179 189 190 197 157 163 179

2000 124 97 137 130 154 128 90 70 73 135

2010 89 129 86 98 198 291 130

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1765B 1915 to 2016 102 years Series 29

[B] Entire series, effect on correlation ( .615) is:

Lower 1936> -.016 1974> -.013 1967< -.012 1972< -.012 1977< -.009 1997< -.007 Higher 1949 .010 1958 .010

1765B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 118 142 99 102 35

1920 72 71 90 71 93 51 54 68 55 51

1930 50 80 163 93 112 380 145 344 397 429

1940 300 211 218 256 218 245 226 306 224 174

1950 183 252 330 243 288 356 300 242 345 283

1960 229 210 246 221 227 201 164 149 206 221

1970 234 199 171 178 156 104 116 115 201 167

1980 183 205 203 132 147 195 192 198 140 141

1990 146 175 155 176 143 117 120 110 116 134

2000 80 121 107 112 154 113 118 72 141 155

2010 107 102 98 119 165 205 100

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PART 7: DESCRIPTIVE STATISTICS: FAGR\_STAL\_CORR1-50 08:30 Tue 21 Nov 2017 Page 6

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Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

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

1 1645A 1917 2016 100 4 0 .627 .98 2.45 .504 .766 .291 2.47 .350 -.051 1

2 1645B 1916 2016 101 4 0 .555 1.28 2.83 .608 .740 .307 2.59 .417 .037 2

3 1646A 1936 2016 81 3 0 .644 1.74 3.17 .597 .556 .294 2.49 .375 .006 1

4 1646B 1921 2016 96 4 0 .664 1.63 3.11 .568 .546 .290 2.54 .356 -.042 2

5 1647A 1916 2016 101 4 0 .715 1.16 2.73 .516 .693 .277 2.58 .459 -.043 1

6 1647B 1927 2016 90 3 0 .715 1.52 2.66 .553 .587 .262 2.57 .381 -.037 1

7 1648A 1940 2016 77 3 0 .594 1.51 3.53 .923 .893 .257 2.47 .462 .018 1

8 1648B 1920 2016 97 4 0 .442 1.14 2.32 .412 .622 .263 2.71 .551 -.057 2

9 1649A 1925 2016 92 3 0 .682 1.55 2.93 .555 .697 .234 2.68 .496 .105 1

10 1649B 1918 2016 99 4 0 .686 1.40 3.13 .650 .752 .277 2.61 .488 -.004 1

11 1650A 1936 2016 81 3 0 .612 1.67 3.14 .559 .678 .214 2.55 .443 -.052 1

12 1650B 1950 2016 67 2 0 .446 2.08 4.02 .667 .683 .232 2.58 .503 -.067 1

13 1755A 1942 2016 75 3 0 .563 1.85 2.88 .414 .472 .185 2.40 .371 -.065 1

14 1755B 1937 2016 80 3 0 .374 2.12 3.29 .476 .570 .168 2.61 .515 -.050 2

15 1756A 1942 2016 75 3 0 .584 1.59 3.57 .599 .667 .253 2.71 .502 .006 1

16 1756B 1933 2016 84 3 0 .572 2.27 3.65 .631 .497 .232 2.74 .495 -.055 2

17 1757A 1937 2016 80 3 1 .338 1.14 2.81 .515 .745 .263 2.75 .435 -.046 1

18 1757B 1913 2016 104 4 0 .658 1.52 4.71 .760 .716 .278 2.94 .521 -.051 1

19 1758A 1918 2016 99 4 0 .688 1.18 2.78 .514 .623 .294 2.40 .359 -.019 1

20 1758B 1933 2016 84 3 0 .618 1.13 2.52 .492 .569 .343 2.51 .421 -.003 1

21 1759A 1931 2016 86 3 2 .238 1.20 3.07 .625 .829 .261 2.88 .541 .068 1

22 1759B 1935 2016 82 3 2 .282 1.46 3.14 .642 .811 .219 2.65 .473 -.001 1

23 1760A 1933 2016 84 3 2 .350 2.51 5.09 .929 .875 .145 2.61 .440 .000 1

24 1760B 1934 2016 83 3 2 .375 2.43 4.71 .672 .791 .135 2.76 .455 -.012 1

25 1762B 1918 2016 99 4 0 .530 1.56 2.85 .504 .645 .223 2.73 .549 -.011 1

26 1763A 1910 2016 107 4 1 .386 1.12 2.96 .611 .790 .290 2.75 .601 .040 1

27 1763B 1910 2016 107 4 0 .389 1.12 2.97 .614 .794 .279 2.67 .497 .035 1

28 1765A 1906 2016 111 4 1 .482 2.11 5.95 1.160 .757 .249 2.54 .384 -.064 1

29 1765B 1915 2016 102 4 0 .615 1.71 4.29 .830 .740 .238 2.55 .396 -.029 1

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Total or mean: 2624 99 11 .536 1.56 5.95 .628 .696 .253 2.94 .457 -.015

- = [ COFECHA FAGR COF ] = -