[] Dendrochronology Program Library Run VMC12 Program COF 14:27 Fri 16 Jun 2017 Page 1

[]

[] P R O G R A M C O F E C H A Version 6.06P 30119

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: VMC12COF\_corr2-50\_FINAL

File of DATED series: VMC1235\_TSCA\_corr2.txt FINAL

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 1845 to 2015 171 years

Continuous time span is 1845 to 2015 171 years

Portion with two or more series is 1854 to 2015 162 years

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

\*C\* Number of dated series 27 \*C\*

\*O\* Master series 1845 2015 171 yrs \*O\*

\*F\* Total rings in all series 3224 \*F\*

\*E\* Total dated rings checked 3215 \*E\*

\*C\* Series intercorrelation .677 \*C\*

\*H\* Average mean sensitivity .266 \*H\*

\*A\* Segments, possible problems 3 \*A\*

\*\*\* Mean length of series 119.4 \*\*\*

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

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

300A 1 absent rings: 1918

1 absent rings .031%

PART 2: TIME PLOT OF TREE-RING SERIES: VMC12COF\_corr2-50 14:27 Fri 16 Jun 2017 Page 2

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

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

. . . . . . . . . . . . . . . . . <=============> . 284A 1 1874 2015 142

. . . . . . . . . . . . . . . . . <===========> . 284B 2 1897 2015 119

. . . . . . . . . . . . . . . . . . <======> . 285A 3 1944 2015 72

. . . . . . . . . . . . . . . . . .<=========> . 285B 4 1910 2015 106

. . . . . . . . . . . . . . . . . . <======> . 286A 5 1936 2009 74

. . . . . . . . . . . . . . . . . <==========> . 286B 6 1907 2015 109

. . . . . . . . . . . . . . . . <===============> . 287A 7 1856 2015 160

. . . . . . . . . . . . . . . . . <=============> . 287B 8 1876 2015 140

. . . . . . . . . . . . . . . . . <============> . 288A 9 1880 2015 136

. . . . . . . . . . . . . . . . . <============> . 288B 10 1889 2015 127

. . . . . . . . . . . . . . . . . <============> . 289A 11 1888 2015 128

. . . . . . . . . . . . . . . . . <============> . 289B 12 1887 2015 129

. . . . . . . . . . . . . . . . . <============> . 291A 13 1877 2009 133

. . . . . . . . . . . . . . . . . <=============> . 291B 14 1870 2015 146

. . . . . . . . . . . . . . . . . <===========> . 292A 15 1892 2015 124

. . . . . . . . . . . . . . . . <================> . 292B 16 1845 2015 171

. . . . . . . . . . . . . . . . . <=============> . 293A 17 1877 2015 139

. . . . . . . . . . . . . . . . . . .<====> . 295B 18 1966 2015 50

. . . . . . . . . . . . . . . . . . <=======> . 296A 19 1938 2015 78

. . . . . . . . . . . . . . . . . . <=====> . 296B 20 1953 2015 63

. . . . . . . . . . . . . . . . . . <=======> . 297A 21 1939 2012 74

. . . . . . . . . . . . . . . . . . <========> . 297B 22 1929 2015 87

. . . . . . . . . . . . . . . . . .<=========> . 298A 23 1910 2015 106

. . . . . . . . . . . . . . . . . <=============> . 298B 24 1878 2015 138

. . . . . . . . . . . . . . . . <===============> . 300A 25 1854 2015 162

. . . . . . . . . . . . . . . . <===============> . 300B 26 1857 2015 159

. . . . . . . . . . . . . . . . .<==============> . 293B 27 1862 2013 152

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

1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050

PART 3: Master Dating Series: VMC12COF\_corr2-50 14:27 Fri 16 Jun 2017 Page 3

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Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

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1850 .980 1 1900 -1.703 17 1950 -1.541 25 2000 -.465 27

1851 1.125 1 1901 -1.269 17 1951 -.615 25 2001 .404 27

1852 -2.048 1 1902 .421 17 1952 .057 25 2002 .627 27

1853 1.089 1 1903 1.637 17 1953 -.451 26 2003 -2.399 27

1854 -.774 2 1904 .864 17 1954 .310 26 2004 -.389 27

1855 -1.477 2 1905 1.276 17 1955 1.058 26 2005 .820 27

1856 .126 3 1906 .900 17 1956 -.180 26 2006 -1.083 27

1857 .082 4 1907 .336 18 1957 .857 26 2007 .046 27

1858 .788 4 1908 -.773 18 1958 .210 26 2008 -.128 27

1859 .059 4 1909 -.177 18 1959 -.568 26 2009 .567 27

1860 .651 4 1910 .637 20 1960 -1.064 26 2010 1.216 25

1861 1.404 4 1911 -1.029 20 1961 1.142 26 2011 .067 25

1862 -1.542 5 1912 -.557 20 1962 -.631 26 2012 1.240 25

1863 -.924 5 1913 1.113 20 1963 .127 26 2013 .861 24

1864 -.461 5 1914 .012 20 1964 .053 26 2014 .796 23

1865 -.741 5 1915 .812 20 1965 -.060 26 2015 -2.849 23

1866 -.211 5 1916 .551 20 1966 -.463 27

1867 .689 5 1917 .437 20 1967 .846 27

1868 -.064 5 1918 -2.976 20 1 1968 -.559 27

1869 -1.579 5 1919 -1.274 20 1969 .473 27

1870 .452 6 1920 -.446 20 1970 .105 27

1871 1.357 6 1921 1.146 20 1971 .925 27

1872 -.018 6 1922 .867 20 1972 -.182 27

1873 -.315 6 1923 -.098 20 1973 .988 27

1874 .241 7 1924 .559 20 1974 -.266 27

1875 -.680 7 1925 .250 20 1975 -.049 27

1876 -.152 8 1926 -.206 20 1976 -.332 27

1877 -.200 10 1927 .349 20 1977 .056 27

1878 .763 11 1928 -.203 20 1978 .154 27

1879 -.272 11 1929 .180 21 1979 .818 27

1880 .561 12 1930 -.273 21 1980 .569 27

1881 .524 12 1931 -.936 21 1981 -4.434 27

1882 1.498 12 1932 -.980 21 1982 -1.250 27

1883 -.810 12 1933 -.925 21 1983 .079 27

1884 .521 12 1934 -2.095 21 1984 -1.278 27

1885 -.852 12 1935 -1.811 21 1985 .397 27

1886 .882 12 1936 -.399 22 1986 .878 27

1887 -1.912 13 1937 .733 22 1987 1.724 27

1888 -.695 14 1938 1.648 23 1988 .081 27

1889 -.611 15 1939 1.209 24 1989 -.052 27

1890 .181 15 1940 .932 24 1990 .359 27

1891 -.153 15 1941 .194 24 1991 .965 27

1892 -.416 16 1942 .566 24 1992 .631 27

1893 -1.166 16 1943 -.083 24 1993 -2.150 27

1894 1.006 16 1944 -.053 25 1994 -1.225 27

1845 -.916 1 1895 .450 16 1945 .408 25 1995 .874 27

1846 .940 1 1896 .423 16 1946 .987 25 1996 .874 27

1847 -.471 1 1897 1.345 17 1947 .993 25 1997 .412 27

1848 1.832 1 1898 1.261 17 1948 -1.974 25 1998 .139 27

1849 1.647 1 1899 -1.203 17 1949 -.139 25 1999 .005 27

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PART 4: Master Bar Plot: VMC12COF\_corr2-50 14:27 Fri 16 Jun 2017 Page 4

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Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value

1850---------D 1900g 1950f 2000--b

1851---------D 1901-e 1951--b 2001------B

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

1853---------D 1903----------G 1953--b 2003j

1854--c 1904--------C 1954------A 2004---b

1855-f 1905----------E 1955---------D 2005--------C

1856-----A 1906--------D 1956---a 2006-d

1857-----@ 1907------A 1957--------C 2007-----@

1858--------C 1908--c 1958-----A 2008----a

1859-----@ 1909---a 1959--b 2009-------B

1860-------C 1910-------C 1960-d 2010----------E

1861----------F 1911-d 1961---------E 2011-----@

1862f 1912--b 1962--c 2012----------E

1863-d 1913---------D 1963-----A 2013--------C

1864--b 1914-----@ 1964-----@ 2014--------C

1865--c 1915--------C 1965----@ 2015k

1866---a 1916-------B 1966--b

1867-------C 1917------B 1967--------C

1868----@ 1918l 1968--b

1869f 1919-e 1969-------B

1870------B 1920--b 1970-----@

1871----------E 1921---------E 1971---------D

1872----@ 1922--------C 1972---a

1873---a 1923----@ 1973---------D

1874------A 1924-------B 1974---a

1875--c 1925------A 1975----@

1876----a 1926---a 1976---a

1877---a 1927------A 1977-----@

1878--------C 1928---a 1978-----A

1879---a 1929-----A 1979--------C

1880-------B 1930---a 1980-------B

1881-------B 1931-d 1981r

1882----------F 1932-d 1982-e

1883--c 1933-d 1983-----@

1884-------B 1934h 1984-e

1885-c 1935g 1985------B

1886--------D 1936---b 1986--------D

1887h 1937--------C 1987----------G

1888--c 1938----------G 1988-----@

1889--b 1939----------E 1989----@

1890-----A 1940---------D 1990------A

1891----a 1941-----A 1991---------D

1892---b 1942-------B 1992-------C

1893-e 1943----@ 1993i

1894---------D 1944----@ 1994-e

1845-d 1895------B 1945------B 1995--------C

1846---------D 1896------B 1946---------D 1996--------C

1847--b 1897----------E 1947---------D 1997------B

1848----------G 1898----------E 1948h 1998-----A

1849----------G 1899-e 1949----a 1999----@

PART 5: CORRELATION OF SERIES BY SEGMENTS: VMC12COF\_corr2-50 14:27 Fri 16 Jun 2017 Page 5

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Correlations of 50-year dated segments, lagged 25 years

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

Seq Series Time\_span 1850 1875 1900 1925 1950 1975

1899 1924 1949 1974 1999 2024

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

1 284A 1874 2015 .60 .64 .56 .50 .75 .76

2 284B 1897 2015 .59 .72 .66 .79 .82

3 285A 1944 2015 .69 .71 .64

4 285B 1910 2015 .77 .73 .48 .54

5 286A 1936 2009 .54 .67 .63

6 286B 1907 2015 .35B .68 .51 .60

7 287A 1856 2015 .59 .66 .66 .63 .63 .72

8 287B 1876 2015 .57 .58 .68 .61 .75

9 288A 1880 2015 .82 .78 .61 .68 .80

10 288B 1889 2015 .78 .75 .55 .54 .64

11 289A 1888 2015 .66 .65 .65 .80 .82

12 289B 1887 2015 .60 .70 .59 .77 .83

13 291A 1877 2009 .79 .77 .67 .87 .87

14 291B 1870 2015 .61 .57 .66 .50 .72 .80

15 292A 1892 2015 .80 .78 .66 .70 .80

16 292B 1845 2015 .58 .79 .71 .55 .58 .69

17 293A 1877 2015 .51 .52 .44 .62 .73

18 295B 1966 2015 .78

19 296A 1938 2015 .46 .62 .80

20 296B 1953 2015 .75 .77

21 297A 1939 2012 .80 .80 .79

22 297B 1929 2015 .74 .81 .82

23 298A 1910 2015 .35 .34B .43 .62

24 298B 1878 2015 .65 .48 .29B .60 .69

25 300A 1854 2015 .59 .73 .71 .76 .79 .84

26 300B 1857 2015 .64 .77 .72 .58 .71 .75

27 293B 1862 2013 .47 .79 .68 .55 .78 .79

Av segment correlation .58 .69 .65 .59 .68 .74

PART 6: POTENTIAL PROBLEMS: VMC12COF\_corr2-50 14:27 Fri 16 Jun 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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284A 1874 to 2015 142 years Series 1

[B] Entire series, effect on correlation ( .623) is:

Lower 1944< -.046 1926< -.009 1988> -.009 1874> -.007 2011> -.006 1884< -.006 Higher 1981 .093 1918 .021

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

1943 1944 -4.0 SD

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

1944 -6.3 SD

284A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1874 157 110 95 58 66 37

1880 33 23 25 11 8 6 11 6 7 3

1890 3 4 6 4 13 17 17 26 15 7

1900 5 8 14 54 42 30 14 19 12 14

1910 19 18 26 33 15 23 21 21 6 17

1920 32 42 59 46 50 57 24 58 37 57

1930 62 39 42 81 74 94 102 116 200 198

1940 191 172 213 162 30 149 242 223 127 265

1950 203 210 258 288 345 322 155 202 253 98

1960 157 202 105 133 110 149 108 207 143 184

1970 152 187 154 144 99 104 144 149 149 165

1980 157 43 79 124 142 199 244 234 274 226

1990 213 223 238 205 237 308 305 267 227 189

2000 203 241 240 206 256 257 182 199 235 288

2010 371 496 505 464 348 78

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284B 1897 to 2015 119 years Series 2

[B] Entire series, effect on correlation ( .732) is:

Lower 1959< -.018 1899> -.015 1906< -.011 2001< -.011 1898< -.009 1972> -.008 Higher 1981 .076 2015 .022

284B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1897 43 24 32

1900 24 29 83 88 90 98 30 16 13 15

1910 30 31 27 70 54 63 68 52 19 26

1920 47 86 96 76 152 160 126 116 98 122

1930 124 113 108 164 139 170 283 279 376 323

1940 298 377 390 286 221 261 335 351 197 332

1950 242 255 244 223 251 268 232 206 179 67

1960 62 117 84 92 83 108 101 140 71 91

1970 103 156 178 160 130 119 147 158 138 161

1980 162 43 106 113 141 207 216 202 197 172

1990 162 213 206 142 198 271 292 305 258 299

2000 307 244 271 226 269 265 223 262 251 239

2010 284 219 310 261 202 58

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285A 1944 to 2015 72 years Series 3

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

Lower 2003> -.057 2000< -.016 1966> -.010 1978< -.008 1956> -.004 1957< -.004 Higher 1981 .041 2015 .027

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

2003 +3.7 SD

285A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1944 363 348 393 387 123 336

1950 207 242 247 210 250 276 258 218 175 135

1960 119 193 153 246 278 269 292 293 202 188

1970 157 213 169 168 157 139 134 122 101 119

1980 144 83 86 103 99 123 162 175 150 149

1990 166 160 158 140 152 167 197 202 184 164

2000 126 161 188 187 170 166 112 142 167 146

2010 160 162 229 143 118 27

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285B 1910 to 2015 106 years Series 4

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

Lower 1981> -.048 2006< -.013 1975< -.011 1988> -.010 1999< -.009 1914< -.008 Higher 1918 .042 2015 .041

285B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 92 48 63 124 63 84 87 90 57 99

1920 114 122 111 110 147 171 162 215 213 210

1930 227 199 223 190 133 154 187 243 397 387

1940 390 389 374 376 441 472 467 427 290 296

1950 206 238 313 318 380 393 322 336 250 206

1960 158 235 180 208 190 184 165 195 117 136

1970 121 116 81 86 62 47 78 74 62 86

1980 92 76 82 121 124 144 150 233 233 227

1990 226 192 165 142 164 182 154 144 166 129

2000 119 164 163 130 135 129 79 117 113 114

2010 111 92 143 104 81 13

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286A 1936 to 2009 74 years Series 5

[B] Entire series, effect on correlation ( .539) is:

Lower 1943< -.073 2006> -.027 1938< -.017 2008< -.016 1942< -.015 1970< -.012 Higher 1981 .065 2003 .038

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

1943 1944 4.9 SD

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

1943 -7.2 SD; 1981 +3.3 SD

286A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 601 857 590 484

1940 498 375 224 40 286 239 269 260 104 159

1950 107 118 221 261 276 359 316 344 307 239

1960 192 265 194 127 151 189 163 189 83 115

1970 60 96 112 170 192 249 290 284 328 348

1980 345 157 224 305 163 255 279 264 214 176

1990 145 145 124 79 76 77 72 89 92 91

2000 99 83 105 56 55 77 76 76 38 40

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

286B 1907 to 2015 109 years Series 6

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

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

1907 1956 -1 -.10 -.17 -.09 -.12 -.07 -.06 -.02 -.05 -.01 .38\* .35| .12 .12 .13 -.37 -.08 -.05 -.12 -.05 .06 -.19

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

Lower 1915< -.029 1918> -.019 1996< -.017 1908> -.012 1911> -.011 1917< -.011 Higher 2003 .040 2015 .025

1907 to 1956 segment:

Lower 1915< -.094 1917< -.034 1908> -.034 1911> -.027 1918> -.021 1914> -.020 Higher 1948 .102 1938 .044

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

1981 +4.1 SD; 2003 -5.3 SD

286B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1907 44 50 27

1910 37 36 17 23 38 14 27 14 19 15

1920 19 37 44 47 52 61 82 113 99 112

1930 96 107 104 103 76 101 138 190 273 222

1940 250 186 203 189 186 157 179 182 81 108

1950 90 68 108 153 184 238 214 257 209 104

1960 104 197 121 126 173 194 110 135 44 146

1970 179 179 131 120 130 134 162 188 267 338

1980 341 187 241 269 164 289 257 247 185 150

1990 163 162 149 122 115 117 86 88 109 73

2000 55 52 66 28 54 64 49 47 46 43

2010 48 40 67 70 90 18

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287A 1856 to 2015 160 years Series 7

[B] Entire series, effect on correlation ( .674) is:

Lower 1993< -.020 1903< -.010 1883> -.007 1971< -.007 1872> -.005 1959> -.005 Higher 2015 .017 2003 .017

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

1993 -6.1 SD

287A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1856 11 12 20 24

1860 31 42 5 16 14 19 23 50 48 40

1870 100 120 164 164 158 151 200 223 232 229

1880 234 226 361 254 257 173 188 104 92 94

1890 129 134 92 80 105 93 79 108 119 43

1900 36 32 50 37 38 43 39 37 20 26

1910 31 18 19 32 23 42 24 29 19 30

1920 29 41 46 42 56 43 52 51 66 62

1930 77 83 107 109 91 102 126 243 318 259

1940 246 224 167 184 181 185 235 227 165 207

1950 148 229 248 221 235 261 234 279 188 219

1960 133 199 134 148 168 167 146 157 96 118

1970 102 104 81 121 135 145 177 208 200 209

1980 177 102 143 203 147 193 193 191 165 132

1990 160 168 194 86 128 176 202 164 171 169

2000 157 172 183 111 129 150 107 141 120 152

2010 172 112 132 144 136 27

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287B 1876 to 2015 140 years Series 8

[B] Entire series, effect on correlation ( .691) is:

Lower 1922< -.016 1910< -.012 1968< -.011 1918> -.008 1885< -.008 1908> -.008 Higher 2015 .034 2003 .019

287B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1876 151 148 127 137

1880 174 197 211 138 164 87 115 74 61 72

1890 94 90 75 56 67 59 65 68 76 32

1900 23 23 42 89 68 94 118 126 116 107

1910 46 24 31 48 38 44 34 38 25 42

1920 67 130 68 55 55 63 65 81 74 68

1930 78 68 76 79 56 60 74 114 209 218

1940 209 207 165 156 174 159 191 185 123 194

1950 159 163 220 242 282 444 327 354 224 235

1960 148 267 230 176 199 192 165 195 108 130

1970 146 176 182 247 227 227 251 358 296 325

1980 266 165 179 281 235 274 314 267 189 167

1990 141 171 172 124 126 154 222 200 159 163

2000 148 157 135 92 104 121 92 119 119 125

2010 156 123 161 173 168 18

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288A 1880 to 2015 136 years Series 9

[B] Entire series, effect on correlation ( .766) is:

Lower 1958< -.013 1943< -.013 1973< -.008 1980< -.006 1959> -.006 1884< -.005 Higher 1918 .021 2003 .014

288A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1880 253 282 248 156 136 124 134 83 113 80

1890 117 87 76 62 104 81 67 93 85 19

1900 20 26 29 40 32 47 39 35 20 25

1910 31 22 20 27 19 30 27 46 18 26

1920 32 64 75 58 57 82 58 71 71 64

1930 69 67 91 60 58 84 126 161 247 219

1940 147 134 169 93 188 171 255 246 138 213

1950 154 219 275 186 211 345 272 312 182 255

1960 254 307 189 293 236 209 218 279 202 174

1970 149 181 127 116 107 127 91 120 118 127

1980 74 30 45 71 63 86 133 166 116 107

1990 115 137 100 73 99 128 154 127 105 110

2000 113 123 112 81 115 118 106 119 126 128

2010 166 152 193 190 169 57

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288B 1889 to 2015 127 years Series 10

[B] Entire series, effect on correlation ( .685) is:

Lower 1971< -.026 1973< -.016 1959> -.011 1943> -.009 1994> -.008 1996< -.005 Higher 2015 .020 2003 .017

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

2003 -5.2 SD

288B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1889 96

1890 96 92 58 56 70 66 63 66 56 16

1900 12 14 23 34 26 28 20 19 11 11

1910 19 18 14 30 25 34 31 36 22 29

1920 37 80 101 88 108 107 98 110 112 123

1930 106 105 101 95 81 80 102 144 187 165

1940 215 148 149 270 230 310 340 271 149 173

1950 144 186 243 187 234 276 192 236 188 239

1960 183 247 133 193 139 151 136 174 108 197

1970 134 48 48 25 34 28 48 82 121 148

1980 136 51 67 91 80 109 135 167 155 193

1990 211 185 184 137 176 207 154 136 153 130

2000 109 123 122 76 123 148 124 121 124 147

2010 148 153 184 252 177 47

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289A 1888 to 2015 128 years Series 11

[B] Entire series, effect on correlation ( .740) is:

Lower 1918> -.020 2004< -.011 1947< -.009 1988< -.009 1889> -.007 1956> -.007 Higher 1981 .072 2003 .013

289A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1888 138 151

1890 121 71 49 42 81 74 55 59 55 24

1900 17 18 29 37 32 32 29 18 11 11

1910 17 9 8 17 18 26 20 15 11 12

1920 11 24 35 46 45 48 36 56 66 67

1930 63 44 30 36 32 59 99 165 186 171

1940 165 116 109 80 64 112 103 64 16 39

1950 26 128 237 248 175 155 173 178 142 139

1960 108 178 153 175 194 164 170 173 156 157

1970 151 169 167 225 176 197 150 112 126 132

1980 139 50 153 191 130 174 179 250 133 189

1990 251 242 220 128 136 181 194 197 160 158

2000 136 125 125 63 42 124 90 107 138 181

2010 169 69 119 153 141 25

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289B 1887 to 2015 129 years Series 12

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

Lower 2012< -.013 1887> -.013 1924< -.011 1952< -.011 1920< -.010 1971< -.010 Higher 1981 .065 2015 .014

289B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1887 110 149 131

1890 114 70 56 57 98 84 69 99 100 51

1900 33 37 51 69 57 74 49 37 26 33

1910 26 17 22 28 22 27 37 23 12 12

1920 13 35 52 59 48 85 65 108 112 108

1930 112 116 139 111 104 157 252 333 368 335

1940 324 254 267 260 230 229 233 233 87 113

1950 61 38 30 59 58 104 106 109 97 93

1960 89 132 129 145 168 167 177 192 132 152

1970 176 153 202 309 229 236 276 189 164 221

1980 248 98 237 270 167 220 206 267 172 214

1990 222 256 200 121 143 183 168 165 135 112

2000 114 148 172 100 141 149 89 96 115 142

2010 180 126 75 118 148 23

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291A 1877 to 2009 133 years Series 13

[B] Entire series, effect on correlation ( .815) is:

Lower 1924< -.010 1926> -.008 1967< -.007 1889< -.006 1966< -.005 1946< -.005 Higher 1981 .052 1918 .014

291A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1877 165 146 113

1880 139 138 144 71 108 64 96 30 38 13

1890 24 24 30 28 44 30 36 49 51 22

1900 19 24 45 70 53 55 34 36 26 30

1910 46 24 33 54 28 31 33 29 12 30

1920 34 41 36 24 22 30 45 47 41 48

1930 41 38 52 55 26 22 51 95 107 113

1940 116 104 139 109 108 100 117 159 90 131

1950 96 144 250 247 354 350 209 356 322 245

1960 254 370 204 235 204 211 124 163 102 247

1970 215 242 183 209 193 162 126 154 180 185

1980 184 63 152 165 113 181 165 242 156 158

1990 175 196 181 104 146 295 175 171 132 172

2000 80 129 119 44 84 130 81 104 71 118

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

291B 1870 to 2015 146 years Series 14

[B] Entire series, effect on correlation ( .695) is:

Lower 1967< -.027 1960> -.009 1885> -.008 1914> -.008 1946< -.008 1962> -.007 Higher 1981 .065 2015 .021

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

1967 -4.9 SD

291B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1870 169 172 122 122 129 108 95 117 177 115

1880 90 83 96 46 160 124 130 65 74 88

1890 72 47 59 32 54 35 34 41 72 40

1900 43 38 66 83 51 47 30 25 22 23

1910 42 22 32 53 63 69 49 42 11 21

1920 30 26 21 20 23 29 22 43 29 39

1930 32 41 35 47 30 69 102 118 138 131

1940 130 133 169 134 152 141 128 167 104 131

1950 102 222 273 297 387 401 258 320 324 329

1960 402 570 428 277 252 259 202 128 251 394

1970 287 344 289 280 223 242 146 214 224 291

1980 329 91 211 286 160 209 204 284 133 143

1990 146 196 173 111 82 152 225 192 177 148

2000 205 229 182 109 156 183 133 162 163 173

2010 216 106 198 134 145 24

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292A 1892 to 2015 124 years Series 15

[B] Entire series, effect on correlation ( .762) is:

Lower 1968> -.013 1953> -.007 1939< -.007 1940< -.007 1976> -.006 1951> -.005 Higher 1918 .022 2003 .016

292A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1892 50 37 68 50 61 78 69 27

1900 26 29 52 61 42 39 40 36 25 27

1910 33 20 34 60 50 42 61 45 15 33

1920 36 43 38 29 43 42 40 39 36 49

1930 43 36 35 51 44 51 88 100 100 76

1940 70 92 116 115 128 132 150 144 60 149

1950 108 166 160 187 168 158 156 150 125 140

1960 108 194 118 158 184 157 192 295 301 295

1970 232 266 174 265 194 293 350 252 362 257

1980 188 70 119 169 145 180 196 279 172 176

1990 180 228 176 115 105 169 191 156 142 137

2000 115 106 112 54 59 80 58 60 74 82

2010 91 68 97 87 92 25

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292B 1845 to 2015 171 years Series 16

[\*] Early part of series cannot be checked from 1845 to 1853 -- not matched by another series

[B] Entire series, effect on correlation ( .633) is:

Lower 1981> -.030 1854< -.020 1940< -.016 1991< -.009 1950> -.009 1941< -.008 Higher 1918 .030 2003 .019

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

1981 +3.0 SD

292B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1845 66 91 65 101 92

1850 75 73 32 64 23 33 42 37 39 23

1860 43 52 12 16 33 49 57 57 34 19

1870 44 57 25 33 53 55 69 62 82 80

1880 82 107 128 73 93 68 127 72 87 79

1890 75 80 70 48 85 56 67 69 75 38

1900 30 34 48 71 78 44 48 42 22 38

1910 39 19 32 49 29 40 35 54 12 32

1920 36 42 48 35 46 37 34 32 39 48

1930 45 38 38 47 41 49 62 67 75 73

1940 54 51 82 91 117 129 148 206 85 202

1950 155 152 119 118 155 173 128 141 126 113

1960 123 219 119 134 142 131 128 185 141 212

1970 195 234 133 236 179 158 147 160 156 178

1980 174 122 120 153 129 150 152 154 99 85

1990 86 77 80 61 70 115 96 91 86 78

2000 94 78 84 51 82 86 70 82 91 80

2010 100 51 130 87 75 14

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293A 1877 to 2015 139 years Series 17

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

Lower 1941< -.040 1922< -.015 1898< -.014 1925< -.011 1887> -.009 1881< -.008 Higher 2015 .044 1918 .038

293A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1877 116 103 109

1880 157 85 149 92 142 65 102 71 56 52

1890 47 33 48 42 58 74 90 109 51 53

1900 48 65 90 61 68 52 39 39 30 35

1910 36 24 29 30 29 32 27 31 13 15

1920 21 29 17 21 31 19 28 32 33 51

1930 53 69 81 84 84 66 124 146 154 141

1940 171 74 133 149 134 146 155 208 113 181

1950 104 98 127 133 227 140 111 233 206 110

1960 127 154 117 177 143 160 66 186 155 222

1970 335 473 416 588 308 386 172 277 222 221

1980 222 64 93 117 53 69 76 116 93 98

1990 126 142 127 89 56 133 139 179 181 168

2000 158 192 132 89 96 135 92 102 108 152

2010 119 138 134 98 127 26

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295B 1966 to 2015 50 years Series 18

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

Lower 1994< -.045 1966< -.027 1968> -.010 1988> -.009 1972> -.007 1976< -.007 Higher 1981 .068 2003 .030

295B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1966 89 175 172 148

1970 149 216 174 188 134 180 110 115 141 157

1980 132 71 118 151 99 128 117 167 130 100

1990 131 156 127 72 59 104 95 97 89 88

2000 86 91 99 44 77 107 48 90 100 86

2010 114 54 88 76 75 13

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296A 1938 to 2015 78 years Series 19

[B] Entire series, effect on correlation ( .556) is:

Lower 1949< -.059 1948> -.027 1950> -.020 1959> -.019 1957< -.016 1969< -.014 Higher 1981 .165 1993 .034

296A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 147 182

1940 155 136 130 90 102 101 123 106 101 40

1950 103 64 60 96 103 101 113 97 232 307

1960 153 221 270 190 259 273 306 361 350 257

1970 301 505 368 545 503 437 396 384 372 369

1980 283 112 215 291 240 358 345 330 260 253

1990 267 289 276 178 237 279 309 328 264 276

2000 235 208 238 162 267 268 219 190 135 117

2010 191 181 263 261 298 46

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296B 1953 to 2015 63 years Series 20

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

Lower 2006> -.025 1960> -.015 1994> -.014 1970> -.011 1980< -.010 2008< -.010 Higher 1981 .129 2015 .024

296B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1953 283 627 534 312 386 395 275

1960 431 477 395 348 406 379 375 461 367 356

1970 434 387 333 357 253 247 242 173 160 175

1980 128 49 91 118 89 134 116 147 107 85

1990 94 119 167 84 143 163 147 121 130 177

2000 142 117 137 80 148 157 154 101 61 89

2010 151 129 160 123 140 16

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297A 1939 to 2012 74 years Series 21

[B] Entire series, effect on correlation ( .769) is:

Lower 2012< -.032 1967< -.023 1960> -.010 1951> -.009 1983< -.008 2011> -.007 Higher 1981 .115 2003 .016

297A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 359

1940 294 272 309 290 218 268 338 300 150 256

1950 158 334 313 194 303 319 216 236 263 155

1960 240 301 220 216 206 201 147 159 203 266

1970 209 315 194 278 170 185 141 138 135 198

1980 180 40 117 126 114 139 162 164 120 127

1990 136 150 132 87 90 115 127 111 107 109

2000 98 122 102 70 103 152 103 143 111 136

2010 182 166 58

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297B 1929 to 2015 87 years Series 22

[B] Entire series, effect on correlation ( .797) is:

Lower 1960> -.010 1959< -.009 1983< -.009 2011< -.007 2003> -.006 1993> -.006 Higher 1981 .081 1948 .014

297B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 72

1930 82 97 84 98 78 125 165 346 444 414

1940 424 424 431 414 364 404 345 297 91 214

1950 164 166 244 204 214 240 254 413 369 208

1960 314 402 328 391 368 341 338 442 283 339

1970 326 373 272 301 248 268 207 257 229 233

1980 199 61 115 113 102 135 189 216 132 183

1990 175 218 204 149 163 219 260 167 189 183

2000 140 176 154 103 96 149 92 91 78 125

2010 212 77 114 159 122 18

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298A 1910 to 2015 106 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

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

1925 1974 -6 -.11 .01 .11 -.30 .37\*-.01 .27 .10 .15 .08 .34|-.25 .02 -.19 -.05 -.30 .25 .00 -.09 .07 -.03

[B] Entire series, effect on correlation ( .498) is:

Lower 1954< -.044 2003> -.017 1981> -.011 1948> -.011 1918> -.010 1956< -.009 Higher 2015 .065 1993 .015

1925 to 1974 segment:

Lower 1954< -.099 1948> -.032 1968> -.022 1936< -.013 1927< -.012 1937< -.009 Higher 1935 .031 1961 .025

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

1954 -5.3 SD; 1981 +3.2 SD

298A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 41 30 30 44 48 52 54 55 52 47

1920 66 87 109 85 108 130 98 76 96 110

1930 106 89 83 85 92 40 63 113 206 184

1940 231 240 218 244 233 331 297 282 213 203

1950 159 301 204 107 52 395 148 253 318 289

1960 293 387 309 316 354 334 318 337 338 363

1970 329 344 264 367 231 202 214 246 263 242

1980 268 172 178 179 104 135 188 225 146 178

1990 151 178 171 111 110 127 130 109 145 141

2000 200 187 172 176 258 267 179 225 188 286

2010 250 211 309 221 236 66

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298B 1878 to 2015 138 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

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

1925 1974 -6 .14 -.03 .03 -.22 .30\* .05 .16 .17 .26 .10 .29|-.32 -.16 -.16 -.11 -.26 .15 .16 -.10 .10 -.10

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

Lower 1948> -.029 2003> -.023 1954< -.012 1910< -.009 1969< -.008 1968> -.007 Higher 1981 .034 2015 .030

1925 to 1974 segment:

Lower 1948> -.101 1954< -.043 1969< -.032 1968> -.023 1936< -.019 1962> -.016 Higher 1935 .038 1961 .034

[E] Outliers 4 3.0 SD above or -4.5 SD below mean for year

1887 -4.7 SD; 1948 +3.4 SD; 1954 -4.7 SD; 2003 +3.4 SD

298B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1878 164 104

1880 106 98 85 64 78 62 69 30 41 48

1890 57 57 55 36 59 62 52 68 74 39

1900 32 32 48 62 35 37 46 38 24 28

1910 18 9 11 30 23 38 24 32 25 41

1920 59 99 100 56 89 104 93 98 83 104

1930 110 90 79 86 89 37 39 83 163 192

1940 222 165 185 220 184 182 279 280 268 265

1950 192 125 124 37 18 130 74 163 153 198

1960 200 261 232 271 209 176 203 236 231 179

1970 192 218 182 236 171 158 162 185 220 232

1980 215 134 195 202 160 203 262 269 152 216

1990 224 223 191 108 136 159 153 101 86 104

2000 110 128 169 139 144 136 99 90 55 89

2010 113 66 108 74 90 16

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300A 1854 to 2015 162 years Series 25

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

Lower 1854> -.028 1998< -.009 1993> -.008 1913< -.007 1857> -.007 1884< -.007 Higher 1981 .040 2015 .021

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

1918 -2.976 20 1

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

1854 +3.4 SD

300A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1854 177 150 151 179 167 147

1860 157 167 128 113 118 110 127 133 132 119

1870 139 172 152 121 85 57 71 62 80 56

1880 57 49 62 33 28 24 39 21 27 25

1890 36 38 30 20 38 31 27 29 28 15

1900 13 14 22 36 30 40 46 25 16 27

1910 33 23 22 18 19 28 26 30 0 16

1920 21 50 48 53 51 40 45 43 32 33

1930 30 22 36 40 39 63 109 199 307 245

1940 268 304 344 267 224 318 359 292 147 190

1950 122 190 232 201 243 314 299 343 288 301

1960 244 305 236 242 228 191 252 412 348 384

1970 329 353 280 356 253 232 210 188 137 166

1980 158 69 120 164 144 176 190 203 153 146

1990 179 183 176 153 146 164 168 147 123 142

2000 125 158 166 119 118 173 145 178 163 145

2010 136 139 186 161 134 23

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300B 1857 to 2015 159 years Series 26

[B] Entire series, effect on correlation ( .678) is:

Lower 1925< -.015 1857< -.015 2003> -.011 1907< -.011 1865> -.007 1984> -.006 Higher 1981 .056 1918 .027

300B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1857 172 215 221

1860 197 230 134 147 187 216 184 217 183 146

1870 219 280 212 175 132 89 93 81 82 54

1880 64 61 71 44 47 39 49 24 32 27

1890 43 41 38 34 62 51 43 55 50 24

1900 14 14 27 52 34 53 55 19 29 27

1910 24 18 22 24 16 23 29 32 14 23

1920 28 42 38 32 44 26 43 58 48 63

1930 56 50 61 49 47 67 88 97 153 171

1940 218 206 206 175 205 169 197 210 127 166

1950 141 160 153 124 174 150 122 157 139 146

1960 126 164 115 172 150 142 163 195 193 225

1970 234 234 233 261 194 195 163 149 152 158

1980 174 67 89 109 128 164 157 199 156 106

1990 125 124 103 84 97 104 84 74 89 75

2000 77 116 114 89 96 133 57 124 128 140

2010 141 85 144 89 57 7

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293B 1862 to 2013 152 years Series 27

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

Lower 1862> -.031 1863> -.018 2003> -.013 1865< -.011 1925< -.010 1904< -.009 Higher 1981 .052 1918 .020

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

1863 +4.0 SD

293B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1862 187 277 142 48 90 143 130 67

1870 69 89 63 50 80 79 81 68 125 82

1880 120 121 150 80 111 77 120 48 61 60

1890 73 75 75 82 106 83 73 102 102 62

1900 52 51 72 102 54 77 91 75 59 63

1910 82 66 74 82 57 59 65 53 21 29

1920 39 47 42 31 42 23 28 34 35 47

1930 50 56 77 86 87 89 151 188 235 241

1940 238 149 213 250 236 320 295 382 190 316

1950 203 145 267 196 226 194 152 328 283 244

1960 127 345 264 412 230 231 242 349 314 448

1970 229 284 181 254 163 228 158 200 183 217

1980 188 82 112 170 80 125 124 154 115 91

1990 92 120 116 53 56 133 91 93 75 87

2000 68 89 84 68 63 80 51 69 78 110

2010 130 64 106 66

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PART 7: DESCRIPTIVE STATISTICS: VMC12COF\_corr2-50 14:27 Fri 16 Jun 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 284A 1874 2015 142 6 0 .623 1.30 5.05 1.102 .892 .329 2.58 .327 -.010 1

2 284B 1897 2015 119 5 0 .732 1.65 3.90 .968 .879 .256 2.38 .332 .004 1

3 285A 1944 2015 72 3 0 .634 1.84 3.93 .719 .681 .196 2.39 .365 -.067 1

4 285B 1910 2015 106 4 0 .636 1.81 4.72 1.045 .926 .195 2.62 .459 -.045 1

5 286A 1936 2009 74 3 0 .539 2.08 8.57 1.458 .839 .276 2.60 .464 -.053 1

6 286B 1907 2015 109 4 1 .525 1.22 3.41 .776 .849 .274 2.45 .343 -.086 1

7 287A 1856 2015 160 6 0 .674 1.27 3.61 .761 .877 .238 2.63 .302 -.010 3

8 287B 1876 2015 140 5 0 .691 1.44 4.44 .813 .853 .230 2.83 .428 -.014 1

9 288A 1880 2015 136 5 0 .766 1.23 3.45 .758 .841 .265 2.60 .462 -.022 1

10 288B 1889 2015 127 5 0 .685 1.19 3.40 .729 .847 .252 2.47 .380 .007 1

11 289A 1888 2015 128 5 0 .740 1.06 2.51 .678 .842 .289 2.48 .319 -.026 3

12 289B 1887 2015 129 5 0 .736 1.31 3.68 .814 .857 .259 2.55 .361 .005 1

13 291A 1877 2009 133 5 0 .815 1.15 3.70 .836 .827 .316 2.58 .322 -.011 1

14 291B 1870 2015 146 6 0 .695 1.42 5.70 1.046 .850 .299 2.59 .373 -.050 1

15 292A 1892 2015 124 5 0 .762 1.14 3.62 .788 .863 .258 2.46 .385 -.017 1

16 292B 1845 2015 171 6 0 .633 .84 2.36 .494 .798 .284 2.58 .392 -.002 1

17 293A 1877 2015 139 5 0 .581 1.16 5.88 .879 .795 .297 2.59 .457 -.022 2

18 295B 1966 2015 50 1 0 .776 1.13 2.16 .415 .561 .301 2.52 .583 -.018 2

19 296A 1938 2015 78 3 0 .556 2.33 5.45 1.112 .787 .247 2.45 .413 -.008 1

20 296B 1953 2015 63 2 0 .739 2.20 6.27 1.391 .851 .278 2.45 .408 .050 1

21 297A 1939 2012 74 3 0 .769 1.85 3.59 .775 .659 .263 2.54 .386 -.015 2

22 297B 1929 2015 87 3 0 .797 2.23 4.44 1.127 .818 .263 2.46 .352 -.020 1

23 298A 1910 2015 106 4 1 .498 1.87 3.95 .966 .765 .233 2.60 .499 .050 1

24 298B 1878 2015 138 5 1 .594 1.21 2.80 .741 .877 .274 2.60 .370 -.021 1

25 300A 1854 2015 162 6 0 .751 1.35 4.12 .998 .925 .243 2.48 .373 .010 1

26 300B 1857 2015 159 6 0 .678 1.10 2.80 .674 .899 .244 2.55 .405 -.091 1

27 293B 1862 2013 152 6 0 .658 1.30 4.48 .885 .771 .293 2.65 .457 -.002 1

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Total or mean: 3224 122 3 .677 1.39 8.57 .861 .836 .266 2.83 .391 -.018

- = [ COFECHA VMC12COF ] = -