[] Dendrochronology Program Library Run LPRD5 Program COF 11:47 Mon 11 Mar 2013 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 28561

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: LPRD\_5

File of DATED series: LPRD\_5COMP

CONTENTS:

Part 1: Title page, options selected, summary, absent rings by series

Part 2: Histogram of time spans

Part 3: Master series with sample depth and absent rings by year

Part 4: Bar plot of Master Dating Series

Part 5: Correlation by segment of each series with Master

Part 6: Potential problems: low correlation, divergent year-to-year changes, absent rings, outliers

Part 7: Descriptive statistics

RUN CONTROL OPTIONS SELECTED VALUE

1 Cubic smoothing spline 50% wavelength cutoff for filtering

32 years

2 Segments examined are 30 years lagged successively by 15 years

3 Autoregressive model applied A Residuals are used in master dating series and testing

4 Series transformed to logarithms Y Each series log-transformed for master dating series and testing

5 CORRELATION is Pearson (parametric, quantitative)

Critical correlation, 99% confidence level .4226

6 Master dating series saved N

7 Ring measurements listed N

8 Parts printed 1234567

9 Absent rings are omitted from master series and segment correlations (Y)

Time span of Master dating series is 1897 to 2012 116 years

Continuous time span is 1897 to 2012 116 years

Portion with two or more series is 1904 to 2012 109 years

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

\*C\* Number of dated series 21 \*C\*

\*O\* Master series 1897 2012 116 yrs \*O\*

\*F\* Total rings in all series 1904 \*F\*

\*E\* Total dated rings checked 1897 \*E\*

\*C\* Series intercorrelation .566 \*C\*

\*H\* Average mean sensitivity .221 \*H\*

\*A\* Segments, possible problems 34 \*A\*

\*\*\* Mean length of series 90.7 \*\*\*

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

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

175A 1 absent rings: 1997

1 absent rings .053%

PART 2: TIME PLOT OF TREE-RING SERIES: LPRD\_5 11:47 Mon 11 Mar 2013 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

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

. . . . . . . . . . . . . . . . . . <========> . 165A 1 1922 2012 91

. . . . . . . . . . . . . . . . . .<=========> . 165B 2 1913 2012 100

. . . . . . . . . . . . . . . . . . <========> . 166A 3 1925 2012 88

. . . . . . . . . . . . . . . . . . <=======> . 166B 4 1937 2012 76

. . . . . . . . . . . . . . . . . <==========> . 167A 5 1905 2012 108

. . . . . . . . . . . . . . . . . <==========> . 168A 6 1904 2012 109

. . . . . . . . . . . . . . . . . <==========> . 168B 7 1906 2012 107

. . . . . . . . . . . . . . . . . . <========> . 169A 8 1926 2012 87

. . . . . . . . . . . . . . . . . . <=======> . 169B 9 1930 2012 83

. . . . . . . . . . . . . . . . . . <=======> . 170A 10 1930 2012 83

. . . . . . . . . . . . . . . . . . <======> . 170B 11 1943 2012 70

. . . . . . . . . . . . . . . . . . <========> . 171B 12 1928 2012 85

. . . . . . . . . . . . . . . . . . <=======> . 172A 13 1933 2012 80

. . . . . . . . . . . . . . . . . <===========> . 173A 14 1897 2012 116

. . . . . . . . . . . . . . . . . <==========> . 174A 15 1909 2012 104

. . . . . . . . . . . . . . . . . . <======> . 174B 16 1946 2012 67

. . . . . . . . . . . . . . . . . . <=======> . 175A 17 1935 2012 78

. . . . . . . . . . . . . . . . . . <=======> . 175B 18 1933 2012 80

. . . . . . . . . . . . . . . . . .<=========> . 176A 19 1911 2012 102

. . . . . . . . . . . . . . . . . .<=========> . 176B 20 1913 2012 100

. . . . . . . . . . . . . . . . . . <========> . 172B 21 1923 2012 90

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

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: LPRD\_5 11:47 Mon 11 Mar 2013 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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1900 -1.561 1 1950 .033 21 2000 -.005 21

1901 .914 1 1951 .282 21 2001 1.788 21

1902 -1.599 1 1952 -.219 21 2002 1.783 21

1903 .507 1 1953 .078 21 2003 .281 21

1904 -1.065 2 1954 .102 21 2004 -.926 21

1905 -.064 3 1955 .678 21 2005 -.045 21

1906 1.046 4 1956 -1.452 21 2006 -.528 21

1907 1.367 4 1957 .837 21 2007 1.587 21

1908 1.560 4 1958 2.031 21 2008 .097 21

1909 .417 5 1959 .062 21 2009 -.426 21

1910 1.453 5 1960 -.223 21 2010 1.228 21

1911 -.337 6 1961 .666 21 2011 -1.769 21

1912 1.157 6 1962 -.321 21 2012 1.500 21

1913 1.432 8 1963 -.104 21

1914 -1.042 8 1964 .058 21

1915 1.017 8 1965 .351 21

1916 -.341 8 1966 .241 21

1917 .166 8 1967 -.391 21

1918 .576 8 1968 -.714 21

1919 -.377 8 1969 -.353 21

1920 -1.156 8 1970 .293 21

1921 -.882 8 1971 1.030 21

1922 -.292 9 1972 .697 21

1923 -.903 10 1973 .520 21

1924 .130 10 1974 .303 21

1925 -.281 11 1975 1.120 21

1926 -1.348 12 1976 -.380 21

1927 -.708 12 1977 -1.200 21

1928 -.281 13 1978 -1.203 21

1929 -.612 13 1979 -.753 21

1930 -.842 15 1980 .042 21

1931 -1.261 15 1981 -1.106 21

1932 .953 15 1982 .109 21

1933 .928 17 1983 .016 21

1934 .896 17 1984 -1.169 21

1935 -.045 18 1985 -.270 21

1936 1.450 18 1986 .328 21

1937 .497 19 1987 .358 21

1938 .476 19 1988 1.033 21

1939 1.293 19 1989 .242 21

1940 -.221 19 1990 .868 21

1941 1.559 19 1991 1.080 21

1942 .579 19 1992 1.652 21

1943 -.839 20 1993 1.475 21

1944 -.723 20 1994 -.441 21

1945 -.385 20 1995 .360 21

1946 -1.071 21 1996 -1.973 21

1897 -2.026 1 1947 .398 21 1997 -2.455 21 1

1898 -2.327 1 1948 -1.487 21 1998 -2.420 21

1899 -1.356 1 1949 .707 21 1999 -.412 21

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PART 4: Master Bar Plot: LPRD\_5 11:47 Mon 11 Mar 2013 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

1900f 1950-----@ 2000-----@

1901--------D 1951------A 2001----------G

1902f 1952----a 2002----------G

1903-------B 1953-----@ 2003------A

1904-d 1954-----@ 2004--d

1905-----@ 1955-------C 2005-----@

1906---------D 1956-f 2006---b

1907---------E 1957--------C 2007----------F

1908----------F 1958----------H 2008-----@

1909-------B 1959-----@ 2009---b

1910----------F 1960----a 2010---------E

1911---a 1961-------C 2011g

1912---------E 1962---a 2012----------F

1913----------F 1963----@

1914-d 1964-----@

1915--------D 1965------A

1916---a 1966------A

1917-----A 1967---b

1918-------B 1968--c

1919---b 1969---a

1920-e 1970------A

1921--d 1971---------D

1922----a 1972--------C

1923--d 1973-------B

1924-----A 1974------A

1925----a 1975---------D

1926-e 1976---b

1927--c 1977-e

1928----a 1978-e

1929--b 1979--c

1930--c 1980-----@

1931-e 1981-d

1932--------D 1982-----@

1933--------D 1983-----@

1934--------D 1984-e

1935-----@ 1985----a

1936----------F 1986------A

1937-------B 1987------A

1938-------B 1988---------D

1939---------E 1989------A

1940----a 1990--------C

1941----------F 1991---------D

1942-------B 1992----------G

1943--c 1993----------F

1944--c 1994---b

1945---b 1995------A

1946-d 1996h

1897h 1947-------B 1997j

1898i 1948f 1998j

1899-e 1949--------C 1999---b

PART 5: CORRELATION OF SERIES BY SEGMENTS: LPRD\_5 11:47 Mon 11 Mar 2013 Page 5

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Correlations of 30-year dated segments, lagged 15 years

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

Seq Series Time\_span 1890 1905 1920 1935 1950 1965 1980 1995

1919 1934 1949 1964 1979 1994 2009 2024

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

1 165A 1922 2012 .47 .52 .35B .35B .58 .52

2 165B 1913 2012 .57 .50 .49 .35A .35B .58 .67

3 166A 1925 2012 .48 .62 .55 .59 .66 .82

4 166B 1937 2012 .45 .57 .65 .78 .82

5 167A 1905 2012 .32A .25B .36A .27A .38A .74 .81

6 168A 1904 2012 .49B .53 .60 .75 .45 .09B .59 .80

7 168B 1906 2012 .42B .50 .52 .43 .54 .76 .88

8 169A 1926 2012 .62 .61 .36A .20B .56 .75

9 169B 1930 2012 .70 .72 .50 .35A .64 .76

10 170A 1930 2012 .53 .45 .30B .52 .72 .83

11 170B 1943 2012 .46 .41A .33A .69 .77

12 171B 1928 2012 .71 .66 .47 .52 .70 .81

13 172A 1933 2012 .34B .32B .41A .64 .72 .70

14 173A 1897 2012 .19B .22B .76 .72 .56 .58 .84 .77

15 174A 1909 2012 .45 .52 .38A .29A .68 .69 .80

16 174B 1946 2012 .50 .34A .31A .57 .65

17 175A 1935 2012 .54 .59 .28B .48 .48

18 175B 1933 2012 .41A .41A .40B .39A .70 .56

19 176A 1911 2012 .54 .51 .58 .47 .52 .60 .67

20 176B 1913 2012 .50 .48 .65 .59 .51 .77 .84

21 172B 1923 2012 .32B .60 .41A .44 .74 .85

Av segment correlation .34 .44 .51 .54 .43 .44 .67 .74

PART 6: POTENTIAL PROBLEMS: LPRD\_5 11:47 Mon 11 Mar 2013 Page 5

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

[A] Correlations with master dating series of flagged 30-year segments of series filtered with 32-year spline,

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

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

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

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

[D] Absent rings (zero values)

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

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165A 1922 to 2012 91 years Series 1

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

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

1950 1979 -3 -.14 .01 -.12 -.04 -.07 -.05 -.06 .40\*-.32 -.17 .35|-.05 -.25 .14 .09 -.15 -.17 .06 .08 -.14 -.10

1965 1994 -3 .08 -.09 -.31 -.13 .22 .19 .20 .43\* .03 .27 .35|-.16 -.02 -.09 -.20 -.42 -.21 .08 -.04 .11 .01

[B] Entire series, effect on correlation ( .464) is:

Lower 2011> -.032 1976> -.018 1923> -.016 1956> -.016 1932< -.015 1987< -.013 Higher 2012 .021 1948 .016

1950 to 1979 segment:

Lower 1956> -.074 1976> -.068 1968> -.020 1950> -.013 1967> -.009 1961< -.008 Higher 1959 .091 1958 .028

1965 to 1994 segment:

Lower 1976> -.100 1987< -.087 1990< -.035 1968> -.025 1988< -.021 1982< -.016 Higher 1981 .112 1992 .074

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

165B 1913 to 2012 100 years Series 2

[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 1979 0 -.06 .07 -.08 -.09 -.01 -.17 .10 .05 -.38 .08 .35\*-.03 -.20 .09 .09 -.32 .08 .13 -.05 -.28 -.31

1965 1994 -5 -.05 -.01 -.15 -.11 -.08 .39\* .19 .25 -.08 .07 .35|-.10 .00 .11 -.19 -.34 -.05 -.02 .09 -.02 -.05

[B] Entire series, effect on correlation ( .508) is:

Lower 1981< -.022 2011> -.021 1976> -.017 1961< -.014 1939< -.014 1948> -.012 Higher 2012 .015 1958 .013

1950 to 1979 segment:

Lower 1976> -.085 1961< -.067 1960< -.028 1969> -.026 1974> -.022 1963< -.017 Higher 1958 .100 1959 .087

1965 to 1994 segment:

Lower 1976> -.069 1994> -.028 1990< -.026 1984> -.024 1987< -.018 1969> -.018 Higher 1981 .134 1992 .046

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166A 1925 to 2012 88 years Series 3

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

Lower 1928< -.032 1959> -.021 1964< -.017 1981> -.014 2008> -.011 1931> -.010 Higher 2011 .058 1956 .020

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166B 1937 to 2012 76 years Series 4

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

Lower 1938< -.065 1960< -.012 1976> -.011 1962> -.009 1944> -.006 1945> -.006 Higher 1956 .021 2012 .014

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167A 1905 to 2012 108 years Series 5

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

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

1905 1934 0 - - -.34 .19 -.01 .14 -.01 .13 .03 -.16 .32\*-.30 -.23 .19 -.02 .12 .20 -.35 -.16 .17 -.12

1920 1949 -4 -.27 .17 -.26 .03 -.10 .24 .39\*-.07 .15 -.29 .25| .03 -.16 .03 .23 -.14 .18 -.49 -.02 .18 -.07

1935 1964 0 -.34 .12 -.16 -.11 -.11 .05 .20 .07 -.01 -.20 .36\* .03 -.08 .16 .06 -.26 .17 -.23 .16 .15 -.20

1950 1979 0 -.15 .18 -.21 -.14 .11 .04 .01 .21 -.25 .20 .27\*-.25 -.39 .17 -.21 -.27 .02 .18 .24 -.12 -.03

1965 1994 0 -.05 .02 -.22 -.14 .06 .22 .02 .18 .19 .22 .38\*-.11 .03 .13 -.05 -.30 -.25 -.42 -.23 -.24 .06

[B] Entire series, effect on correlation ( .519) is:

Lower 1919> -.022 1956> -.021 1905< -.020 1947< -.017 1976> -.015 1934< -.013 Higher 2011 .088 1914 .024

1905 to 1934 segment:

Lower 1919> -.083 1905< -.062 1929> -.041 1909> -.039 1934< -.038 1922> -.024 Higher 1914 .154 1926 .039

1920 to 1949 segment:

Lower 1947< -.067 1934< -.048 1939< -.038 1929> -.036 1925< -.024 1943> -.024 Higher 1941 .074 1936 .048

1935 to 1964 segment:

Lower 1947< -.090 1956> -.058 1939< -.054 1942< -.022 1953< -.016 1943> -.015 Higher 1958 .073 1941 .053

1950 to 1979 segment:

Lower 1956> -.088 1976> -.076 1970< -.036 1971< -.030 1965< -.021 1953< -.020 Higher 1958 .133 1975 .044

1965 to 1994 segment:

Lower 1976> -.122 1989> -.039 1974> -.035 1970< -.027 1977> -.027 1971< -.021 Higher 1994 .095 1981 .054

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168A 1904 to 2012 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

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1904 1933 -2 - - - .30 -.33 .40 -.13 -.05 .49\*-.45 .49|-.12 .05 -.02 .02 .22 -.16 .41 -.28 .13 .20

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

1965 1994 2 .02 -.02 .10 -.05 -.45 -.31 -.13 .15 -.11 -.39 .09| .19 .37\* .17 .04 .34 .10 -.06 -.13 -.05 .17

[B] Entire series, effect on correlation ( .602) is:

Lower 1971< -.045 1981> -.017 1916< -.014 1907< -.014 1969> -.011 1904< -.010 Higher 2011 .069 1956 .020

1904 to 1933 segment:

Lower 1907< -.048 1916< -.042 1904< -.034 1926> -.027 1922< -.026 1918< -.019 Higher 1914 .075 1932 .042

1965 to 1994 segment:

Lower 1971< -.198 1981> -.064 1969> -.031 1968> -.026 1975< -.021 1988< -.014 Higher 1994 .112 1976 .107

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168B 1906 to 2012 107 years Series 7

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

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1906 1935 5 - .16 -.42 .15 -.23 .10 -.17 -.24 .00 -.28 .42|-.23 .02 .32 -.22 .52\* .03 .30 -.07 .07 -.15

[B] Entire series, effect on correlation ( .605) is:

Lower 1909< -.023 1974< -.019 1952< -.015 1954< -.013 1929> -.012 1915< -.011 Higher 2011 .051 1914 .013

1906 to 1935 segment:

Lower 1909< -.065 1929> -.044 1915< -.034 1926> -.029 1924< -.029 1922< -.025 Higher 1914 .081 1912 .032

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169A 1926 to 2012 87 years Series 8

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

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

1950 1979 0 .18 -.17 .30 -.17 -.02 -.10 -.22 .04 .13 -.11 .36\* .18 -.30 .12 -.04 .14 .09 -.18 .22 .03 -.26

1965 1994 1 .27 -.10 -.11 .05 -.27 -.22 -.26 -.21 .19 .06 .20| .41\* .02 .12 -.01 .22 -.04 -.13 .04 .12 -.17

[B] Entire series, effect on correlation ( .573) is:

Lower 1975< -.034 1981> -.025 1969< -.022 1959> -.018 1974> -.018 2012< -.016 Higher 2011 .090 1956 .026

1950 to 1979 segment:

Lower 1975< -.106 1959> -.074 1974> -.049 1969< -.043 1960> -.034 1973< -.012 Higher 1956 .186 1957 .050

1965 to 1994 segment:

Lower 1975< -.110 1981> -.105 1974> -.053 1984> -.042 1969< -.028 1991< -.017 Higher 1976 .078 1994 .056

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169B 1930 to 2012 83 years Series 9

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

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

1965 1994 0 -.04 -.07 .22 .00 -.31 -.25 -.19 -.03 .03 -.17 .35\* .19 .13 -.12 -.05 .23 -.09 .07 .16 .04 .02

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

Lower 1976< -.037 1981> -.027 1970< -.018 1931> -.015 1959> -.010 2003> -.010 Higher 1996 .029 1956 .021

1965 to 1994 segment:

Lower 1981> -.113 1970< -.052 1971< -.028 1978> -.026 1984> -.009 1972< -.005 Higher 1976 .047 1977 .031

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170A 1930 to 2012 83 years Series 10

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

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1950 1979 -8 .00 -.16 .32\*-.16 .15 -.15 .17 -.09 -.27 -.07 .30|-.08 .08 -.08 .08 -.09 -.21 .10 -.07 .14 .28

[B] Entire series, effect on correlation ( .600) is:

Lower 1959> -.023 1937> -.018 1936< -.014 2004> -.013 1962> -.013 1950> -.009 Higher 1996 .027 2011 .027

1950 to 1979 segment:

Lower 1959> -.073 1962> -.038 1978> -.026 1950> -.025 1954< -.024 1972< -.023 Higher 1956 .143 1977 .040

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170B 1943 to 2012 70 years Series 11

[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 1979 0 .00 .01 .33 -.43 .14 .03 -.15 .03 -.05 -.15 .41\*-.04 -.44 .20 .18 -.18 .24 .01 .06 -.12 -.25

1965 1994 0 -.23 .03 .01 -.12 .01 .30 .20 .02 -.03 .05 .33\* .22 -.19 -.19 -.02 -.10 .06 -.13 .12 .11 -.30

[B] Entire series, effect on correlation ( .608) is:

Lower 1959> -.021 2004> -.016 1948> -.016 1961< -.014 1945< -.014 2009> -.011 Higher 2011 .095 1996 .032

1950 to 1979 segment:

Lower 1959> -.063 1961< -.046 1972< -.029 1973< -.026 1974> -.017 1978> -.017 Higher 1956 .292 1977 .029

1965 to 1994 segment:

Lower 1972< -.035 1974> -.034 1969> -.033 1973< -.032 1978> -.027 1983< -.020 Higher 1992 .064 1977 .053

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171B 1928 to 2012 85 years Series 12

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

Lower 1979< -.044 1959> -.041 1931< -.014 1942> -.010 1996> -.009 1953< -.006 Higher 2011 .065 1956 .013

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

1979 -5.5 SD

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

172A 1933 to 2012 80 years Series 13

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

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

1933 1962 5 -.08 .08 .05 -.19 -.07 .12 -.19 .12 -.37 .10 .34|-.26 .08 .10 -.29 .42\*-.26 -.04 .37 -.17 -.04

1935 1964 5 -.08 .05 .10 -.12 -.10 .12 -.14 .15 -.37 .07 .32|-.29 .06 .08 -.27 .41\*-.30 -.07 .32 -.16 .00

1950 1979 0 -.01 -.02 -.07 -.09 -.12 .03 -.29 .10 -.22 .20 .41\* .08 -.06 .27 -.14 .00 -.11 -.03 -.10 -.29 -.36

[B] Entire series, effect on correlation ( .514) is:

Lower 1935< -.032 1938< -.030 1981> -.022 2011> -.018 1956> -.015 2003> -.013 Higher 1996 .050 2007 .015

1933 to 1962 segment:

Lower 1938< -.054 1956> -.037 1935< -.036 1937> -.022 1950> -.021 1959> -.020 Higher 1943 .071 1958 .038

1935 to 1964 segment:

Lower 1938< -.053 1956> -.040 1935< -.034 1937> -.023 1959> -.023 1950> -.022 Higher 1943 .072 1958 .044

1950 to 1979 segment:

Lower 1956> -.051 1950> -.047 1952> -.038 1961< -.028 1959> -.026 1965< -.024 Higher 1958 .084 1971 .041

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173A 1897 to 2012 116 years Series 14

[\*] Early part of series cannot be checked from 1897 to 1903 -- 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

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

1904 1933 1 - - - -.20 .00 .14 -.02 -.06 -.04 -.04 .19| .41\* .10 .11 .09 .11 -.02 .05 -.09 -.10 -.01

1905 1934 1 - - -.09 -.21 .00 .14 -.02 -.06 -.04 -.05 .22| .41\* .10 .11 .09 .11 -.02 .05 -.09 -.10 -.01

[B] Entire series, effect on correlation ( .545) is:

Lower 1914> -.034 1959< -.028 1911> -.024 2011> -.020 1904> -.020 1905> -.008 Higher 1948 .018 2012 .014

1904 to 1933 segment:

Lower 1914> -.095 1911> -.078 1917< -.033 1905> -.024 1913< -.024 1904> -.024 Higher 1932 .075 1912 .058

1905 to 1934 segment:

Lower 1914> -.122 1911> -.097 1905> -.033 1917< -.031 1913< -.025 1916> -.020 Higher 1932 .074 1912 .056

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

174A 1909 to 2012 104 years Series 15

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

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

1935 1964 0 -.23 -.19 .08 -.13 .08 -.24 .22 .00 .32 -.30 .38\* .01 -.09 .11 .03 .04 .03 -.31 .05 .11 -.18

1950 1979 0 -.29 -.06 .28 -.02 -.01 -.12 .09 -.11 -.02 -.07 .29\* .11 -.01 -.23 .12 -.06 -.17 -.08 .00 .27 .28

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

Lower 1956> -.028 1912< -.025 1968< -.019 2002< -.013 1920< -.011 1909> -.010 Higher 2011 .061 2007 .012

1935 to 1964 segment:

Lower 1956> -.103 1962> -.028 1939< -.028 1958< -.025 1960> -.020 1963< -.019 Higher 1948 .055 1936 .051

1950 to 1979 segment:

Lower 1956> -.121 1958< -.031 1962> -.026 1959> -.020 1978> -.017 1960> -.014 Higher 1957 .055 1977 .041

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

174B 1946 to 2012 67 years Series 16

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

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

1950 1979 0 -.26 .15 .06 -.01 .03 -.14 .19 -.05 -.13 -.20 .34\* .05 -.43 -.20 .31 -.04 .01 .15 .27 .11 .18

1965 1994 0 -.01 .16 -.07 -.05 -.09 .03 -.14 -.38 -.27 -.23 .31\*-.01 -.02 .18 .09 .10 .11 -.06 .11 .04 .16

[B] Entire series, effect on correlation ( .550) is:

Lower 1968< -.024 1956> -.017 1955< -.017 1997> -.015 1981> -.014 1971< -.014 Higher 1996 .039 1948 .032

1950 to 1979 segment:

Lower 1955< -.052 1956> -.048 1971< -.046 1973< -.024 1967> -.024 1979> -.019 Higher 1959 .061 1958 .053

1965 to 1994 segment:

Lower 1981> -.052 1971< -.040 1993< -.035 1967> -.030 1979> -.024 1973< -.018 Higher 1994 .125 1992 .037

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

175A 1935 to 2012 78 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

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

1965 1994 7 -.04 .09 .34 -.22 -.08 .10 -.15 -.20 -.31 -.02 .28|-.19 -.02 -.11 .24 .33 -.08 .41\*-.01 -.12 -.09

[B] Entire series, effect on correlation ( .496) is:

Lower 2011> -.054 1990< -.021 1981> -.014 1949< -.013 1989< -.011 1937< -.010 Higher 1996 .027 1948 .020

1965 to 1994 segment:

Lower 1990< -.087 1981> -.058 1969> -.024 1989< -.022 1968> -.019 1983> -.014 Higher 1977 .062 1976 .057

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

1997 -2.455 21 1

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

175B 1933 to 2012 80 years Series 18

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

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

1933 1962 0 -.17 -.09 .00 -.24 .40 .04 -.03 .02 .14 -.23 .41\*-.20 .02 -.01 .06 -.20 .21 -.17 .27 -.39 -.16

1935 1964 0 -.16 -.12 .00 -.18 .36 .03 .00 .04 .18 -.27 .41\*-.23 .04 -.06 .08 -.20 .19 -.15 .22 -.42 -.12

1950 1979 -6 .06 -.13 .12 -.17 .51\*-.25 -.20 .13 .10 -.33 .40|-.19 -.07 .09 -.07 -.07 -.03 -.06 -.22 -.21 -.03

1965 1994 0 .13 -.09 .22 .06 .16 .20 -.17 -.01 -.18 -.28 .39\*-.35 .08 .17 -.21 .04 -.46 -.05 -.31 -.04 .11

[B] Entire series, effect on correlation ( .473) is:

Lower 2011> -.058 1949< -.021 1977> -.018 1943> -.017 1959> -.015 1991< -.013 Higher 1948 .035 1996 .030

1933 to 1962 segment:

Lower 1949< -.053 1943> -.045 1959> -.039 1936< -.022 1946> -.020 1940> -.018 Higher 1948 .128 1958 .025

1935 to 1964 segment:

Lower 1949< -.054 1943> -.047 1959> -.041 1936< -.022 1946> -.021 1940> -.019 Higher 1948 .128 1958 .028

1950 to 1979 segment:

Lower 1962< -.076 1977> -.060 1959> -.045 1965< -.028 1960> -.018 1966< -.014 Higher 1956 .060 1971 .034

1965 to 1994 segment:

Lower 1977> -.098 1991< -.059 1993< -.029 1978> -.020 1965< -.018 1986< -.016 Higher 1984 .098 1994 .060

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

176A 1911 to 2012 102 years Series 19

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

Lower 2011> -.035 1927< -.029 1981< -.020 1962> -.010 1920> -.009 1994> -.009 Higher 1914 .022 1948 .013

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176B 1913 to 2012 100 years Series 20

[B] Entire series, effect on correlation ( .670) is:

Lower 1930< -.020 1918< -.020 1968> -.015 1942< -.009 2003< -.009 2000< -.007 Higher 2011 .052 1996 .013

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172B 1923 to 2012 90 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

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

1923 1952 8 -.28 .26 -.12 -.32 -.09 .03 -.17 .33 -.04 -.07 .32|-.07 .15 .05 -.14 .08 .12 -.28 .33\*-.16 -.11

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

1950 1979 0 -.02 .11 .03 -.06 -.26 -.14 .03 .15 -.06 .03 .41\*-.11 -.33 .33 -.19 -.14 -.11 .12 .23 .08 -.03

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

Lower 1926> -.049 1929< -.020 1930> -.019 1969< -.016 1962> -.014 1932< -.011 Higher 2011 .071 1996 .021

1923 to 1952 segment:

Lower 1926> -.143 1930> -.050 1932< -.026 1947< -.026 1929< -.021 1937> -.019 Higher 1943 .080 1941 .044

1950 to 1979 segment:

Lower 1969< -.061 1962> -.055 1971< -.028 1970< -.023 1950> -.022 1977> -.021 Higher 1959 .073 1958 .057

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

1926 +3.5 SD

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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 165A 1922 2012 91 6 2 .464 1.10 3.50 .556 .806 .208 2.61 .402 .003 1

2 165B 1913 2012 100 7 2 .508 .89 2.42 .405 .729 .240 2.51 .390 -.009 1

3 166A 1925 2012 88 6 0 .634 2.48 4.96 .839 .587 .245 2.81 .518 -.069 1

4 166B 1937 2012 76 5 0 .563 1.51 3.51 .658 .686 .264 2.67 .435 -.080 2

5 167A 1905 2012 108 7 5 .519 1.55 4.12 .772 .825 .211 2.48 .348 -.038 1

6 168A 1904 2012 109 8 2 .602 2.01 4.53 1.126 .850 .212 2.54 .389 -.126 1

7 168B 1906 2012 107 7 1 .605 1.21 4.03 .724 .857 .232 2.80 .542 -.073 1

8 169A 1926 2012 87 6 2 .573 2.16 4.38 .963 .864 .199 2.67 .420 -.015 1

9 169B 1930 2012 83 6 1 .601 1.54 2.87 .655 .892 .173 2.59 .445 .022 1

10 170A 1930 2012 83 6 1 .600 2.25 4.22 .627 .730 .176 2.65 .528 -.048 1

11 170B 1943 2012 70 5 2 .608 2.79 4.17 .691 .529 .196 2.46 .465 -.070 2

12 171B 1928 2012 85 6 0 .674 1.58 4.36 1.270 .911 .293 2.79 .470 -.097 1

13 172A 1933 2012 80 6 3 .514 1.65 4.06 .817 .793 .233 2.57 .478 -.071 1

14 173A 1897 2012 116 8 2 .545 1.33 3.42 .695 .893 .198 2.57 .380 -.058 1

15 174A 1909 2012 104 7 2 .564 1.20 2.79 .688 .879 .223 2.73 .511 .001 1

16 174B 1946 2012 67 5 2 .550 1.79 3.15 .505 .516 .223 2.73 .589 -.067 1

17 175A 1935 2012 78 5 1 .496 .99 2.65 .667 .860 .300 2.55 .451 .095 1

18 175B 1933 2012 80 6 4 .473 1.00 2.55 .622 .871 .249 2.74 .597 .017 1

19 176A 1911 2012 102 7 0 .548 1.77 3.75 .759 .803 .220 2.61 .412 -.009 1

20 176B 1913 2012 100 7 0 .670 1.17 3.01 .525 .829 .202 2.65 .490 -.118 1

21 172B 1923 2012 90 6 2 .555 1.69 3.24 .665 .835 .175 2.67 .538 -.047 1

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Total or mean: 1904 132 34 .566 1.58 4.96 .729 .797 .221 2.81 .462 -.042

- = [ COFECHA LPRD5COF ] = -