# Time series (2)

**2. Distributed lag model**

**Source:** FERTIL3, from L.A. Whittington, J. Alm, and H.E. Peters (1990), “Fertility and the Personal Exemption: Implicit Pronatalist Policy in the United States,” *American Economic Review* 80, 545-556.

gfr births per 1000 women 15-44

pe real value pers. exemption, $

year 1913 to 1984

t time trend, t=1,...,72

pill =1 if year >= 1963

ww2 =1, 1941 to 1945

. list year gfr pe pill ww2, sep(0)

+------------------------------------+

| year gfr pe pill ww2 |

 |------------------------------------|

1. | 1913 124.7 0 0 0 |

2. | 1914 126.6 0 0 0 |

3. | 1915 125 0 0 0 |

4. | 1916 123.4 0 0 0 |

5. | 1917 121 19.27 0 0 |

6. | 1918 119.8 23.94 0 0 |

7. | 1919 111.2 20.07 0 0 |

25. | 1937 77.1 42.79 0 0 |

26. | 1938 79.1 32.22 0 0 |

27. | 1939 77.6 36.53 0 0 |

28. | 1940 79.9 53.33 0 0 |

29. | 1941 83.4 102.49 0 1 |

30. | 1942 91.5 137.7 0 1 |

31. | 1943 94.3 141.2 0 1 |

32. | 1944 88.4 243.83 0 1 |

33. | 1945 85.9 238.4 0 1 |

34. | 1946 101.9 193.16 0 0 |

35. | 1947 113.3 168.9 0 0 |

49. | 1961 117.2 160.71 0 0 |

50. | 1962 112.2 161.58 0 0 |

51. | 1963 108.5 161.61 1 0 |

52. | 1964 105 142.73 1 0 |

71. | 1983 65.8 92.49 1 0 |

72. | 1984 65.4 83.9 1 0 |

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**Static time series regression**

. reg gfr pe ww2 pill

Source | SS df MS Number of obs = 72

-------------+------------------------------ F( 3, 68) = 20.38

Model | 13183.6215 3 4394.54049 Prob > F = 0.0000

Residual | 14664.2739 68 215.651087 R-squared = 0.4734

-------------+------------------------------ Adj R-squared = 0.4502

Total | 27847.8954 71 392.223879 Root MSE = 14.685

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gfr | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

pe | .08254 .0296462 2.78 0.007 .0233819 .1416981

ww2 | -24.2384 7.458253 -3.25 0.002 -39.12111 -9.355684

pill | -31.59403 4.081068 -7.74 0.000 -39.73768 -23.45039

\_cons | 98.68176 3.208129 30.76 0.000 92.28003 105.0835

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**Distributed lag model**

. sort year

. g pe1=pe[\_n-1]

(1 missing value generated)

. g pe2=pe[\_n-2]

(2 missing values generated)

. list year gfr pe pe1 pe2

+-----------------------------------------+

| year gfr pe pe1 pe2 |

|-----------------------------------------|

1. | 1913 124.7 0 . . |

2. | 1914 126.6 0 0 . |

3. | 1915 125 0 0 0 |

4. | 1916 123.4 0 0 0 |

5. | 1917 121 19.27 0 0 |

|-----------------------------------------|

6. | 1918 119.8 23.94 19.27 0 |

7. | 1919 111.2 20.07 23.94 19.27 |

8. | 1920 117.9 15.33 20.07 23.94 |

9. | 1921 119.8 34.32 15.33 20.07 |

10. | 1922 111.2 36.65 34.32 15.33 |

. reg gfr pe pe1 pe2 ww2 pill

Source | SS df MS Number of obs = 70

-------------+------------------------------ F( 5, 64) = 12.73

Model | 12959.7886 5 2591.95772 Prob > F = 0.0000

Residual | 13032.6443 64 203.635067 R-squared = 0.4986

-------------+------------------------------ Adj R-squared = 0.4594

Total | 25992.4329 69 376.701926 Root MSE = 14.27

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gfr | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

pe | .0726718 .1255331 0.58 0.565 -.1781094 .323453

pe1 | -.0057796 .1556629 -0.04 0.970 -.316752 .3051929

pe2 | .0338268 .1262574 0.27 0.790 -.2184013 .286055

ww2 | -22.1265 10.73197 -2.06 0.043 -43.56608 -.6869196

pill | -31.30499 3.981559 -7.86 0.000 -39.25907 -23.35091

\_cons | 95.8705 3.281957 29.21 0.000 89.31403 102.427



**Long term effect =**



. lincom pe+pe1+pe2

( 1) pe + pe1 + pe2 = 0

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gfr | Coef. Std. Err. t P>|t| [95% Conf. Interval]

-------------+----------------------------------------------------------------

(1) | .1007191 .0298027 3.38 0.001 .0411814 .1602568

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