Econometria Avançada - 2015-1

Trabalho 3 - Time-varying parameter regression

Due date: April 30th 2015

Time-varying money multiplier. The following time-varying parameter (TVP) model specifies that money supply, y_t, is a linear function of high-powered money, x_t,

$$y_t = \beta_t x_t + v_t$$

where the coefficient β_t is the money multiplier at time t and v_t is added white noise to account for the error measurement effect and it is assumed to be $N(0, V)$.

The table next page and Figure 1 provide the financial year-end data on y_t and x_t for a particular economy over the 31-year period between 1960 and 1990. Both of these variables are measured in that particular economy's currency. For computational reasons, y_t and x_t should be normalized by 99081 (the maximum of x_t and y_t).

OLS estimation. The estimated OLS model is $\hat{y}_t = 1.17x_t$ with $\widehat{V} = 0.0194^2$ and assumes that both α_t and β_t are constant over the 30-year period. An alternative, more elaborated model might envision a break point in β, say at $t = 1976$. In this particular case, the OLS regressions are $\hat{y}_t = 1.57x_t$ ($\widehat{V} = 0.0044^2$) and $\hat{y}_t = 1.16x_t$ ($\widehat{V} = 0.0159^2$), respectively. See Figure 2.

Dynamic regression. Let us now contemplate the extended model with time-varying β_t:

$$\beta_t = \beta_{t-1} + w_{1t} \qquad w_{1t} \sim N(0, W)$$

where, to simplify, we assume that $V = 0.0002$, $W = 0.002$ and $\beta_0 \sim N(1.57, 0.1^2)$.

Your task is to obtain both filtered and smoothed paths for $(\beta_1, \ldots, \beta_n)$. You can use use your favorite software (`R`,Eviews, Stata, etc.) or code up the Kalman recursions presented in class (see the slides!) which are actually quite easy to implement in `R`! Results you are expected to find are in Figures 3 and 4.

	year	x	y
1	1960	2161	2869
2	1961	2275	3057
3	1962	2462	3316
4	1963	2710	3792
5	1964	2882	4127
6	1965	3146	4570
7	1966	3328	4950
8	1967	3557	5401
9	1968	3901	5838
10	1969	4251	6470
11	1970	4823	7373
12	1971	5382	8322
13	1972	6033	9700
14	1973	7273	11200
15	1974	7604	11975
16	1975	7808	13325
17	1976	9798	16024
18	1977	10941	14388
19	1978	14083	17292
20	1979	16573	20000
21	1980	19452	23424
22	1981	20998	24937
23	1982	23110	28535
24	1983	28993	33398
25	1984	35216	39915
26	1985	38165	44095
27	1986	44808	51516
28	1987	53489	58555
29	1988	62958	71107
30	1989	73788	85921
31	1990	82808	99081

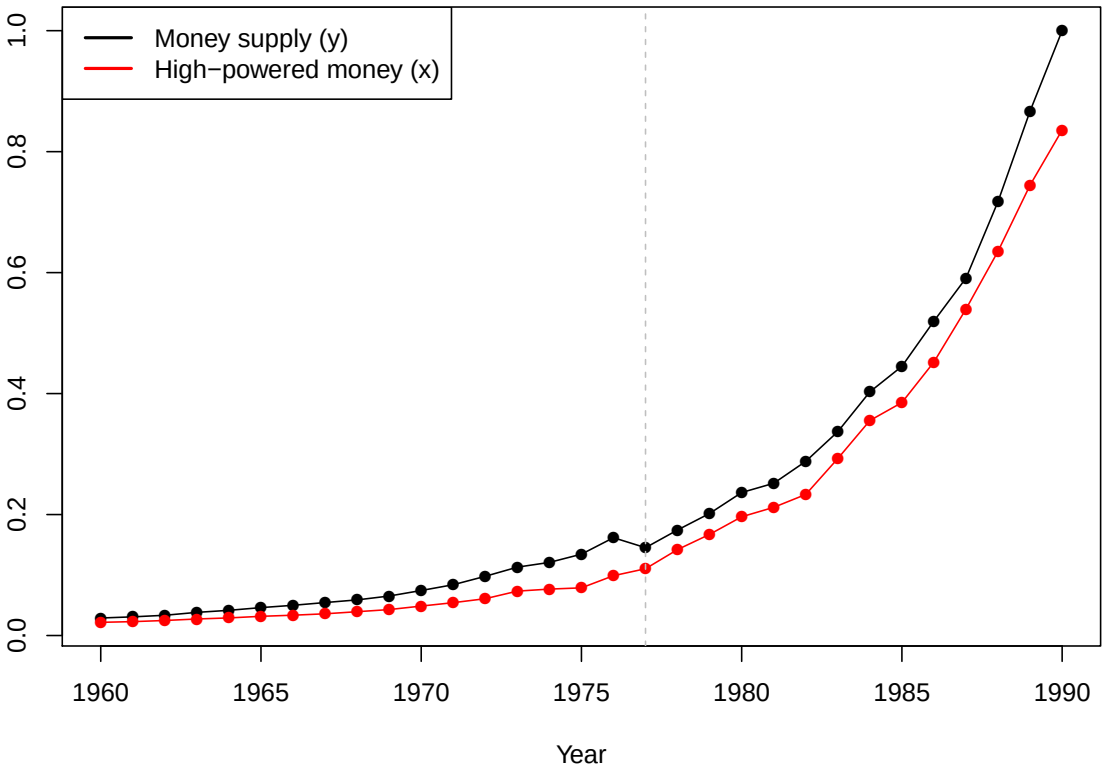

Figure 1: Is money supply, y_t, a linear function of high-powered money, x_t?

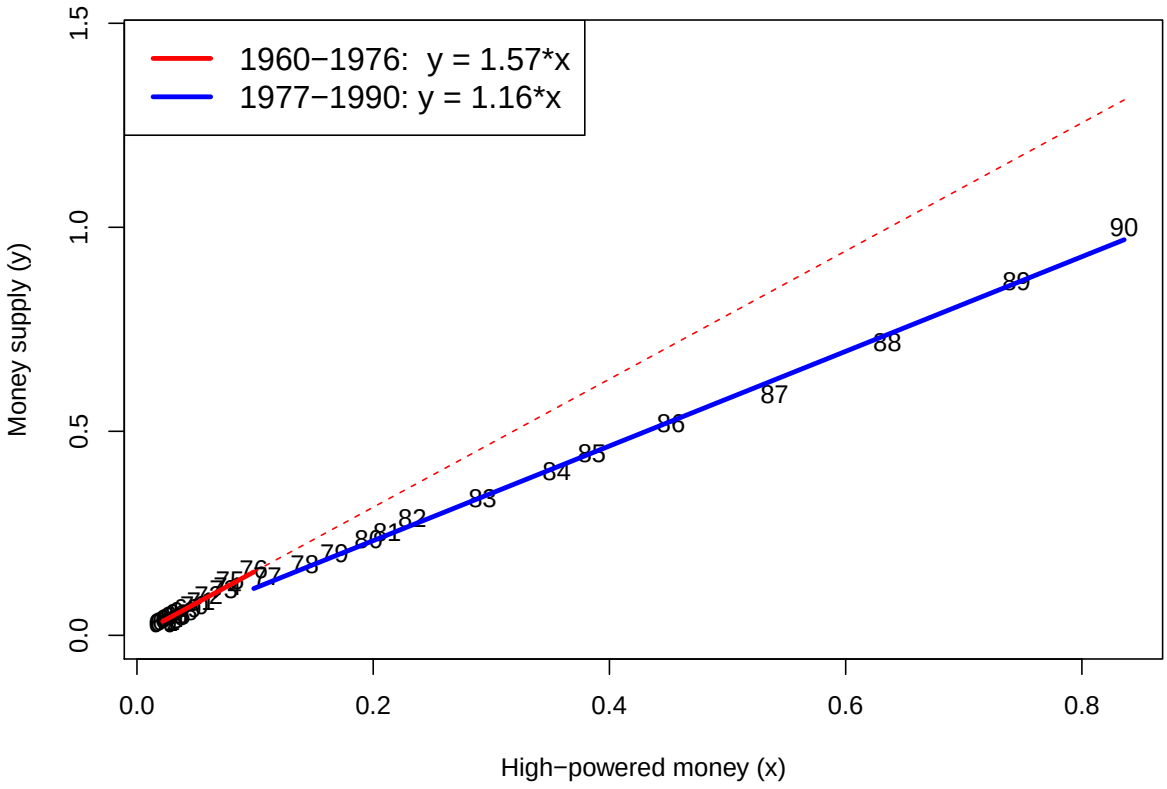

Figure 2: OLS regressions.

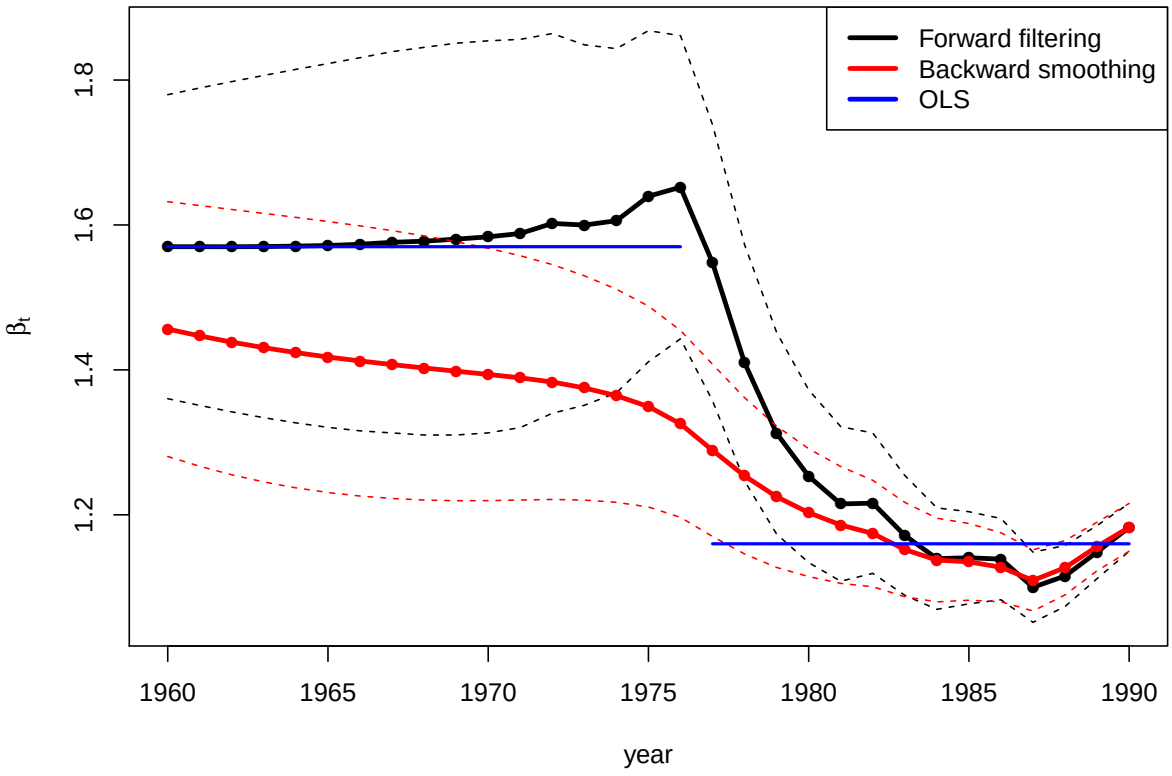

Figure 3: *Kalman recursions:* Forward filtering and backward smoothing

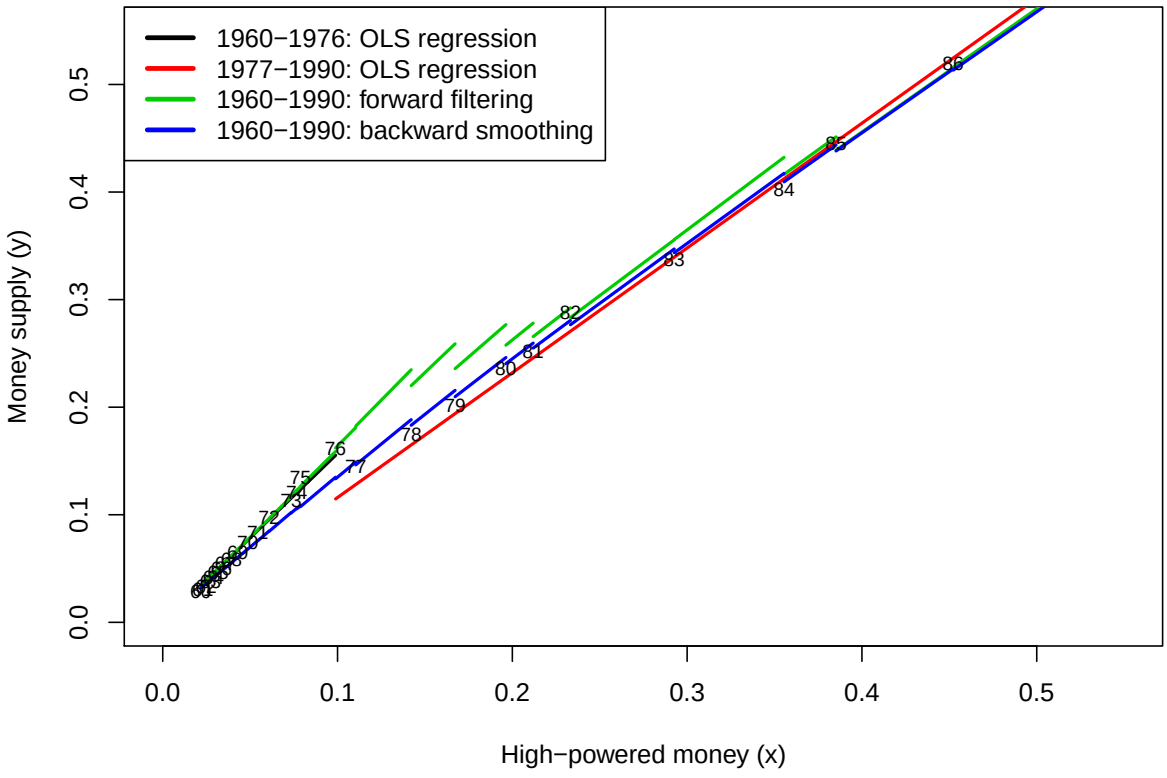

Figure 4: Comparing OLS and dynamic regressions.