5) Proxy vs Indicator

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Proxy vs Indicator

$$y = \beta_0 + \beta_1 x_1 + ... + \beta_k x_k + \gamma q + v$$

Proxy: $q = \theta_0 + \theta_1 z_1 + r_1$

$$Cov(z, r_1) = 0, \; Cov(x, r_1) = 0$$

Indicator: $q_1 = \delta_0 + \delta_1 q + a_1$

$$Cov(q, a_1) = 0, \; Cov(x, a_1) = 0$$

$$q = -\frac{\delta_0}{\delta_1} + \frac{q_1}{\delta_1} - \frac{a_1}{\delta_1}$$

$$Cov(q_1, a_1) \neq 0$$

Solutions Using Indicators of the Unobservables

$$y = \beta_0 + \beta_1 x_1 + ... + \beta_k x_k + \gamma q + v$$

$$q = -\frac{\delta_0}{\delta_1} + \frac{q_1}{\delta_1} - \frac{a_1}{\delta_1}$$

$$q_2 = \rho_0 + \rho_1 q + a_2$$

$$\rho_1 \neq 0,\ Cov(a_1, a_2) = 0$$

$$y = -\frac{\gamma\delta_0}{\delta_1} + x\beta + \frac{\gamma}{\delta_1} q_1 + (v - \frac{\gamma}{\delta_1} a_1)$$

Blackburn and Neumark (1992)

use nls80.dta

summarize

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	935	957.9455	404.3608	115	3078
hours	935	43.92941	7.224256	20	80
iq	935	101.2824	15.05264	50	145
kww	935	35.74439	7.638788	12	56
educ	935	13.46845	2.196654	9	18
exper	935	11.56364	4.374586	1	23
tenure	935	7.234225	5.075206	0	22
age	935	33.08021	3.107803	28	38
married	935	.8930481	.3092174	0	1
black	935	.1283422	.3346495	0	1
south	935	.3411765	.4743582	0	1
urban	935	.7176471	.4503851	0	1

Summary of Previous Approach

reg lwage exper tenure married south urban black educ

estimates store OLS

reg lwage exper tenure married south urban black educ iq

estimates store Proxy

ivregress 2sls lwage exper tenure married south urban black (educ = iq)

estimates store IV_IQ

ivregress 2sls lwage exper tenure married south urban black (educ = iq kww)

estimates store IV_IQ_KWW

estimates table OLS Proxy IV_IQ IV_IQ_KWW, b(%9.4f) se

Variable	OLS	Proxy	IV_IQ	IV_IQ_KWW
exper	0.0140	0.0141	0.0244	0.0237
	0.0032	0.0032	0.0044	0.0040
tenure	0.0117	0.0114	0.0105	0.0106
	0.0025	0.0024	0.0025	0.0025
married	0.1994	0.1998	0.2055	0.2051
	0.0391	0.0388	0.0400	0.0398
south	-0.0909	-0.0802	-0.0820	-0.0827
	0.0262	0.0263	0.0270	0.0268
urban	0.1839	0.1819	0.1712	0.1721
	0.0270	0.0268	0.0278	0.0276
black	-0.1883	-0.1431	-0.1458	-0.1488
	0.0377	0.0395	0.0404	0.0397
educ	0.0654	0.0544	0.1105	0.1073
	0.0063	0.0069	0.0144	0.0122
iq		0.0036		
		0.0010		

KWW as an Instrument for IQ

ivregress 2sls lwage exper tenure married south urban black educ (iq = kww)

lwage	Coef.	Std. Err.	z	P>|z|
iq	.0130473	.0049103	2.66	0.008
exper	.01442	.0033047	4.36	0.000
tenure	.0104562	.0025887	4.04	0.000
married	.2006903	.0404813	4.96	0.000
south	-.0515532	.0309777	-1.66	0.096
urban	.1767058	.0280756	6.29	0.000
black	-.0225612	.0736029	-0.31	0.759
educ	.0250321	.0165266	1.51	0.130
_cons	4.592453	.324209	14.17	0.000

IQ as an Instrument for KWW

ivregress 2sls lwage exper tenure married south urban black educ (kww = iq)

lwage	Coef.	Std. Err.	z	P>|z|
kww	.0308885	.0094815	3.26	0.001
exper	.0028943	.0048853	0.59	0.554
tenure	.0075982	.0029716	2.56	0.011
married	.1382493	.0466842	2.96	0.003
south	-.0951859	.0287601	-3.31	0.001
urban	.1325074	.0334611	3.96	0.000
black	-.0403851	.0613403	-0.66	0.510
educ	.0174901	.0162284	1.08	0.281
_cons	5.170017	.1419471	36.42	0.000