

*Andrea Vaona*

**STATA tip : a quick trick to perform  
a Roy-Zellner test for poolability in  
STATA**

**Quaderno N. 08-04**

Decanato della Facoltà di Scienze economiche  
Via G. Buffi, 13 CH-6900 Lugano

# STATA tip: A quick trick to perform a Roy-Zellner test for poolability in Stata

Andrea Vaona<sup>1</sup>

University of Lugano, CH, and Kiel Institute for the World Economy, DE

[andrea.vaona@lu.unisi.ch](mailto:andrea.vaona@lu.unisi.ch)

Vaona (2008) and Schiavo and Vaona (2008) showed two empirical applications of the Roy-Zellner test for poolability that have attracted considerable interest. This note shows a quick trick to implement this test in Stata, once applying it to the slope coefficients of a linear model.

In a given panel sample  $(y_{it}, x_{it}) \in \mathbf{R}^{1+d}$ , let  $y_{it}$  and  $x_{it}$  respectively be the observations of the dependent and of the  $d$  independent variables for individual  $i$  at time  $t$ . Suppose to have the following model:

$$y_{it} = \alpha + \beta_i x_{it} + \varepsilon_{it} \quad (1)$$

where  $\varepsilon_{it}$  is a stochastic error and  $\alpha$  and  $\beta_i$  are coefficients. The null hypothesis of the Roy-Zellner test applied to the slope coefficients is that

$$\beta_i = \beta \quad (2)$$

under the assumption that  $\varepsilon_{it} = \eta_i + u_{it}$ , where  $\eta_i \sim N(0, \sigma_\eta^2)$  and  $u_{it} \sim N(0, \sigma_u^2)$ . The difference with a Chow test is that the latter one tests (2) under the hypothesis that  $\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$ . Baltagi (2001) recommends to rely on a Roy-Zellner test for poolability unless being sure that the underlying assumption of the Chow test is correct.

We discuss here how to easily implement a Roy-Zellner test in Stata. The procedure is in three steps. First, we interact the regressors with a set of individual dummies to obtain the unpooled data. Second, we run a random effect regression on the unpooled data. Finally, we test for the equality of the individual coefficients.

As in Baltagi (2001) we illustrate this procedure using the Grunflod dataset, which concerns 10 large manufacturing firms (whose indexes are contained in the variable `firm`) from 1935 to 1954 (a time index is contained in the variable `year`). We would like to explain real gross investment (I) as a function of outstanding shares (F) and the real value of the capital stock (C).

First tsset the dataset:

```
. tsset firm year
```

Then generate a set of individual dummy variables

```
. xi, prefix(F) i.firm
```

```
. gen Ffirm_1=1 if firm==1
```

```
. replace Ffirm_1=0 if firm!=1
```

---

<sup>1</sup> The author would like to thank Finn Martensen for an helpful comment. The usual disclaimer applies.

Interact these dummies with the regressors, F and C:

```
. foreach var of varlist C F{  
.  foreach num of numlist 1(1)10{  
.    gen `var'`_num'=`var'*Ffirm_`num'  
.  }  
.}
```

Run a random effect regression for the unpooled data:

```
. quietly xtreg I F_* C_*, re
```

Test for the equality of the coefficients of the unpooled data:

```
. test (F_1 = F_2 = F_3 = F_4 = F_5 = F_6 = F_7 = F_8 = F_9 = F_10) (C_1 = C_2 = C_3 = C_4 =  
C_5 = C_6 = C_7 = C_8 = C_9 = C_10)
```

Stata uses a Wald test distributed as a  $\chi^2$  with 18 degrees of freedom, which returns a value of 739.84, rejecting the null of poolability consistently with the results contained in Baltagi (2001).

## References

Baltagi, Badi (2001), *Econometric Analysis of Panel Data*, Wiley: Chichester, UK.

Schiavo, Stefano and Vaona, Andrea (2008), "Poolability and the Finance – Growth Nexus: a Cautionary Note", *Economics Letters*, 98, 2, pp. 144-147. DOI: <http://dx.doi.org/10.1016/j.econlet.2007.04.015>

Vaona, Andrea (2008), "Regional Evidence on Financial Development, Finance Term Structure and Growth", *Empirical Economics*, 34, 1, pp. 185-201. DOI: <http://dx.doi.org/10.1007/s00181-007-0153-2>.

## QUADERNI DELLA FACOLTÀ

---

*I quaderni sono richiedibili (nell'edizione a stampa) alla Biblioteca universitaria di Lugano  
via G. Buffi 13 CH 6900 Lugano  
e-mail: [biblioteca@lu.unisi.ch](mailto:biblioteca@lu.unisi.ch)*

*The working papers (printed version) may be obtained by contacting the Biblioteca universitaria di  
Lugano  
via G. Buffi 13 CH 6900 Lugano  
e-mail: [biblioteca@lu.unisi.ch](mailto:biblioteca@lu.unisi.ch)*

---

Quaderno n. 98-01

**P. Balestra**, *Efficient (and parsimonious) estimation of structural dynamic error component models*

Quaderno n. 99-01

**M. Filippini**, *Cost and scale efficiency in the nursing home sector : evidence from Switzerland*

Quaderno n. 99-02

**L. Bernardi**, *I sistemi tributari di oggi : da dove vengono e dove vanno*

Quaderno n. 99-03

**L.L. Pasinetti**, *Economic theory and technical progress*

Quaderno n. 99-04

**G. Barone-Adesi, K. Giannopoulos, L. Vosper**, *VaR without correlations for portfolios of derivative securities*

Quaderno n. 99-05

**G. Barone-Adesi, Y. Kim**, *Incomplete information and the closed-end fund discount*

Quaderno n. 99-06

**G. Barone-Adesi, W. Allegretto, E. Dinenis, G. Sorwar**, *Valuation of derivatives based on CKLS interest rate models*

Quaderno n. 99-07

**M. Filippini, R. Maggi, J. Mägerle**, *Skalenerträge und optimale Betriebsgrösse bei den schweizerische Privatbahnen*

Quaderno n. 99-08

**E. Ronchetti, F. Trojani**, *Robust inference with GMM estimators*

Quaderno n. 99-09

**G.P. Torricelli**, *I cambiamenti strutturali dello sviluppo urbano e regionale in Svizzera e nel Ticino sulla base dei dati dei censimenti federali delle aziende 1985, 1991 e 1995*

- Quaderno n. 00-01  
**E. Barone, G. Barone-Adesi, R. Masera**, *Requisiti patrimoniali, adeguatezza del capitale e gestione del rischio*
- Quaderno n. 00-02  
**G. Barone-Adesi**, *Does volatility pay?*
- Quaderno n. 00-03  
**G. Barone-Adesi, Y. Kim**, *Incomplete information and the closed-end fund discount*
- Quaderno n. 00-04  
**R. Ineichen**, *Dadi, astragali e gli inizi del calcolo delle probabilità*
- Quaderno n. 00-05  
**W. Allegretto, G. Barone-Adesi, E. Dinienis, Y. Lin, G. Sorwar**, *A new approach to check the free boundary of single factor interest rate put option*
- Quaderno n. 00-06  
**G.D.Marangoni**, *The Leontief Model and Economic Theory*
- Quaderno n. 00-07  
**B. Antonioli, R. Fazioli, M. Filippini**, *Il servizio di igiene urbana italiano tra concorrenza e monopolio*
- Quaderno n. 00-08  
**L. Crivelli, M. Filippini, D. Lunati**, *Dimensione ottima degli ospedali in uno Stato federale*
- Quaderno n. 00-09  
**L. Buchli, M. Filippini**, *Estimating the benefits of low flow alleviation in rivers: the case of the Ticino River*
- Quaderno n. 00-10  
**L. Bernardi**, *Fiscalità pubblica centralizzata e federale: aspetti generali e il caso italiano attuale*
- Quaderno n. 00-11  
**M. Alderighi, R. Maggi**, *Adoption and use of new information technology*
- Quaderno n. 00-12  
**F. Rossera**, *The use of log-linear models in transport economics: the problem of commuters' choice of mode*
- Quaderno n. 01-01  
**M. Filippini, P. Prioni**, *The influence of ownership on the cost of bus service provision in Switzerland. An empirical illustration*
- Quaderno n. 01-02  
**B. Antonioli, M. Filippini**, *Optimal size in the waste collection sector*
- Quaderno n. 01-03  
**B. Schmitt**, *La double charge du service de la dette extérieure*

- Quaderno n. 01-04  
**L. Crivelli, M. Filippini, D. Lunati**, *Regulation, ownership and efficiency in the Swiss nursing home industry*
- Quaderno n. 01-05  
**S. Banfi, L. Buchli, M. Filippini**, *Il valore ricreativo del fiume Ticino per i pescatori*
- Quaderno n. 01-06  
**L. Crivelli, M. Filippini, D. Lunati**, *Effizienz der Pflegeheime in der Schweiz*
- Quaderno n. 02-01  
**B. Antonioli, M. Filippini**, *The use of a variable cost function in the regulation of the Italian water industry*
- Quaderno n. 02-02  
**B. Antonioli, S. Banfi, M. Filippini**, *La deregolamentazione del mercato elettrico svizzero e implicazioni a breve termine per l'industria idroelettrica*
- Quaderno n. 02-03  
**M. Filippini, J. Wild, M. Kuenzle**, *Using stochastic frontier analysis for the access price regulation of electricity networks*
- Quaderno n. 02-04  
**G. Cassese**, *On the structure of finitely additive martingales*
- Quaderno n. 03-01  
**M. Filippini, M. Kuenzle**, *Analisi dell'efficienza di costo delle compagnie di bus italiane e svizzere*
- Quaderno n. 03-02  
**C. Cambini, M. Filippini**, *Competitive tendering and optimal size in the regional bus transportation industry*
- Quaderno n. 03-03  
**L. Crivelli, M. Filippini**, *Federalismo e sistema sanitario svizzero*
- Quaderno n. 03-04  
**L. Crivelli, M. Filippini, I. Mosca**, *Federalismo e spesa sanitaria regionale : analisi empirica per i Cantoni svizzeri*
- Quaderno n. 03-05  
**M. Farsi, M. Filippini**, *Regulation and measuring cost efficiency with panel data models : application to electricity distribution utilities*
- Quaderno n. 03-06  
**M. Farsi, M. Filippini**, *An empirical analysis of cost efficiency in non-profit and public nursing homes*
- Quaderno n. 03-07  
**F. Rossera**, *La distribuzione dei redditi e la loro imposizione fiscale : analisi dei dati fiscali svizzeri*

Quaderno n. 03-08

**L. Crivelli, G. Domenighetti, M. Filippini**, *Federalism versus social citizenship : investigating the preference for equity in health care*

Quaderno n. 03-09

**M. Farsi**, *Changes in hospital quality after conversion in ownership status*

Quaderno n. 03-10

**G. Cozzi, O. Tarola**, *Mergers, innovations, and inequality*

Quaderno n. 03-11

**M. Farsi, M. Filippini, M. Kuenzle**, *Unobserved heterogeneity in stochastic cost frontier models : a comparative analysis*

Quaderno n. 04-01

**G. Cassese**, *An extension of conditional expectation to finitely additive measures*

Quaderno n. 04-02

**S. Demichelis, O. Tarola**, *The plant size problem and monopoly pricing*

Quaderno n. 04-03

**F. Rossera**, *Struttura dei salari 2000 : valutazioni in base all'inchiesta dell'Ufficio federale di statistica in Ticino*

Quaderno n. 04-04

**M. Filippini, M. Zola**, *Economies of scale and cost efficiency in the postal services : empirical evidence from Switzerland*

Quaderno n. 04-05

**F. Degeorge, F. Derrien, K.L. Womack**, *Quid pro quo in IPOs : why book-building is dominating auctions*

Quaderno n. 04-06

**M. Farsi, M. Filippini, W. Greene**, *Efficiency measurement in network industries : application to the Swiss railway companies*

Quaderno n. 04-07

**L. Crivelli, M. Filippini, I. Mosca**, *Federalism and regional health care expenditures : an empirical analysis for the Swiss cantons*

Quaderno n. 04-08

**S. Alberton, O. Gonzalez**, *Monitoring a trans-border labour market in view of liberalization : the case of Ticino*

Quaderno n. 04-09

**M. Filippini, G. Masiero, K. Moschetti**, *Regional differences in outpatient antibiotic consumption in Switzerland*

Quaderno n. 04-10

**A.S. Bergantino, S. Bolis**, *An adaptive conjoint analysis of freight service alternatives : evaluating the maritime option*

- Quaderno n. 05-01  
**M. Farsi, M. Filippini**, *An analysis of efficiency and productivity in Swiss hospitals*
- Quaderno n. 05-02  
**M. Filippini, G. Masiero, K. Moschetti**, *Socioeconomic determinants of regional differences in outpatient antibiotic consumption : evidence from Switzerland*
- Quaderno n. 06-01  
**M. Farsi, L. Gitto**, *A statistical analysis of pain relief surgical operations*
- Quaderno n. 06-02  
**M. Farsi, G. Ridder**, *Estimating the out-of-hospital mortality rate using patient discharge data*
- Quaderno n. 06-03  
**S. Banfi, M. Farsi, M. Filippini**, *An empirical analysis of child care demand in Switzerland*
- Quaderno n. 06-04  
**L. Crivelli, M. Filippini**, *Regional public health care spending in Switzerland : an empirical analysis*
- Quaderno n. 06-05  
**M. Filippini, B. Lepori**, *Cost structure, economies of capacity utilization and scope in Swiss higher education institutions*
- Quaderno n. 06-06  
**M. Farsi, M. Filippini**, *Effects of ownership, subsidization and teaching activities on hospital costs in Switzerland*
- Quaderno n. 06-07  
**M. Filippini, G. Masiero, K. Moschetti**, *Small area variations and welfare loss in the use of antibiotics in the community*
- Quaderno n. 06-08  
**A. Tchipev**, *Intermediate products, specialization and the dynamics of wage inequality in the US*
- Quaderno n. 06-09  
**A. Tchipev**, *Technological change and outsourcing : competing or complementary explanations for the rising demand for skills during the 1980s?*
- Quaderno n. 07-01  
**M. Filippini, G. Masiero, K. Moschetti**, *Characteristics of demand for antibiotics in primary care : an almost ideal demand system approach*
- Quaderno n. 07-02  
**G. Masiero, M. Filippini, M. Ferech, H. Goossens**, *Determinants of outpatient antibiotic consumption in Europe : bacterial resistance and drug prescribers*
- Quaderno n. 07-03  
**R. Levaggi, F. Menoncin**, *Fiscal federalism, patient mobility and the soft budget constraint : a theoretical approach*



Quaderno n. 07-04

**M. Farsi**, *The temporal variation of cost-efficiency in Switzerland's hospitals : an application of mixed models*

Quaderno n. 08-01

**M. Farsi, M. Filippini, D. Lunati**, *Economies of scale and efficiency measurement in Switzerland's nursing homes*

Quaderno n. 08-02

**A. Vaona**, *Inflation persistence, structural breaks and omitted variables : a critical view*

Quaderno n. 08-03

**A. Vaona**, *The sensitivity of non parametric misspecification tests to disturbance autocorrelation*

Quaderno n. 08-04

**A. Vaona**, *STATA tip : a quick trick to perform a Roy-Zellner test for poolability in STATA*