

A light discussion on: "Decomposing Duration Dependence in a Stopping Time Model"

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An extremely stylized model of labor market transitions

- Using an optimal stopping time model
- Where workers move from joblessness to employment
- When a Brownian motion with drift (a Wiener process) hits a barrier (a reservation wage or productivity)
- Leading to an Inverse Gaussian hazard function
- Which lends itself to a (heuristic) structural interpretation of the parameters of the IG distribution function of joblessness duration
- In a context that allows for worker heterogeneity
- Through the use of a finite mixture distribution model

A fascinating mapping

- From a Brownian motion with drift

$$d\omega(t) = \mu_{s(t)}dt + \sigma_{s(t)}dB(t)$$

it can be shown that the probability density function of the duration of the spells of joblessness given by the time when the worker reaches a threshold $\bar{\omega}$ (a reservation wage) follows an Inverse Gaussian (or Wald) distribution function:

$$f(t; \alpha, \beta) = \frac{\beta}{(2\pi t^3)^{1/2}} e^{\frac{(\alpha t - \beta)^2}{2t}}$$

where $\alpha = \mu_n/\sigma_n$ is a diffusion constant and $\beta = (\bar{\omega} - \underline{\omega})/\sigma_n$ is the fixed distance to be covered.

A fascinating mapping

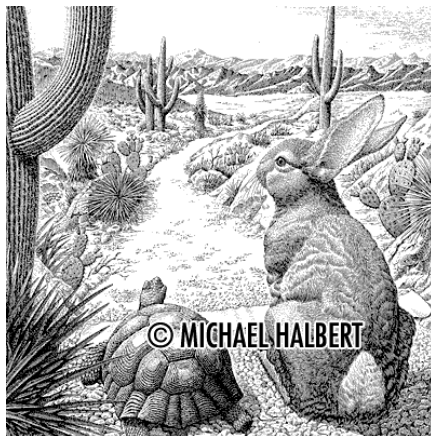
- In essence, the parameters from the structural models of Alvarez and Shimer (2011) and Shimer (2008) can be recovered simply from the parameters of the distribution of joblessness duration.
- In another "tour de force", the authors obtain upper bounds for the size of fixed costs associated with transitions to and from non-employment.
- The connection between the parameters of Inverse Gaussian and the parameters from a structural model of job-matching was first staged in a less known paper by Boyan Jovanovic (1984) titled "Wages and Turnover: A Parameterization of the Job-Matching Model".

Duration dependence is key

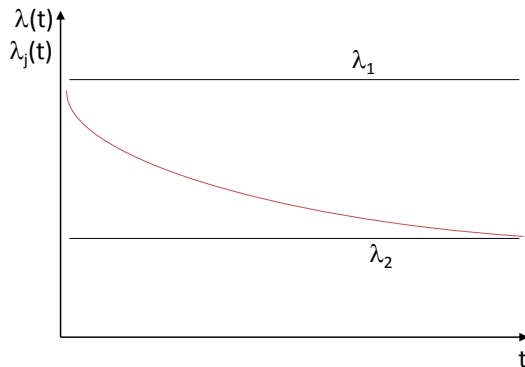
A key contribution of the paper is to disentangle "true" (structural) duration dependence from individual heterogeneity (or dynamic selection).

- It is well known that, with unobserved individual heterogeneity, duration dependence is negatively biased because as time progresses the sample is increasingly made up of slower movers (less employable).
- In the words of Salant (1977), "In the cooling process by evaporation, hot molecules (and thus faster) exit the liquid, while the cold ones (and thus slower) stay."
- A number of studies have emphasized the role of duration dependence driving long-term unemployment in the US
- Which relate closely with reemergence of models of hysteresis (Blanchard and Summers, 1986 and Blanchard and Diamond, 1994)
- The authors use an amazingly saturated mixture distribution model
- Taking advantage of repeated of joblessness spells to extract true duration dependence

Duration dependence and unobserved heterogeneity



Duration dependence and unobserved heterogeneity



A model for the length of the crab forehead

Mass Point Approach

$$L = \prod_{i=1}^N [pf_1(t_i)] + [(1-p)f_2(t_i)], \quad 0 \leq p \leq 1$$

$$L = \prod_{i=1}^N [p_1 f_1(t_i)] + [p_2 f_2(t_i)] + \dots + [p_J f_J(t_i)]$$

where $0 \leq p_j \leq 1, j = 1, \dots, J$, and $p_1 + p_2 + \dots + p_J = 1$

Pearson solved this problem for a mixture of two normal distributions in 1894 to help his biologist friend Weldon.

Fifty shades o grey

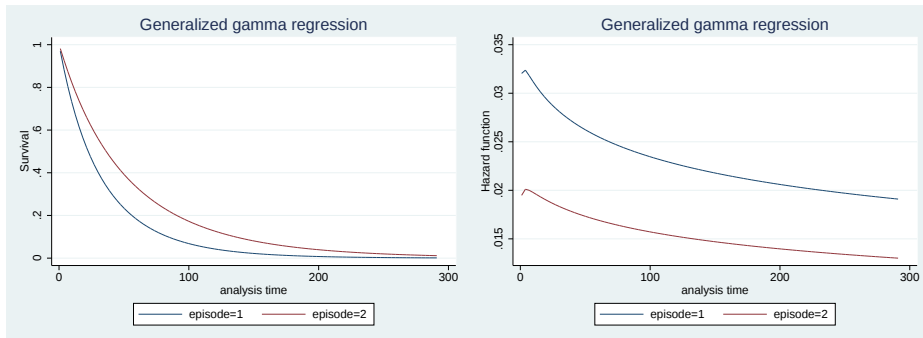
- The authors mix 50 IG distributions to the data.
- Meaning that they are assuming 50 distinct sub-populations or groups of individuals in the data.
- This is very unusual and raises the possibility that the model is over parametrized. After all, one is fitting 50 α , 50 β and 49 p simply from an empirical bivariate distribution joblessness durations.
- What is the goodness of fit criterium (Akaike type) being used?
- How sensitive are the results, in particular with respect to the duration dependence decomposition, to the choice of the number of groups?
- How much traction one can get from the fact that repeated spells, with different lengths, are being used?
- Repeated spells would appear to call for the presence of common frailties (individual specific error terms) leading to non-independent observations within individuals.
- Are indeed individuals sampling from the same distribution in the two non-employment episodes?

Inverse Gaussian Distribution

Table : Joblessness duration distribution

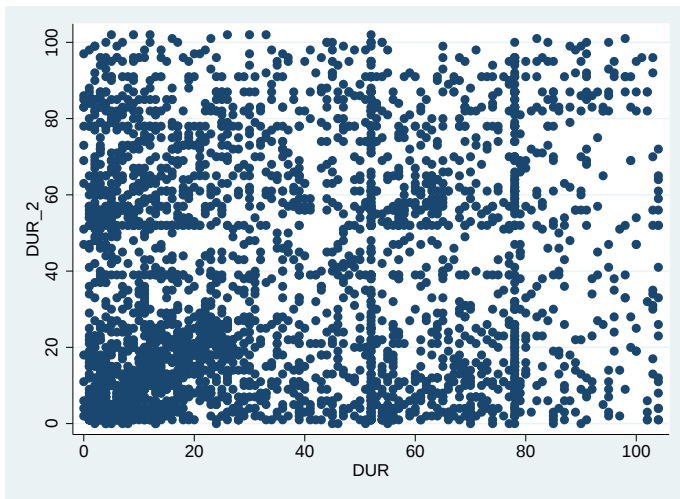
	Portugal	Austria
α	0.09	0.36
β	4.70	7.48

Duration Distribution



Source: Social Security

A glimpse at Portuguese Social Security Data



Some trepidation

- Predicting unemployment duration is notoriously very hard.
- Even if we know the previous labor market history of the individuals.
- The Portuguese data seems to suggest that the distributions differ across spells. This does not preclude identification but would call for a different model strategy.
- Individuals with at least two spells are a minority in our short (10 years) data set. There is always a concern about self-selected samples.

Econometric issues

- The asymptotic properties of these types of estimators are not well known.
- Even consistency, in general, can not be established. This has to do mostly with the fact that the number of sub-populations is not known a priori.
- The identification propositions in the paper were derived in continuous time but the estimation procedure used discrete durations. One could use duration intervals and their corresponding survivor functions to comply with (time) aggregate data.
- Alternatively, discrete distributions could be used but that would defeat the purpose of mapping the structural to the statistical parameters.
- Statistical inference is very hard to accomplish in this type of framework, mostly because it is hard to separate sample variability from individual heterogeneity, but an idea of the precision of the estimates of the structural parameters would be welcome.

Possible extensions

- It would seem more natural to combine employment spell with non-employment spells. Or even the all sequence of employment and unemployment spells. Indeed, by focusing solely on non-employment one faces the risk of non-representativeness.
- Other statistical models could be considered and being confronted with the stopping time model:
 - Bivariate discrete distribution models
 - Mixed proportional hazard models
 - Shared frailty models
 - Copulas
- Information on worker transitions can be used to estimate the parameter of more involved structural models as in Ejarque and Portugal (2008) who find that labor adjustment fixed costs are small (1.25 percent of the annual wage) but have a significant on the intensity of worker flows.

Conclusions

- A fascinating paper
 - Using an extremely stylized model
 - To provide an elegant solution to the estimation of structural parameters of the labor market transition model.
 - A thorough and convincing derivation of the identification propositions.
 - And very useful duration dependence decomposition exercise.

Still a bit puzzled with the number of groups being mixed.

- Not that I not convinced with the importance of heterogeneity.
- Indeed, I am in favor that each individual should be entitled to a specific intercept and slope, by law.

- The Bank of Portugal is launching a new research unit to promote the analysis of micro data.
 - The researchers of the unit are specialized in the production of micro econometric estimators and techniques.
 - The datasets used and produced at the Bank of Portugal are going to be available to the international academic community.
 - Through a network of powerful virtual computers (sand boxes) that can be accessed anywhere in the world.
 - Provided that a research project was submitted and approved by the head of the research unit.
 - Issues of statistical secret are dealt on a case by case basis.
 - Portuguese micro data is very, very rich.