

Inferring features of underlying death process from cohort-based (firm) survival fractions

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Abstract

Understanding firm death processes is crucial for insights into economic dynamics and policy formulation. In this work, we analyze survival fraction curves derived from firm registration and current status data for cohorts spanning the 14 largest sectors in Singapore over three decades. Unlike traditional approaches requiring detailed exit dates, our method infers features of the underlying death process solely from survival fractions as a function of cohort age.

We employ a maximum likelihood estimation framework to fit parametric death rate models to the survival data. Our results show that firm death rates exhibit strong age dependency, with the Hill model providing the best fit across sectors. Cluster analysis based on estimated death model parameters revealed patterns of heterogeneity among sectors, indicating structural similarities beyond standard sector classifications.

Further extending the model, we incorporate a time-dependent perturbation function that accounts for transient external shocks, capturing systematic deviations in survival fractions such as dips associated with economic events. This enhances model fit and offers interpretability regarding the resilience and recovery dynamics of firms across sectors.

This framework demonstrates that vital information on firm exit dynamics can be recovered from limited survival data, even without explicit exit timing. The methodology is broadly applicable to study death or exit processes in other domains where only cohort survival information is available.

References

Guo, Y., Nguyen, H. H., Ling, F. *Inferring features of underlying death process from cohort-based (firm) survival fractions*, ICCS 2025.