

Stochastic Model of Inter-purchase Time with Mental Accounting Effect

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Unlike the principle of traditional economics that substitution possibility holds for goods with monetary equivalency, mental accounting elaborates goods would have different criteria values for consumers depending on purposes of use and circumstances at purchase. Aided by modeling of inter-purchase duration that accommodates mental condition changes captured by two latent variables, i.e. metal loading defined as cumulative spends counting from individual payday, and household goods stock value recursively estimated from holdout samples of purchase history (Fig1.).

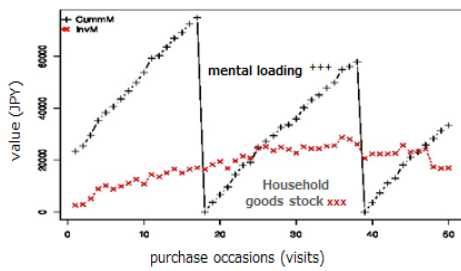


Fig1. Example of a household's mental factors

Our research intends to reveal how consumer mental factors impact purchase behavior. Viewing from behavioral economics, the research attempts to comprehend such behaviors that are seemingly irrational from traditional economics viewpoints but why it actually happens.

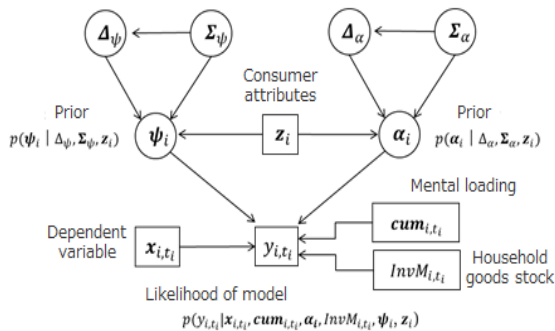


Fig2. Directed Acyclic Graph of model

The model is derived from threshold-based modeling framework that incorporates consumer heterogeneity in a hierarchical Bayesian manner, and modeling parameters are estimated using Markov Chain Monte Carlo (MCMC) method. Fig2. depicts Directed Acyclic Graph of the model, where two mental factors and threshold values determine inter-purchase regimes consumer resides. Empirical studies have been exploited with ID-POS data of a retailer store, and results indicate that our model outperforms by having consumer mental factors into consideration at times of purchase. Inter-purchase hazard of average consumer presents steep peak in Regime 1, where both of mental factors exceed their thresholds and consumer perceives pressure from cumulative spend and household goods stock.

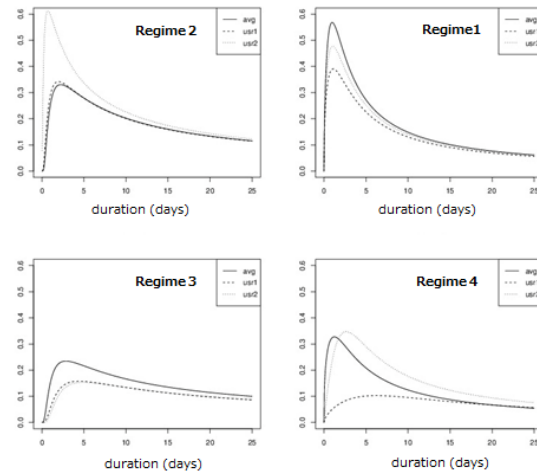


Fig3. Hazard of inter-purchase duration

Results from the proposed model indicate consumer mental factor affects inter-purchase duration, and instantaneous probability of store visit, unimodal not monotonously increasing or decreasing, is accelerates at particular regime where mental condition changes, and such changes are heterogeneous for each consumer.