230M HW2

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1 Question a

Given the matlab code ($prop_haz.m$) we can know that estimating hazard function follows the following formula:

$$\begin{aligned}\lambda(t) &= Pr(\tau = t|\tau > t-1, v)\\ &= \frac{\gamma p(\gamma t)^{p-1}}{1+(\gamma t)^p}e^{\beta v}\end{aligned}$$

where the covariates v are

- Indicator for summer months.
- Difference between "contract mortgage rate" and "the 3 month lag of the 10 year LIBOR rate".

From the formula, we know γ is the magnitude of the baseline hazard, and p is the shape parameter for the baseline hazard. The last two parameters are coefficients for covariates, which are $\beta 1$ and $\beta 2$.

$\beta 1$ measures how borrowers react to coupon gaps and $\beta 2$ measures the sensitivity to the summer months.

2 Question d

The economics ideas are quite similar after considering the time-varying feature of the hazard model. From the formula, we know γ is the magnitude of the baseline hazard, and p is the shape parameter for the baseline hazard. The last two parameters are coefficients for covariates, which are $\beta 1$ and $\beta 2$.

$\beta 1$ measures how borrowers react to coupon gaps and $\beta 2$ measures the sensitivity to the summer months.

Now, we use time-varying data to estimate the time-varying hazard model using log-logistic baseline hazard method. Compared to the result in question a, the magnitude of hazard function is 0.0048 which is slightly smaller than the non-varying model. The shape parameter (p) is 1.31 which is much smaller than the shape coefficient in question a.

The β parameters behave quite different from question a, within time-varying model, the reaction to coupon gaps ($\beta 1$) is strongly positive while in non-time varying model, there is a negative relation. For $\beta 2$, summer indicator used to have a negative impact on hazard rate, however, the effect diminish to zero when we use time-varying model.