

Dynamic Programming Exercise Class 7

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Case study: Same as last few weeks

We are still replacing engines

New approach for solving discrete choice models

- With NFXP we solved the model by iterating on the (integrated) value function.
- With NPL we instead iterate on choice probabilities.
- Turns out you can show that you can find the integrated value function from choice probabilities:

$$V_{\sigma}(x) = (I - \beta F_u)^{-1} \sum_a P(a|x) (u(x, a) + \gamma - \ln P(a|x))$$

- $V_{\sigma}(x)$ maps into choice probabilities:

$$P(a = R|x) = \frac{\exp\{u^R + \beta P^R V_{\sigma}(x)\}}{\exp\{u^R + \beta P^R V_{\sigma}(x)\} + \exp\{u^K + \beta P^K V_{\sigma}(x)\}}$$

- We can iterate on choice-probabilities by applying these two formulas.

Swapping the loops in the NFXP-algorithm

In NFXP we have two "loops":

- Inner loop that solves for V_σ for a given set of parameters θ .
- Outer loop maximizes likelihood to get optimal θ . Likelihood:

$$\log L = \sum_i \log P(a_i^{data} | x_i^{data}) \quad (1)$$

With NPL:

- Inner loop maximizes likelihood for current guess on $P(a|x)$.
- Outer loop solves fixed-point problem by iterating on choice-probabilities given current optimal θ .

- Not that many exercises today
- Try to understand some math behind mapping between Bellman equation, iterated value function and conditional choice-probabilities.
- Try to finish everything in part 2 before next time.
- You can Look at the MPEC exercise if you want.