

Lecture on July 31st, 2019  
Long-time Behavior of Birth and Death Process

**1 Linear Growth with Immigration Model (See Chap 6.3)**

- Using Forward Kolmogorov equations to find mean population.
- Explain the result for long time behavior when  $\lambda \geq \mu$  and  $\lambda < \mu$ .

**2 Limiting Behavior of Birth and Death Process (See Chap 6.4)**

- Theorem on existence of limiting distribution for birth and death process.
- Using Forward Kolmogorov equations to find limiting distributions.
- Example: Logistic Model.

**3 Birth and Death Process with absorption (See Chap 6.5)**

- Derive first transition probability.
- Using first step analysis to establish the iterative formulas to find probability and mean time of absorption at state 0 given starting from state  $i$ . Furthermore, the solutions to these two problems.