Note on Change Detection

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?? solve the change detection problem with i.i.d in Bayesian setup. But he didn't show the asymptotic property of his proposal. Notation in the paper follows **?**.

1 Problem formulation

The observed sequence of random variables $X_1, X_2, ...$ are i.i.d., untile a change occurs, the observations are again i.i.d., but with another distribution. General guideline for math notations:

- use lower case Greek letter for parameters, β, α
- use capital letters for random variables, X,Y, sometime for matrix
- use lower case letter for realization of random variables, x,y, or individual observation.
- use $\mathbb{R}$ denote space and $\mathcal{F}$ to denote σ-algebra on the space.

2 Measure

A measure is a set function, a mapping which associates a real number with a set. **?**

3 Expectation

Corollary 3.1. *Let $g : \mathbb{R} \mapsto \mathbb{R}$ be a function with that property that $x \geq a$ implies $g(x) \geq g(a) > 0$, for a given constant a. Then*

$$P(X \geq a) \leq \frac{E(g(X))}{g(a)}.$$

Proof.

$$\begin{aligned} g(a)P(X \geq a) &= g(a) \int_{x \geq a} dF(x) \\ &\leq \int_{x \geq a} g(x) dF(x) \\ &\leq E(g(X). \end{aligned}$$

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Appendix

Notations	Description
λ	structural breaking time
τ	stopping time
Ω	sample space
$\omega \in \Omega$	a point in the sample space
$\mathbb{R}$	real number space
$\mathbb{Q}$	rational number space
$(\Omega, \mathcal{F}, \mu)$	measurable space

Table 1: Table of Notations