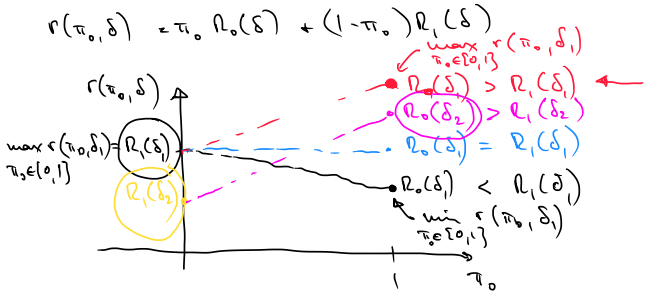
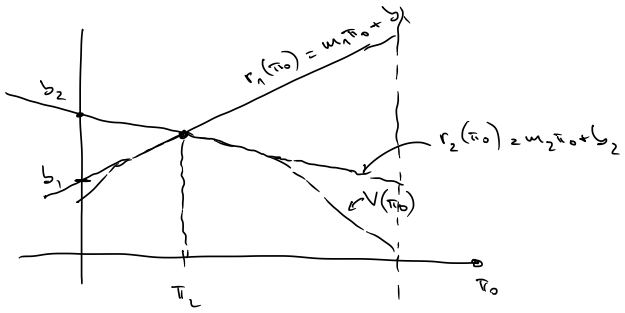
Bayes risk is an affine function of $\pi_0$ (i.e. linear)

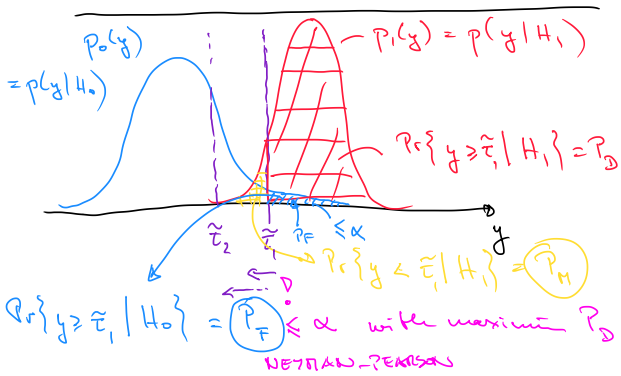
$r(\pi_0, \delta) = \pi_0 R_0(\delta) + (1-\pi_0) R_1(\delta)$




$q\, r_1(\pi_0) + (1-q)\, r_2(\pi_0)$ should be independent of $\pi_0 \Leftrightarrow \dfrac{\partial}{\partial \pi_0} \left[ q\, r_1(\pi_0) + (1-q)\, r_2(\pi_0) \right] = 0$

$\Rightarrow q m_1 + (1-q) m_2 = 0 \Leftrightarrow \boxed{q = \dfrac{m_2}{m_2 - m_1}}$

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