

$$\mathbb{E} \left[G_L(\omega) \right] = \mathbb{E} \left[G_0(\omega) \right] + \sum_{\ell=1}^L \mathbb{E} \left[G_\ell(\omega) + G_{\ell-1}(\omega) \right] := \sum_{\ell=1}^L \mathbb{E} \left[\Delta G_\ell(\omega) \right].$$