

$$\begin{aligned}
\mathbb{E}\left[\frac{\mathbb{E}[|XY|\mid\mathcal{G}]}{UV}1_G\right] &= \mathbb{E}\left[\mathbb{E}\left[\frac{|XY|}{UV}1_G\mid\mathcal{G}\right]\right] \\
&= \mathbb{E}\left[\frac{|X|}{U}1_G \cdot \frac{|Y|}{V}1_G\right] \\
&\leq \left(\mathbb{E}\left[\frac{|X|^p}{U^p}1_G\right]\right)^{1/p} \left(\mathbb{E}\left[\frac{|Y|^q}{V^q}1_G\right]\right)^{1/q} \\
&= \left(\mathbb{E}\left[\underbrace{\frac{\mathbb{E}[|X|^p\mid\mathcal{G}]}{U^p}}_{=1 \text{ a.s. on } G}1_G\right]\right)^{1/p} \left(\mathbb{E}\left[\underbrace{\frac{\mathbb{E}[|Y|^q\mid\mathcal{G}]}{V^q}}_{=1 \text{ a.s. on } G}1_G\right]\right)^{1/q} \\
&= \mathbb{E}[1_G].
\end{aligned}$$