Propagate to δM

$$M_{D^*}^2 = m_{D^0}^2 + m_{\pi_s}^2 + \underbrace{2 p_{D^0} \cdot p_{\pi_s}}_{\text{all variance here}}$$

$$|\vec{p}_\pi| = \frac{p_+}{\sin\theta}$$

$$\vec{p}_{D^0} \cdot \vec{p}_\pi = p_{TD} \cdot p_{T\pi} \left(\cos\Delta\varphi + \cot\theta_{D^0} \cot\theta_\pi \right)$$

$$= |\vec{p}_{D^0}||\vec{p}_\pi| \cos\alpha$$

$$\frac{\partial M_{D^*}}{\partial p_{T\pi}} = \frac{E_{D^0}}{M_{D^*}} \left(\beta_\pi - \beta_{D^0} \cos\alpha \right) \frac{1}{\sin\theta_\pi}$$

$$\frac{\partial M_{D^*}}{\partial \theta_\pi} = \frac{E_{D^0} |\vec{p}_\pi|}{M_{D^*}} \left(\beta_{D^0} \cos\theta_{D^0} - \beta_\pi \cos\theta_\pi \right) \times \frac{1}{\sin\theta_\pi}$$