

- (Unit)  $\frac{\Phi \vdash \Gamma \mathbf{Ok}}{\llbracket \Phi | \Gamma \vdash () : \mathbf{Unit} \rrbracket_M = \langle \rangle_{\Gamma} : \Gamma \rightarrow \mathbf{1}}$
- (Const)  $\frac{\Phi \vdash \Gamma \mathbf{Ok}}{\llbracket \Phi | \Gamma \vdash \mathbf{C}^A : A \rrbracket_M = \llbracket \mathbf{C}^A \rrbracket_M \circ \langle \rangle_{\Gamma} : \Gamma \rightarrow \llbracket A \rrbracket_M}$
- (True)  $\frac{\Phi \vdash \Gamma \mathbf{Ok}}{\llbracket \Phi | \Gamma \vdash \mathbf{true} : \mathbf{Bool} \rrbracket_M = \mathbf{inl} \circ \langle \rangle_{\Gamma} : \Gamma \rightarrow \llbracket \mathbf{Bool} \rrbracket_M = \mathbf{1} + \mathbf{1}}$
- (False)  $\frac{\Phi \vdash \Gamma \mathbf{Ok}}{\llbracket \Phi | \Gamma \vdash \mathbf{false} : \mathbf{Bool} \rrbracket_M = \mathbf{inr} \circ \langle \rangle_{\Gamma} : \Gamma \rightarrow \llbracket \mathbf{Bool} \rrbracket_M = \mathbf{1} + \mathbf{1}}$
- (Var)  $\frac{\Phi \vdash \Gamma \mathbf{Ok}}{\llbracket \Phi | \Gamma, x : A \vdash x : A \rrbracket_M = \pi_2 : \Gamma \times A \rightarrow A}$
- (Weaken)  $\frac{f = \llbracket \Phi | \Gamma \vdash x : A \rrbracket_M : \Gamma \rightarrow A}{\llbracket \Phi | \Gamma, y : B \vdash x : A \rrbracket_M = f \circ \pi_1 : \Gamma \times B \rightarrow A}$
- (Lambda)  $\frac{f = \llbracket \Phi | \Gamma, x : A \vdash C : \mathbf{M}_{\epsilon} B \rrbracket_M : \Gamma \times A \rightarrow T_{\epsilon} B}{\llbracket \Phi | \Gamma \vdash \lambda x : A. C : A \rightarrow \mathbf{M}_{\epsilon} B \rrbracket_M = \mathbf{cur}(f) : \Gamma \rightarrow (T_{\epsilon} B)^A}$
- (Subtype)  $\frac{f = \llbracket \Phi | \Gamma \vdash v : A \rrbracket_M : \Gamma \rightarrow A \quad g = \llbracket A \leq B \rrbracket_M}{\llbracket \Phi | \Gamma \vdash v : B \rrbracket_M = g \circ f : \Gamma \rightarrow B}$
- (Return)  $\frac{f = \llbracket \Phi | \Gamma \vdash v : A \rrbracket_M}{\llbracket \Phi | \Gamma \vdash \mathbf{return} v : \mathbf{M}_1 A \rrbracket_M = \eta_A \circ f}$
- (If)  $\frac{f = \llbracket \Phi | \Gamma \vdash v : \mathbf{Bool} \rrbracket_M : \Gamma \rightarrow \mathbf{1} + \mathbf{1} \quad g = \llbracket \Phi | \Gamma \vdash C_1 : \mathbf{M}_{\epsilon} A \rrbracket_M \quad h = \llbracket \Phi | \Gamma \vdash C_2 : \mathbf{M}_{\epsilon} A \rrbracket_M}{\llbracket \Phi | \Gamma \vdash \mathbf{if}_{\epsilon, A} v \mathbf{then} C_1 \mathbf{else} C_2 : \mathbf{M}_{\epsilon} A \rrbracket_M = \mathbf{app} \circ ((\mathbf{cur}(g \circ \pi_2), \mathbf{cur}(h \circ \pi_2)) \circ f) \times \mathbf{Id}_{\Gamma}) \circ \delta_{\Gamma} : \Gamma \rightarrow T_{\epsilon} A}$
- (Bind)  $\frac{f = \llbracket \Phi | \Gamma \vdash C_1 : \mathbf{M}_{\epsilon_1} A : \Gamma \rightarrow T_{\epsilon_1} A \quad g = \llbracket \Phi | \Gamma, x : A \vdash C_2 : \mathbf{M}_{\epsilon_2} B \rrbracket_M : \Gamma \times A \rightarrow T_{\epsilon_2} B}{\llbracket \Phi | \Gamma \vdash \mathbf{do} \ x \leftarrow C_1 \mathbf{in} \ C_2 : \mathbf{M}_{\epsilon_1 \cdot \epsilon_2} B \rrbracket_M = \mu_{\epsilon_1, \epsilon_2, B} \circ T_{\epsilon_1} g \circ \mathbf{t}_{\Gamma, A, \epsilon_1} \circ \langle \mathbf{Id}_{\Gamma}, f \rangle : \Gamma \rightarrow T_{\epsilon_1 \cdot \epsilon_2} B}$
- (Apply)  $\frac{f = \llbracket \Phi | \Gamma \vdash v_1 : A \rightarrow \mathbf{M}_{\epsilon} B \rrbracket_M : \Gamma \rightarrow (T_{\epsilon} B)^A \quad g = \llbracket \Phi | \Gamma \vdash v_2 : A \rrbracket_M : \Gamma \rightarrow A}{\llbracket \Phi | \Gamma \vdash v_1 \ v_2 : \mathbf{M}_{\epsilon} B \rrbracket_M = \mathbf{app} \circ \langle f, g \rangle : \Gamma \rightarrow T_{\epsilon} B}$
- (Effect-Lambda)  $\frac{f = \llbracket \Phi, \alpha | \Gamma \vdash v : A \rrbracket_M : (\Gamma, A)}{\llbracket \Phi | \Gamma \vdash \Lambda \alpha. A : \forall \epsilon. A \rrbracket_M = f : (\Gamma, (A))}$
- (Effect-App)  $\frac{g = \llbracket \Phi | \Gamma \vdash v : \forall \alpha. A \rrbracket_M : (\Gamma, (A)) \quad h = \llbracket \Phi \vdash \epsilon : \cdot \rrbracket_M}{\llbracket \Phi | \Gamma \vdash v \ \epsilon : A[\epsilon/\alpha] \rrbracket_M = \langle \mathbf{Id}_I, h \rangle \star (\epsilon_{\llbracket \Phi, \beta \vdash A[\beta/\alpha] : \cdot \rrbracket_M})}$