

S1 Table: Details of feed-forward network motif for ERK/FRK module.

<i>Species</i>	<i>Equation</i>	<i>Ref.</i>
ELK1	$\dot{X}_1 = V_{z_1}^{x_1} \cdot f(Z_1, K_{z_1}^{x_1}) - k_{x_1}^{z_1} \cdot f(X_1, K_{x_1}^{z_1}) \cdot f_s^{\text{ERK}}$	
p-ELK1	$\dot{Z}_1 = k_{x_1}^{z_1} \cdot f(X_1, K_{x_1}^{z_1}) \cdot f_s^{\text{ERK}} - V_{z_1}^{x_1} \cdot f(Z_1, K_{z_1}^{x_1}) - k_{z_1}^c X_2^{\text{pr}} Z_1 + k_c^{z_1} C$	
c-Fos _{pr} :p-ELK1	$\dot{C} = k_{z_1}^c X_2^{\text{pr}} Z_1 - k_c^{z_1} C$	
c-Fos _{pre} -mRNA	$\dot{X}_2^{\text{pre-mRNA}} = R_0 + k_c^{\text{pre-mRNA}} C - \frac{V_c}{V_n} \cdot k_{\text{pre-mRNA}}^{\text{mRNA}} X_2^{\text{pre-mRNA}}$	
c-Fos _m mRNA	$\dot{X}_2^{\text{mRNA}} = \frac{V_n}{V_c} \cdot k_{\text{pre-mRNA}}^{\text{mRNA}} X_2^{\text{pre-mRNA}} - k_{\text{mRNA}}^\phi X_2^{\text{mRNA}}$	
c-FOS _p	$\dot{X}_2^{\text{p}} = k_{\text{mRNA}}^{\text{p}} X_2^{\text{mRNA}} - k_{\text{cyt}}^{\text{p}} X_2^{\text{p}}$	[1]
c-FOS	$\dot{X}_2 = \frac{V_n}{V_c} \cdot k_{\text{cyt}}^{\text{n}} X_2^{\text{p}} + V_{y_2}^{x_2} \cdot f(Y_2, K_{y_2}^{x_2}) + V_D^{x_2, x_2^*} \cdot f(D, K_D^{x_2, x_2^*}) - k_{x_2}^{y_2} \cdot f(X_2, K_{x_2}^{y_2}) \cdot f_s^{\text{FRK}} - k_{x_2}^\phi X_2$	
pc-FOS	$\dot{Y}_2 = k_{x_2}^{y_2} \cdot f(X_2, K_{x_2}^{y_2}) \cdot f_s^{\text{FRK}} + V_{z_2}^{y_2} \cdot f(Z_2, K_{z_2}^{y_2}) - k_{y_2}^{z_2} \cdot f(Z_2, K_{y_2}^{z_2}) \cdot f_s^{\text{FRK}} - V_{y_2}^{x_2} \cdot f(Y_2, K_{y_2}^{x_2}) - k_{y_2}^\phi Y_2$	
ppc-FOS	$\dot{Z}_2 = k_{y_2}^{z_2} \cdot f(Y_2, K_{y_2}^{z_2}) \cdot f_s^{\text{FRK}} - V_{z_2}^{y_2} \cdot f(Z_2, K_{z_2}^{y_2}) - k_{z_2, z_2^*}^D Z_2 Z_2^* + k_D^{z_2, z_2^*} D - k_{z_2}^\phi Z_2$	
ppc-FOS:ppc-JUN	$\dot{D} = k_{z_2, z_2^*}^D Z_2 Z_2^* - k_D^{z_2, z_2^*} D - V_D^{x_2, x_2^*} \cdot f(D, K_D^{x_2, x_2^*}) - k_D^\phi D$	
$V_{z_1}^{x_1} = 4.5337 \text{ nM s}^{-1}, \quad K_{z_1}^{x_1} = 9.5340 \text{ nM}, \quad k_{x_1}^{z_1} = 0.2705 \text{ s}^{-1}, \quad K_{x_1}^{z_1} = 65.2625 \text{ nM}, \quad k_c^{z_1} = 3.4048 \text{ nM s}^{-1}$ $k_c^{z_1} = 3.1303 \text{ nM}, \quad R_0 = 8.2285 \times 10^{-5} \text{ nM s}^{-1}, \quad k_c^{\text{pre-mRNA}} = 0.4274 \text{ s}^{-1}, \quad k_{\text{pre-mRNA}}^{\text{mRNA}} = 0.3316 \text{ s}^{-1}$ $k_{\text{mRNA}}^\phi = 0.1557 \text{ s}^{-1}, \quad k_{\text{mRNA}}^{\text{p}} = 16.6871 \text{ s}^{-1}, \quad k_{\text{cyt}}^{\text{n}} = 2.6297 \text{ s}^{-1}, \quad V_{y_2}^{x_2} = 8.4053 \text{ nM s}^{-1}, \quad K_{y_2}^{x_2} = 6.8804 \text{ nM}$ $V_D^{x_2, x_2^*} = 55.9578 \text{ nM s}^{-1}, \quad K_D^{x_2, x_2^*} = 8.947 \text{ nM}, \quad k_{x_2}^{y_2} = 0.154 \text{ s}^{-1}, \quad K_{x_2}^{y_2} = 1.6189 \text{ nM}, \quad k_{x_2}^\phi = 0.2741 \text{ s}^{-1}$ $k_{y_2}^{z_2} = 5.1573 \text{ s}^{-1}, \quad K_{y_2}^{z_2} = 3.0176 \text{ nM}, \quad V_{z_2}^{y_2} = 3.8786 \text{ nM s}^{-1}, \quad K_{z_2}^{y_2} = 15.0773 \text{ nM}, \quad k_{z_2, z_2^*}^D = 0.2867 \text{ nM s}^{-1}$ $k_D^{z_2, z_2^*} = 1.2753 \text{ s}^{-1}, \quad k_{z_2}^\phi = 0.0730 \text{ s}^{-1}, \quad k_{y_2}^\phi = 1.1317 \text{ s}^{-1}, \quad k_D^\phi = 0.0774 \text{ s}^{-1}$		
$f(x, K) = \frac{x}{K + x}, \quad f_s = f_s(\alpha, \tau, t), \quad Z_2^* = \text{ppc-JUN}, \quad X_2^* = \text{c-JUN}, \quad V_c = \text{cell volume}, \quad V_n = \text{nucleus volume}$		

¹ Miller GM, Ogunnaike BA, Schwaber JS, Vadigepalli R (2010) Robust dynamic balance of AP-1 transcription factors in a neuronal gene regulatory network. BMC Systems Biology 4: 171.