Recent work has suggested that the non-flux adjusted global climate models used to project future climate changes may significantly overestimate the stability Atlantic Meridional Overturning Circulation under anthropogenic global warming. Temperature, salinity and density fields in flux-adjusted models likely deviate from observations because of biases in model physics. Recent work has suggested that correcting the density field via flux adjustment reduces model stability. It is unclear, however, whether adjusting the fluxes to produce a more realistic density field will result in a model with more realistic stability properties, as flux correction may be compensating for other inaccuracies in model formulation. We investigate this question using a simplified dynamical box model- in which we can flux-correct one version of the model to look like another version of the model. We show that flux adjustment can sometimes realistically compensate for physical biases associated with some processes (such as uncertainty in the value of the eddy stirring coefficient A_{Redi}) but not others (such as inaccurate simulation of the relationship between density structure and overturning). It remains reasonable to be skeptical about conclusions drawn about stability based on flux adjusted models.