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Relaxation after a quench in the Bose Hubbard Model[1] MALCOLM KENNETT, Simon Fraser University, DENIS DALIDOVICH, Perimeter Institute for Theoretical Physics — Cold bosonic atoms confined in an optical lattice potential give a realization of the Bose Hubbard model, which has allowed the study of the phase transition between a superfluid and a Mott insulator as the depth of the optical lattice is varied. We study the real time dynamics of the Bose Hubbard model in the presence of time-dependent hopping using the Schwinger-Keldysh technique. Using a strong-coupling approach, we determine the effective action in the vicinity of the zero-temperature transition between superfluid and Mott insulating phases. We then study the solutions of the resulting saddle-point dynamical equations as the hopping is varied to sweep across the phase transition from the superfluid to insulating phase. We find that the dynamics can be understood within a picture where there are two timescales for relaxation. First, there is local equilibration, and on longer timescales there is mass transport. We discuss the implications of our results to realizations of the Bose Hubbard model in a harmonic trap.

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