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Dynamical instabilities and transient short-range order in the fermionic Hubbard model JOHANNES BAUER, Harvard University, MEHRTASH BABADI, California Institute of Technology, EUGENE DEMLER, Harvard University — We study the dynamics of magnetic correlations in the half-filled fermionic Hubbard model following a fast ramp of the repulsive interaction. We use Schwinger-Keldysh self-consistent second-order perturbation theory to investigate the evolution of single-particle Green's functions and solve the non-equilibrium Bethe-Salpeter equation to study the dynamics of magnetic correlations. This approach gives us new insights into the interplay between single-particle relaxation dynamics and the growth of antiferromagnetic correlations. Depending on the ramping time and the final value of the interaction, we find different dynamical behavior which we illustrate using a dynamical phase diagram. Of particular interest is the emergence of a transient short-range ordered regime characterized by the strong initial growth of antiferromagnetic correlations followed by a decay of correlations upon thermalization. The discussed phenomena can be probed in experiments with ultracold atoms in optical lattices.

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