Applications of Measure Rigidity of Diagonalizable Actions

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We start by recalling the conjectures and the known theorems regarding the dynamics of diagonalizable subgroup actions on homogeneous spaces. In particular, we will discuss the question which probability measures are invariant under the full diagonal subgroup A on $\mathrm{SL}(n, \mathbb{Z}) \setminus \mathrm{SL}(n, \mathbb{R})$ for $n > 2$ and the partial classification of such measures due to Katok, Lindenstrauss, and myself. These questions are intimately connected to certain number theoretic problems. While our understanding of the dynamics is still not complete, in some of the applications this can be overcome. We will discuss the number theoretic and equidistribution applications of the measure classification and how they are related to the dynamical problem.