Summary: This article focuses on the maximum of relative projection constants over all \( m \)-dimensional subspaces of the \( N \)-dimensional coordinate space equipped with the max-norm. This quantity, called maximal relative projection constant, is studied in parallel with a lower bound, dubbed quasimaximal relative projection constant. Exploiting alternative expressions for these quantities, we show how they can be computed when \( N \) is small and how to reverse the Kadec-Snobar inequality when \( N \) does not tend to infinity. Precisely, we first prove that the (quasi)maximal relative projection constant can be lower-bounded by \( c\sqrt{m} \), with \( c \) arbitrarily close to one, when \( N \) is superlinear in \( m \). The main ingredient is a connection with equiangular tight frames. By using the semicircle law, we then prove that the lower bound \( c\sqrt{m} \) holds with \( c < 1 \) when \( N \) is linear in \( m \).

MSC:

- 46B07 Local theory of Banach spaces
- 46B04 Isometric theory of Banach spaces
- 52A21 Convexity and finite-dimensional Banach spaces (including special norms, zonoids, etc.) (aspects of convex geometry)

Keywords:

- projection constants
- Seidel matrices
- tight frames
- equiangular lines
- graphs
- semicircle law

Software:

- Traces; nauty

Full Text: DOI

References:

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