

Sums of hermitian squares, the BMV conjecture and Connes' embedding problem

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(Joint work with Markus Schweighofer)

We consider polynomials in noncommuting symmetric variables. Which of these polynomials yield a matrix with positive trace whenever matrices are substituted for the variables? Can one find algebraic certificates for the global positivity of the trace? Natural candidates involve sums of hermitian squares and can be searched for using semidefinite programming. We relate this to two long-standing and famous conjectures: the Bessis-Moussa-Villani conjecture from quantum physics and Connes' embedding problem for type II_1 von Neumann algebras.