

# An ergodic theorem for dynamical systems of von Neumann algebras

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We prove an ergodic theorem for a one-parameter  $w^*$ -continuous semigroup of  $w^*$ -continuous completely positive maps on a von Neumann algebra. As a consequence we show that on any infinite dimensional Hilbert space there exists a quantum dynamical system and a bounded observable which is a constant but its standard deviation is not.