$O(n+m)$ by monotone pointer.
easy to construct $\Omega(\min(n,m))$ lower bound.

wlog assume $n \leq m$.
monotone pointer+binary search on each row. if at row i we move left d_i cells, binary search takes $\log(d_i)$ time (use doubling to estimate d_i). $\sum_{i=1}^{n} d_i = O(m)$, by Jensen's inequality, the running time is $O(n \log(\frac{m}{n}))$.
this is optimal: http://twistedoakstudios.com/blog/Post5365_searching-a-sorted-matrix-faster

References