Use the universal portfolios algorithm and its analysis.

Also, here is a fact from calculus that you might find helpful. If $c_1, \ldots, c_N$ are nonnegative integers (with $N \geq 2$), then

$$\int \left( \prod_{i=1}^{N} b_i^{c_i} \right) d\mu(b) = \frac{\prod_{i=1}^{N} (c_i!)}{(N - 1 + \sum_{i=1}^{N} c_i)!}$$

where, as in class, the integral is over all vectors $b = \langle b_1, \ldots, b_N \rangle \in [0,1]^N$ with $\sum_{i=1}^{N} b_i = 1$. 

\[ \int \left( \prod_{i=1}^{N} b_i^{c_i} \right) d\mu(b) = \frac{\prod_{i=1}^{N} (c_i!)}{(N - 1 + \sum_{i=1}^{N} c_i)!} \]