Transform coding is routinely used for lossy compression of discrete sources with memory. The input signal is divided into N-dimensional vectors, which are transformed by means of a linear mapping. Then, transform coefficients are quantized and entropy coded. In this paper, we consider the problem of identifying the transform matrix as well as the quantization step sizes. First, we study the case in which the only available information is a set of P transform decoded vectors. We formulate the problem in terms of finding the lattice with the largest determinant that contains all observed vectors. We propose an algorithm that is able to find the optimal solution and we formally study its convergence properties. Three potential realms of application are considered as example scenarios for the proposed theory: 1) parameter retrieval in the presence of a chain of two transform coders; 2) image tampering identification; and 3) parameter estimation for predictive coders. We show that, despite their differences, all three scenarios can be tackled by applying the same fundamental methodology. Experiments on both the synthetic data and the real images validate the proposed approach.