

Figure 1: Regret plot. The label OCO-UM refers to formulating the problem as an OCO with unbounded memory problem and using Algorithm 1. The OCO-FM-m refers to formulating the problem as an OCO with finite memory problem with constant memory length m. The titles of the plots indicate the values of the dimension, the diagonal entries of F, and the upper triangular entries of F.

Fig. 1 shows the results after using the theoretically optimal step-size for each algorithm. In both plots OCO with unbounded memory performs better than OCO with finite memory for a range of memory lengths. It achieves the lowest regret and even asymptotes because it has found the optimal control input. Note that in the Fig. 1a, the ordering of OCO with finite memory is the reverse of what one would expect: m = 1 has lower regret than m = 16. This is simply due to the constants for small values of the time horizon T. However, as we can see from the slope of the curves, for larger time horizons T, we will observe the correct ordering: m = 1 has higher regret than m = 16. Regardless, all the finite memory approximations perform worse than OCO with unbounded memory.