Supplemental Information

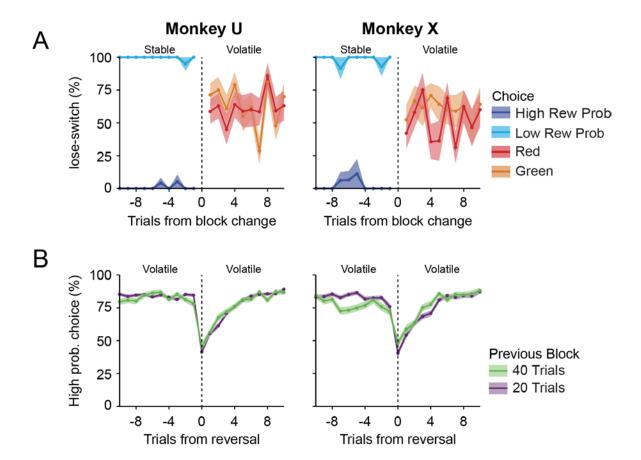


Figure S1. Behavioral changes after the reversal of reward probabilities. Related to Figure 2. (A) The probability of switching to the other target color (or shape) when the previous choice was unrewarded before and after the onset of volatile blocks, plotted separately according to the nature of target chosen in the previous trial. The animals adjusted their preference for different targets based on the previous outcome immediately after the onset of the volatile block. Only trials in which reward magnitude was the same for both targets in the current trial were included in this analysis. (B) The probability of choosing the high reward-probability target before and after their reversal in volatile blocks, plotted separately according to the size of the previous block. Trials in which the ratio of small vs. large reward magnitudes was >2 were excluded in this figure, since the animal's choice in those trials was strongly influenced by the reward magnitudes. Shaded areas represent ± SEM.

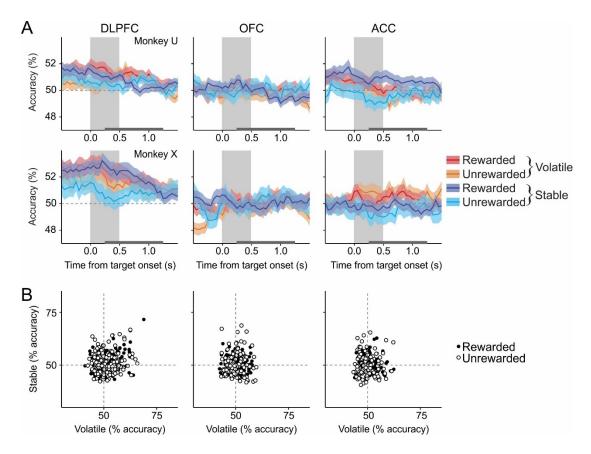


Figure S2. Signals related to the previous action. Related to Figure 3. (A) Time course of the average decoding accuracy for the previously chosen location, plotted separately for two animals. Neither previous reward nor volatility significantly affected decoding accuracy for either animal in any cortical region (all main and interaction effects in a reward \times volatility repeated measures ANOVA, p > 0.05 for all regions in both animals). Shaded areas represent \pm SEM. (B) The accuracy of decoding previously chosen location following rewarded and unrewarded trials for individual neurons in each block type.

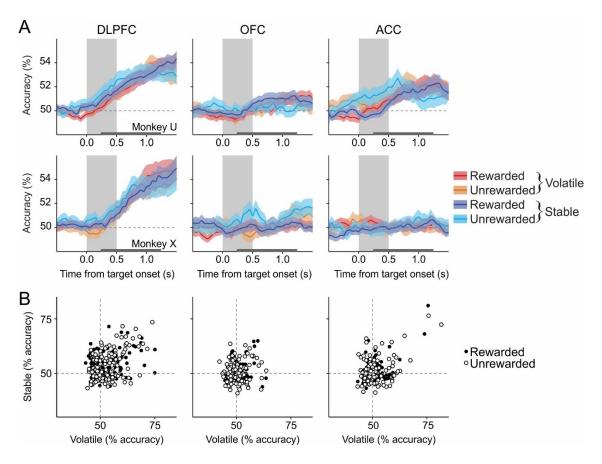


Figure S3. Signals related to upcoming action. Related to Figure 4. (A) Time course of the average decoding accuracy for upcoming action, plotted separately for two animals (all main and interaction effects in a reward \times volatility repeated measures ANOVA, p > 0.05 for all regions in both animals). Shaded areas represent \pm SEM. (B) The accuracy of decoding upcoming action following rewarded and unrewarded trials for individual neurons in each block type.

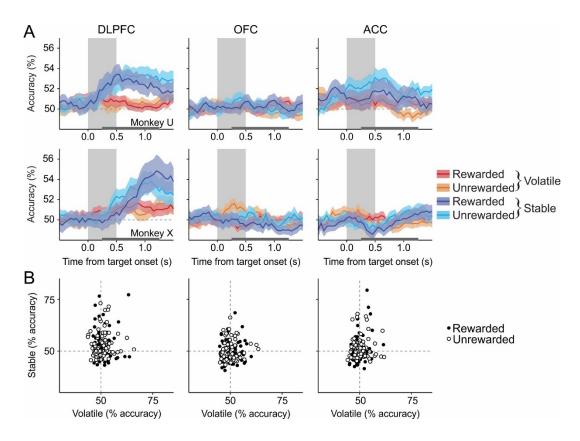


Figure S4. Signals related to the relative positions of the different target colors or high reward-probability targets. Related to Figure 5. (A) Time course of the average decoding accuracy for the relative target positions shown separately for two animals. Effect of volatility was significant only in monkey U (effect of volatility in a reward \times volatility repeated measures ANOVA, p<0.005) but not monkey X (p=0.1). Shaded areas represent \pm SEM. (B) The accuracy of decoding the relative positions of the two targets following rewarded and unrewarded trials for individual neurons in each block type.

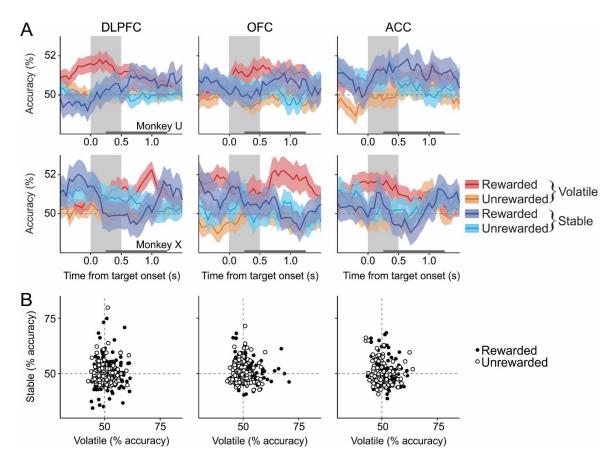


Figure S5. Signals related to the target color (or shape) chosen in the previous trial. Related to Figure 6. (A) Time course of the average decoding accuracy for the previously chosen target color (or shape) shown separately for two animals. Shaded areas represent \pm SEM. (B) The accuracy of decoding previously chosen target color (or shape) following rewarded and unrewarded trials for individual neurons in each block type.

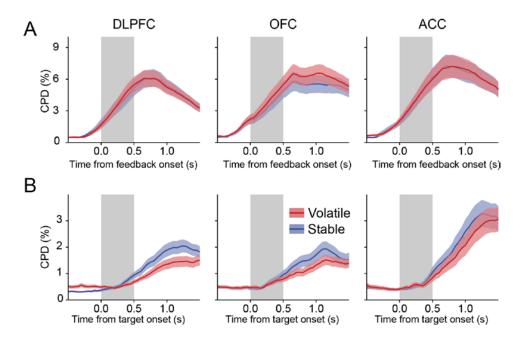


Figure S6. Signals related to the difference in reward magnitude and outcome in the current trial. Related to Figure 7. (A) Time course of the mean CPD for the outcome of the current trial. Shaded areas represent \pm SEM. (B) Time course of the mean CPD for the difference between the chosen and unchosen magnitudes. During the post-target period, there was no significant effect of volatility or region (all main effects and interactions in a region \times volatility mixed effects ANOVA, p>0.05).

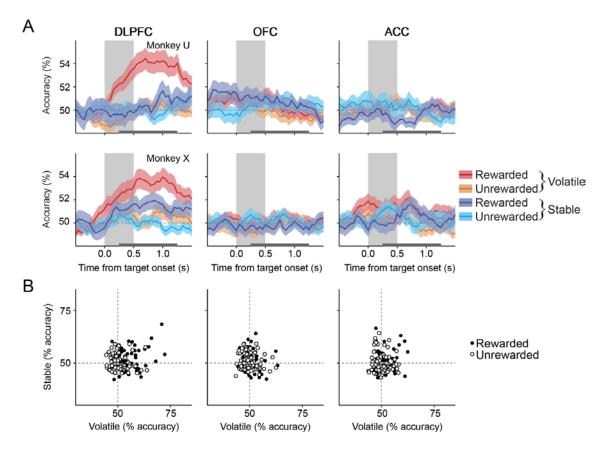


Figure S7. Signals related to the current position of the previously chosen target color (or shape). Related to Figure 8. (A) Time course of the average decoding accuracy for the current position of the previously chosen target color (or shape), plotted separately for two animals. Effect of previous reward in the DLPFC was significant in both animals (a reward \times volatility repeated measures ANOVA, p<0.005), although reward \times volatility interaction was significant only in monkey X p<0.01). Shaded areas represent \pm SEM. (B) The accuracy of decoding the current position of the previously chosen target color (or shape) following rewarded and unrewarded trials for individual neurons in each block type.