

# Managing shutdown risk in commodity and energy production

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Commodity and energy production assets face the risk of having to permanently shut down when operating in an uncertain environment, for instance, due to fluctuations in input/output prices and exchange rates. In this paper, we formulate a new shutdown risk-averse Markov decision process (MDP) to balance the asset market value and shutdown risk. We adapt the regress-later least squares Monte Carlo method to compute heuristic risk-averse operating policies for our high dimensional MDP. We apply this approach to a realistic Aluminium smelter application with mothballing and shutdown flexibility. Our numerical results show that our shutdown risk-averse policy outperforms CVaR-based policies, providing more efficient trade-offs between asset value and shutdown risk. Further, we compare the reductions in shutdown risk when employing our risk-averse operating policies and using long-term forward contracts for procuring/selling inputs/outputs, and find that the former operational hedging strategy outperforms the latter financial hedging strategy. These findings are potentially relevant beyond Aluminum production to the management of shutdown risk in other commodity and energy production assets.

## References

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