Our information updating valuation model is based on the decision model of Huchzermeier and Loch (2001). Contrary to their model, we limit the variability of the product performance to $N = 1$. In the subsequent section, we will explain this limitation and its implication for our model in greater detail and prove the validity of applying the properties derived by Huchzermeier and Loch to our case. For reasons of consistency, we will apply our notation also to their properties and proofs.

In their decision model, Huchzermeier and Loch generalize the performance variability to be spread over $N$ states, i.e., the uncertainty of the development process at stage $t$, denoted by $\omega_t$, is given as

\[
\omega_t = \begin{cases} 
  \frac{i}{2} & \text{with probability } \frac{p}{N} \\
  -\frac{i}{2} & \text{with probability } \frac{1-p}{N}
\end{cases} \quad \text{for } i = 1, \ldots, N. 
\tag{B.1}
\]

They claim in Proposition 1 (p. 91), amongst other properties of the value function, that the project value $V_t(x)$ is convex-concave increasing in $x$ if the payoff function $II(x)$ is increasing in $x$ as well. The proof of the corresponding lemma (Lemma 1, p. 99) is based on the argument that $\frac{1}{1+p}E[V_{t+1}(x + 1) - V_{t+1}(x)]$ increases and decreases in $x$ since $V_{t+1}(x + 1) - V_{t+1}(x)$ does so due to the described convex-concavity of $V_{t+1}(x)$. In particular, they state that improvement is preferred over continuation in state $x$ iff
\[ \alpha_t < \frac{1}{1+r} E \omega_t [V_{t+1}(x+1) - V_{t+1}(x)] \]

\[ = \frac{1}{N(r+1)} \sum_{i=1}^{N} \left[ pV_{t+1} \left( x + 1 + \frac{i}{2} \right) - (1-p)V_{t+1} \left( x + 1 - \frac{i}{2} \right) \right] \]

\[ - \frac{1}{N(r+1)} \sum_{i=1}^{N} \left[ pV_{t+1} \left( x + \frac{i}{2} \right) - (1-p)V_{t+1} \left( x - \frac{i}{2} \right) \right] \] (B.2)

and – by the convex-concavity of \( V_{t+1}(x) \) – the right-hand side of Eq. B.2 first increases and then decreases in \( x \).

However, Santiago and Vakili (2005) have shown that this has not necessarily to be the case. For certain cases, the difference function may have more than one maximum. The reason is that the average of several functions each of which first increases and then decreases does not necessarily have the increasing-decreasing property. This discrepancy, however, can be resolved by limiting the product performance variability to \( N = 1 \). In this special case namely, the argument from above holds, i.e.,

\[ \alpha_t < \frac{1}{1+r} E \omega_t [V_{t+1}(x+1) - V_{t+1}(x)] \]

\[ = \frac{1}{(r+1)} \left[ pV_{t+1} \left( x + 1 + \frac{1}{2} \right) - (1-p)V_{t+1} \left( x + 1 - \frac{1}{2} \right) \right] \]

\[ - \frac{1}{(r+1)} \left[ pV_{t+1} \left( x + \frac{1}{2} \right) - (1-p)V_{t+1} \left( x - \frac{1}{2} \right) \right] , \] (B.3)

since we now do not average over multiple functions anymore. Thus, the resulting averaged function has a single mode, i.e., is convex-concave increasing in \( x \).

Although this assumption limits the uncertainty of the development process (modeled by the described binomial distribution) and thus, abstracts from the performance variability occurring in most real-life projects, it does not confine the practical applicability of the model too much. For the objective of our research, to combine real options valuation with Bayesian analysis and to study the resulting implications, the extent of the performance variability is circumstantial. In fact, the assumption allows us to reduce the complexity of our information updating valuation model noticeably and thus, enabling us to analyze the model with respect to the desired insights more generally. In addition and most of all, all other properties of the Huchzermeier and Loch model, in particular the property of the market performance variability, remain valid due to this limitation, which allow us to prove some of our findings in closed form and explain some numerical results more plausibly. However, for the sole purpose of an application to a