# Case Summary of Gillette vs. Energizer.

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As the basis of our analysis, we first construct a decision tree to illustrate the two alternatives. The expected returns of settlement remain to be **$4.5 million constantly**. From the decision tree, the expected return of continuing litigation (file a lawsuit) is **$4.954 million**, which is larger than that of settlement. Then we use the following analytical tools to compare these two alternatives.

**Basic Decision Tree.** To be more concrete, the probability of gaining the patent's validity is 0.4011 and the patent's infringement is 0.505. Therefore, the probability of wining in the court is only 0.2026, which is a quite small value. However, we could enjoy great payoff after wining in the court. The expectation of payoff is **$36.8 million**, ranging from $27.5 million to $65 million based on damages and market business returns. Therefore, the alternative of filing a lawsuit can be very risky and have huge payoffs.

**Sensitivity Analysis & Value of Information.** After doing sensitivity analysis, the possibility of 2-yr Hiatus for Business Impact, Examiner can testify, Infringement on Working same way, Costs of Continuing the Litigation can play an important role in the expected payoffs of two decisions. Furthermore, we found that if given some certain information about some events instead of probabilities, we can enjoy higher payoffs. For example, the perfect information in terms of the value of whether examiner can testify is $0.34 million. The value of whether infringement on working on the same way is 2.76 million. If we could have more accurate information given costs fewer than that, we could use that to guide us better in the decision-making. And we found **the information of whether examiner can testify is a significant factor**.

**Risk Profile & Downside Risk.** We also notice that the risk can influence our decision-making greatly and we show the risk profile of two alternatives. From the cdf and pdf charts, it can be easily seen that the choice of continuing litigation has risks. Downside risk analysis can also help us analyze. Then, we use the widely acknowledged measure in portfolio, i.e. VaR (Value at Risk) and CVaR (Conditional Value at Risk, which is a coherent measure) to estimate the percentile expectation and show the continuing litigation choice is worse than settlement in prevention of downside risks given risk percentile less than 75%.

**Utility Theory.** Given the two different streams from expectation and risk profile (and downside risk), we need to incorporate the risk and return together. Then we introduce the utility theory to analyze that. We use the most commonly-used utility function – simple **exponential utility function**. We show the break-even point for risk-tolerance R to be R* = 250.2 million. If the decision maker's risk tolerance is less than that, we prefer them to choose to settle for conservativeness. Otherwise, we should still go for continuing litigation. Then, we illustrate that different approximations of CE (utility and second-order moment) converge to the expected returns when R increases.

**Generalization.** We also extend our results to **a different set of utility functions**. We analyze the case if we prefer to risk seeking in terms of lost values qualitatively. Then the R* is even smaller compared with the original exponential utility function because the lost part is convex. In the slides we show one adjustment and the break-even point becomes R* = 64.23 which is less that before. In general, if the slope of concave utility function approaches y-axis more slowly, we could prefer the filing a lawsuit at a high chance. Under our analysis, we found that the CARA (Constant Absolute Risk Aversion) function tends to be more risk-averse than our base case.

In a nutshell, we give a whole analytical research of these two alternatives in terms of expectations, risks and utility. We also conduct sensitivity analysis and robustness check to have better extensions in different cases for decision-makers to decide. If one prefers a stable payoff, then he should choose to settle (as the loss probability for filing a lawsuit is about 0.8). However, if he has ambition and is willing to embrace uncertainty, he can continue litigation despite its high risks. And we could suggest the company to conduct more research to identify some key information such as whether examiner can testify to better understand the risks.