系统工程作业7

张博睿 自75 2017011537

# 1.

### 解：

如图，根据题目信息，绘制决策树如下



其中，公司利润计算公式为

每一种方案的计算方式为

综上，应该选择建立大工厂的方案。

# 2.

### 解：

该问题既可以建模成**多级决策树**的问题，也可以建模成**情报信息价值**的问题。下面以**情报信息价值**的方式进行建模。

**（1）在没有引进检测技术时，通过决策树的方法建模如下**



可以看到，应该选择A2策略进行生产，这个时候的益损值为880。

**（2）引进检测技术后，由于不知道确切状态，因此通过状态的概率分布来计算期望益损值。**

题目描述为“既保证化学溶剂质量，又使得益损值期望值较大”，我把这个描述建模为在提升化学溶剂质量的同时，主要是使得**益损值期望值最大化**。从而选择策略为

从而益损值期望值为

得到的期望值提升为

因此，应该增加该检验工序。

# 3.

### 解：

### （1）

记进货量为，卖出量为，对应收益为，其期望值为

已知该经营者为中立决策者，因此

其中，为出现情况的概率，为对应收益。首先计算期望收益值如下

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 概率 |  |  |  |  |  |  |  |  |
| 销售量  进货量 |  |  |  |  |  |  | 期望值 | 单位成本 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

对于中立型决策者，期望效用与期望收益呈线性关系，从而调整计算对应期望效用如下

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 进货量 |  |  |  |  |  |  |  |
| 期望收益 |  |  |  |  |  |  |  |
| 期望效用 |  |  |  |  |  |  |  |

根据效用理论，选择期望效用值最大的进货方案，则应该进货的数量为250箱。

### （2）

对于中立性决策者，由于期望效用与期望收益呈线性。为了计算的简便，不妨在计算过程中不对效用值进行归一化，

极小化最大后悔值准则数学描述为

（1）中已经计算了的表格，即

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量  进货量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**1.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

**2.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

**3.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

**4.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

**5.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

**6.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

**7.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

**8.当时，**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 销售量 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

从而

综上，得到最大后悔值和进货量的关系如下

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 进货量 |  |  |  |  |  |  |  |  |
| 最大后悔值 |  |  |  |  |  |  |  |  |

从而，极小化最大后悔值的决策为。