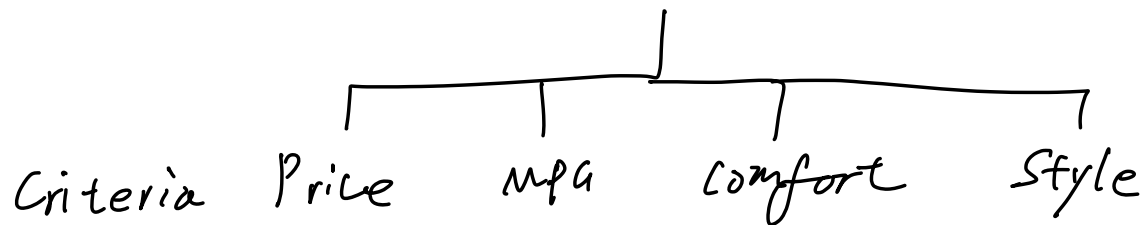


# Example 1 AHP

Solution

① developing the Hierarchy

Overall goal select the Best Car



Decision Accord Accord Accord Accord  
 Alternatives Saturn Saturn Saturn Saturn  
 Cavalier Cavalier Cavalier Cavalier

② establishing priorities using AHP

Price - mpg 3

└─ comfort 2

└─ style 2

mpg └─ comfort 4

└─ style 4

comfort - style 2.

### ③ Reciprocal Matrix

	Price	mpg	comfort	Style
Price	1	3	2	2
mpg	$\frac{1}{3}$	1	$\frac{1}{4}$	$\frac{1}{4}$
comfort	$\frac{1}{2}$	4	1	$\frac{1}{2}$
Style	$\frac{1}{2}$	4	2	1

### ④ Synthesis 列和

	Price	mpg	comfort	Style
Price	1	3	2	2
mpg	$\frac{1}{3}$	1	$\frac{1}{4}$	$\frac{1}{4}$
comfort	$\frac{1}{2}$	4	1	$\frac{1}{2}$
Style	$\frac{1}{2}$	4	2	1
	2.3333	12	5.25	3.75

归一

	Price	mpg	comfort	style	Priority
Price	0.4286	0.25	0.3810	0.5333	0.398
mpg	0.1429	0.0833	0.0476	0.0667	0.085
comfort	0.2143	0.3333	0.1905	0.1333	0.218
style	0.2143	0.3333	0.3810	0.2667	<del>0.219</del>
	2.3333	12	5.25	3.75	0.299

计算一致性比率

① Reciprocal Matrix

	Price	mpg	comfort	style	
Price	1	3	2	2	0.398
mpg	$\frac{1}{3}$	1	$\frac{1}{4}$	$\frac{1}{4}$	0.085
comfort	$\frac{1}{2}$	4	1	$\frac{1}{2}$	0.218
style	$\frac{1}{2}$	4	2	1	<del>0.219</del>

$$= \begin{bmatrix} 1.687 \\ 0.347 \\ 0.907 \\ 1.274 \end{bmatrix}$$

②

$$\begin{aligned}
 1.687 \div 0.398 &= 4.236 \\
 0.547 \div 0.085 &= 6.435 \\
 0.907 \div 0.217 &= 4.183 \\
 1.274 \div 0.299 &= 4.262
 \end{aligned}$$

③ 平均值记为  $\lambda_{max}$

$$\begin{aligned}
 \lambda_{max} &= (4.236 + 6.435 + 4.183 + 4.262) / 4 \\
 &= 4.185
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{4} \quad C.I. &= \frac{\lambda_{max} - n}{n - 1} = \frac{4.185 - 4}{3} = \frac{0.185}{3} \\
 &= 0.06167
 \end{aligned}$$

$$\textcircled{5} \quad CR = \frac{C.I.}{R.I.} = \frac{0.06167}{0.9} = 0.0685 < 1$$

acceptable consistency

$$\text{整体排序} = \begin{bmatrix} 0.265 \\ 0.421 \\ 0.314 \end{bmatrix} \quad \begin{matrix} 3rd \\ 1st \\ 2nd \end{matrix}$$

**Table E:**  
Pairwise  
comparison  
matrices  
showing  
preferences for  
the cars using  
each criterion

Price		Accord	Saturn	Cavalier
	Accord	1	1/3	1/4
	Saturn	3	1	1/2
	Cavalier	4	2	1

MPG		Accord	Saturn	Cavalier
	Accord	1	1/4	1/6
	Saturn	4	1	1/3
	Cavalier	6	3	1

Comfort		Accord	Saturn	Cavalier
	Accord	1	2	8
	Saturn	1/2	1	6
	Cavalier	1/8	1/6	1

表E：两两比较矩阵显示了使用每个标准对汽车的偏好

Style		Accord	Saturn	Cavalier
	Accord	1	1/3	4
	Saturn	3	1	7
	Cavalier	1/4	1/7	1

**Table F: Priorities for each car using each criterion**

表F：使用每个标准的每辆车的优先级

Criterion				
	Price	MPG	Comfort	Style
Accord	0.123	0.087	0.593	0.265
Saturn	0.320	0.274	0.341	0.656
Cavalier	0.557	0.639	0.065	0.080

The **composite priority** is calculated as follows: 复合优先级计算公式如下:

$$\begin{array}{c}
 \text{Level 3 priority matrix} \\
 \begin{array}{c} \text{标准1} \quad \text{标准2} \quad \text{标准3} \quad \text{标准4} \\
 \begin{array}{c} \text{车1} \\ \text{车2} \\ \text{车3} \end{array}
 \begin{bmatrix} 0.123 & 0.087 & 0.593 & 0.265 \\ 0.320 & 0.274 & 0.341 & 0.656 \\ 0.557 & 0.639 & 0.065 & 0.080 \end{bmatrix}
 \end{array}
 \end{array}
 \times
 \begin{array}{c}
 \text{Level 2 priorities} \\
 \begin{array}{c} \text{标准1} \\ \text{标准2} \\ \text{标准3} \\ \text{标准4} \end{array}
 \begin{bmatrix} 0.398 \\ 0.085 \\ 0.218 \\ 0.299 \end{bmatrix}
 \end{array}$$

$$= \begin{bmatrix} .123(.398) + .087(.085) + .593(.218) + .265(.299) \\ .320(.398) + .274(.085) + .341(.218) + .656(.299) \\ .557(.398) + .639(.085) + .065(.218) + .080(.299) \end{bmatrix}$$

$$= \begin{bmatrix} 0.265 \\ 0.421 \\ 0.314 \end{bmatrix}$$

Ranking these priorities, we have **the AHP ranking of the decision alternatives**

对这些优先级进行排序，我们有决策选择的AHP排序

	Car	Priority
1.	Saturn	<b>0.421</b>
2.	Cavalier	<b>0.314</b>
3.	Accord	<b>0.265</b>

