Advanced Statistics HW – 1

Team members:

Deepak Singh
Priyanka Malhotra
Himanish Prakash
Kumar Kishalaya
Nishita Singh Parmar

1. **Conjoint Analysis:**

   Conjoint analysis is basically a market (product and pricing) research technique which is used to understand consumer behavior while making purchases. This technique studies the decision-making process when a consumer is presented with various features of a product that could influence their decisions. It helps businesses in determining preferences and priorities of customers while evaluating products or services.

How Conjoint analysis works:

   1. In this technique, the product/service is broken down to its component levels (features) and different combinations of these components are then tested to identify consumer preferences. These features can include factors like price, brand, product features, size, color, and more.
   2. For each attribute, various levels are defined. Such as Price - Low, Medium, High ; Colour - Red, Blue, Green etc.
   3. "Hypothetical products" or "Service profiles" are created and respondents are presented with multiple choice sets and are required to select their preferred set. Data is collected on the combinations of attribute levels that are more appealing to consumers.
   4. This data is then analyzed using statistical techniques to determine the relative importance of each attribute and its levels. It basically helps in understanding how consumers trade-off between different attributes when making decisions.
   5. Conjoint analysis then includes assigning utility scores to each attribute level based on the respondents' preferences. These scores quantify the preference/likeness of each level and allow businesses to predict how new product configurations could perform in the market.

Benefits of Conjoint analysis:

Conjoint analysis is valuable in understanding customer preferences, product development, pricing strategy, and market segmentation. It provides insights into consumer preferences that can guide businesses in optimizing their products and services to meet customer expectations effectively. Businesses can also use conjoint analysis to evaluate their existing product portfolio and decide which products or variants to retain, modify, or discontinue.
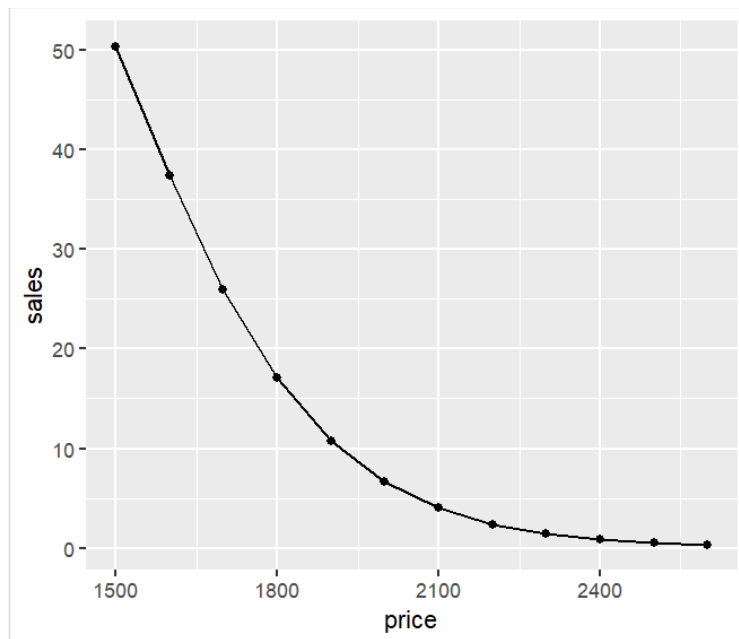
2. **Findings - per team member:**

(i) Nishita Singh Parmar

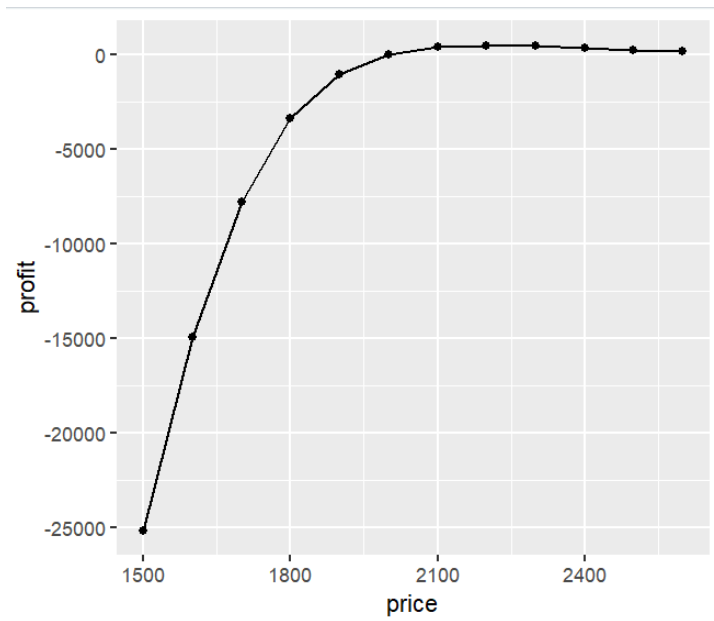| OUTPUTS	VALUES	INTERPRETATIONS
Partworths for each attribute level	Coef_screen_75 → 8 Coef_screen_85 → 1.75 Partworth_4k → 1 Partworth_sony → -2.1 Partworth_price → -2.66	The higher coefficient represents the higher preference. A 75" screen is preferred over an 85" screen. As the coefficient for resolution is 1, a screen resolution of 4k is preferred. Due to the negative utility for Sony, the brand is less preferred over others. The price coefficient represents my sensitivity to price. As the coefficient is negative, that means with an increase in price, the demand for such televisions decreases. Therefore, higher prices have a strong negative influence on sales.
Attribute Importance of each attribute	Importance_screen_size → 51.7 Importance_screen_resolution → 8.28 Importance_screen_brand → 17.93 Importance_screen_price → 22.07	Screen size - The large coefficient in screen size indicates that this is an important feature to me as a consumer. Screen resolution & Brand - The features are relevant but of less importance as compared to screen size Price - This coefficient indicates that price has a limited impact on utility.
Willingness to pay for each non-price attribute level	1 Util – $187.5 Wtp_screen_size_85 – 328.1 Wtp_brand_sony – -406.25 Wtp_resolution_4k – 187.5	Willingness to pay indicates how much more I'm willing to pay for an 85" screen, Sony brand and 4k resolution respectively. As the coefficient for Sony is negative, it signifies that the brand is not desirable and as a consumer I would not be willing to pay more.
Optimal price	2200	The optimal price of $2200 is the

		price point that would maximize profit as per the analysis.
Maximum profit	478.5	The maximum profit of $478.5 is the highest profit that can be achieved at the optimal price.
Market share associated with optimal price	0.023	A market share of 0.023 (2.3%) at the optimal price suggests that at this price point, the television would capture 2.3% of the market according to our analysis.

Sales as a function of price:

This plot depicts a typical demand curve where sales decrease with increase in television prices. This graph illustrates a negative correlation between price and sales. Therefore, as the price increases, the number of units sold decreases.

Profit as as function of price:

This plot illustrates the relationship between the price of televisions and the profit generated by sales. As prices increase from the lowest point, profits also increase.

The peak in the curve appears to occur before the price reaches $2100. This is the optimal price point for maximizing profits.

After reaching the optimal level the profits level off and the curve flattens out implying that any further increase in price may not affect the total profit.

(ii) Priyanka Malhotra

| OUTPUTS	VALUES	INTERPRETATIONS
Partworths for each attribute level	Partworth_intercept = 13 Partworth_screen_75 = 2 Partworth_screen_85 = 4 Partworth_4k = 6 Partworth_sony = 1 Partworth_price = (-12)	The higher coefficient shows a higher preference. 85" screen is preferred over a 75" screen. Also, the coefficient for 4k screen resolution is 4 which shows that 4k is preferred over 1k resolution. Coefficient of brand name for Sony is 1 which shows that it is more preferred than Sharp. The price coefficient represents my sensitivity to price. As the coefficient is negative, that indicates that an increase in price leads to a decrease in the overall utility or desirability of the option.
Attribute Importance of each attribute	Importance_screen_size = 9.52 Importance_screen_resolution = 28.57 Importance_screen_brand = 4.76 Importance_screen_price = 57.14	Screen resolution and screen price have the highest importance of 28.57% and 57.14% which shows that these are the most important features for me. Screen size and brand are not very important for me and hence indicate low importance 9.52% and 4.76%.
Willingness to pay for each non-price attribute level	1 Util = $41.66667 Wtp_screen_size_85 = $166.6667 Wtp_brand_sony = $41.66667 Wtp_resolution_4k = $250	Willingness to pay shows how much I want to pay for certain features in a TV. For this project my willingness to pay was highest for the resolution 4k which is $250. The second most important feature for me was the screen size 85" and my willingness to pay for it is $167 approx. Finally, the brand name is the least important for me so my

		willingness to pay for the Sony brand name was only $41.67.
Optimal price	2100	The analysis indicates that a price of $2100 is optimal for maximizing profit.
Maximum profit	$2.2481	The optimal price yields a maximum profit of $2.24 approximately which is the greatest profit achievable at this price point.
Market share associated with optimal price	0.000248	The analysis suggests that setting the TV at the optimal price would result in capturing 0.000248% of the market, which is a market share of 0.000248.

Sales as a function of price:
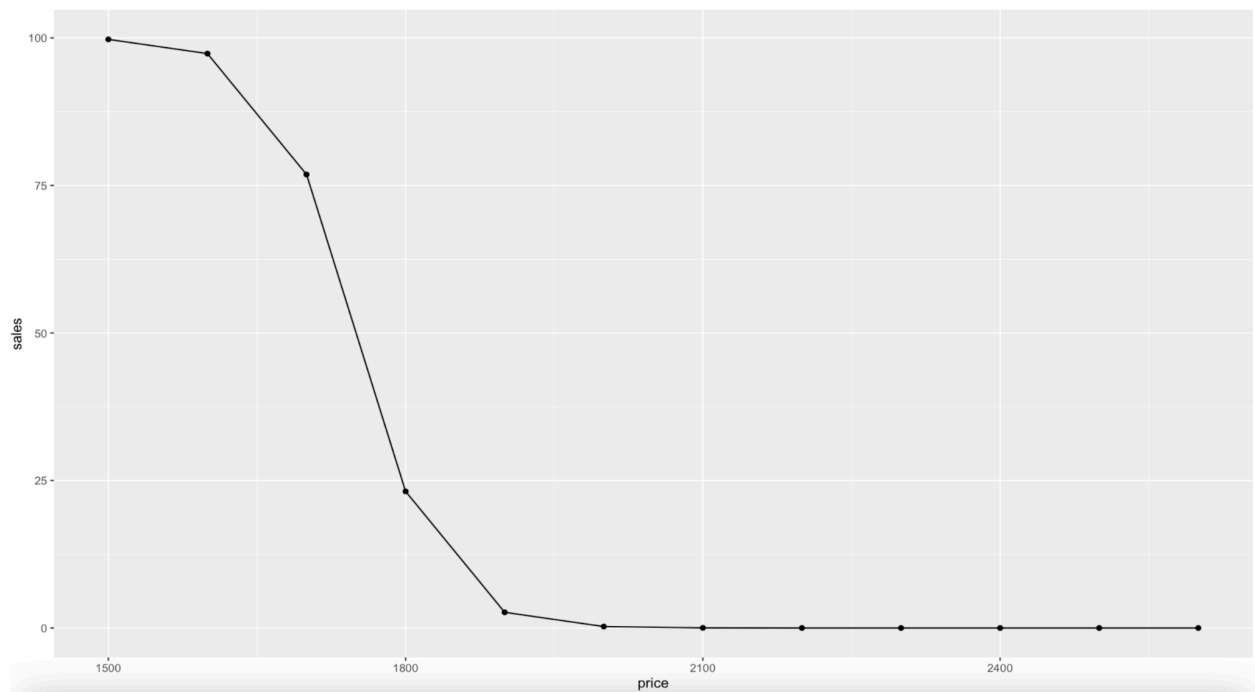
The above graph demonstrated a negative correlation between price and sales, typical of a demand curve. As the price of the TV rises, the quantity sold decreases, which is a typical consumer response in many markets.

Profit as a function of price:
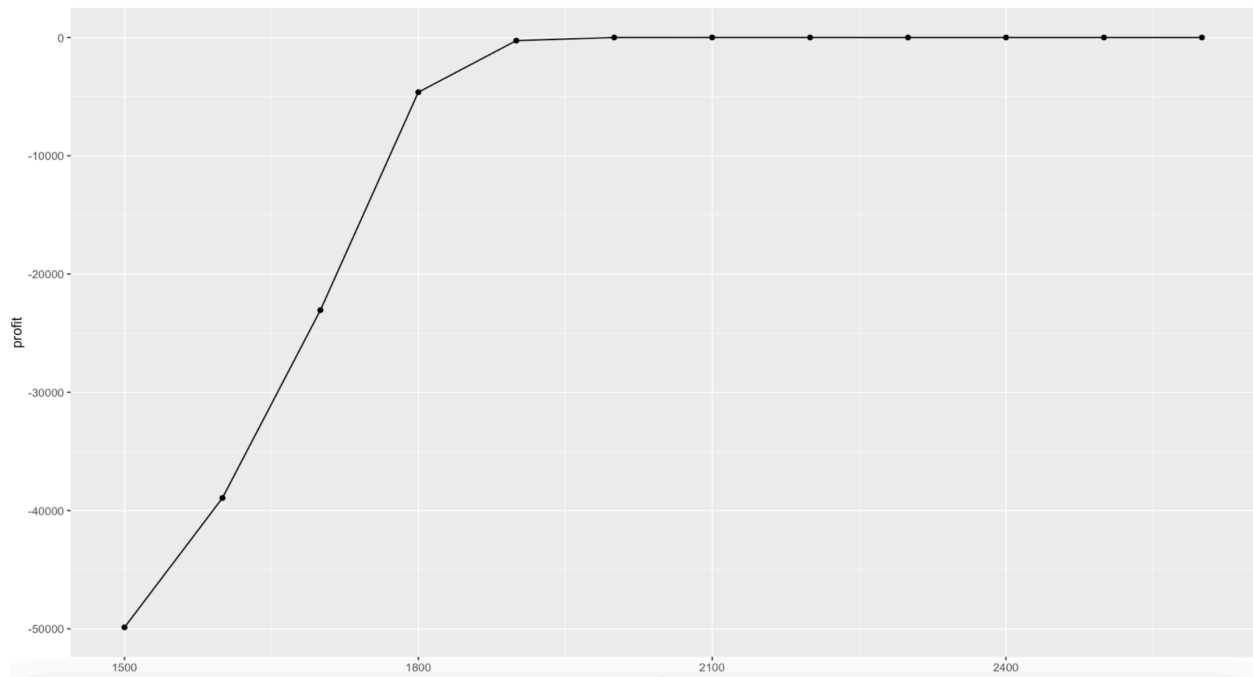
The graph above shows how the price of TV impacts profits. Initially, as prices rise from their lowest, there is a corresponding increase in profits. The curve reaches its peak before hitting $2100, this indicates the optimal price point that maximized profit. Setting the price beyond this point does not contribute to higher profits, indicating a price ceiling in the market for this particular television.

In summary, these graphs together imply that while there is a price that can maximize profits, it must be carefully chosen to ensure that it does not adversely affect the sales volume to the point where the business becomes unviable, especially considering the competitive nature of the market and the small market share that the product is able to capture.
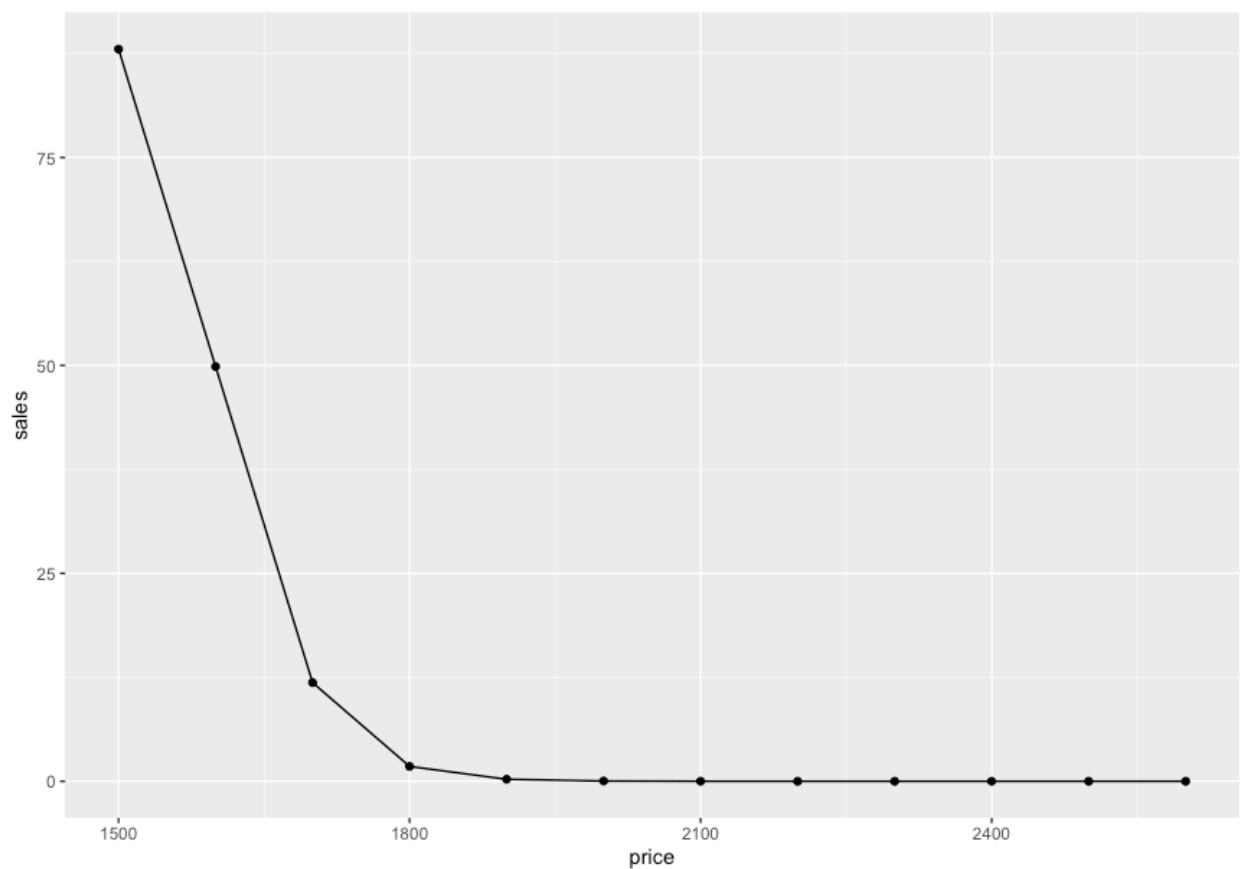
(iii) Himanish Prakash

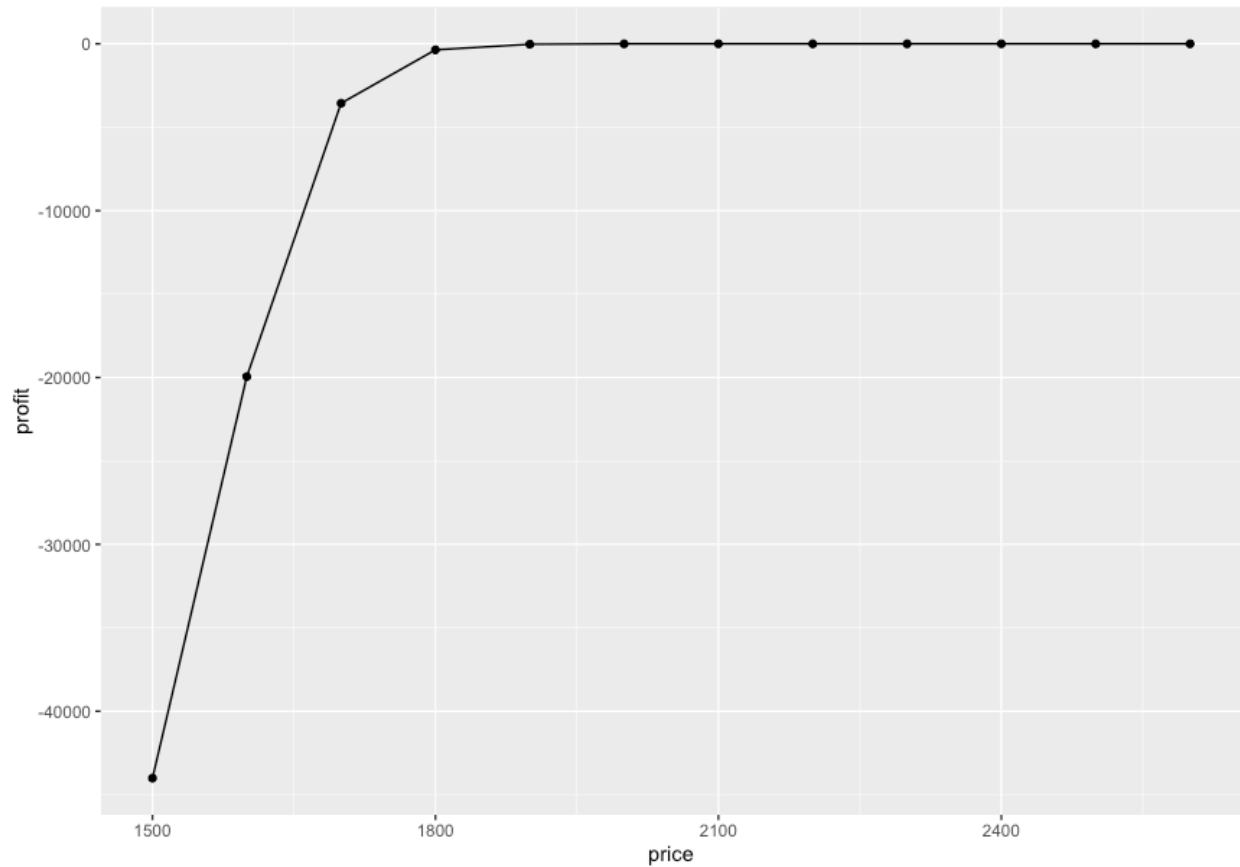| OUTPUTS	VALUES	INTERPRETATIONS
Partworths for each attribute level	Parthworth_intercept - 11 Parthworth_75 – 4.25 Parthworth_screen_85 – 1 Partworth_4k – 8 Partworth_sony – 1.5 Partworth_price – -10	The higher coefficient represents the higher preference. A 75" screen is preferred over an 85" screen. As the coefficient for resolution is 8, a screen resolution of 4k is strongly preferred. As the parthworth value of sony is 1.5, it tells us that sony is preferred. The price coefficient represents my sensitivity to price. As the coefficient is negative, that indicates that an increase in price leads to a decrease in the overall utility or desirability of the option.
Attribute Importance of each attribute	Importance_screen_size – 14.29 Importance_screen_resolution – 35.16 Importance_screen_brand – 6.59 Importance_screen_price – 43.96	Screen size and Brand - with importance of 14.29% and 6.59indicates that this is a less important feature to me as a consumer. Screen resolution - The features are relevant but of less importance as compared to price Price - The importance of 43.96% indicates that it has the highest impact..
Willingness to pay for each non-price attribute level	1 Util – $50 Wtp_screen_size_85 – 50 Wtp_brand_sony – 75 Wtp_resolution_4k – 400	Willingness to pay indicates how much more I'm willing to pay for an 85" screen, Sony brand and 4k resolution respectively. As the values we can see that i am willing to pay for 4k regardless of screen size and brand.
Optimal price	2100	The optimal price of $1200 is the price point that would maximize profit as per the analysis.
Maximum profit	0.45	The maximum profit of $0.45 is the highest profit that can be

		achieved at the optimal price.
Market share associated with optimal price	0.000045	A market share of 0.000045(0.0045%) at the optimal price suggests that at this price point, the television would capture 0.0045% of the market according to our analysis.

Sales as a function of price:

This plot depicts a typical demand curve where sales decrease with increase in television prices.
This graph illustrates a negative correlation between price and sales. Therefore, as the price increases, the number of units sold decreases.

Profit as as function of price:

This plot illustrates the relationship between the price of televisions and the profit generated by sales. As prices increase from the lowest point, profits also increase.

The peak in the curve appears to occur before the price reaches $2100. This is the optimal price point for maximizing profits.

After reaching the optimal level the profits level off and the curve flattens out implying that any further increase in price may not affect the total profit.
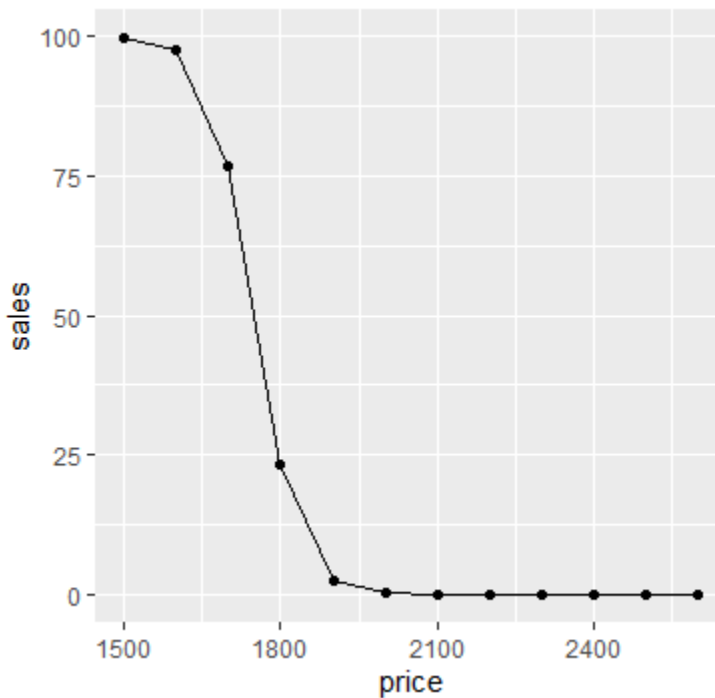
Based on the analysis, it's best not to enter the market with current configuration. We could see that we are capturing a market which is nearly 0.005 percent, which is very less and the profit margin is $0.45. Based on this we cannot survive in the market.

(iv) Deepak Singh

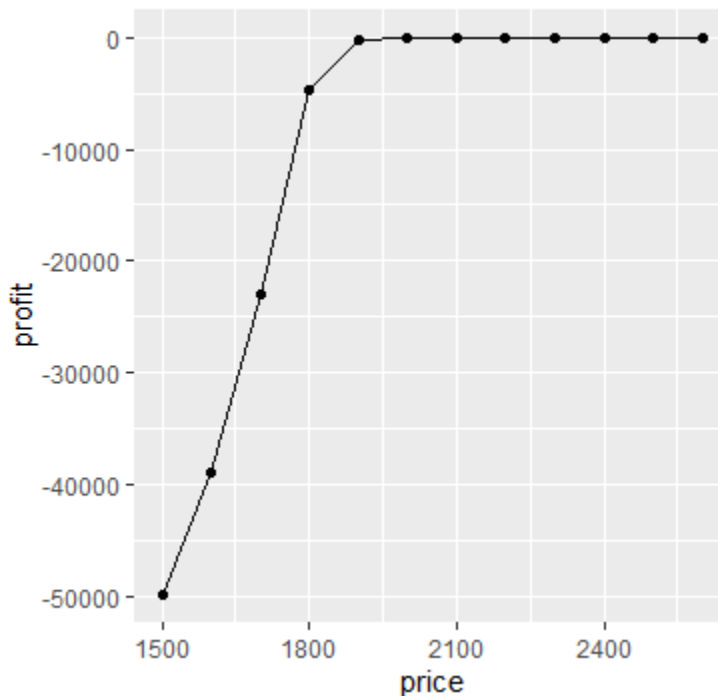| OUTPUTS	VALUES	INTERPRETATIONS
Partworths for each attribute level	Coef_screen_75 –0.5 Coef_screen_85 – 1..37 Partworth_4k – 6 Partworth_sony – 3 Partworth_price – -12	The larger magnitude of a coefficient indicates a greater impact on preference. Accordingly, an 85-inch screen is more desirable than a 75-inch screen. A 4K resolution is favored, highlighting a preference for higher screen resolution. The positive coefficient for the Sony brand suggests a preference for this brand due to its reputation. The negative coefficient for price reflects a sensitivity to cost, indicating that an increase in price leads to a decrease in the overall utility or desirability of the option.
Attribute Importance of each attribute	Importance_screen_size – 4. Importance_screen_resolution – 27.43 Importance_screen_brand – 13.71 Importance_screen_price – 54.86	Screen size - The analysis shows that screen size hold very little relevance compared to other attributes Screen resolution & Brand - The features are very important as per consumer Price - The importance is suggesting that price is of really high importance compared to other attributes
Willingness to pay for each non-price attribute level	1 Util – $41.67 Wtp_screen_size_85 – $57.29 Wtp_brand_sony – $ 125 Wtp_resolution_4k – $ 250	Willingness to pay indicates how much more I'm willing to pay for an 85" screen, Sony brand and 4k resolution respectively. We can clearly see from the result that brand and resolution has high willingness to pay
Optimal price	$2100	The optimal price of $2100 is the price point that would maximize profit as per the analysis.

Maximum profit	$2.25	The maximum profit of $2.25 is the highest profit that can be achieved at the optimal price.
Market share associated with optimal price	0.00022	A market share of 0.00022 (0.022%) at the optimal price suggests that at this price point, the television would capture 0.022% of the market according to our analysis.

Sales as a function of price:

This plot depicts a typical demand curve where sales decrease with increase in television prices. This graph illustrates a negative correlation between price and sales. Therefore, as the price increases, the number of units sold decreases.

Profit as as function of price:

This plot illustrates the relationship between the price of televisions and the profit generated by sales. As prices increase from the lowest point, profits also increase.
The peak in the curve appears to occur before the price reaches $2100. This is the optimal price point for maximizing profits.
After reaching the optimal level the profits level off and the curve flattens out implying that any further increase in price may not affect the total profit.

The comprehensive analysis of the product design suggests that it would be inadvisable to enter the market with the current configuration. The evaluation indicates that certain key attributes of the product may not align well with consumer preferences or market expectations. This misalignment could lead to challenges in gaining a significant market share or achieving competitive advantage. It is recommended to revisit the design elements and consider adjustments that more closely align with consumer needs and market trends. Entering the market without making these necessary modifications could result in suboptimal market performance and may not meet the strategic business objectives.

(v) Kumar Kishalaya

| OUTPUTS	VALUES	INTERPRETATIONS
Partworths for each attribute level	Partworth Intercept → 14.58 Partworth_screen_75 → -2.875 Partworth_screen_85 → 0.875 Partworth_4k → -0.416 Partworth_sony → 5.75 Partworth_price → -8.25	The higher coefficient represents the higher preference. A 85" screen is preferred over an 75" screen. As the coefficient for resolution is negative, a screen resolution of 4k is not preferred. Due to the high positive utility for Sony, the brand is more preferred over others. The price coefficient represents my sensitivity to price. As the coefficient is highly negative, that means with an increase in price, the preferences.
Attribute Importance of each attribute	Importance_screen_size → 20.64 Importance_screen_resolution → 2.29 Importance_screen_brand → 31.65 Importance_screen_price → 45.41	Screen Price - The large coefficient in screen price indicates that this is an important feature to me as a consumer. Screen resolution & Size - The features are relevant but of less importance as compared to screen size. Resolution has the lowest relevance to me. Brand - This coefficient indicates that brand has a strong impact on my preference.
Willingness to pay for each non-price attribute level	1 Util – $60.60 Wtp_screen_size_85 – $53.03 Wtp_brand_sony – $348.48 Wtp_resolution_4k – $-25.25	Willingness to pay indicates how much more I'm willing to pay for an 85" screen, Sony brand and 4k resolution respectively. As the coefficient for Sony is very high, it signifies that the brand is super highly desirable for me as a consumer and I would be willing to pay a lot more. Also, I won't be willing to pay more for 4k resolution.
Optimal price	2100	The optimal price of $2100 is the price point that would maximize

		profit as per the analysis.
Maximum profit	$2252.61	The maximum profit of $2,252.6 is the highest profit that can be achieved at the optimal price.
Market share associated with optimal price	0.22	A market share of 0.22 (22%) at the optimal price suggests that at this price point, the television would capture 22% of the market according to our analysis.

Sales as a function of price:
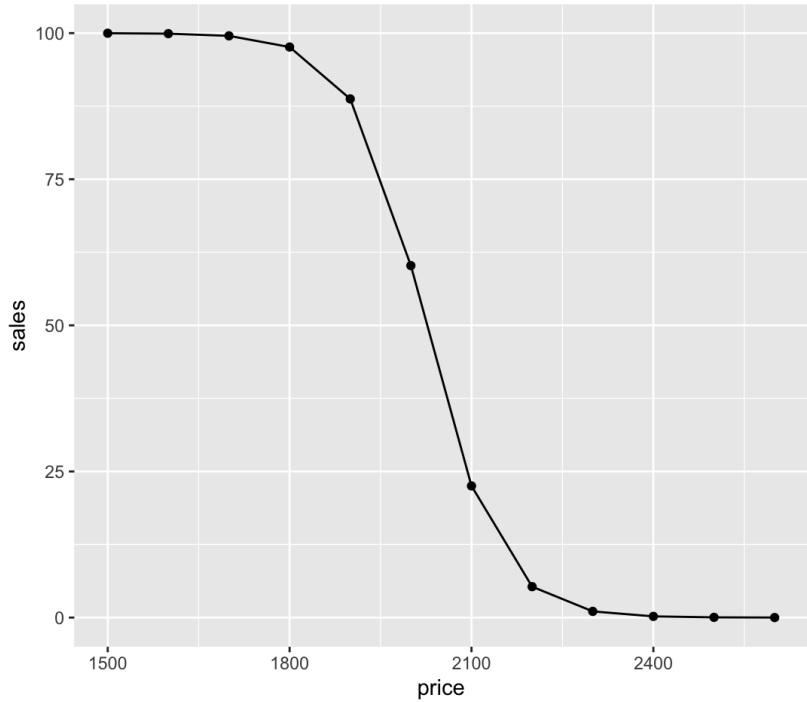
This graph represents a typical demand curve, showing how sales tend to decline as television prices increase. It showcases a negative relationship between price and the quantity sold, indicating that higher prices lead to a decrease in the number of units purchased.

Profit as as function of price:
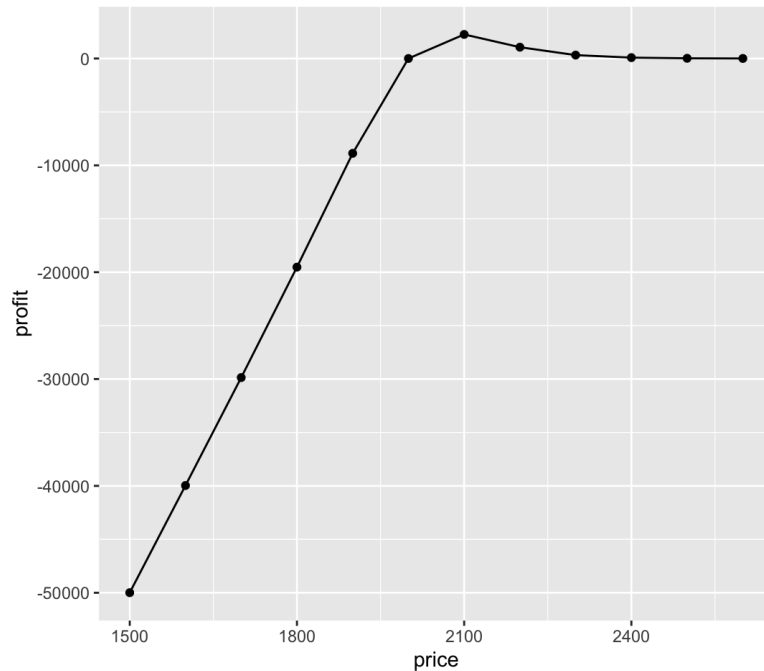
This graph illustrates the relationship between the price of televisions and the profit generated by sales. As prices increase from the lowest point, profits also increase.

The peak in the curve appears to occur when the price reaches $2100. This is the optimal price point for maximizing profits.

After reaching the optimal level the profits level off and the curve flattens out implying that any further increase in price may not affect the total profit.

The comprehensive analysis of the product design suggests that it might be worth exploring the possibility of entering the market with the current configuration. A market share of 22% and a maximum profit of $2252 might be an indication of profitability in the market with the current configuration and can be further explored. .