

Game Theory

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## Abstract

Game theory explores how players circumnavigate different situations in real life. As such, firms have used different aspects of game theory to help them make the best possible decision that favors their business. This paper explores how two competitive firms actively engage the Nash principle to outdo their competitors. It also analyzes how firms with dominant strategy are immune to the changes in the market price. The questions also address the Prisoner's dilemma in the competitive market structure. The last section of the article explores questions regarding why institutions may opt to come into agreement as a mean of making more profit and why some cooperation always decides to cheat even after agreeing with a fellow competitor. The analysis of the company's behaviors shows that companies often break from their agreement as a way of making more profit. Finally, the questions also address cases of why firms opt to use two-part pricing instead of standard pricing.

*Keywords: Nash equilibrium, Prisoner's dilemma, Cheating, Dominant strategy, Marginal Cost*

## Game Theory

**Question 1**

Tampa Tribune's dominant strategy is selling at a high price. According to Sgroi (n.d.), a dominant strategy is a position in which a player maximizes their payoff for any strategy profile of all other players. For instance, when analyzing a Prisoner's Dilemma, Sgroi argues that some strategy often makes some players dominate in the outcome of any decision the opposing player decides to take. In Tampa Tribune's case, selling at a high price is Tampa's dominant strategy because it is the only price that, regardless of what St Petersburg Time decides, does not affect Tampa's dominance in the market. For instance, when both sell at a high price, Tribune gets \$90,000 while St. Petersburg gets \$88,000. Should St. Petersburg change his strategy to low price, Tampa makes \$120,000, and St. Petersburg gets \$54,000.

**Question 2**

Unlike St. Tampa Tribune's, St. Petersburg has no dominant strategy. St. Petersburg can either decide to sell at a high price or low, and they will still not dominate the Tampa strategy. For instance, when both sell at a high price, St. Petersburg gets a profit of \$88,000, while Tampa gets \$90,000. Even though St. Petersburg Times dominates Tampa whenever Tampa sells at a low price, they do not have a dominant strategy as they lose their dominance whenever Tampa shift to high price regardless of St. Petersburg's strategy.

**Question 3**

Tampa Tribune's dominated strategy is low price. According to Carla (n.d.), a dominated strategy includes strategies that a manager would not choose, no matter what their rivals decide to choose. In Tampa Tribune's case scenario, choosing low price affects their dominance; this is

because whenever Tampa chooses low price St. Petersburg seems to enjoy market dominance. For instance, when both choose a low price, St. Makes \$120,000 while Tampa makes \$100,000. When Tampa remain low and St, Petersburg shift to high price, Tampa makes \$54,000 and St. Petersburg makes \$90,000. As such, Tampa cannot choose a low price, no matter what St. Petersburg decides to choose since choosing a low price makes them loose to St. Petersburg.

#### **Question 4**

St. Petersburg has no dominated strategy. As earlier stated, a dominated strategy is a strategy that managers cannot enjoy any advantage over the competitor. Since St. Petersburg has no dominant strategy, they lack dominated strategy. For instance, if St. Petersburg decides to choose low price as its dominated strategies, it would be avoiding trades at a low rice, and it will experience two scenarios. When selling at a high price, they can make a profit of \$90,000 while Tampa \$54,000 when selling at a low price. However, this changes when Tampa decides to sell at a high price as St. will now make \$88,000 against Tampa's \$90,000. The same applies when St. Petersburg ought to go with a high price as a dominated strategy.

#### **Question 5**

The St. Petersburg and Tampa newspaper pricing do not relate to the Prisoner's dilemma. According to Kuhn (2019), in a prisoner's dilemma, the players are in the dilemma of deciding as such, they tend to choose the best possible scenario that will not be affected by the other player's choice. However, the same outcome does not apply in the newspaper pricing since both Tampa and St. Petersburg lack a scenario in which if they both choose, they remain unaffected by choice of the competitor. Since only Tampa has search liberty, this is not a prisoner's dilemma.

**Question 6**

According to Osborne (2009), the term Nash equilibrium refers to a stable state of a system in which no participant gains in changing strategies as long as the other participant remains constant. As such, the newspaper pricing needs to have a situation in which none of the participant gains anything as long as the other remains constant. In our case, Nash equilibrium occurs in the cell where both Nash and St. Petersburg sells at a high price. In this cell, Tampa profits are \$88,000, while St. Petersburg is \$90,000. The cell represents Nash equilibrium since assuming Tampa remains constant, any change St. Petersburg tries to make they do not gain since shifting when they shift to low price, they make \$54,000, which is less than \$90,000. Similarly, should Tampa shift to the low price, they shift from \$88,000 to \$54,000 no gain? However, the players have no dominant strategy equilibrium. According to Maschler, Solan, and Zamir (2013), dominant strategy equilibrium refers to a situation in which each player has a dominant strategy, but, in our case, only Tampa has a dominant strategy.

**Question 7**

According to Carla (n.d) in Nash equilibrium, strategic stability refers to a condition in which a small change in the probability of one player makes the player who did not change to lack a better strategy in the new circumstance while the payer who changed has a less strictly worse strategy. A stable cell is a cell where the opposing firm will not make a profit should they opt to change, thus forcing them to remain in the table of the opposing firm. Therefore, the stable strategy is for each party to sell at a low price.

**Question 8**

The two firms tend to benefit if they both sell at a high price. At a high price, Kaiser will make \$400 per month. However, should Kaiser decide to cheat and start selling at a low price, they will make a monthly profit of \$525. As such, Kaiser will make a monthly benefit of \$125 ( $\$525 - \$400$ ) and \$250 for the two months of cheating.

**Question 9**

When Kaiser cheats, the firm makes a profit of \$525; however, should Alcoa detect and shift to low price, at this point, profit will shift from \$525 to \$273. Therefore, the monthly cost of punishment for Kaiser is  $\$525 - \$273 = \$252$ . For the two months, the firm will have lost a profit of \$502 ( $252 \times 2$ ).

**Question 10**

From the analysis, Kaiser makes a high profit in two scenarios, and that is if they cooperate and sell at a high price (Kaiser \$400 and Alcoa \$500), and when selling at a low price Alcoa sells at a high price (Kaiser \$ 525 and Alcoa \$ 200). However, both firms want to make a profit, therefore, when Kaiser sells at a low price, Alcoa shifts to a low price (Kaiser \$273 and Alcoa \$ 250) making additional \$50 from there sales. However, selling at a low price does not favor both parties as Kaiser and Alcoa know they can gain much by cooperating. As such, Kaiser will have no option but to cooperate.

**Question 11**

As a new manager of a golf course price, the clubs need to use two-part pricing since the firm enjoys the monopoly and because it will provide the firm with more profit. In economics,

the optimum price is when the marginal cost (MC) is equal to marginal revenue (MR) (Optimum price=MC=MR). Therefore, to determine the optimum price, it involves dividing the total cost by the change in quantity, which is equivalent to the marginal cost, which equals to optimum price.

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