Econ 101 Winter 2012 Professor Dan Friedman
Managerial Economics Solutions to HW #4

Part I:

Chapter 11:

13. Charge \$500 for a bundle containing skis and bindings. All consumers will purchase a bundle at this price, so your total profits from this strategy are (\$500)(60) - \$30,000 = \$0.

15. Set P = MC to obtain 3 - .5Q = 1 and solve to obtain the optimal package size, Q = 4 units.

18. Probably the best you can do in this instance is charge different per-unit prices on weekends and weekdays. The optimal decision on weekends is determined by $15-.002Q=2$ (MR = MC). Solving yields Q = 6,500. The optimal price on weekends is thus P = 15 – .001(6500) = \$8.50. The optimal decision for weekdays is determined by $10-.002Q=2$. Solving yields Q = 4,000. The optimal weekday price is thus P = 10 –.001(4000) = \$6.

Part II:

1. $q_H = 100 - 2p_H$ (Demand function for home market)

$q_F = 200 - 5p_F$ (Demand function for foreign market)

$C(q_t) = 20 + 10q_T$, and $q_T = q_H + q_F$

(a) The total profit function is

$\Pi = TR - TC = p_H q_H + p_F q_F - (20 + 10q_T)$

Set MR_H = MC and MR_F=MC

$P_H = 50 - .5q_H$ (by rearranging demand function)

$TR_H = P_H * q_H = (50 - .5q_H) * q_H = 50q_H - .5q_H^2$

$MR_H = 50 - q_H$ (by taking derivative of Total Revenue with respect to quantity)

$P_F = 40 - .2q_F$ (by rearranging demand function)

$TR_F = P_F * q_F = (40 - .2q_F) * q_F = 40q_F - .2q_F^2$

$MR_F = 40 - 0.4q_F$ (by taking derivative of Total Revenue with respect to quantity)

MC = 10

$50 - q_H = 10 \rightarrow q_H = 40$

$40 - 0.4q_F = 10 \rightarrow q_F = 75$

The Corresponding Prices Level will be:

$p_H = 50 - 0.5q_H = 30$

$p_F = 40 - 0.2q_F = 25$

(b) $p = p_H = p_F$

The profit function can be written as a function of *p* and maximized as follows:

$$\Pi = p\,(q_H + q_F) - 20 - 10(q_H + q_F)$$

$$= p\,(100 - 2p + 200 - 5p) - 20 - 10(100 - 2p + 200 - 5p)$$

$$= 300p - 7p^2 - 20 - 3000 + 70p$$

$$\partial \Pi / \partial p = 0 \rightarrow p = 26.4$$

(c) The maximum amount of willingness to pay is the difference between the present values of profits streams under part (a) and the profit under part (b)

$$\Pi_a = p_H q_H + p_F q_F - 20 - 10(q_H + q_F)$$

$$= 30 \times 40 + 25 \times 75 - 20 - 10 \times (40 + 75)$$

$$= 1,905$$

$$\Pi_b = 300p - 7p^2 - 20 - 3000 + 70p$$

$$= 300 \times 26.4 - 7 \times 26.4^2 - 20 - 3000 + 70 \times 26.4$$

$$= 1,869.28$$

Remember that the present value of a constant profit stream *c* at interest rate *r* is *c/r*. Assuming the interest rate is r = 10%, the willingness to pay is:

$$\frac{\Pi_a - \Pi_b}{r} = \frac{\Pi_a - \Pi_b}{0.1} = (1,905 - 1,869.28) \times 10 = 357.2$$

2. (a) Maximize profits by setting:

$MC = 400$

$10Q_F = 400$

$Q_F = 40$

$P_F = \$400$

(b) Since there is a competitive market for the intermediate good, the transfer price for frames should be the market price, $P_F = \$400$. If the transfer price were higher, the downstream division would rather buy the cheaper frames of equal quality on the market, and the frames division wouldn't have any business. Also, the frames division would overproduce, building frames whose marginal cost was above the true opportunity cost of $400. If the transfer price were lower, the firm would not maximize its profits since it is selling below what it could be getting (i.e., there is an opportunity cost of selling the frames beneath the market price). Also, the frames division would underproduce, not building frames whose marginal cost was below the true opportunity cost of $400. If the frames division produces more or less than the downstream division needs, the extra frames can be bought or sold in the competitive market.

(c) How would your answer change if the market for frames disappeared? This is where you use the textbook formulation.

From the final demand equation:

$$P = 1{,}150 - 2.5Q$$
$$MR = 1{,}150 - 5Q$$

Without the market for frames, your firm maximizes profits by setting net marginal revenue (NMR) to marginal cost to find quantity and transfer price for frames.

$$NMR = 1{,}150 - 5Q - 8Q = 10Q = MC$$
$$Q = 50$$
$$P_F = 10(50) = \$500$$

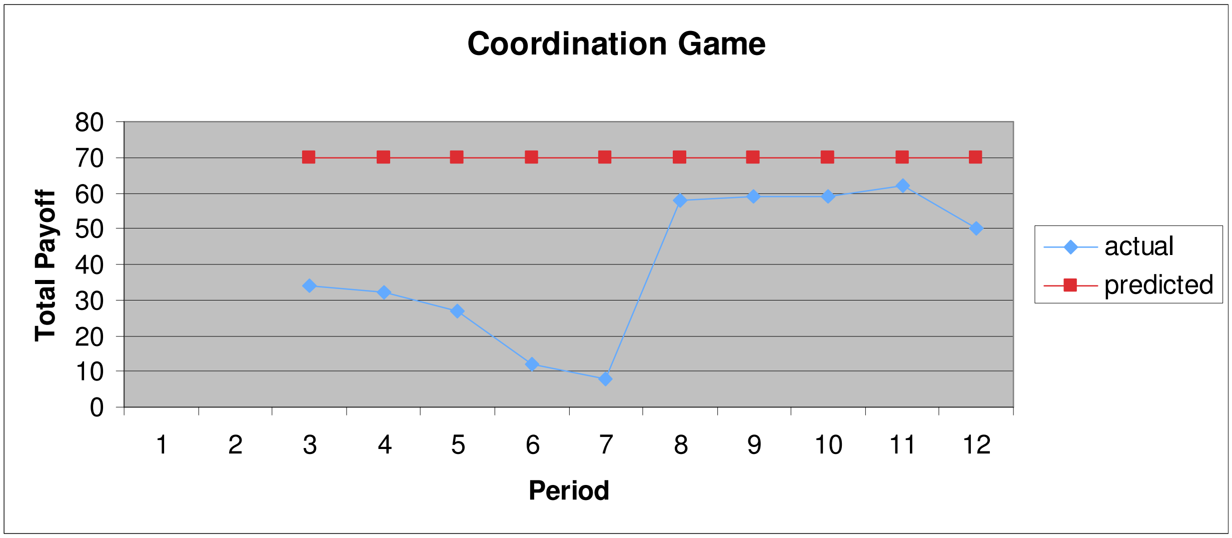
Part III:

(a). There are 10 Nash equilibria in the coordination game. In each one, every member of the group chooses the same number, e.g., 7. The equilibria are Pareto ranked; only the NE under which everybody chooses 10 is efficient.

There is only one Nash equilibrium for the motivation game. In Nash equilibrium every member of the group chooses 0, because it is a dominant strategy that always earns the player 4 more than choosing 1. The Pareto optimal outcome (not a NE in this game) is when everybody chooses 1.

(b) Graph total payoffs (ΣL_i) on the vertical access and the period on the horizontal axis. For the coordination game, the predicted Nash Equilibrium is for $L_i = 10$ in each group. This prediction is represented by a total (7 groups x 10) horizontal line at 70.

The graph for the motivation game differs among groups and group sizes.



(c) Comment on the relation between predicted and actual data.

For the coordination game:
From period 0 through 7, the Pareto efficient Nash equilibrium wasn't achieved when there is no talk among the members in the same group. In period 8, 9, 10 and 11 when talk is allowed, the efficient NE was nearly achieved. The few people who had "a score to settle" kept the total payoff from reaching the maximum of 70 for the whole class. In this game, players have common interests. Thus, the direct communication between players helped raise total payoffs to near the Pareto efficient Nash equilibrium.
For the motivation game:
The Nash equilibrium (everyone chooses 0) was not achieved in any period. On the other hand, it's difficult to get the Pareto optimal outcome since in this game the players have a personal interest diametrically opposed to the common interest. Actual outcomes were in between these two extremes and tended to be much closer to NE in most periods. Allowing talk helped at first, but not nearly as much as in the coordination game. Only when the group Z option (move to a group where x=1 was enforced) was an efficient (Pareto optimal) outcome achieved.