

## IEOR 153 Fall 2004 Practice Final Solutions

NOTE: The answers provided here aren't the be-all and end-all of possible answers, particularly for the essay questions.

1.

- a. False. Small demand uncertainty leads to greater importance of a long term forecast, and high transportation costs lead to a greater importance of economies of scale, both of which suggest a push strategy makes more sense than a pull strategy. (123-4)
- b. True. (252)
- c. True. (218)
- d. False. Postponement strategies lower inventory and handling costs, but they often require additional facilities. (224)
- e. False. High option levels involve a large amount of commodity that the supplier must produce in case the buyer decides to exercise the option, but they buyer has a choice, so the inventory risk for the supplier is high. (189)
- f. False. Direct shipment is the most appropriate strategy for a product that is perishable. (134)
- g. False. Quick response partnerships make it easier for a supplier to make accurate forecasts and respond to changing market conditions, because the supplier receives POS data. (153-4)
- h. True. (reading)
- i. True. (123-4)
- j. True. (136)
- k. False. Postponement worked for HP, but in general it depends on the tradeoff between savings in inventory costs and the upfront investment and potential increase in production costs as a result of process redesign. (224)
- l. True. (189)
- m. False. You need a high volume so you can ship to stores with full truckloads. (134-5)
- n. True. (251)
- o. False. VMI eliminates the need for the retailer to manage their inventory. (153-4)
- p. True. (183)
- q. True. (no specific page)

2.

- a. The three approaches are long term contracts, option contracts and spot purchasing. The appropriate strategy depends both on the type of product and the risk the firm is willing to take. With a product where the demand and market price are predictable, a long-term contract makes the most sense, since the product has the cheapest per unit price that way, and there is little risk, either of excess inventory or of the price changing in the future. If the demand is uncertain, it would make more sense to have an option contract with a low level

of initial commitment to minimize the chance of buying too much (inventory risk). If in addition to the uncertain demand, the market price is volatile, an option contract with a high level of initial commitment may make more sense, because the price risk will be less (although the inventory risk will be higher). Spot purchasing is only needed if the sum of all the commitments plus option levels is insufficient to cover demand. The buyer would love to have option levels as high as infinity, but they have to be capped somewhere to minimize the supplier's risk, of course. (189).

- b. The decision to use VMI or QR is often related to market forces. In VMI, the supplier owns the inventory and pays inventory costs, which has obvious benefits to the retailer. If the retailer is a giant such as Wal-Mart, they will have the power to dictate such an arrangement – the supplier will have no choice, since they do not want to lose Wal-Mart as a customer. Even so, VMI may still be beneficial to a supplier, because it can utilize risk pooling / economies of scale and manage inventories for many of its customers at once, lowering its costs. QR may be more beneficial if it is crucial to synchronize production with actual sales, perhaps in more of a pull situation such as computers. QR also helps increase forecast accuracy better, which could be beneficial in such products where demand fluctuates considerably. (153-6)
- c. Customized Pricing distinguishes customers by their price sensitivity. For example, there could be different prices for private customers vs. businesses, or mail-in rebates for customers who will take the trouble to save a small amount of money. Mail in rebates in particular address the conflict of interest between retailers (who want to order just enough to satisfy demand and to charge a price high enough to make the most profit but not charge so much that the customers think it's too expensive) and suppliers (who want the retailers to order as much as possible for as high a price as possible). The rebate enables the retailer to charge a higher price than they would otherwise, since customers whose thresholds are between the price with and without the rebate will buy the product and utilize the rebate. The rebate also enables the retailer to order more than they would otherwise, since they'll be able to sell more. Meanwhile, the supplier gets to sell more. Dynamic pricing changes prices over time in response to demand variability and/or seasonality, as opposed to a fixed-price scheme. This addresses the risk of the retailer charging too much or too little for a product, and also helps resolve the issues of not being able to produce enough to satisfy demand.

3.

(a) Postponement

$$\text{Product (Revenue - Cost)} = 52[(130-65)*100 + (165-105)*120] = 712,400$$

Safety Stock:

$$\text{G-50: } 2.05*10*(0.5^{0.5}) = 14.5$$

$$\text{G-100: } 2.05*20*(0.5^{0.5}) = 29$$

Optimal Order Quantity =  $\text{Sqrt}(2*148*2*220/1) = 360.9$

This is 1.64 weeks worth of demand, so we make  $52 / 1.64 = 31.7$  orders per year

Fixed Cost =  $148*2*31.7 = 9,383$

Average Inventory =  $43.5 + 360.9/2 = 223.95$ , so annual inventory cost =  $31.7*223.95 = 7,099$

Overall Profit:  $712,400 - 9,383 - 8,237 = 695,918$

(b) Downward substitution

Product (Revenue – Cost) =  $52[(130-95)*100 + (165-95)*120] = 618,800$

Safety Stock:

Overall Std Dev =  $\text{Sqrt}(10^2 + 20^2) = 22.36$

So safety stock =  $2.05*22.36*(0.75^{0.5}) = 39.7$

Optimal Order Quantity =  $\text{Sqrt}(2*148*220/1) = 255.2$

This is 1.16 weeks worth of demand, so we make  $52 / 1.16 = 44.83$  orders per year

Fixed Cost =  $148*44.83 = 6,635$

Average Inventory =  $39.7 + 255.2/2 = 167.3$ , so annual inventory cost =  $44.83*167.3 = 7,500$

Overall Profit:  $618,800 - 6,635 - 7,500 = 604,665$

- (c) Customers would end up just buying the G-50 instead of the G-100, which would hurt profit, because the “G-50” (a G-100 in reality) has a lower selling price than the G-100, but an equal manufacturing cost. One way to address this problem would be to eliminate the G-50 altogether. This may hurt some sales in the market of people who don’t want to pay the higher price for the G-100, but it will save production costs, and enable the company to charge less for the G-100, meaning that customers may end up buying the G-100 after all.

4.

- (a) Superstores want to market themselves as stores that have the largest possible selection of books, and want customers to be able to walk into their store and come out with the book they were looking for. Without a distribution center, the lead times for products are reduced, and there is less chance of a stockout.
- (b) On line retailers are establishing their own distribution centers when they get bigger, because if they don’t their suppliers’ capacities have a large effect on their

service levels. A prime example is amazon.com – before they established their own warehouses, their supplier, Ingram Book, was often running out of stock. Using Ingram reduced Amazon's inventory costs, but also hurt their profits. As demand increased, it became possible for Amazon to aggregate their own demand and utilize economies of scale, rather than utilizing their suppliers' economies of scale.

- (c) Some ideas: MBD could use the internet to facilitate ordering. They could ship directly to stores, establish long-term partnerships to hedge the risk of lower profit margins. They could also expand into music and other products to accommodate superstores and other on-line retailers. And of course, they could use POS data to help forecast demand better, and possibly move towards a pull distribution strategy.