**Assignment 2 Yichen Wang (260761601)**

The data associated with this part of the case can be found in two tabs, “Part 2 (wholesale)”

and “Part 2 (revenue sharing),” of the spreadsheet associated with this case. It refers to the

simulations carried out on the phone charger described in the case, which costs $2.50 to

produce and retails for $10 (both prices are included in the spreadsheet). The file also contains

simulated demand realizations for 300 months. First, assume that there is no salvage value for

the phone chargers at the end of each month.

**1. We consider and simulate the supply chain under a wholesale price contract. As**

**mentioned, we use a retail price of $10, a unit production cost of $2.50, and a (monthly)**

**demand that is normally distributed with mean 1,000 and standard deviation 200. The**

**demand realizations are given in the spreadsheet.**

1. **Under a wholesale price of $5, what is the retailer’s optimal order quantity?**

Cu = 10-2.5 = 7.5; Co = 10-0 = 10;

Critical fractile = cu/(cu+co)= 0.428571429

Quantity ordered = NORMINV(0.429,1000,200)=963.99

Therefore, should order 964.

1. **Under a wholesale price of $5, compute the expected profit of the retailer and of the supplier.**

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1. **Vary the value of the wholesale price between $2.50 and $10 and find the value that yields the highest possible profit for the supplier. What is this wholesale price value?**



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1. **For the wholesale price value obtained in Part 1c, what is the total expected profit of the supply chain (i.e., the sum of the retailer’s profit and the supplier’s profit)?**



**2. The supply chain’s *First-Best* profit is defined as the profit under the ideal situation**

**where the entire supply chain is owned by one party, i.e., the centralized supply chain.**

1. **What is the supply chain’s optimal order quantity?**

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Therefore quantity is around 1135

1. **What is the First-Best expected profit?**



1. **How does the retailer’s order quantity (from Part 1a) compare to the First-Best’s optimal order quantity (from Part 2a)? Why is it the case? Carefully justify your answer.**

The retailer’s order quantity from part 1a (964) is lower than the First-Best’s optimal order quantity (1135). This is because the profit margin is much higher in the First-Best’s case since there’re no retailers sharing the profit, so supplier is more willing to supply more quantity as the expected return will be higher.

1. **How does the total expected profit (from Part 1d) compare to the First-Best expected profit (from Part 2b)? What is the relative difference between these two values?**

The total expected profit from Part 1d is lower than the First-Best expected profit. The supply chain’s profit under the wholesale price contract is 21.17% lower than the first-best profit.

**3. (Optional) Re-solve questions 1 and 2 using a salvage value of $1. How does it affect the results? Please elaborate.**

Wholesale: quantity ordered = 756

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First-Best: quantity ordered = 1193

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When there is salvage value, the quantity ordered in wholesale strategy decreases dramatically while that for First-Best strategy increases a bit. However, the total supply chain profit does not change much for both strategies and the profit difference is similar to previous scenario. The reason why the quantity ordered reduced for wholesale strategy is because the profit margin is reduced even further, making the action holding inventory even riskier than before.

**4. We now consider using a revenue sharing contract. We start with a wholesale price *w***

**of $0.75 and a revenue share percentage *y* of 0.7.**

1. **What is the retailer’s optimal order quantity? What can you say on this value?**

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the quantity ordered is the same as that in the First-Best strategy.

1. **Compute the retailer’s expected profit and the supplier’s expected profit under the above revenue sharing contract. What can you conclude?**

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1. **When comparing the wholesale price contract to the revenue sharing contract, who benefits? Justify your answer.**

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When comparing the two strategies, retailer benefits from the revenue sharing while the supplier does not.

**5. (Optional) In Part 4b, you calculated the expected profit earned by the supplier and by**

**the retailer. In some settings, to incentivize the retailer to sign on, the supplier needs to**

**guarantee a minimum expected profit level to the retailer. Find the wholesale price *w***

**and the revenue share percentage *y* that maximize the supplier’s expected profit while**

**ensuring the retailer makes at least as much as under the wholesale price contract (see**

**Part 1b).**

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**6. (Optional) In a buyback contract, the supplier does not receive a share of the retailer’s**

**revenue. Instead, the supplier offers to buy back any unsold unit from the retailer (at a**

**discount) at the end of the selling period. Implement such a contract in this context.**

**What is the optimal buyback price? How does this contract perform relative to the**

**wholesale price contract and relative to the revenue sharing contract?**

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Supplier benefit more from Buyback than the wholesale and revenue sharing contract, but the total supply chain profit reduces a lot.