

Beer Transportation Game

You are the logistics manager of a beer brewer and have to make transport mode decisions: Either ship the volume from Brussels to London using road trips every day, or alternatively, use a train that operates on Monday, Wednesday, and Friday. Road transport can ship any flexible volume and rail transport requires the same fixed quantity in every delivery. Evaluate your decisions by simulating the impact on the total logistics costs and emissions.

The simulation works as follows:

At the beginning of every day, you receive shipment from road or rail transport and replenish your inventory. Then, the demand is realized by throwing three dices. If the on-hand inventory is larger than demand, excessive stock will be kept to the next period with a holding cost; if the on-hand inventory is less than demand, a stock-out occurs and unmet demand will be backordered to the next period with a stock-out penalty cost. Finally, you make a replenishment order following the base-stock policy¹, which will arrive at the beginning of the next day. The parameters are summarized in Table 1. Simulate one week and compare the performance of using road transport with the performance of using rail transport. Use the same demand in order to have a fair comparison.

Table 1: A list of parameters used in the game

Description	Value	Unit
Cost of road transport	400	EUR per FCL
Cost of rail transport	350	EUR per FCL
Carbon emissions of road transport	0.72	ton per FCL shipment
Carbon emissions of rail transport	0.20	ton per FCL shipment
Unit inventory holding cost	136	EUR per FCL per day
Unit inventory stock-out penalty cost	2584	EUR per FCL per day
Mean of daily demand at the DC	10.5	FCL
Standard deviation of daily demand	3	FCL

¹ You may find more descriptions on the base-stock policy in the file "BeerTransportationGame"

Table 2: Simulation sheet when using road transport to ship freight.

Week day	Start inv (FCL)	Receive from road (FCL)	Inv before demand (FCL)	Demand (FCL)	Inv after demand (FCL)	Order via road (FCL)	Transp cost (EUR)	Inv Cost (EUR)	Total cost (EUR)	Emissions (ton)
Mon	-	-	15							
Tue										
Wed										
Thu										
Fri										
Sat										

Average total transportation cost per day is: _____

Average total inventory cost per day is: _____

Average total logistics cost per day is: _____

Average total carbon emission per day is: _____

The number of days without a stock-out at the DC is: _____

Table 3: Simulation sheet when using rail transport to ship freight

Week day	Start inv (FCL)	Receive from rail (FCL)	Inv before demand (FCL)	Demand (FCL)	Inv after demand (FCL)	Order via rail (FCL)	Transp cost (EUR)	Inv Cost (EUR)	Total cost (EUR)	Emissions (ton)
Mon	-	-	15			21				
Tue										
Wed										
Thu										
Fri										
Sat										

Hint: The expected demand of two days is 21 FCL. You want to make your total shipment the same as the total demand, and hence ship 21 FCLs every time the train operates. No base-stock policy is applied to control rail shipments here.

Average total transportation costs per day is: _____

Average total inventory costs per day is: _____

Average total logistics cost per day is: _____

Average total carbon emission per day is: _____

The number of days without a stock-out at the DC is: _____

Please design your strategy to combine both road and rail transport.

Table 4: Simulation sheet when use both road and rail transport to ship freight

Week day	Start inv (FCL)	Receive from road (FCL)	Receive from rail (FCL)	Inv before demand (FCL)	Demand (FCL)	Inv after demand (FCL)	Order via road (FCL)	Order via rail (FCL)	Transp cost (EUR)	Inv Cost (EUR)	Total cost (EUR)	Emissions (ton)
Mon	-	-	-	15								
Tue												
Wed												
Thu												
Fri												
Sat												

Hint: You want to first fix the shipment volume in rail transport, and then use the base-stock control to decide the shipment volume in road transport every day.

Average total transportation cost per day is: _____

Average total inventory cost per day is: _____

Average total logistics cost per day is: _____

Average total carbon emission per day is: _____

The number of days without a stock-out at the DC is: _____