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ISMT E-130 – Spreadsheets Models for Mangers

Course Project

###### HOTDOG Project

Reference

## Overview

While the HOTDOG model appears fairly simple from a user standpoint, there are many intricacies for the person who will maintain the model. If any additions or deletions of parameters, input data streams, functions, formulas, or named ranges are warranted, it is necessary to understand the style and design of the model, to include naming conventions used, and the formulas and functions.

# Model Style and Design

First and foremost, this model was designed around fidelity, usability, and maintainability. While the first aspect listed is dependent on many factors, the latter two are achieved by keeping your model simple. The first way this was accomplished was by using the most meaningful names for all of the parameters, data streams, named ranges, and worksheet names.

The seven worksheet names used were, in order, “Inputs”, “Parameter”, “OrderPlan”, “OrderFulFill”, “AllBeefHD”, “AllMeatHD” and “HDProfits”.

All of the names defined in HOTDOG workbook are given below along with their cell references.

|  |  |
| --- | --- |
| CattlePurchaseSchedule | =Inputs!$C$6:$N$6 |
| HogsPurchaseSchedule | =Inputs!$C$7:$N$7 |
| CurInvDay1 | =Inputs!$C$40:$N$63 |
| CurInvDay2 | =Inputs!$C$64:$N$87 |
| CurInvDay3 | =Inputs!$C$88:$N$111 |
| CurInvDay4 | =Inputs!$C$112:$N$135 |
| CurInvDay5 | =Inputs!$C$136:$N$159 |
| ForecasePriceAllBeefHD | =Inputs!$C197:$N197 |
| ForecasePriceAllMeatHD | =Inputs!$C198:$N198 |
| InventoryPlan | =Inputs!$C$161:$N$161 |
| Orders | =Inputs!$C$12:$N$35 |
| Products | =Inputs!$B$12:$B$35 |
| SalesAllBeefHD | =Inputs!$C$34:$N$34 |
| SalesAllMeatHD | =Inputs!$C$35:$N$35 |
| SteerYield | =Inputs!$C$193 |
| FillFirst | =Parameter!$C$31 |
| FillSecond | =Parameter!$C$32 |
| FillThird | =Parameter!$C$33 |
| Slope | =Parameter!$C$4:$C$27 |
| Yintercept | =Parameter!$D$4:$D$27 |
| PAD | =Parameter!$E$4:$E$27 |

|  |  |
| --- | --- |
| Grade | =Parameter!$F$4:$F$27 |
| Yield | =Parameter!$G$4:$G$27 |
| Shrinkage | =Parameter!$H$4:$S$27 |
| Today\_Start\_Num | =Parameter!$B$4 |
| OrderPlan | =OrderPlan!$C$5:$N$26 |
| OrderPlanDay2 | =OrderPlan!$D$5:$D$28 |
| Production | =OrderPlan!$C$39:$N$62 |
| CurrentDayStartValue | =OrderFulFill!$B$4 |
| SecondDayStartValue | =OrderFulFill!$B$28 |
| ThirdDayStartValue | =OrderFulFill!$B$52 |
| FourthDayStartValue | =OrderFulFill!$B$76 |
| FifthDayStartValue | =OrderFulFill!$B$100 |
| FilledInvP1 | =OrderFulFill!$D$4:$O$123 |
| AllBeefDay1 | =AllBeefHD!$D$6:$D$125 |
| AllBeefInventory | =AllBeefHD!$D$6:$O$125 |
| AllBeefMix1 | =AllBeefHD!$G$132:$G$211 |
| AllBeefMix2 | =AllBeefHD!$J$132:$J$211 |
| AllBeefMix3 | =AllBeefHD!$M$132:$M$211 |
| AllBeefMix4 | =AllBeefHD!$P$132:$P$211 |
| AllBeefMix5 | =AllBeefHD!$S$132:$S$211 |
| AllBeefMix6 | =AllBeefHD!$V$132:$V$211 |
| AllBeefMix7 | =AllBeefHD!$Y$132:$Y$211 |
| AllBeefMix8 | =AllBeefHD!$AB$132:$AB$211 |
| AllBeefMix9 | =AllBeefHD!$AE$132:$AE$211 |
| AllBeefMix10 | =AllBeefHD!$AH$132:$AH$211 |
| AllBeefMix11 | =AllBeefHD!$AK$132:$AK$211 |
| AllBeefMix12 | =AllBeefHD!$AN$132:$AN$211 |
| BeefPriorities | =AllBeefHD!$C$132:$C$211 |
| AllMeatRowNumb | =AllMeatHD!$B$6:$B$125 |
| AllMeatInventory | =AllMeatHD!$D$6:$O$125 |
| AllMeatMix1 | =AllMeatHD!$G$132:$G$211 |
| AllMeatMix2 | =AllMeatHD!$J$132:$J$211 |
| AllMeatMix3 | =AllMeatHD!$M$132:$M$211 |
| AllMeatMix4 | =AllMeatHD!$P$132:$P$211 |
| AllMeatMix5 | =AllMeatHD!$S$132:$S$211 |
| AllMeatMix6 | =AllMeatHD!$V$132:$V$211 |
| AllMeatMix7 | =AllMeatHD!$Y$132:$Y$211 |
| AllMeatMix8 | =AllMeatHD!$AB$132:$AB$211 |
| AllMeatMix9 | =AllMeatHD!$AE$132:$AE$211 |
| AllMeatMix10 | =AllMeatHD!$AH$132:$AH$211 |
| AllMeatMix11 | =AllMeatHD!$AK$132:$AK$211 |
| AllMeatMix12 | =AllMeatHD!$AN$132:$AN$211 |
| CostAllBeefHD | =HDProfits!$C$7:$N$7 |
| CostAllMeatHD | =HDProfits!$C$13:$N$13 |
| CostPerLbAllBeefHD | =HDProfits!$C$9:$N$9 |
| CostPerLbAllMeatHD | =HDProfits!$C$15:$N$15 |
| ProdAllBeef | =HDProfits!$C$8:$N$8 |
| ProdAllMeat | =HDProfits!$C$14:$N$14 |
| SalesAllBeefHD | =HDProfits!$C$22$N$22 |
| SalesAllMeatHD | =HDProfits!$C$27:$N$27 |
| SalesPerLBAllBeefHD | =HDProfits!$C$23:$N$23 |
| SalesPerLBAllMeatHD | =HDProfits!$C$28:$N$28 |

**Model Design Details**

HOTDOG model is constructed so that the final results can be seen in (HDProfits sheet), which contains the forecasted costs, sales and profits. The model is constructed on the ripple principle, which means that changes in one place in the model ripple through to the entire model. In this model the 12 days we are modeling refers to the current day and the next 11 days.

**Inputs and Parameters**

All the three input streams are in the “Inputs” worksheet and is given a yellow background color. All the parameters are defined in the “Parameter” worksheet. Any parameter can be changed independently because there are no formulas attached to these cells. . However the parameter blocks, which are named ranges such as the Slope, have an absolute cell address. If the block were changed in size the address attached to the block would need to be changed as well. This change would be accomplished by the following commands in Excel:

* Insert
* Name
* Define
* Scroll through the names to find the block being changed
* On the line under Refers to, Change the address to match to include the changes being made

The parameters are grouped into blocks primarily by category. Linear regression parameters (Slope, Yintercept and pad) are available for each type of meat. This will be useful in calculating forecasted orders from firm orders for the future. Yield for each meat type and Shrinkage values for each meat type and for 12 days are available. These two will be used in deriving the production schedule from the planned orders. Order Fulfillment and Product Substitution policy parameters are available. These two determine which type, grade and how many days old meat are used to fulfill the orders and to make the hotdogs.

**Forecasting Orders**

In order to compute the Order Plan, forecasted order should be derived first. The forecasted order is derived from the firm order by using the following linear regression equation. Forecast Order = Firm Order \* Slope + Yintercept + Padding. The forecast order uncertainty is handled by the model by adjusting the padding percentage. The forecast is applied only to the future 11 days and for the current day it is the same as the firm order. Order Plan is the sum of the planned orders of all available meat types for each of the 12 days.

Inventory Plan is the sum of the meat types available from the inventories in the Inputs worksheet. Production Schedule for each day is derived from the cattle purchase schedule by applying yield and grade parameters for the corresponding days. The sum of production schedule for each meat type is computed for the 12 days. Total meat available is the sum of inventory plan and production schedule for each of the 12 days. Finally meat available for making hotdogs is calculated as a percentage by finding the difference between order plan and the total available meat. The main formula used for this step is: =OFFSET('HotDog-scenario1(rev19).xls'!CattlePurchaseSchedule,0,D$32-1,1,1) \* Parameter!Grade \* Parameter!Yield for computing production schedule.

**Fulfilling Orders**

Order Fulfillment is the process which determines the order and the quantity of the meat used for making hotdogs. This process uses the Order Fulfillment policy and Substitution policy that are defined as parameters to the model. So the main output of this model, profits can be varied by changing these policy parameters. The order fulfillment process can take typically three passes to be completed. In the first pass, the inventory and the production schedule for the corresponding day is taken and shrinkage parameters are applied to it. Then the orders are filled according to the order fulfillment policy. If we run out of meat for completing the firm orders, then a second pass is run to fulfill all the orders. If even this is not enough then the third pass will be run. Since the model has an assumption that enough meat will be there to fulfill all the orders, we should be able to fulfill the orders. The main formulae used for this step are: = Inputs! CurInvDay1\*Parameter! ShrinkageDay1+OrderPlan! Production-IF (Parameter! FillFirst=CurrentDayStartValue, OrderPlan! OrderPlan, 0) and = IF(OFFSET(FilledInvP1,Parameter!FillFirst+$C118,E$117-1,1,1)<0,IF(Parameter!FillSecond=OrderFulFill!$C$118,E4+E26,0),OFFSET(FilledInvP1,$C118,E$117-1,1,1)) for fulfilling the orders.

**Making Hotdogs**

Let’s consider fulfilling All Beef Hotdogs orders first. An All Beef Inventory is created first for the 12 days and each meat type by checking for remaining meat after fulfilling the firm orders for that type. The All Beef Hotdog orders are fulfilled starting from the oldest meat available and utilizing the Beef Substitution policy defined in the parameter worksheet. Therefore by modifying the Beef substitution policies different kinds of situations can be handled by this model. Similarly All Meat Inventory is created for the 12 days and each type of meat by checking the remaining meat after fulfilling firm orders and All Beef Hotdogs orders. The All Meat Hotdog orders are fulfilled starting with the oldest meat and utilizing the All Port substitution policy defined in the parameter worksheet.

**Computing Profits**

In this section, the forecasted costs for making hotdogs and forecasted sales of the same are computed for the 12 days in order to compute the forecasted profits of making and selling Hotdogs. The profit is calculated from the cost per pound for making hotdogs and the revenue that will be generated by sales per pound of those hotdogs. Based on the fluctuating prices of the hotdogs in the real world scenario, profits can be controlled to an extent by adjusting the order fulfillment and the hotdog recipes substitution policies.