TW2Beers

**Sample Only**

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Usage and Maintenance Guide

Revision Number 5

**1. Location and meaning of all input parameters and input streams**

All input parameters and input streams are located on the tab named Inputs. The meaning of each input parameter is described here:

SalesPriceLightBeer is the price in United States dollars (hereinafter, USD) that a consumer will pay for one keg of light beer.

SalesPriceDarkBeer is the price in USD that a consumer will pay for one keg of dark beer.

KegsPerBatchLight is the number of sellable kegs of light beer that the brewery can fill from making one batch of brewed light beer.

KegsPerBatchDark is the number of sellable kegs of dark beer that the brewery can fill from making one batch of brewed dark beer.

CostPerBatchLight is the cost in USD to the brewery of making one batch of light beer. This represents the cost attributable to the production of one batch of light beer, namely materials, ingredients, and production labor. This input parameter does not include distribution or sales costs.

CostPerBatchDark is the cost in USD to the brewery of making one batch of dark beer. This represents the cost attributable to the production of one batch of dark beer, namely materials, ingredients, and production labor. This input parameter does not include distribution or sales costs.

TanksPerBatch is the number of beer tanks that must be brewed simultaneously to equate to one batch.

KegsPerSalesRep is the number of kegs of beer (light and/or dark) that can be sold for every sales employee that works at the brewery (does not include truck drivers).

MonSalSalesRep is the average monthly salary in USD for each sales employee (does not include truck drivers). This number accounts for salary and benefits.

KegsPerTruck is the number of kegs of beer (light and/or dark) that fit into each delivery truck for transport to customers’ city.

CostSpecialEqpt is the cost to the brewery in USD of special truck equipment needed, such as snow tires or air-conditioning.

MaxHoursPerDriver is the maximum number of hours that a driver can work in any given month.

HourlyPayDriver is the average hourly pay rate of pay in USD for each truck driver.

TruckCost is the amount that the delivery truck costs in USD when originally purchased.

TruckFinanceRate is the annual interest rate on the loan TW2Beers took out in order to finance the delivery truck.

TruckFinanceTerm is the term in months of the loan for the delivery truck that TW2Beers is financing.

TruckScrapValue is the amount that the delivery truck will be worth in USD when it is no longer useful to TW2Beers and will be sold to a third party.

LightTankCost is the cost of a new tank in USD that can be used to brew light beer.

DarkTankCost is the cost of a new tank in USD that can be used to brew dark beer.

TankRate is the annual interest rate on each tank.

TankTerm is the number of months it will take TW2Beers to pay off each tank.

MonPY is the number of months that occur in a calendar year, twelve.

The meaning of each input stream is described here:

SalesProjectionLightBeer is the number of kegs of light beer that the TW2Beers sales department predicts they will sell in each of the twelve upcoming months.

SalesProjectionDarkBeer is the number of kegs of dark beer that the TW2Beers sales department predicts they will sell in each of the twelve upcoming months.

HoursPerRoundtrip is the number of hours that it will take for a fully-trained (i.e., 100% productive) truck driver to make one round trip delivery to the destination city.

DriverLearningCurve represents how productive a truck driver will be in his/her first twelve months of driving.

EfficiencyRatioIndustryStd is the average efficiency ratio (expenses / revenue) for all microbreweries in the United States.

**2. Location and meaning of all outputs**

All final outputs used for decision-making are located on the tab named Outputs. All revenue-focused intermediate output streams are located on the tab named Revenue. All expense-focused intermediate output streams are located on the tab named Expenses. The chart that visually compares TW2Beers’ efficiency ratio to the industry standard efficiency ratio is shown on the tab named Chart.

The meaning of each revenue-focused intermediate output stream is described here:

Sales Revenue:

LightBeerRev is the projected revenue in USD that TW2Beers will receive in each of the twelve months as a result of selling light beer

DarkBeerRev is the projected revenue in USD that TW2Beers will receive in each of the twelve months as a result of selling dark beer

MoRev is the projected sales revenue in USD that TW2Beers will receive in each of the twelve months as a result of selling beer (light plus dark)

Cost of Goods Sold Light:

FractionalLightBatchesReqd is the fractional number of batches of light beer that TW2Beers will need to run in order to meet sales projection for light beer

IntegerLightBatchesReqd is the whole number of batches of light beer that TW2Beers will need to run in order to meet sales projection for light beer

OverrunLightBatches is the fractional number of batches that will produce light beer that is more than what is needed to meet sales projections for light beer in each month

CumOverrunLightBatches is the cumulative fractional number of batches that will produce light beer that is more than what is needed to meet sales projections for light beer over the twelve months

CumAvoidLightBatches is the cumulative integer number of batches that will produce light beer that is more than what is needed to meet sales projections for light beer over the twelve months

AvoidLightBatches is the integer number of batches of light beer that can be avoided in each of the next twelve months

ActualLightBatches is the integer number of batches of light beer that TW2Beers will actually produce in each of the next twelve months to avoid waste/overproduction.

Cost of Goods Sold Dark:

FractionalDarkBatchesReqd is the fractional number of batches of dark beer that TW2Beers will need to run in order to meet sales projection for dark beer

IntegerDarkBatchesReqd is the whole number of batches of dark beer that TW2Beers will need to run in order to meet sales projection for dark beer

OverrunDarkBatches is the fractional number of batches that will produce dark beer that is more than what is needed to meet sales projections for dark beer in each month

CumOverrunDarkBatches is the cumulative fractional number of batches that will produce dark beer that is more than what is needed to meet sales projections for dark beer over the twelve months

CumAvoidDarkBatches is the cumulative integer number of batches that will produce dark beer that is more than what is needed to meet sales projections for dark beer over the twelve months

AvoidDarkBatches is the integer number of batches of dark beer that can be avoided in each of the next twelve months

ActualDarkBatches is the integer number of batches of dark beer that TW2Beers will actually produce in each of the next twelve months to avoid waste/over production.

Cost of Goods Sold Total:

MonCostOfGoodsSold is the cost to the brewery of materials, production staff pay, and beer ingredients in USD in each of the next twelve months in order to produce the beer needed (light and dark) without overproducing.

Revenue Summary:

TotalMonthlyRev is the revenue that TW2Beers will draw in each of the next twelve months.

CumMonRev is the cumulative revenue that TW2Beers will draw over the next twelve months.

The meaning of each expense-focused intermediate output stream is described here:

Smoothed Batches:

SalesProjectionTotal is the number of kegs of beer (light and dark) that the TW2Beers sales department predicts they will sell in each of the twelve upcoming months.

ActualLightBatchesSmoothed is the integer number of batches of light beer that TW2Beers will actually produce in each of the next twelve months to avoid waste/overproduction taking into account that if sales dip, TW2Beers must keep the same amount of equipment that they had in the previous month. Once a piece of equipment is acquired, it must be kept during subsequent months whether it is needed or not.

ActualDarkBatchesSmoothed is the integer number of batches of dark beer that TW2Beers will actually produce in each of the next twelve months to avoid waste/overproduction taking into account that if sales dip, TW2Beers must keep the same amount of equipment that they had in the previous month. Once a piece of equipment is acquired, it must be kept during subsequent months whether it is needed or not.

Truck Driver Expenses:

NumRoundTrips is the whole number of times a truck must drive roundtrip from the production facility in Topeka, Kansas to the destination city in order to deliver enough kegs of beer to meet sales projections.

NumDrivingHours is the total number of hours that the delivery truck must be on the road in order to deliver enough kegs of beer to meet sales projections. This assumes that the drivers are fully trained (i.e., 100% productive).

NumDrivers is the total whole number of drivers needed on staff in order to deliver enough kegs of beer to meet sales projections.

DriverHiringCurve is the number of drivers that must be hired in each of the next twelve months to ensure that there are enough drivers on staff in order to deliver enough kegs of beer to meet sales projections.

DriverProductivity is the total productivity that can be expected from the entire driving staff taking into account the driver learning curve and the driver hiring stream.

DriverProductivityPerDriver is the total productivity that can be expected per driver taking into account the driver learning curve and the driver hiring stream.

ActualDrivingHours is the total number of hours that the delivery truck will actually be on the road in order to deliver enough kegs of beer to meet sales projections. This takes into account that there is a driver learning curve and a driver hiring stream.

MonCostOfDrivers is the cost of having the necessary whole number of drivers on staff in each of the twelve months.

SG&A Expenses:

NumSalesRepsNeeded is the whole number of sales representatives that must be on staff in order to process the sales of the projected number of kegs of beers.

TotalSalesRepsSal is the cost of having the necessary whole number of sales reps on staff in each of the twelve months given the sales’ reps monthly salary plus benefits.

Truck Financing Expenses:

TruckInterestExpense is the amount of money in USD that TW2Beers must pay to their creditor in each of the twelve months for use of the money lent to TW2Beers so that TW2Beers could finance their delivery truck.

TruckDepExpense is the amount of money in USD that TW2Beers loses in each of the next twelve months due to the fact that the truck they have financed loses value each month as a result of use and age.

Tank Light Beer:

TanksReqLight is the integer number of tanks that TW2Beers needs in order meet sales projections in each of the next twelve months.

LightTankPurchases is the number of new tanks that TW2Beers must acquire in each of the next twelve months in order to have enough tanks on hand to meet sales projections.

Tank Dark Beer:

TanksReqDark is the integer number of tanks that TW2Beers needs in order meet sales projections in each of the next twelve months.

DarkTankPurchases is the number of new tanks that TW2Beers must acquire in each of the next twelve months in order to have enough tanks on hand to meet sales projections.

Depreciation:

TankDepBase is the percent of each tank’s value that it will lose in each of the next twelve months due to use and age.

LightTankDep is the dollar amount that TW2Beers can write off as an expense in each of the next twelve months taking the tank acquisition curve and depreciate base into account.

DarkTankDep is the dollar amount that TW2Beers can write off as an expense in each of the next twelve months taking the tank acquisition curve and depreciate base into account.

MonTankDep is the dollar amount that TW2Beers can write off as an expense in each of the next twelve months taking the tank acquisition curve and depreciate base into account for both light and dark beer.

Expenses Summary:

TotalMonthlyExpenses is the expenses that TW2Beers will pay out in each of the next twelve months.

CumMonRev is the cumulative expenses that TW2Beers will pay out over the next twelve months.

The meaning of each final output stream is described here:

CumMonRev is the cumulative revenue that TW2Beers will draw over the next twelve months as a result of producing, transporting, and selling their light and dark beers.

CumMonExpenses is the cumulative expenses that TW2Beers will have to pay over the next twelve months as a result of producing, transporting, and selling their light and dark beers.

EfficiencyRatio is the ratio of expenses to revenues for TW2Beers over the next twelve months.

**3. Guide to visual cues and naming conventions**

Input parameters and input streams are shown in yellow cells. Intermediate output streams that contain revenues are shown in green. Intermediate output streams that contain expenses are shown in green. The final output streams are shown in blue.

The model uses the following naming conventions (presented here in alphabetical order): Avoid means avoidable; Cum means cumulative; Dep means depreciation; Eqpt means equipment; Max means maximum; Mon means monthly; Num means number; PY means per year; Reps means representatives; Req means required; Rev means revenue; SG&A means selling, general, and administrative expenses.

**4. Step-by-step use of the model**

This model was designed to help TW2Beers decide to which city they should initiate beer sales. If the user wants to model the effect of beer delivery to a new destination city on TW2Beers’ efficiency ratio compared to the industry standard efficiency ratio, the user should follow these step-by-step instructions:

Step 1: Manually enter numeric input parameters into each one of the yellow input cells.

Step 2: Manually enter numeric input streams into each of the yellow input streams cells.

Step 3: Push “F9” on the keyboard so that the workbook will recalculate.

Step 4: Go to the tab called “Outputs”

Step 5: If over the twelve month period, TW2Beers’ efficiency ratio is less than or equal to the industry standard efficiency ratio, then the city being tested is a viable candidate for delivery. Otherwise, the city being tested is not a viable candidate for delivery.

**5. How the calculation works**

The revenue-focused intermediate outcome streams are calculated in the following way:

Sales revenues for light beer and for dark beer are calculated by multiplying the light beer sales projections by the light beer sales price and the dark beer sales projections by the dark beer sales price, respectively. In each case, this is done by multiplying an array (SalesProjectionsLightBeer) by a constant (SalesPriceLightBeer).

Total monthly revenue was calculated by adding the light beer revenue to the dark beer revenue for each of the twelve months.

To find the cost of goods sold, several stepwise calculations were made.

First, the number of batches of beer that the brewery must produce in order to meet sales projections was calculated by dividing the sales projections for beer kegs by the kegs per batch. This was done for light beer and dark beer in tandem. Since the brewery cannot produce a partial batch of beer, the integer number of batches of beer that the brewery must produce in order to meet sales projections was determined by taking the ceiling to the ones place of the fraction number of batches of beer.

Next, the overrun was determined by subtracting the fractional batches required from the integer batches required. The overruns were cumulated using a running sum and because only integer overruns can be eliminated by the production crew, the decimal portion of the number of overruns was lopped off.

Next, the number of actual batches of beer that the brewery needs to produce in order to eliminate wasted overruns was calculated by subtracting the integer number of avoidable batches from the integer number of batches required.

Next, the cost per batch per month of light beer was multiplied by the number of light batches produced per month and added to the cost per batch per month of dark beer times the number of dark batches produced per month to return to total (light and dark) monthly cost of goods sold.

Finally, the cost of goods sold was subtracted from the sales revenue for each of the twelve months to yield total revenue for each of the twelve months. This was cumulated using a running sum to yield cumulative total monthly revenue.

The expense-focused intermediate outcome streams are calculated in the following way:

To find smoothed batches, the number of smoothed batches of beer for any given month was calculated to be larger of the two following values: the current month’s actual number of batches needed or the previous month’s smoothed number of batches.

To find the expense of the truck drivers, first, the model determines the number of round trips needed each month in order for the company to delivery enough beer to meet sales projections. This is calculated by dividing the total monthly beer sales projections by the number of kegs that fit on each truck. Because TW2Beers cannot make fractional roundtrips to their destination city, the integer number of roundtrips was calculated by finding the ceiling to the nearest ones place.

Now that the number of roundtrips is known, the number of hours on the road per month can be calculated by multiplying the number of roundtrips needed each month by the hours per roundtrip each month. Because each fully-trained driver is restricted to a maximum number of driving hours per month, the number of drivers needed was calculated by dividing the number of hours on the road each month by the maximum number of hours one driver can contribute each month. Because TW2Beers cannot hire a fraction of a driver, the integer number of drivers was calculated by taking the ceiling of the fractional number of driver to the ones place.

The driver hiring curve was then calculated by taking the running difference of the number of drivers needed each month. Because there is a learning curve, rookie drivers will spend more hours on the road per roundtrip while they are in training. To account for the driver learning curve and the driver hiring curve, the driving hiring curve was convolved with the driver learning curve, and the resulting driver productivity curve was then divided by the number of drivers on staff in each month to yield the average productivity of each driver in each month.

To find the actual number of hours that driver(s) spend on the road each month, the productivity was multiplied by the expected number of hours on the road using the mathematical expression ((1+(1-DriverProductivityPerDriver))\*NumDrivingHours). This means that if a new driver is only 75% efficient, it will take him/her 1.25 times as long to make one roundtrip.

To calculate expense of the truck drivers, the number of hours that driver(s) actually spend on the road was multiplied by the hourly pay rate of the driver.

To find the selling expense (i.e., the expense of the sales representatives), the number of sales reps needed each of the twelve months was calculated by dividing the total beer sales projections by the number of kegs each employee can sell. Because TW2Beers cannot hire a fraction of a person, the integer number of sales reps needed in each of the twelve months was calculated using the ceiling function which rounds the fractional number of sales reps up to the next whole number to the ones place. Finally, the number of sales reps needed each month was multiplied by the monthly pay of each sales rep to yield the monthly selling expense to TW2Beers.

The find the expense of the truck, which TW2Beers has financed, two types of expenses were calculated. First, the interest expense of the truck per month was calculated using the basic mathematical equation for interest: interest = principal\*(1+annual rate/periods per year)^last period + principal\*(1+annual rate/periods per year)^last period-1 + … The excel function IMPT was used. Second, the depreciation expense of the truck per month was calculated by subtracting the truck’s scrap value from the truck’s initial value and dividing that difference by the term of the loan.

To find the depreciation expense of the beer tanks, the integer number of tanks needed was divided by the number of tanks used per batch. The running difference was calculated in order to yield the tank acquisition curve. This was done in tandem for both light and dark beer, respectively.

Next, the cost of a tank was multiplied by the tank acquisitions and convolved with the tank depreciation base to yield the dollar amount of tank depreciation in each of the twelve months taking the acquisition curve and depreciation base into account. This was done in tandem for both light beer and dark beer, respectively.

The light tank depreciation expense was added to the dark tank depreciation expense to yield total monthly tank depreciation expense.

To find the total expenses for each of the twelve months, the truck driver expenses, selling expenses, truck interest expenses, truck depreciation expenses, and tank depreciation expenses were added together. The running sum of the total monthly expenses yields the cumulative monthly expenses over the twelve month period.

The final outcome streams are calculated in the following way:

In each of the twelve months, the cumulative monthly expenses were divided by the cumulative monthly revenues to yield a stream called efficiency ratio.

**6. How to make changes**

How to make changes to input parameters or streams:

At the very top of the Inputs tab, there is a cell that contains text (e.g., Scenario 1: Madison). It is okay to change this text on the inputs tab. Once this text has been changed on the input tab, the change will automatically carry through to the other four tabs: Outputs, Revenue, Expenses, Chart.

To rename an existing input parameter or input stream, do two things: (1) change the text in the cell that contains the name in question by manually typing in the applicable cell and (2) edit the defined name in the Name Manager found on the Formulas tab in Excel.

To add an input parameter or stream: add the cell or row, label it, and define the name with a workbook scope. Be sure to review the entire model in order to determine all of the impact points that the added parameter or stream will have.

How to make changes to output streams.

The first output stream (CumMonRev) is simply a reference to CumMonRev from the Revenue tab. Do not make changes to the CumMonRev stream on the Output tab; do so on the Revenue tab. The second output stream (CumMonExpenses) is simply a reference to CumMonExpenses from the Expenses tab. Do not make changes to the CumMonExpenses stream on the Output tab; do so on the Expenses tab. The third output stream (EfficiencyRatio) is array division. To make changes, ensure that the new formula is an array formula.

How to make changes to the chart:

The first series (EfficiencyRatioIndustryStd) is simply a reference to EfficiencyRatioIndustryStd from the Inputs tab. Do not make changes to the EfficiencyRatioIndustryStd stream on the Chart tab; do so on the Inputs tab. The second series (EfficiencyRatio) is simply a reference to EfficiencyRatio from the Outputs tab. Do not make changes to the EfficiencyRatio stream on the Chart tab; do so on the Outputs tab. The chart title references the cell named ChartTitle on the Chart tab; the y-axis title references the cell named ChartLabel2 on the Outputs tab; the x-axis title references the cell named Period on the Chart tab. Change the chart labels in their respective cells, not in the chart area itself.

How to extend the model:

In order to extend the model (for example, expand the model to include the other financial statements or additional business processes), the maintainer of the workbook must first identify what new insight or aspect of the business that is to become a part of the model, and which parts of the existing model it will affect. Any new input parameters or input streams must be created in the ‘Inputs’ tab. From here, the user must identify the aspect of the business, ‘Outputs’, ‘Revenue’, and/or ‘Expenses’, that will incorporate and display the new outcomes from any new adjustments and prepare each worksheet to display the answers that are trying to be discovered. If however, the new question cannot be categorized under the former tabs, a new tab may be created and adjusted accordingly.

If the new input parameters or input streams are variables that can affect the already established outputs and values on the tabs, then the user must accommodate the changes into the formulas that produce our given output data and model.

**7. Appendix**

None.