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Key Risk Indicators and Threshold Analytics

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Project Objective

To assist with the Risk Management department, our team developed an analytical threshold tool with Tableau. The tool was designed for monitoring and adjusting Key Risk Indicator (KRI) threshold values. The primary objective of a KRI is to quantify the risk profile and to integrate measurable risk management practices to show alignment to risk tolerance.

Key Risk Indicator

KRIs are used to monitor the material risks and key operational risks identified within a business unit to the firm. KRIs are managed by the impacted business line or support function following a life cycle that enables effective and timely oversight of key risks and reporting to management if a KRI threshold is breached. The goal for a KRI is to perform consistently at an optimum level against established thresholds. Business lines and support functions with a KRI inventory are responsible for setting thresholds for each KRI in accordance with current risk appetite and evaluated annually for appropriateness.

Each KRI has two thresholds to enable management of KRI performance: Red and Amber.

- The **Amber trigger** is established at a level where management would become concerned. If the KRI performs better than or at the Amber trigger level it is considered “optimum” or **Green**. However, if the KRI is between Amber and Red the KRI is reported Amber.
- The **Red limit** is unacceptable performance based on the established business unit’s tolerance levels and requires action to be taken to return the KRI to acceptable levels.

At least on an annual basis, bank team members review each metric; part of the review is to ensure the thresholds are appropriate for what is being measured. As part of the master’s project we would like to review historical KRI reported data and take a mathematical and statistical approach to review the thresholds with what was reported as part of potential threshold adjustment considerations.

Analytics

See the appendix for visual examples

Descriptive Analytics: Seeks to provide a depiction or “summary view” of facts and figures in an understandable format, to either inform or prepare data for further analysis (*Guha, and Ghosh*).

The main goal of us using descriptive analytics was to allow the user to observe the distribution of Value Scores (*Green, Amber, Red*) among the Key Risk Indicators.

Dashboards that use Descriptive Analytics:

Ratio & Count

Ratio: Pie & Bar

Prescriptive Analytics: Prescriptive Analytics is the area of data analytics that focuses on finding the best course of action in a scenario given the available data. It is related to both descriptive analytics and predictive analytics but emphasizes actionable insights instead of data monitoring. The main goal of us using prescriptive analytics was to support the decision of choosing better threshold values.

Dashboards that use Prescriptive Analytics:

KRI Threshold

Predictive Analytics: This is the use of data, statistical algorithms and machine learning techniques to identify the likelihood of future outcomes based on historical data (*SAS Insights*). In our tool, we use this type of analytics to predict individual KRI values along with overall value scores.

Dashboards that use Predictive Analytics:

KRI Forecast

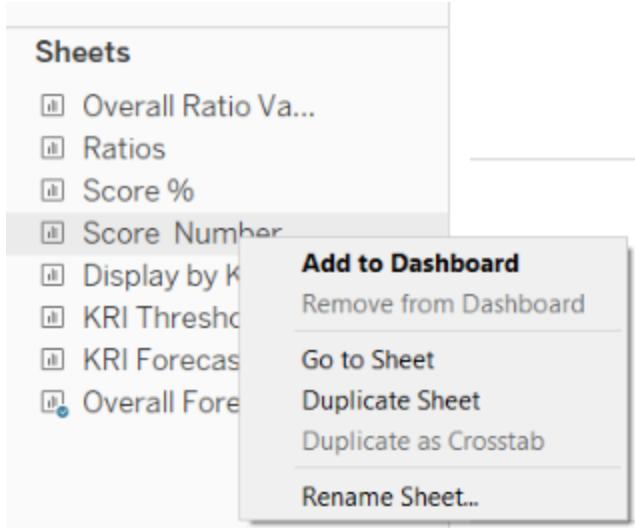
Overall Forecast

Worksheets, Dashboards, and Story

All our tableau work is done in the following order: Worksheets, dashboards, story. The worksheets are where most of the time was spent creating each tool, then in the dashboards we can put one or two tools together and assign which filters are displayed for the tool. Then in the story we select which dashboards we want to be presented.

Right clicking on the Sheets list on the left-hand side of dashboards can lead you to the worksheets if you wish to make your own edits. These edits made in the worksheets will automatically update the dashboard, and story counterparts that reference the worksheet.

(In a Dashboard) Right click on the worksheet you want to edit or view > Select Go to Sheet



Data Loading & Format

The data that needs to be loaded for the tool to function must be in .xlsx format which is a Microsoft Excel Open XML spreadsheet.

*excel
tableau*

Submission Month	KRI Code	Value Score	Unit	Frequency	> or <	Red	Amber	Numerator	Denominator	Value	Business Line
Jul-2019	BPATM4	Green	Percentage	Monthly	<	99	99.5	950.000	950.000	100.000	Operations

UMass Lowell Data	Abc	Abc	Abc	UMass Lowell Data	Abc	Abc	#	#	#	#	Abc
Submission M...	KRI Code	Value Score	Unit	Frequency	> Or <	Red	Amber	Numerator	Denominator	Value	UMass Lowell Data Business Line

This is the exact layout of how we loaded the data into Tableau. The excel layout cannot diverge from this in any way if you want the tool to function the same, this includes: Titles, Data Types, column alignment, and date format.

The following variables are **String** data type: KRI code, Value Score, Unit, Frequency, > Or<, Business Line

The following variables are **Number(decimal)** data type: Red, Amber, Numerator, Denominator, Value

And Submission Month is Data type, **Date**

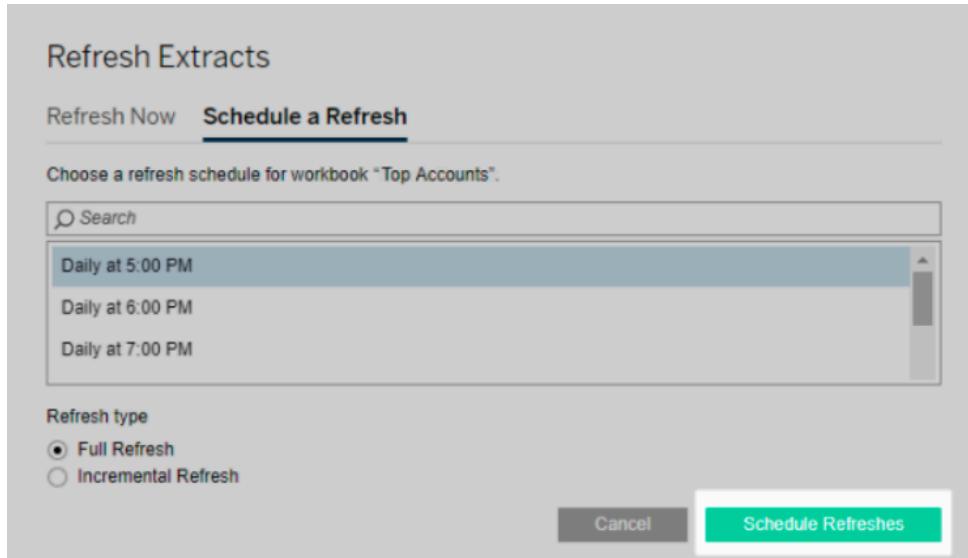
When you receive the file, you will have to load in the real data set for the data source. To do this follow these steps:

1. Go to the Data Source tab (bottom left)
2. Next to connections click Add
3. Select your new Data Source
4. Make sure the excel file is formatted the same
5. Once loaded all the other tabs data should be updated with the new data source

If you choose to continually use a new data source for the tool, we recommend refreshing the data on a schedule. This is fairly simple to do, but it will require Tableau Server. The following are the instructions to schedule a refresh. More detailed instructions can be viewed here: https://help.tableau.com/current/server/en-us/schedule_add.htm

1. When signed into Tableau Server select **Explore** in the top left navigation pane, then select **all workbooks**, or **all data sources** from the drop-down Menu
2. Then in the following dialog box select **Schedule a Refresh**
3. Select the schedule you want
4. Choose if you want an incremental or a full Refresh
 1. An incremental refresh only updates new data found in the data source. You can specify a column in the data source that will be used to identify new rows. For example, if you select the Date field it will only add rows that have new dates. More information on Incremental refresh can be found here
https://help.tableau.com/current/pro/desktop/en-us/extracting_refresh.htm
 2. A Full Refresh completely replaces the old data source with the new one selected
2. Click **Schedule Refreshes** and the refresh schedule is now set.

The image below is an example of the dialog box in Step 2.



Ratio & Count

The Ratio tab is for viewing KRI value distribution through counts, and percentages. It includes overall score values, and score values for individual KRI's (*score values meaning Green, Amber, Red*). The worksheet is simple, and the only modifications are done through filters like selecting a different business line, a group of KRI's, or a series of months. Inside the dashboard and story it contains two worksheets: **Ratios**, and **Overall Ratio Values**

How to Build (**Ratios**):

- Move the Dimensions: KRI Code, Value Score, and Value Score to Rows
 1. Set the second Value Score to **Measure(Count)**, and **Discrete** by clicking on the drop-down option.

The screenshot shows the 'Rows' shelf in Tableau. There are three items listed: 'KRI Code' (highlighted in blue), 'Value Score', and 'CNT(Value Score)'. The 'Rows' shelf icon is also visible.

- Move the Dimension Value Score to the Marks box
 1. In the drop down for Value Score set it to **Measure(Count)**, and **Continuous**
 2. Also, in the drop down click on **Quick Table Calculation** and set it to **Percent of Total**
 3. Set the Marks to Text

The screenshot shows the 'Marks' shelf in Tableau. It includes options for Color, Size, Text, Detail, and Tooltip. Below these, 'CNT(Value Score)' is selected and highlighted in green.

- Insert the following Filters

The screenshot shows the 'Filters' shelf in Tableau. It lists four filters: 'KRI Code', 'Submission Month', 'Business Line', and 'Value Score', each represented by a blue button.

See the appendix as a reference to what the final result for **Ratios** should look like

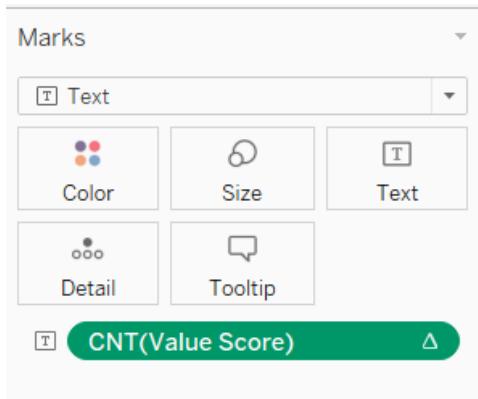
How to Build (**Overall Ratio Values**):

- Move the Dimensions: Value Score, and Value Score to Rows
 1. Set the second Value Score to **Measure(Count)**, and **Discrete** by clicking on the drop-down option.

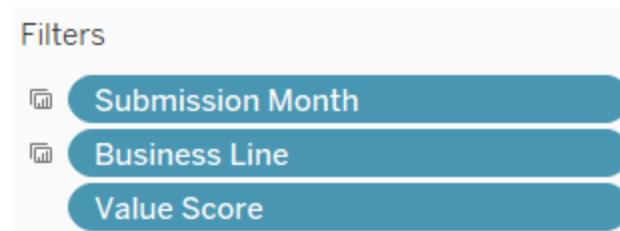
The screenshot shows the 'Rows' shelf in Tableau. It displays three items: 'KRI Code' (selected), 'Value Score', and 'CNT(Value Score)'.

- Move the Dimension Value Score to the Marks box

1. In the drop down for Value Score set it to **Measure(Count)**, and **Continuous**
2. Also, in the drop down click on **Quick Table Calculation** and set it to **Percent of Total**



3. Set the Marks to Text
- Insert the following Filters



See the appendix as a reference to what the final result for **Overall Ratio Value** should be

We put both of these worksheets into the dashboard called **Ratio & Count**. The dashboard contained three filters: KRI Code, Business Line, and Submission Month. Business Line, and Submission Month is applied to both of the worksheets, and KRI Code is only being applied to the **Ratios** worksheet. See the section on **Filters** for instructions on how to do this. Also please reference the appendix as to what the dashboard should look like.

Ratio: Pie & Bar

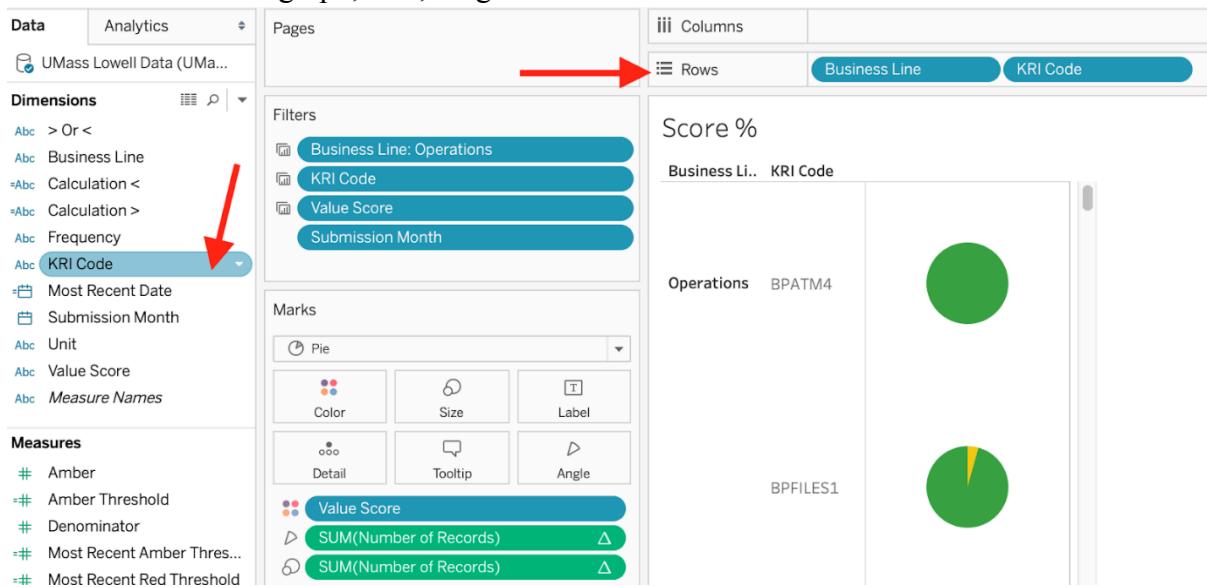
Why did we build this?

This tab is very similar to the Ratio tab, but the biggest difference is the visual component. This tab should be used to quickly identify high risk KRI values. I.E ones with a high percentage of Amber or Red. This is also useful for identifying KRIs that are always in the Green and giving an indication that their thresholds may need to be tightened.

This page can currently be filtered with Business line, and KRI. More filters can be applied.

How to Build (Score Pie Chart):

- To create this graph, first, drag Business Line and KRI Code dimensions to Rows.



- Drag Value Score from Dimensions to Marks. Select Pie for pie charts. Click on Color to edit the color for each value score.

The screenshot shows the Tableau Data Editor interface. On the left, the Data pane displays a connection to 'UMass Lowell Data (UMa...)' and lists dimensions and measures. The 'Measures' section includes items like 'Amber', 'Amber Threshold', 'Denominator', 'Most Recent Amber Thresh...', 'Most Recent Red Threshold', and 'Numerator'. The 'Dimensions' section includes 'Business Line', 'Calculation <', 'Calculation >', 'Frequency', 'KRI Code', 'Most Recent Date', 'Submission Month', 'Unit', and 'Value Score'. A red arrow points from the 'Value Score' measure in the Measures shelf to the 'Color' button in the Marks card. Another red arrow points from the 'Edit Colors...' button in the Marks card to the 'Edit Colors [Value Score]' dialog box.

Edit Colors [Value Score]

Select Data Item: **Value Score**

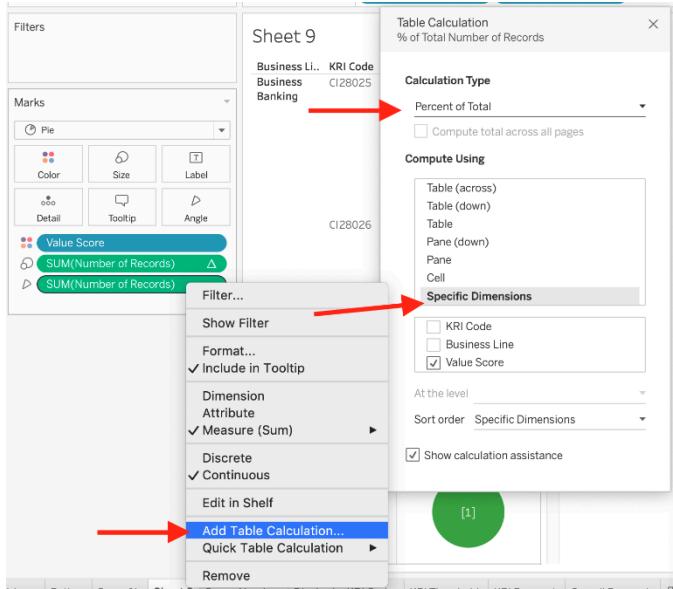
Select Color Palette: **Automatic**

Amber	Yellow
Green	Purple
Red	Light Pink
Cyan	Brown
Blue	Grey

Assign Palette

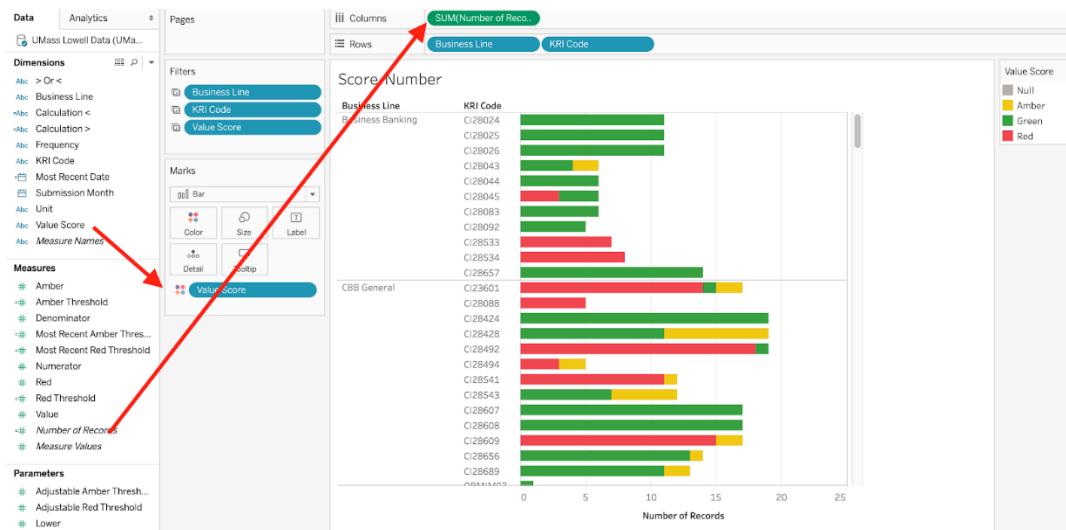
Reset Apply Cancel OK

1. Drag Number of Records from Measures to Marks.



How to Build (Score Number):

- Similar to how the pie chart was built, but the Number of Records have to be dragged to the Columns section.



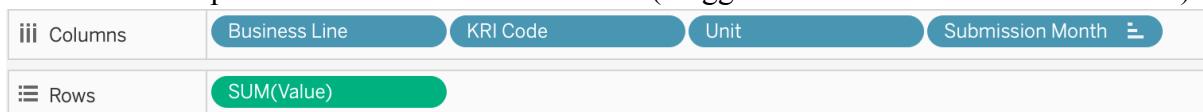
KRI Threshold

Why did we build this?

The KRI Threshold graph shows the confidence intervals of KRIs and the most recent thresholds. This is a way to visualize the distribution of the data with the confidence intervals.

How to Build (KRI Threshold):

- The components of the Columns and Rows(dragged from Dimensions and Measures):



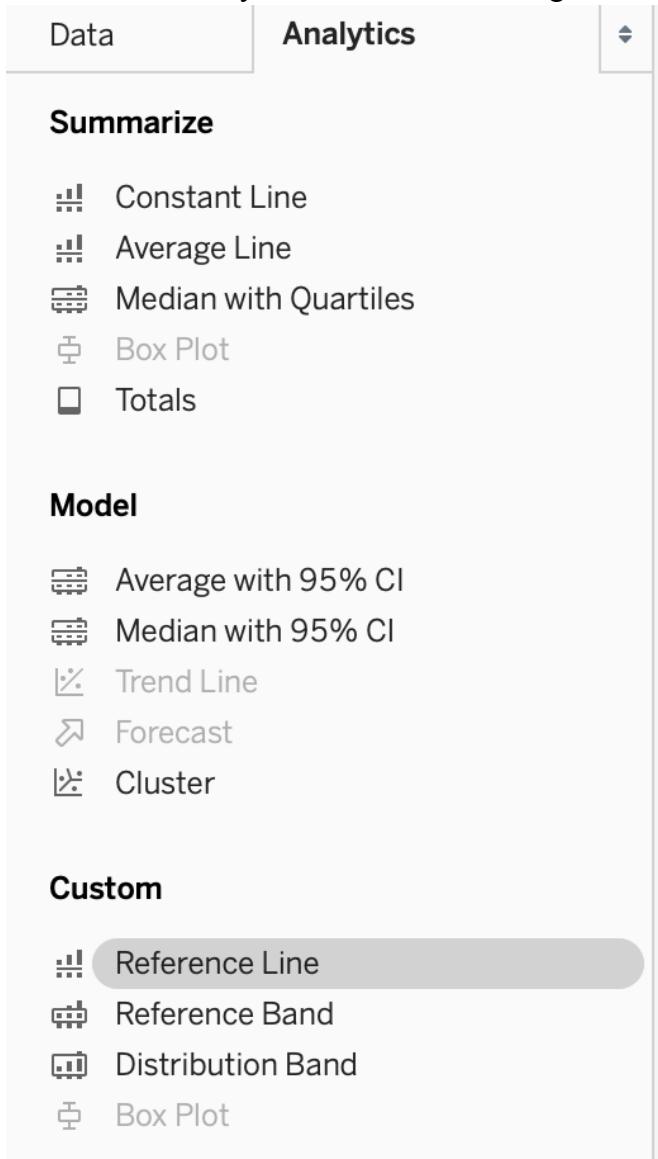
1. To derive the Most Recent Red/Amber Threshold, click on the Analysis tab on top of the screen. Then click on Create Calculated Field.
1. Enter the code for deriving the newest value.

The screenshot shows the Tableau interface with the 'Analysis' tab selected in the top navigation bar. A context menu is open, and the 'Create Calculated Field...' option is highlighted in blue. Below the menu, a dialog box displays the calculated field code:

```
IF [Submission Month] == [Most Recent Date]
OR (ISNULL([Submission Month]) AND ISNULL([Most Recent Date]))
THEN [Red]
END
```

The dialog also indicates that the calculation is valid and provides 'Apply' and 'OK' buttons.

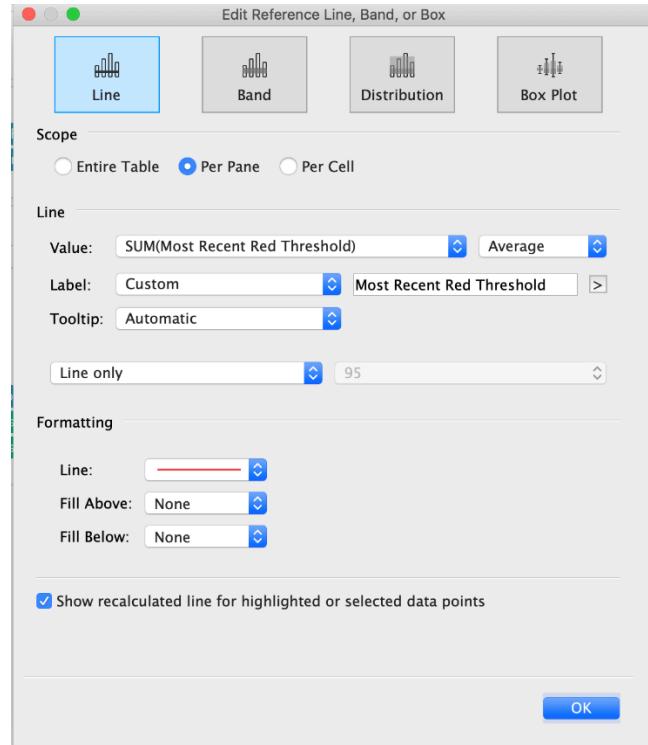
1. Go to Analytics tab on the left. Drag a Reference Line to the graph.



1. Drag the Most Recent Red/Amber Threshold to the Mark section.

The screenshot shows the Tableau Marks shelf on the right side of the interface. It lists several mark types: Bar, Circle, Size, Label, Detail, and Tooltip. Below these, there are three measures: Value Score, SUM(Most Recent Red Threshold), and SUM(Most Recent Amber Threshold). The **Value Score** measure is highlighted with a blue bar, indicating it is selected or being used. The other two measures are also highlighted with blue bars.

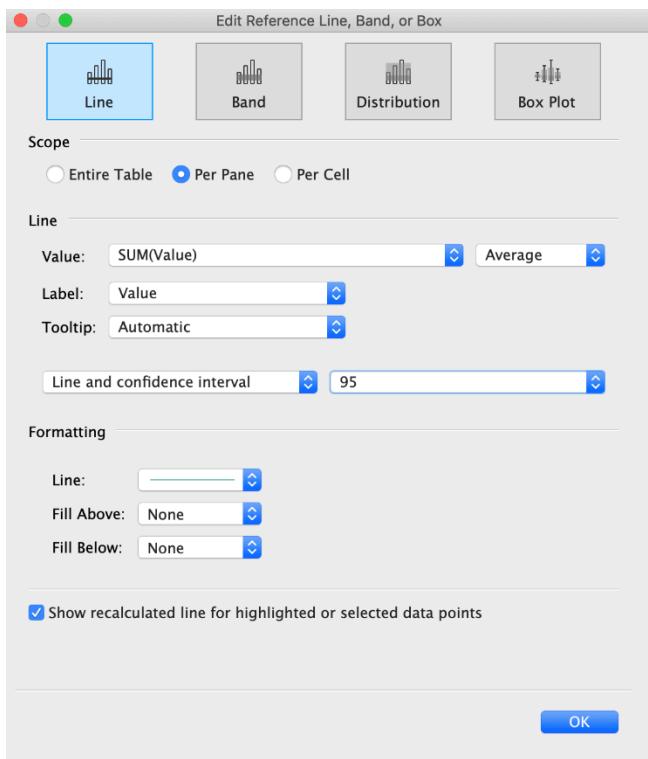
1. Right-click on the reference line on the graph and select Edit.
1. Select Line on the top. Per pane for Scope section. For the Line section, set the



parameters as the same in the graph.

1. For adding confidence intervals, drag another Reference Line to the graph.
1. Right-click on the reference line on the graph and select Edit. Under the Line section, scroll down the Value and select SUM(Value). Select Line and confidence interval in the bottom

of Line section. Select the wanted ratio of confidence level next to it. Then click on OK.

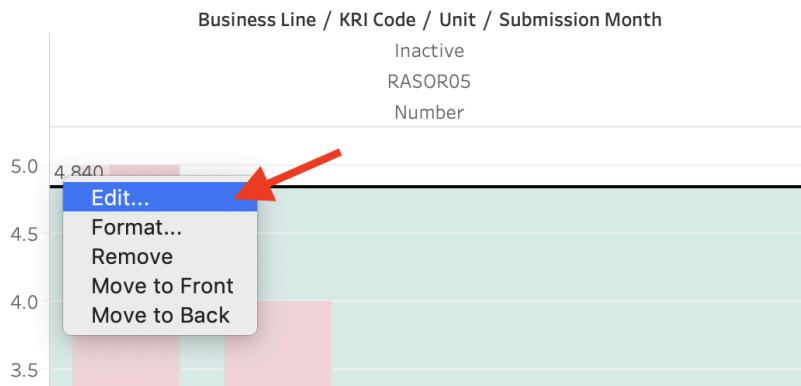


Go to the **Filter** section to add filters for better visualization of the graph.

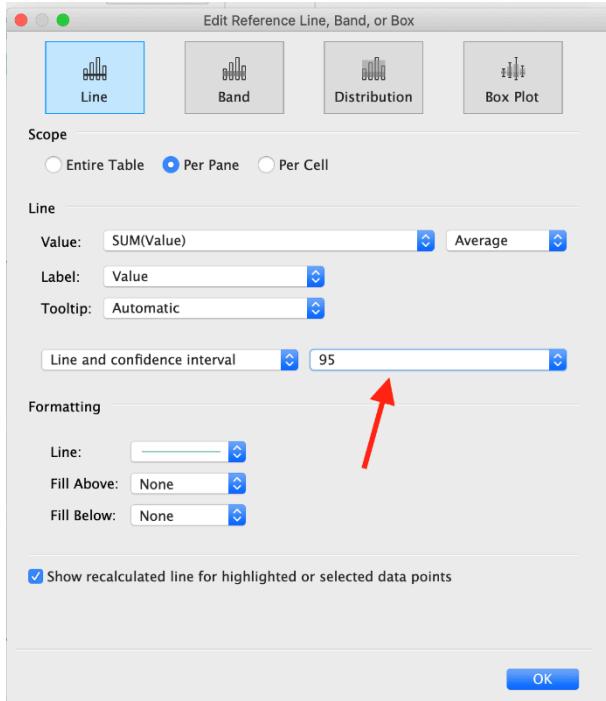
How to adjust it:

1. To change the interval range, right click on the numbers on the confidence interval boundary. Click on Edit.

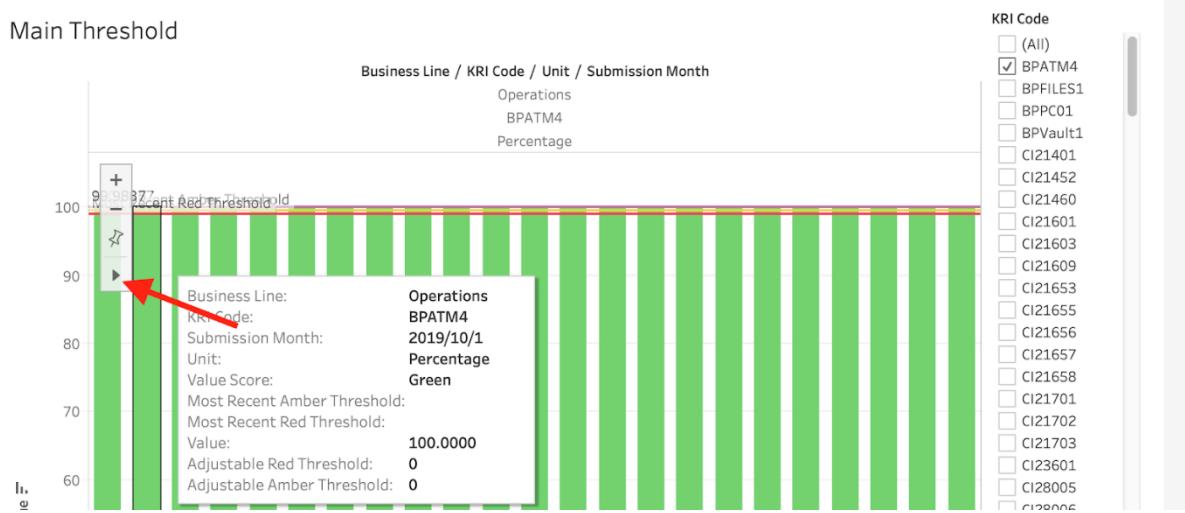
Main Threshold



Change the degree of confidence you want (default 95%) in the section next to Line and confidence interval section.

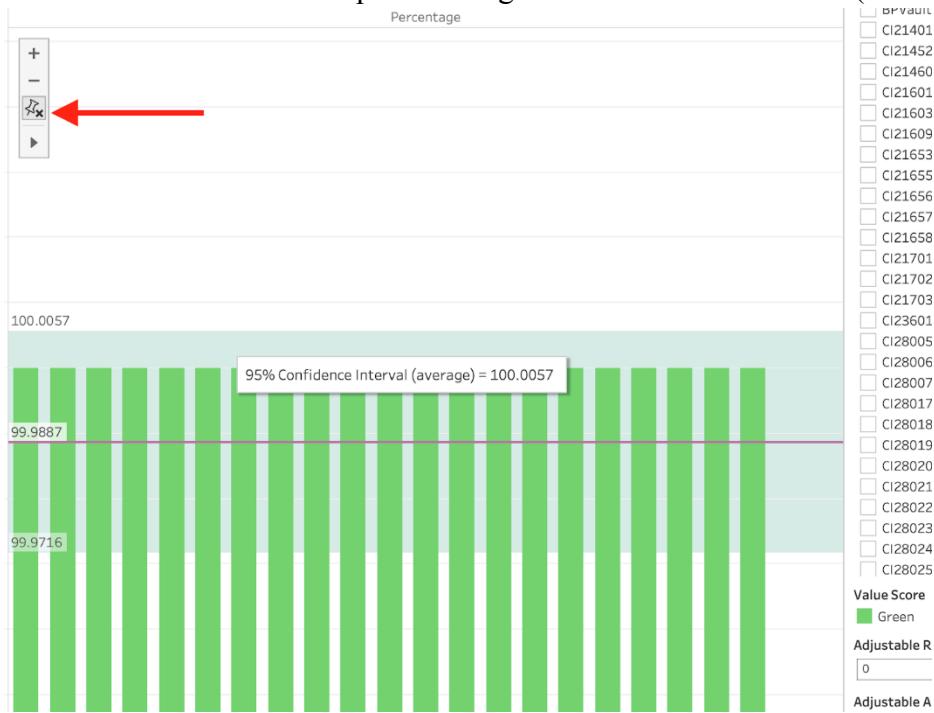


1. If the boundaries seem to be overlapped or hard to tell the number with bare eyes, the following steps should be taken:
 - a. Hover the cursor to the graph.
 - b. Click on the small triangle.



- c. Click on the magnifier.
- d. Use the magnifier to click on the spot that you want to zoom in several times until you can see it better.

- e. Click on the pin to change the scale back to default (automatic).



Confidence Interval:

We chose a 95% confidence level because it is generally just tradition to do so. Jerzy Neyman the man who introduced Confidence Intervals to Statistics generally used a 95% Confidence Level, and people gradually began using it as their benchmark as well (*Confidence Intervals*).

The mathematical reasoning as to why a 95% confidence Interval is the most common is because as the confidence level increases so does the margin of error. That means the interval becomes wider (*Interpreting Confidence Intervals*). For example, if you used a 99% Confidence level and found out that you will score between a 1 and 100 on a test it's essentially useless information, the interval is too wide. Whereas if you use a smaller confidence level like 95% you could say you will score between a 50 and 100. 80% confidence level 75-100 on the test and so on .

A 95% confidence level covers 95% of the sampled means. Meaning anything outside of it occurs less than 5% of the time. Another way to look at it is to say the p-value of anything outside the confidence intervals is $<.05$ and thus is significantly different. I.E Any value that is significantly different will go beyond the set thresholds and be registered as Green or Red. Confidence intervals simply show what future confidence intervals will be. Not the true value or in this case the true threshold value. This is fine since the threshold values that are not zero

tolerance are subjective. An excellent visual demonstration of confidence intervals can be found at <https://rpsychologist.com/d3/ci/>

How Tableau Created the Confidence Intervals

Each KRI has their own corresponding value which is calculated from the Numerator and Denominator columns. Essentially the denominator column is the amount of times that a specific KRI was used and the numerator is how many times it was successful. The Value column is just the numerator divided by the denominator.

By using all the values of a specific KRI we can calculate the confidence intervals for it. Let us use the KRI **BPPC01** This KRI has the following values: 7.5, 7.5, 8, 8, 8, 6, 8, 8, 8, 8, 7.5. The Mean (x) is: 7.682 and the Standard Deviation (s) is .575. The t-value (t) for 95% is 2.23, and the number of observations (n) is 11. Finally put it all together $x \pm t(s/\sqrt{n})$ or $7.682 \pm 2.23(.603022/11)$ and you get 8.087 for the upper limit & 7.277 for the lower limit. Which are the same values given in Tableau.

Tableau does not provide access to the way they create confidence intervals so the validation we did was purely on our own. It should be noted however that the formula may change depending on the number of observations. In Statistics a t-value is normally used when the number of observations is less than 30. When it is over a z value is used. The formula would become $x \pm z(s/\sqrt{n})$. It is not known if Tableau would use this method or their own polynomial series expansion to calculate t-values instead of using z-values.

KRI Forecast

This page shows a line chart of monthly data for every KRI. It also has a forecasting tool used to predict where the KRI is going in the future. The forecast shows three months of predictions using an exponential smoothing method with a 95% prediction interval. The page also contains the new thresholds using a 95% confidence interval. This allows you to see where past data point values fall within the new thresholds and can also show you where future predicted data point values may fall.

To build the tool, follow these steps.

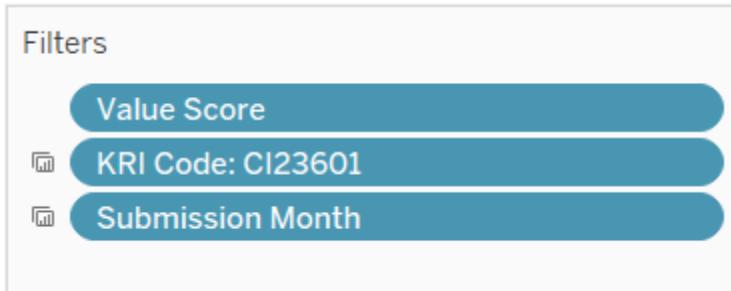
1. Click the “new worksheet” button in the bottom right-hand corner of Tableau
2. Drag in ‘submission month’ from the dimensions list on the left-hand side and place it in the columns box at the top of the worksheet. Right-click and select month so that it reads MONTH(Submission month). There will be two separate month options when you right-click, be sure to select the second one. The MONTH(Submission month) tab should turn Green when you select this.



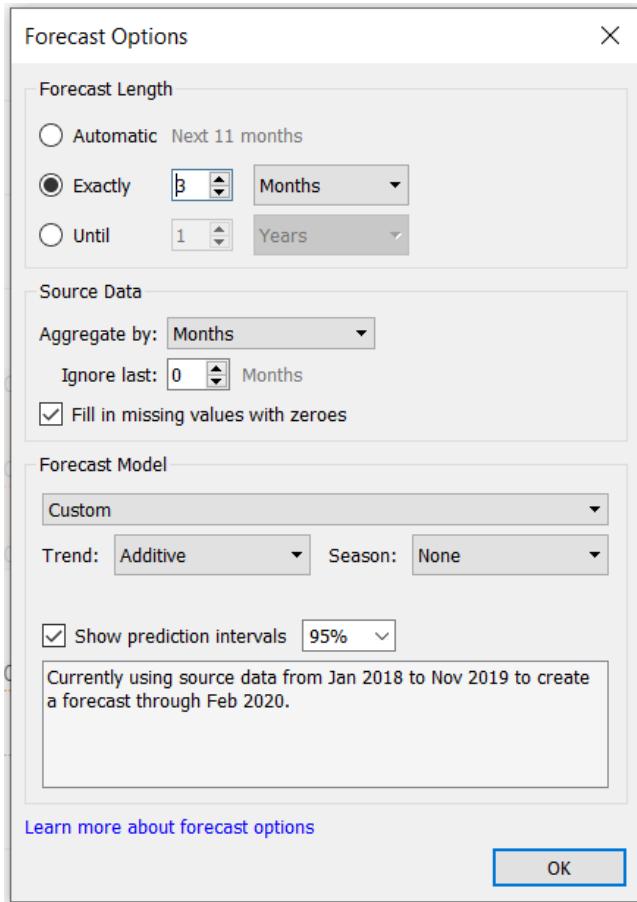
1. Drag in ‘value’ from the measures list on the left-hand side and place it in the rows box at the top of the worksheet. Right-click and hover over measure and then select average so that it reads AVG(Value).



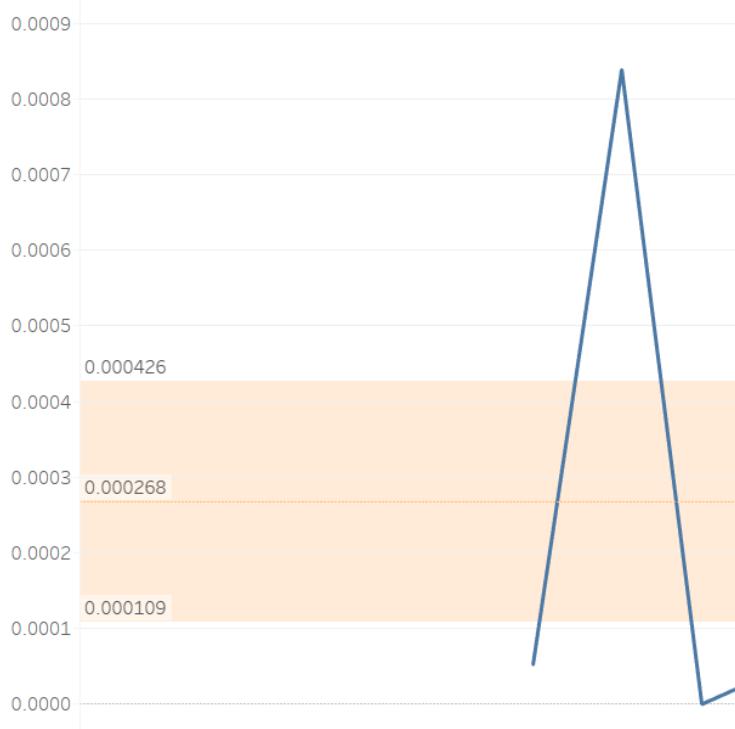
1. Drag in ‘Value Score’, ‘KRI Code’ and ‘Submission month’ from the dimensions list on the left-hand side and place them in the filters section in the middle-left portion of the worksheet. Right-click on all three and select show filter so that you can properly use the filter function.



1. On the top left-hand side of the worksheet, change the view from Data to Analytics. Once in the Analytics section, select Forecast. This should automatically generate a forecast in your worksheet. From there, you can hover over the forecast line on the worksheet and right-click. There should be a choice called forecast. Hover over that and you will see a choice called forecast options. Here you can make the forecast however you want as further explained below. The options we used were exactly three months for the forecast length, and a custom forecast model with an additive trend. We checked the box that says ‘fill in missing values with zeros. We also checked the box that says ‘show prediction intervals’ and used a 95% prediction interval.



1. To add in the confidence interval, go back to the analytics tab on the left-hand side. Select the option that says, ‘Average with a 95% CI’ and drag it into the worksheet. It should automatically add the shaded confidence level region. To add the values on the lines, right click in the region and select edit. In the ‘label’ box, select Value. You should get something that looks like this.

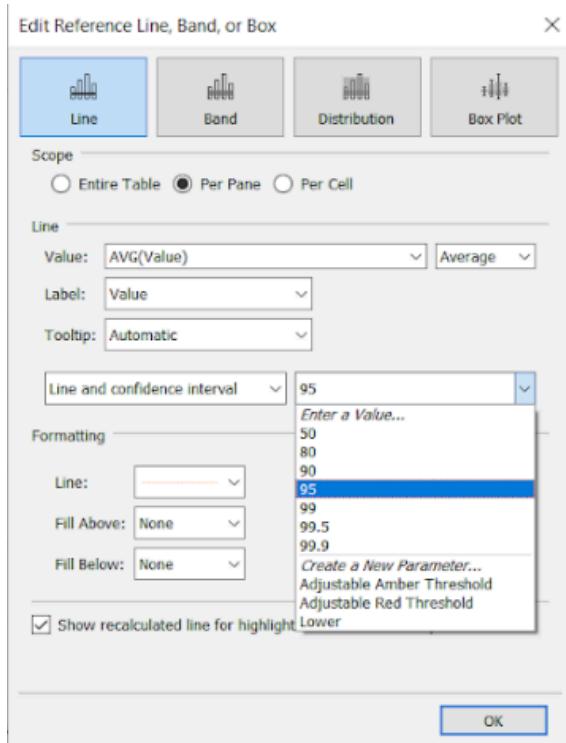


See the appendix as a reference to what the final result for **KRI Forecast** should look like.

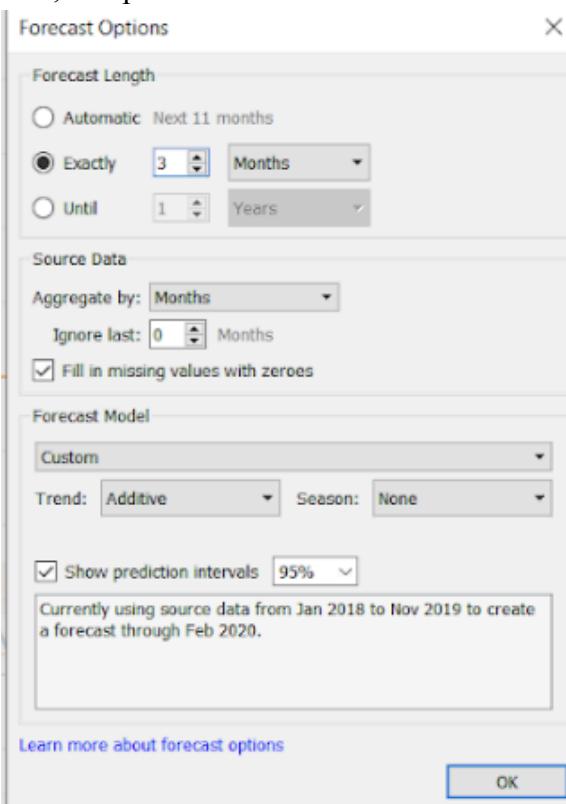
*Note: The page in the story called **KRI Threshold and Forecast** is simply the KRI Threshold page and the KRI Forecast page combined into one. This allows you to view all information about individual KRI's at once. You can see this finished page in the appendix as well.*

To use the tool, follow these steps

1. To change KRI Code simply pick the KRI code you want on the right-hand side.
2. The orange shaded region is the region in between the new Red and Amber thresholds.
To change the confidence interval (currently set at 95%) right-click in the orange shaded region and hit edit.



1. This box will pop up allowing you to pick any confidence interval of your choice.
1. To change forecast details, right-click on the shaded forecast region and hit edit.
1. You can change things such as forecast length, aggregate info, what type of model you want to use, and prediction interval.



1. To see details about a point or prediction, hover over the line with your clicker.

Forecast indicator:	Actual
Month of Submission Month:	November 2018
Avg. Value:	0.1364
Red Threshold:	0.5000
Amber Threshold:	0.3000

Note: The confidence interval level may be slightly different on the KRI Forecast graph from the KRI Threshold graph. This is due to the new forecasted points changing the confidence interval.

Overall Forecast

This page breakdowns the overall change in value scores over time. It shows the total of Red, Amber and Green values. Currently, there are many more Green values than Red and Amber as evident in the graph. We are hoping that our new thresholds will make the distribution between Red, Amber and Green more evenly split. There is also a forecasting tool with this page that predicts the total value scores going forward. This forecast is a yearlong forecast and uses an exponential smoothing method.

To build the tool, follow these steps

1. Click the ‘new worksheet’ button in the bottom right-hand corner of Tableau
2. Drag in ‘submission month’ from the dimensions list on the left-hand side and place it in the columns box at the top of the worksheet. Right-click and select month so that it reads MONTH(Submission month). There will be two separate month options when you right-click, be sure to select the second one. The MONTH(Submission month) tab should turn Green when you select this.

The screenshot shows the 'Rows' section of a Tableau worksheet. A blue bar highlights the 'Value Score' button. To its right, another blue bar highlights the 'CNT(Value)' button.

1. Drag in 'Value score' from the dimensions list on the left-hand side and 'Value' from the measures list on the left-hand side and place them both in the rows box at the top of the worksheet. Right-click on the 'Value' tab and hover over measure and then select count so the tab reads CNT(Value)

The screenshot shows the 'Filters' section of a Tableau worksheet. It contains four items: 'KRI Code', 'Value Score', 'Business Line', and 'Submission Month', each represented by a blue rounded rectangle.

1. Drag in 'Value Score', 'KRI Code', 'Submission month' and 'Business Line' from the dimensions list on the left-hand side and place them in the filters section in the middle-left portion of the worksheet. Right-click on all three and select show filter so that you can properly use the filter function.

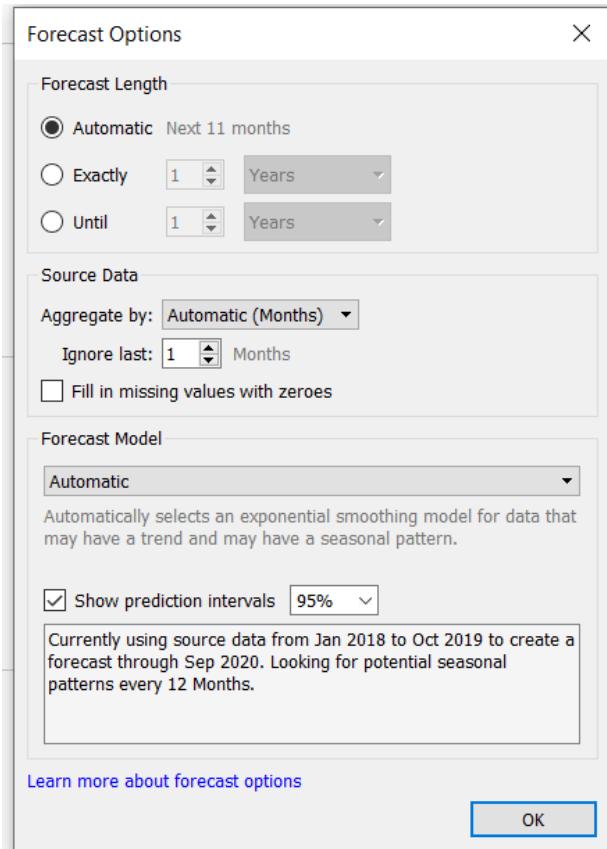
The screenshot shows the 'Marks' section of a Tableau worksheet. It includes several buttons: 'Automatic', 'Color', 'Size', 'Label', 'Detail', 'Tooltip', 'Path', 'Value Score' (selected), and 'Forecast indicator' (selected).

1. Drag in 'Value score' from the dimensions list on the left-hand side and place it on the colors section in the mid-left under the filters. You will be able to choose the colors for the Red, Amber and Green sections of the graph. The 'Forecast indicator' tab will automatically populate in this section when you add the forecast.

The screenshot shows the 'Marks' section of a Tableau worksheet. It includes several buttons: 'Automatic', 'Color', 'Size', 'Label', 'Detail', 'Tooltip', 'Path', 'Value Score' (selected), and 'Forecast indicator' (selected).

1. On the top left-hand side of the worksheet, change the view from Data to Analytics. Once in the Analytics section, select Forecast. This should automatically generate a forecast in your worksheet. From there, you can hover over the forecast line on the worksheet and right-click.

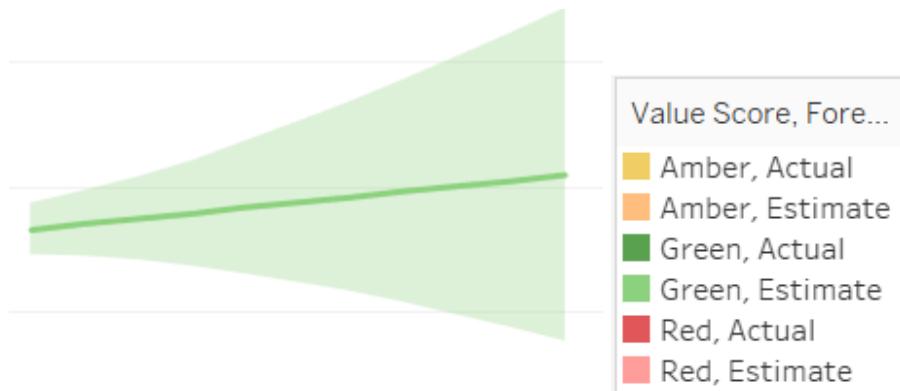
There should be a choice called forecast. Hover over that and you will see a choice called forecast options. Here you can make the forecast however you want as shown above. The options we used for this graph were automatic for the forecast length, and automatic for the forecast model. We did not check the box that says ‘fill in missing values with zeros. We did check the box that says ‘show prediction intervals’ and used a 95% prediction interval. In the Source Data section, we aggregated by automatic(months) and ignored the last 1 month.



See the appendix as a reference to what the final result for **Overall Forecast** should look like.

To use the tool, follow these steps

1. This graph is very similar to use as the last one (KRI Forecast). Follow the same steps to change the confidence interval, change the forecast options, or to hover over a certain point.
2. The shaded Green region shows the 95% prediction range. The line through the middle is the actual prediction, but this shaded region is indicating that the values could fall anywhere within this range.



1. The key in the top right-hand corner breaks down what is being shown.

Prediction Interval

A prediction interval is a type of confidence interval that goes one step further to make predictions. It is used in regression analysis. This interval is a range of values that forecasts the next value based on the previous data in your model. We used a 95% prediction interval for all of our forecasts for similar reasons why we used a 95% confidence interval throughout the project. A 95% prediction interval means that for each forecast, there is a range given. There is a 95% chance that the actual data point will fall into this range. The range allows for prediction errors and unforeseen changes in the data. A 99% prediction interval will give you too wide of a range and will not be as precise as it could. A 90% prediction interval will give you too narrow of a range and could cause serious flaws with your model. 95% has a balance of both and is the best choice for prediction intervals.

Exponential Smoothing

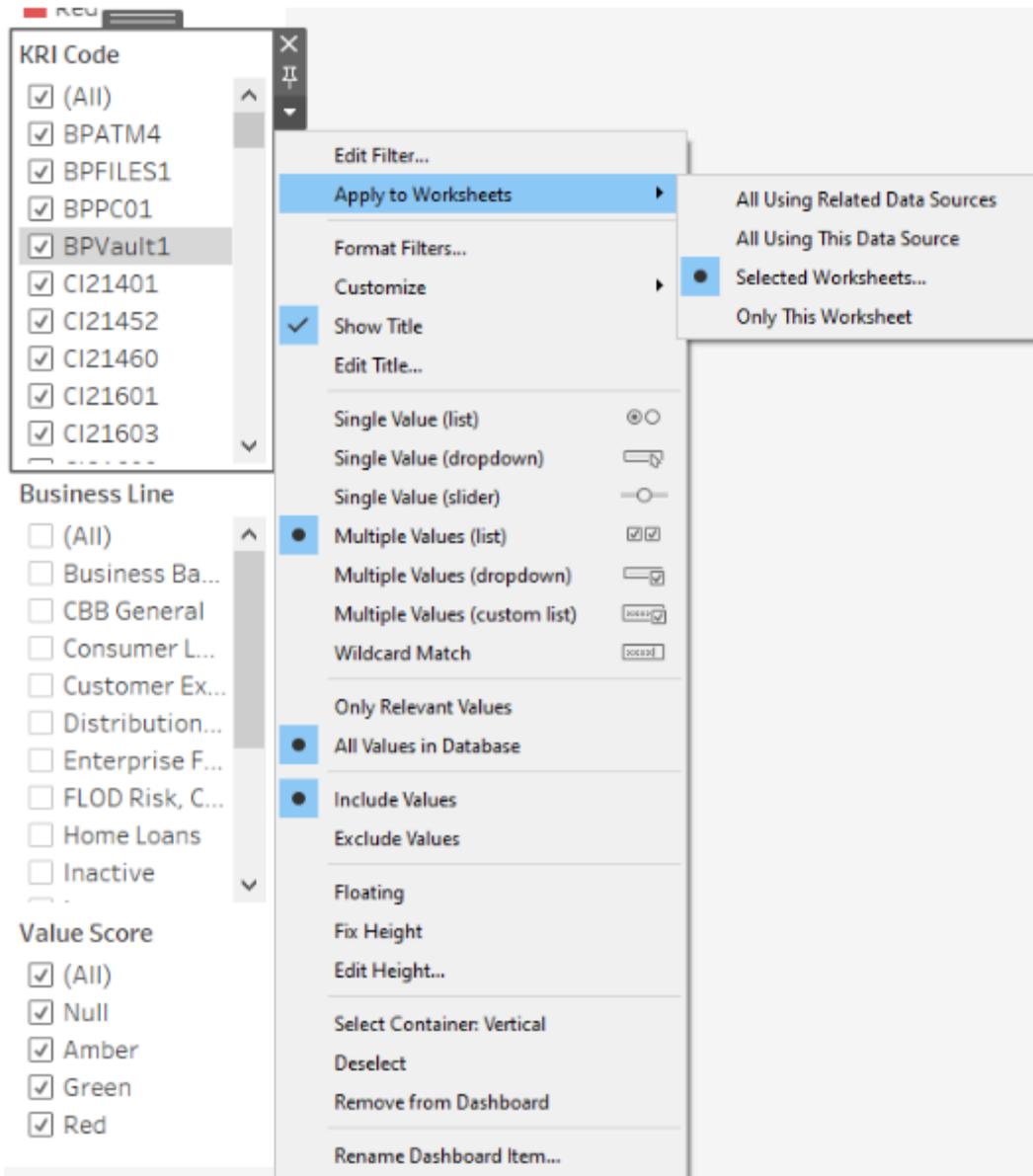
Exponential Smoothing is the method Tableau uses to make the forecasts. Exponential smoothing is a time series forecasting method for univariate data that can be extended to support data with a systematic trend or seasonal component (*Brownlee*). It uses weighted sums of past observations to make predictions. All of the weights are not the same however. Recent observations are given more weight than older observations when making the prediction. This type of method is similar to the Box-Jenkins ARIMA model. Both deal with time-series forecasting and are a part of the ETS family of models. The ETS stands for Error, Trend and Seasonality. Adding a seasonal trend into the prediction is one of the benefits of Exponential Smoothing. We do not have enough data yet to see if there are any seasonal patterns with this data, but it would be an interesting thing to keep an eye on going forward.

Filters

Much of this info may be repetitive, but it will cover the following info on filters

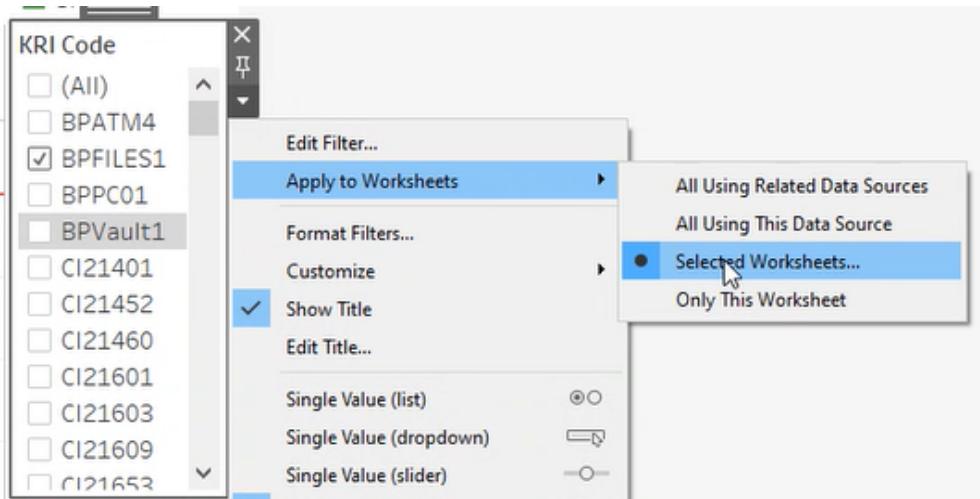
- How to add Filters
- How to apply filters to more than one worksheet at a time

If you want to change filters ideally you should select which filters you want in the worksheet first, then you can select which filters you want in the dashboard. The most convenient way to add filters is just doing it straight from the dashboard.



As you can see the only filters that are available are the dimensions and Measures used in the worksheet.

If you have more than one worksheet inside of a dashboard and want the filter to apply to both worksheets simply scroll over the filters and click on the, downward facing triangle > Apply to worksheets > Selected worksheets then select all the worksheets you want to be affected by the filter.



Miscellaneous

To change the data type of Submission Month to Date in case it is not:

1. Go to Dimensions on the left-hand side
2. Right click on Submission Month
3. Change data type to Date

To filter and focus on certain value distributions (*with an x and y axis*) This is useful for **KRI Threshold**, **KRI Forecast**, and **Overall Forecast**:

1. Click on tab columns' triangle
2. Select the category you want
3. Right click Y-axis and edit it
4. Use fix to type in the range you want, if not sure, use automatic to view if you can find the range (move the cursor to the highest and lowest bar.)

To sort date in Excel:

1. Select the column with date
2. Data (tab)
3. Text to Columns
4. Next
5. Next
6. Date set to MYD
7. Finish
8. Sort the whole column with ascending order and sort the KRI code with ascending order
9. Save

To change any worksheet title:

1. Hover over the title and click the small arrow in the top right
2. Click edit title to change it

Potential Issues:

If the Submission Month Column is Null in the Data Source tab. Try to change the data type in the excel file for submission Month to Date then reload the excel file.

Results & Final Thoughts

Our advice for adjusting KRI threshold values is to utilize every tab within Tableau. Meaning use all of the descriptive, prescriptive, and predictive tools at your disposal. It would be a mistake to adjust KRI thresholds after looking at just a single tab. In our understanding every KRI is different and some are more sensitive than others.

We recommend using different confidence levels if the historical data for a KRI warrants it. For example, a KRI has only Red values, you can use a higher confidence level to increase the upper and lower limits (*or thresholds*). Or maybe you want to make a very restrictive threshold where you do not want the value score reaching Green or Amber easily. You can simply lower the confidence level which will tighten/Reduce the width of the confidence intervals upper and lower bounds thus making it more difficult for KRI's to reach Amber or Green.

The confidence interval in terms of it being utilized in our tool is just upper and lower limits built around the mean of all the KRI's values. It should be up to the user to take these upper and lower confidence interval values, and the information given by the other dashboards to make a decision that aligns with their risk management practices.

Confidence Interval values can replace both the Amber and Red threshold Values. Or the lower limit can replace just the Red threshold. The Average can replace just the Amber threshold and so on. You will need to think about the strategy you want to apply to each KRI in terms of their thresholds and this tool will help you do that.

Citations

Descriptive Analytics

Guha, and Ghosh. "Fundamentals of Descriptive Analytics." DATAVERSITY, 6 July 2017, www.dataversity.net/fundamentals-descriptive-analytics/.

Prescriptive Analytics

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https://www.sas.com/en_us/insights/analytics/predictive-analytics.html

Refresh Data on a schedule

"Refresh Data on a Schedule." Tableau,
help.tableau.com/current/server/en-us/schedule_add.htm.

Incremental & Full Refresh

"Refresh Extracts." Tableau,
help.tableau.com/current/pro/desktop/en-us/extracting_refresh.htm.

Why do people use 95% confidence Intervals

"Confidence Interval." Wikipedia, Wikimedia Foundation, 1 May 2020, en.wikipedia.org/wiki/Confidence_interval#Meaning_and_interpretation.

"Interpreting Confidence Intervals." MathBootCamps, 3 June 2017, www.mathbootcamps.com/interpreting-confidence-intervals/.

Why do people use 95% prediction intervals

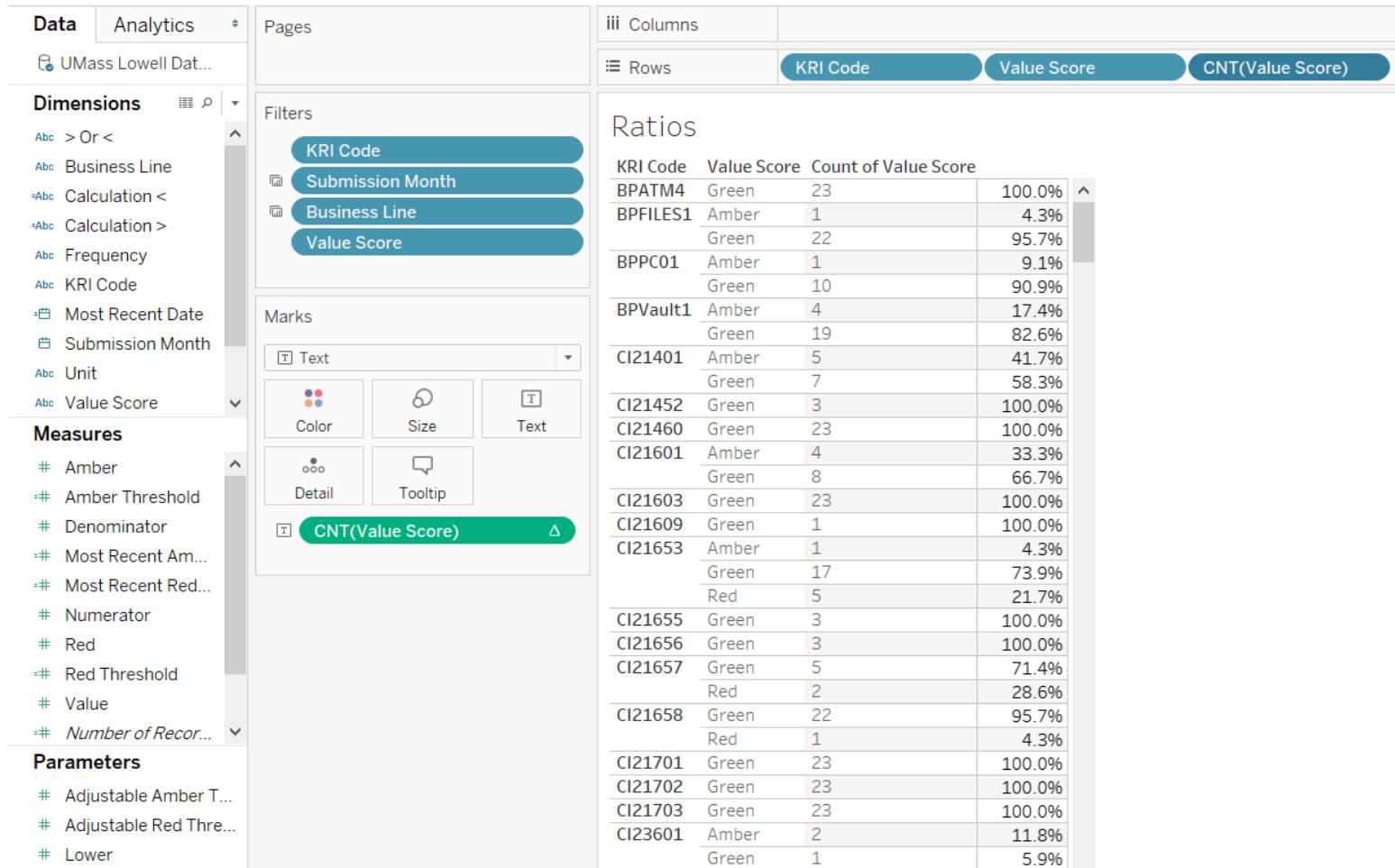
"Prediction Interval: Simple Definition, Examples" StatisticsHowTo, 23 February 2016, <https://www.statisticshowto.com/prediction-interval>

Exponential Smoothing

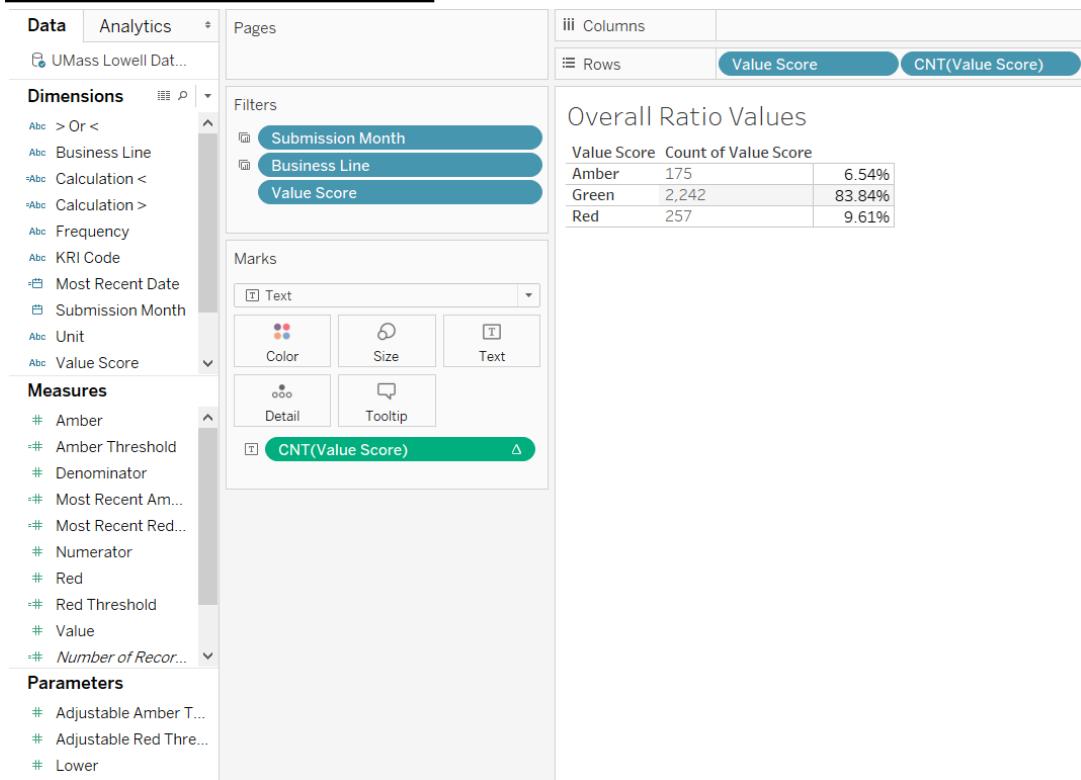
Jason Brownlee. "A Gentle Introduction to Exponential Smoothing..." Machine Learning Mastery, 20 August, 2018,
<https://machinelearningmastery.com/exponential-smoothing-for-time-series-forecasting-in-python/>

Appendix

Ratios Worksheet - Worksheet



Overall Ratio Values - Worksheet



Ratio & Count - Dashboard

Overall Ratio Values

Value Score	Count of Value Score	
Amber	175	6.54%
Green	2,242	83.84%
Red	257	9.61%

Ratios

KRI Code	Value Score	Count of Value Score	
BPATM4	Green	23	100.0%
BPFIES1	Amber	1	4.3%
	Green	22	95.7%
BPPC01	Amber	1	9.1%
	Green	10	90.9%
BPVault1	Amber	4	17.4%
	Green	19	82.6%
CI21401	Amber	5	41.7%
	Green	7	58.3%
CI21452	Green	3	100.0%
CI21460	Green	23	100.0%
CI21601	Amber	4	33.3%
	Green	8	66.7%
CI21603	Green	23	100.0%
CI21609	Green	1	100.0%
CI21653	Amber	1	4.3%
	Green	17	73.9%
	Red	5	21.7%
CI21655	Green	3	100.0%
CI21656	Green	3	100.0%
CI21657	Green	5	71.4%
	Red	2	28.6%
CI21658	Green	22	95.7%
	Red	1	4.3%
CI21701	Green	23	100.0%
CI21702	Green	23	100.0%

KRI Code

- (All)
- BPATM4
- BPFIES1
- BPPC01
- BPVault1
- CI21401
- CI21452
- CI21460
- CI21601
- CI21603

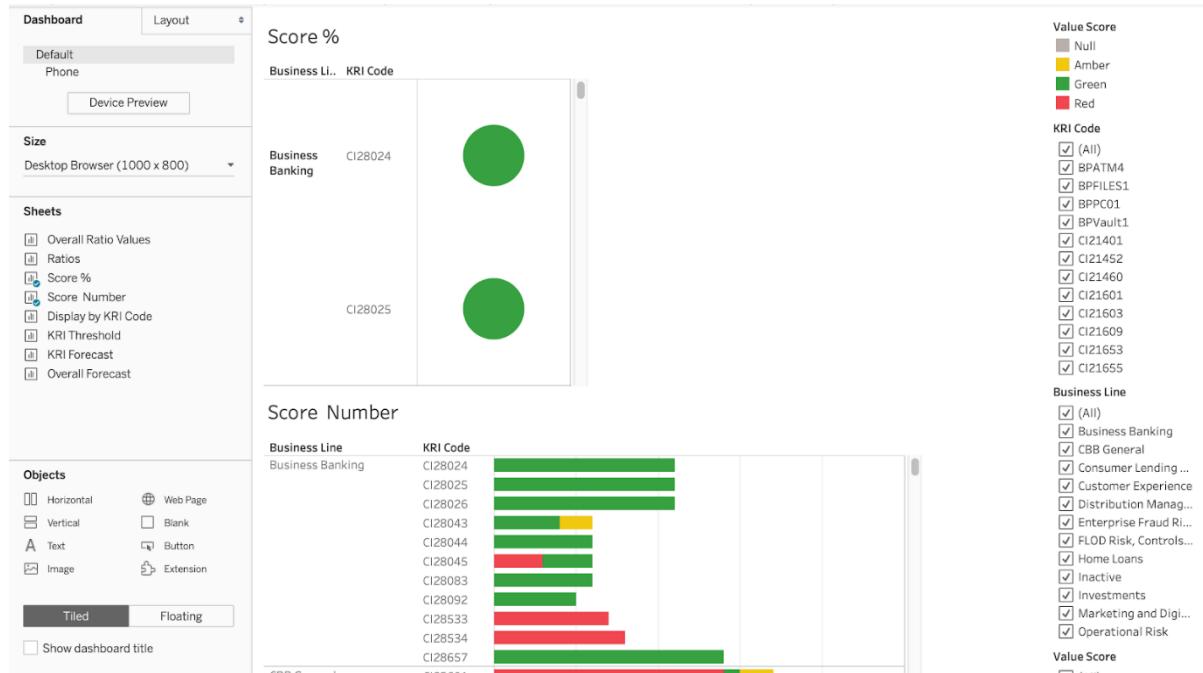
Business Line

- (All)
- Business Banking
- CBB General
- Consumer Lending and Deposit Products
- Customer Experience
- Distribution Management
- Enterprise Fraud Risk
- FLOD Risk, Controls and Compliance
- Home Loans
- Inactive

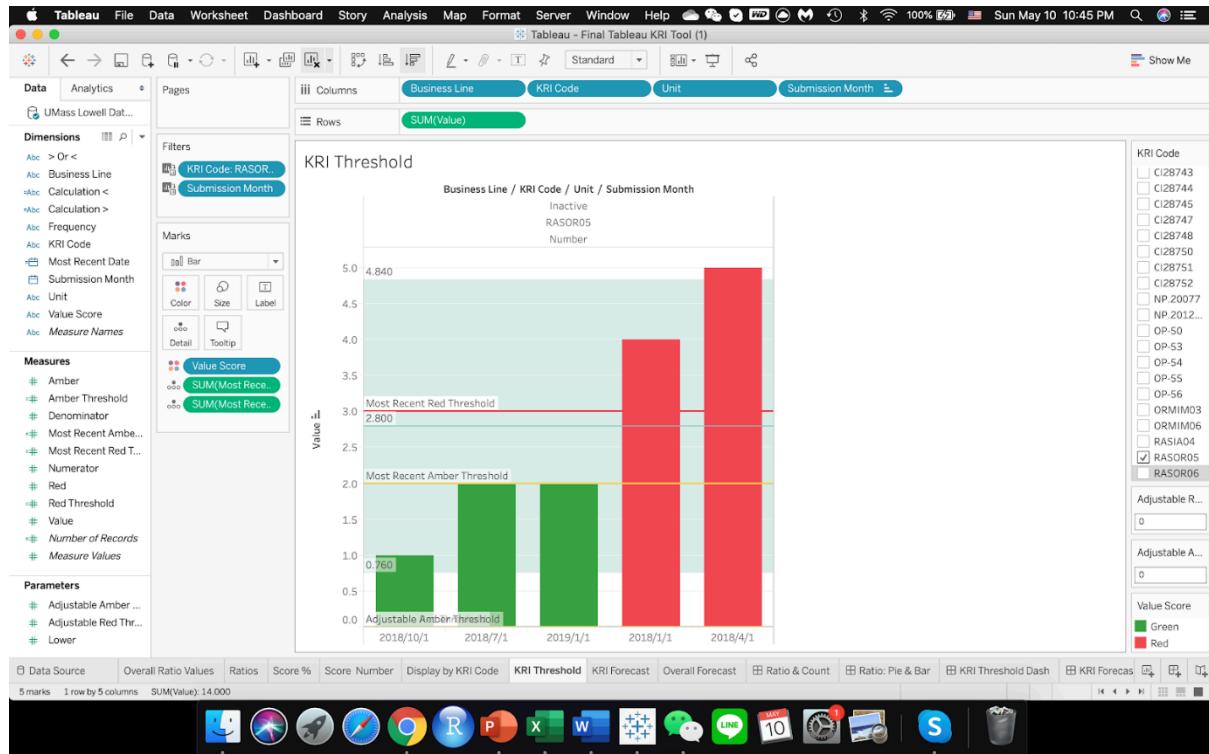
Submission Month

- (All)
- 1/1/2018
- 2/1/2018
- 3/1/2018
- 4/1/2018
- 5/1/2018
- 6/1/2018
- 7/1/2018
- 8/1/2018
- 9/1/2018

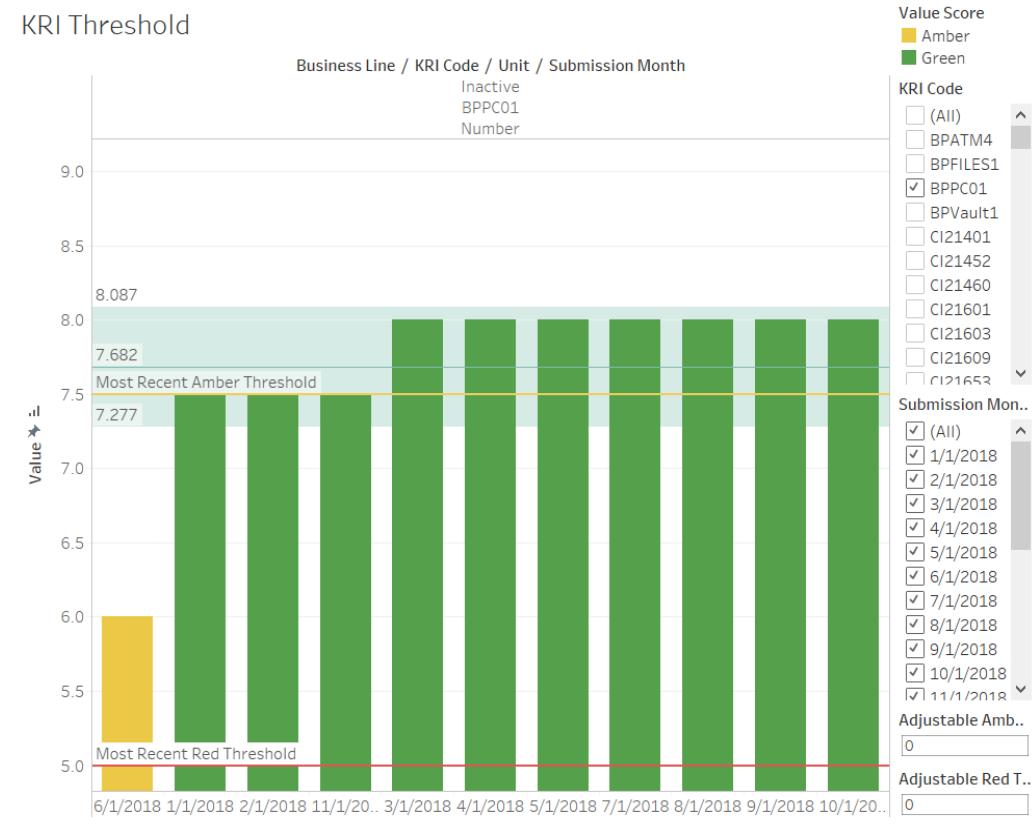
Ratio: Pie & Bar - Dashboard



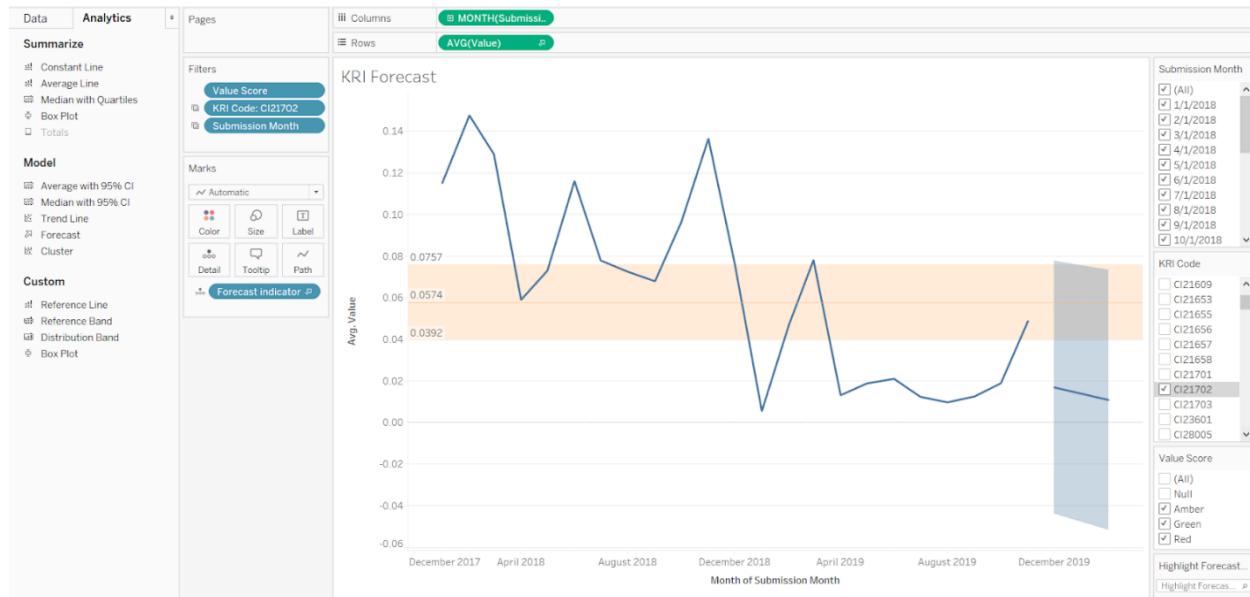
KRI Threshold - Worksheet



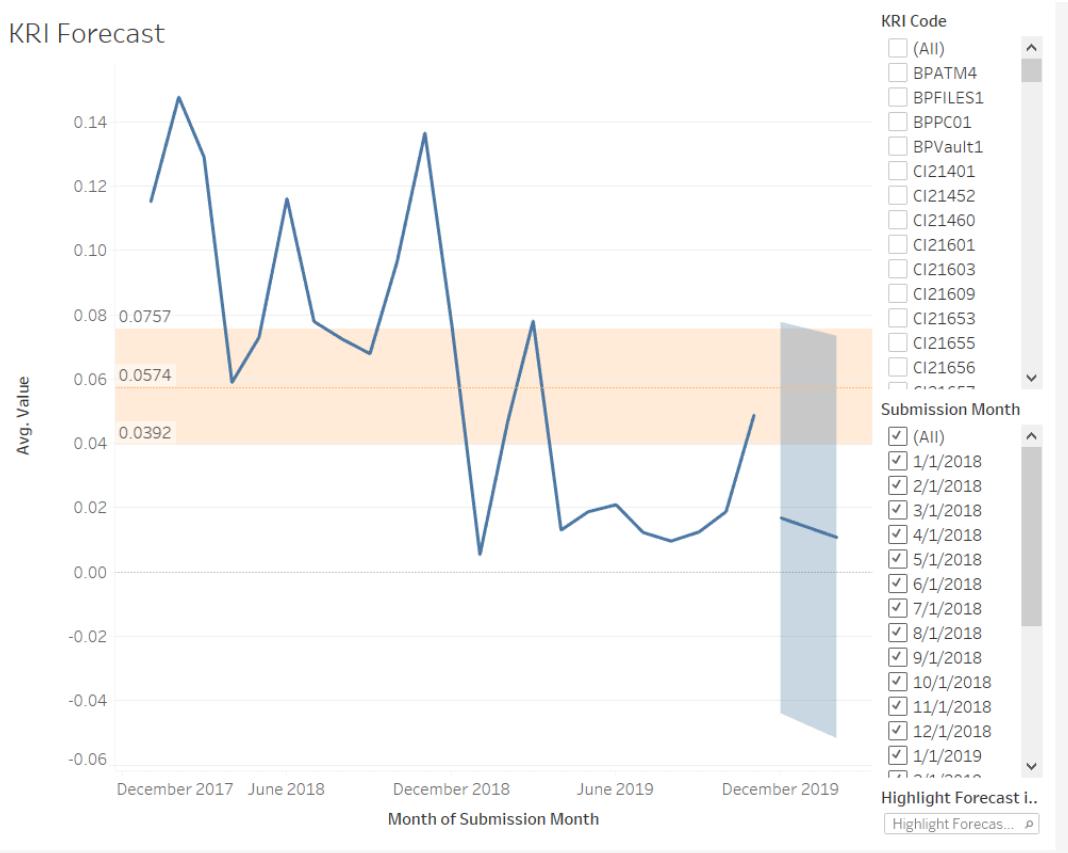
KRI Threshold - Dashboard



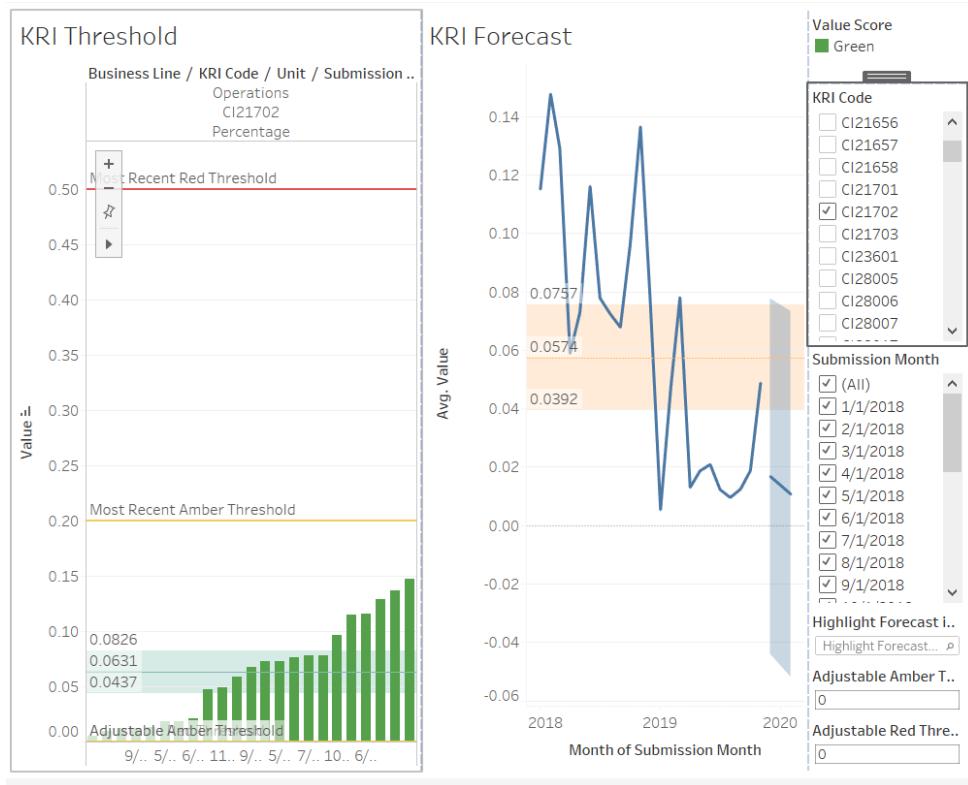
KRI Forecast - Worksheet



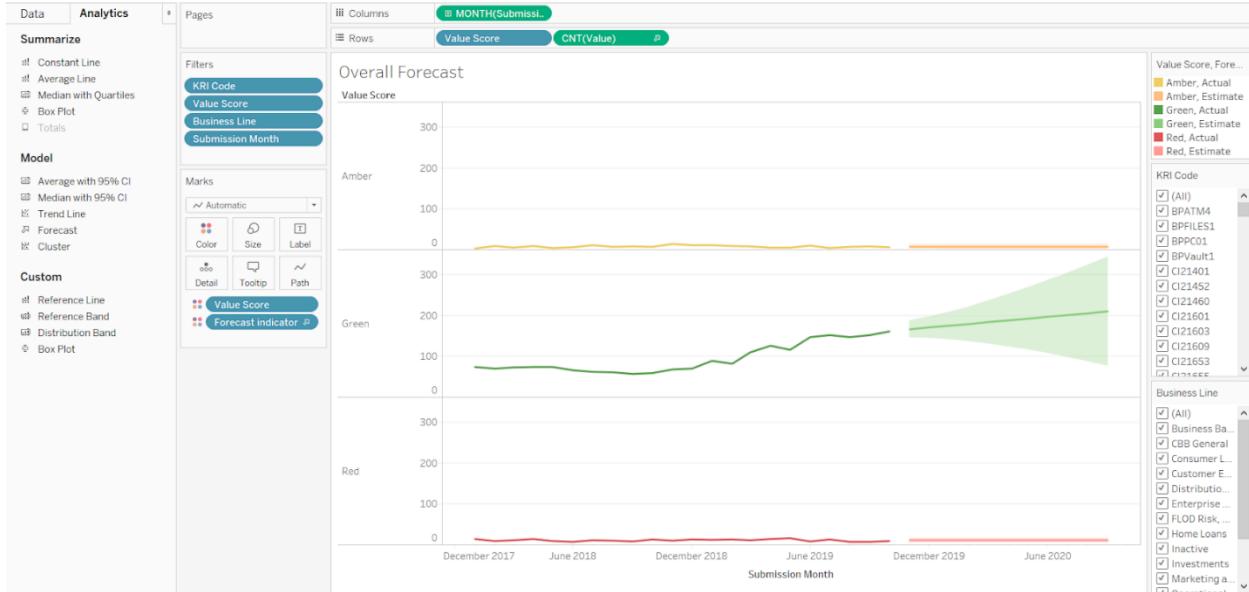
KRI Forecast - Dashboard



KRI Threshold and Forecast - Dashboard



Overall Forecast - Worksheet



Overall Forecast - Dashboard

Overall Forecast

