



University at Buffalo
The State University of New York

Integrating Warehouse with BI Tools

By

POOJA DAYANAND KABADI - 50575012

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1. Summary

This project focused on integrating our company's data warehouse with Tableau, a leading business intelligence and data visualization tool. The goal was to create a proof-of-concept connection between Tableau and our warehouse to enable data-driven insights and forecasting capabilities.

2. Tableau Setup and Data Connection

- Successfully installed Tableau Desktop and connected it to sample Excel data as well as our Oracle Cloud data warehouse.
- Configured the necessary Oracle Instant Client and drivers to enable seamless connectivity between Tableau and our cloud database.

3. Data Preparation and Modelling

- Explored Tableau's data preparation capabilities, including creating calculated fields and modifying data types to ensure accurate representation of our metrics.
- Leveraged Tableau's automated relationship detection to establish connections between fact and dimension tables, creating a functional star schema for analysis.

4. Visualization and Dashboard Creation

- Developed multiple chart types, including line charts for time series data, to visualize key business metrics like employment numbers and unemployment rates.
- Experimented with Tableau's forecasting functionality, applying different models to project future trends based on historical data.
 - **Model Exploration:** Tested various forecasting models available in Tableau, including automatic, and additive models. This allowed us to compare different approaches and understand their strengths and limitations.
 - **Seasonality Analysis:** By adjusting seasonal parameters, we gained insights into cyclical patterns within our data, particularly useful for metrics like employment rates that often have annual trends.
- Played with various aspects of chart creation and customization:

- **Color schemes:** We explored how changing colors can affect data perception and dashboard aesthetics.
- **Axis manipulation:** We learned how adjusting axis ranges can dramatically change the story a chart tells, highlighting the importance of thoughtful design choices.
- **Filtering:** We applied date filters to focus on specific time periods, enhancing the relevance of our visualizations.
- Created a focused 1-page dashboard incorporating multiple visualizations to tell a cohesive story about our business data.

5. Key Learnings

- ✓ **Data Connectivity:** Establishing a robust connection between Tableau and cloud-based data warehouses is a critical first step. While it requires careful configuration, the resulting real-time access to business data is invaluable for timely decision-making.
- ✓ **Data Preparation:** Tableau offers powerful capabilities for data manipulation and calculated fields. These features allow us to refine and enhance our raw data, creating more meaningful metrics and enabling deeper insights.
- ✓ **Visualization Best Practices:** Creating effective dashboards involves more than just presenting data. It requires thoughtful design choices around chart types, colour schemes, and data filtering. We learned the importance of considering the end-user's perspective and the story we want our data to tell.
- ✓ **Forecasting Considerations:** Tableau's forecasting feature is powerful but requires careful application. Understanding the underlying models and the potential impacts of data anomalies is crucial for generating reliable projections. This underscores the need for domain knowledge alongside technical skills in data analysis.
- ✓ **Interactivity and User Engagement:** Tableau's interactive features, such as filters and drill-down capabilities, add significant value to dashboards. They allow users to explore data dynamically, potentially uncovering insights that might be missed in static reports.

6. Tableau Exposure

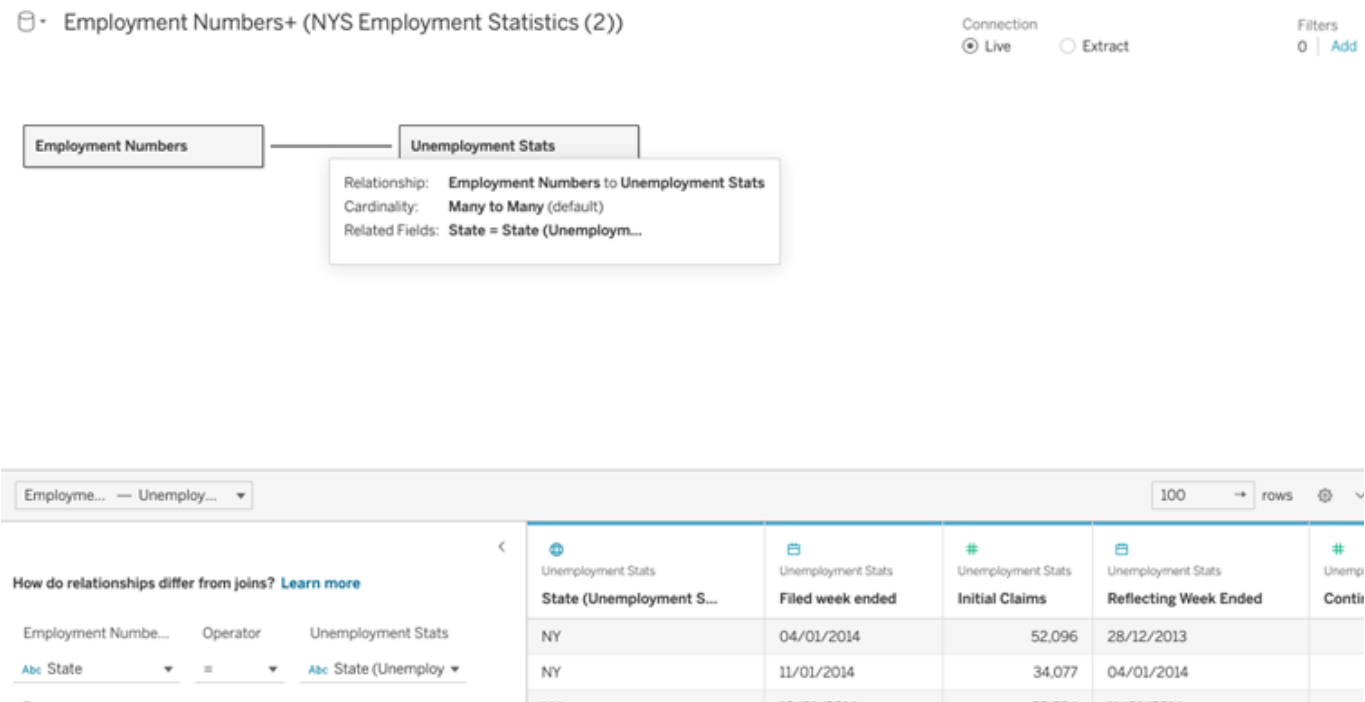


Figure 1 Tableau Data Sources Relationships

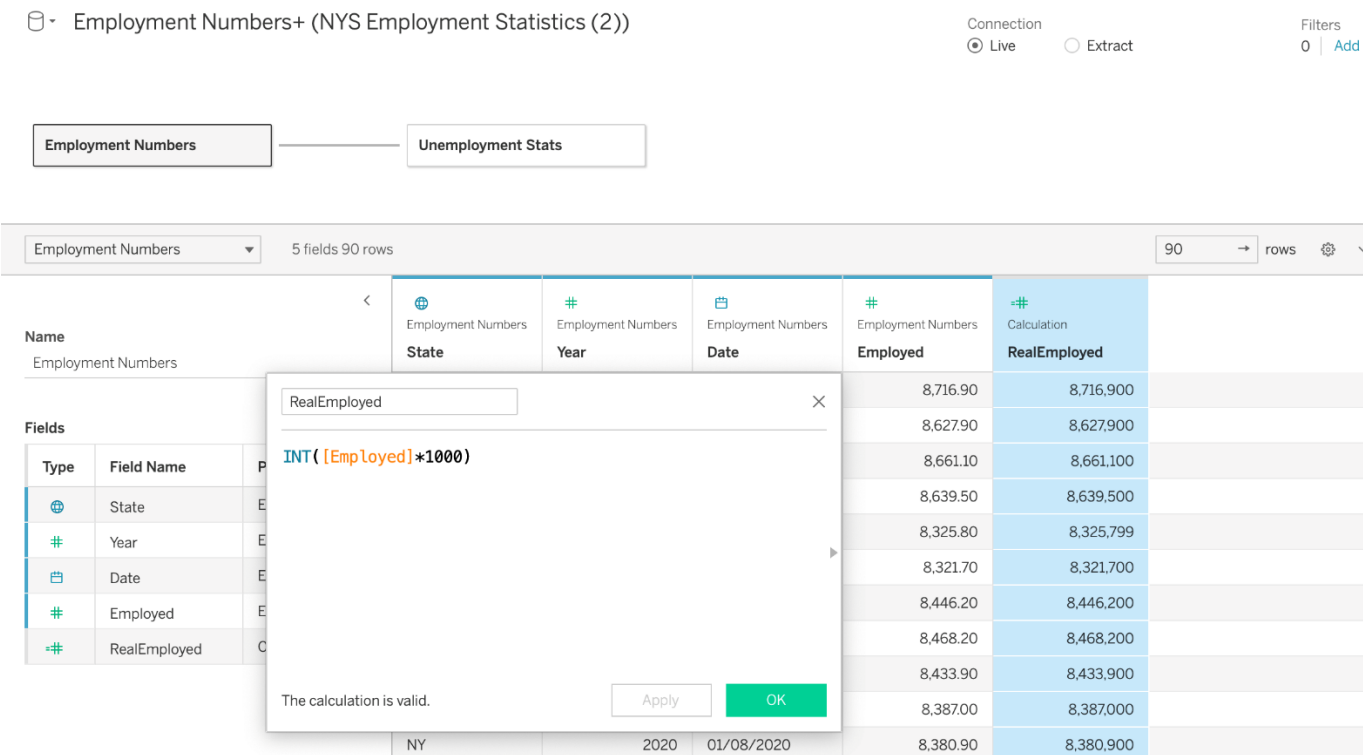


Figure 2 Modifying the Data-1

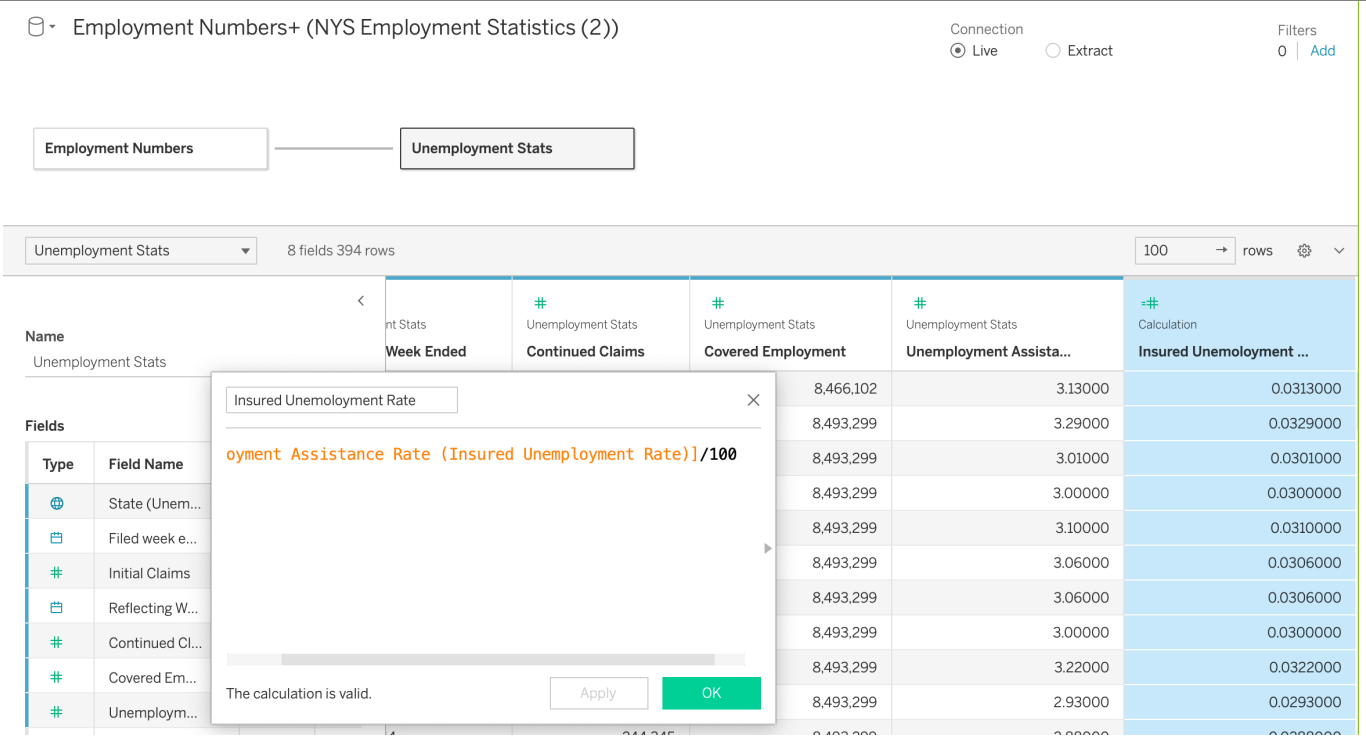


Figure 4 Modifying the data-2

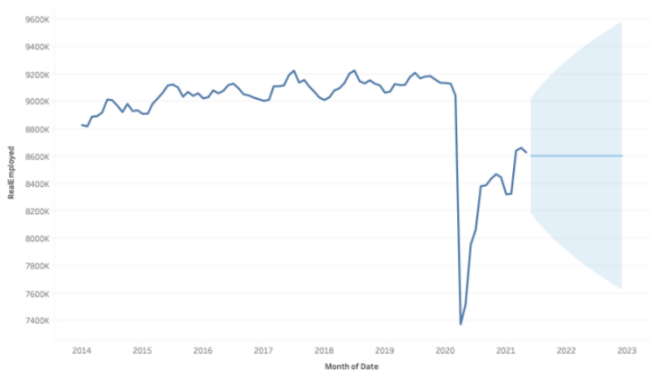


Figure 5 Forecast model default

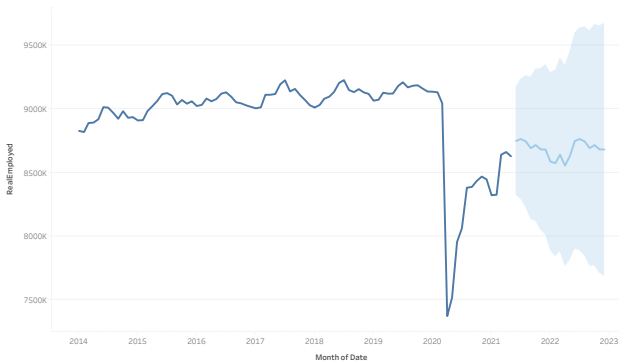


Figure 3 Forecast model modified

The left chart shows a flat forecasted line extending into the future. This flat forecast results from using the default automatic forecast settings, the right chart shows a modified forecast with more variation, reflecting seasonal patterns in the data. This modified forecast was created by adjusting the forecast settings to use a custom model with additive seasonality. The major anomaly visible in both charts is a sharp drop in the data around 2020, which is likely due to the impact of the COVID-19 pandemic on employment numbers. This significant anomaly could be why the initial automatic forecast produced a flat line, as extreme outliers can sometimes lead forecasting algorithms to produce overly conservative predictions.

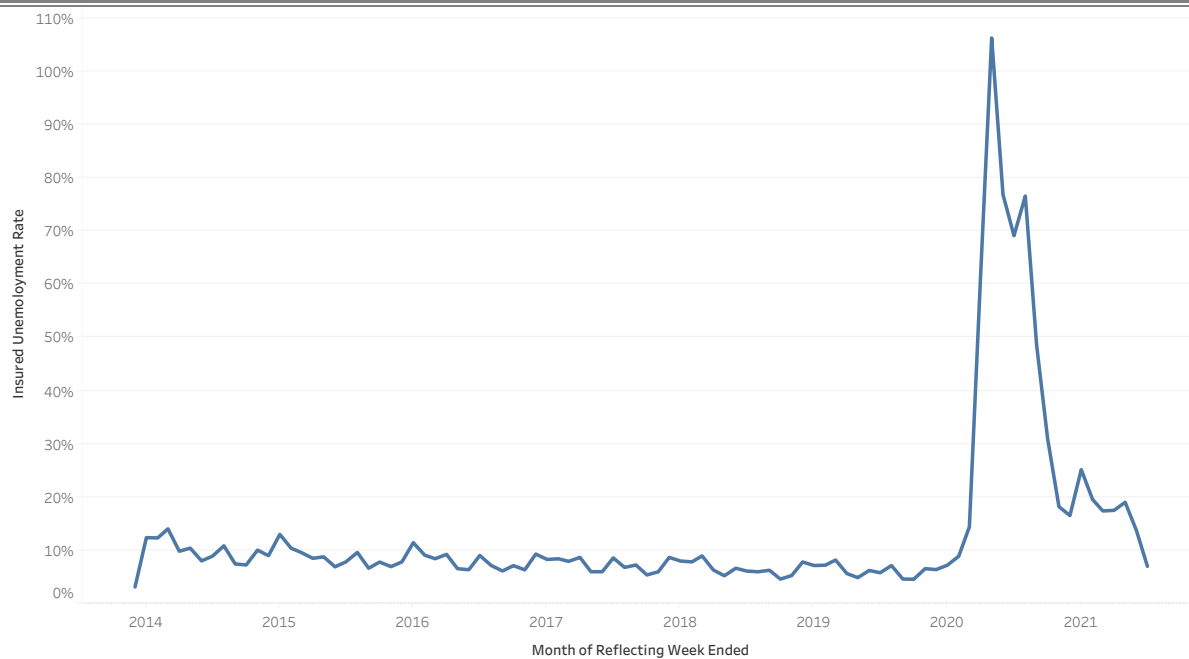


Figure 6 Line Chart from Unemployed Data(%)

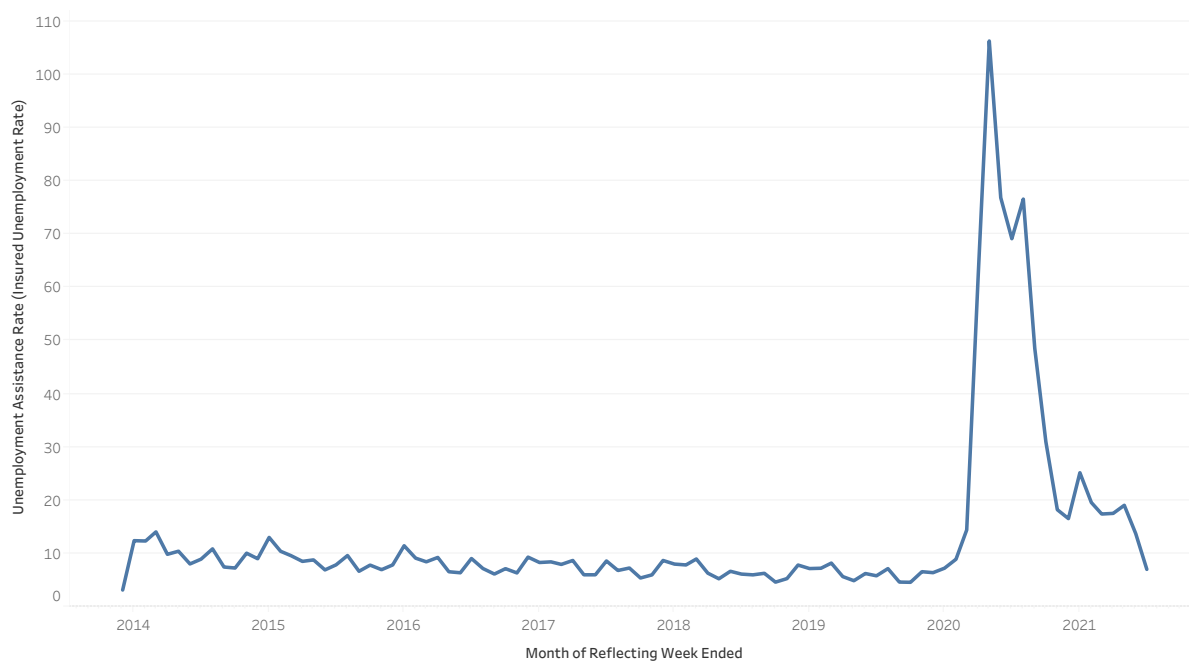


Figure 7 Line Chart from Unemployed Data

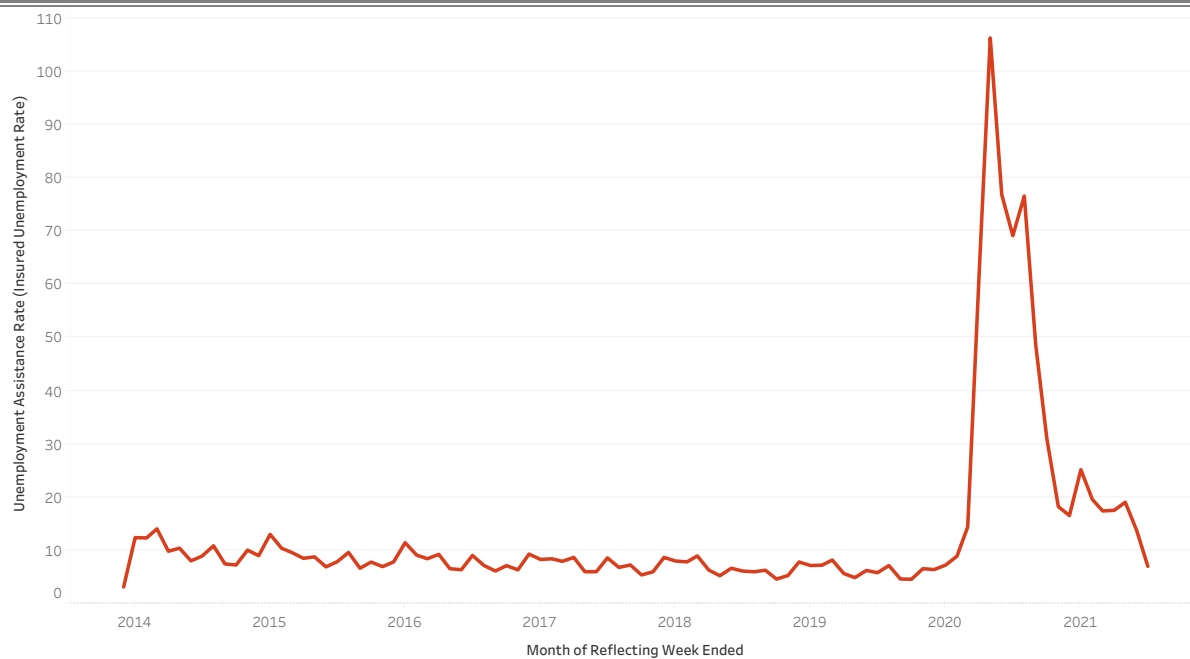


Figure 8 Same Line Chart with Modified Colour

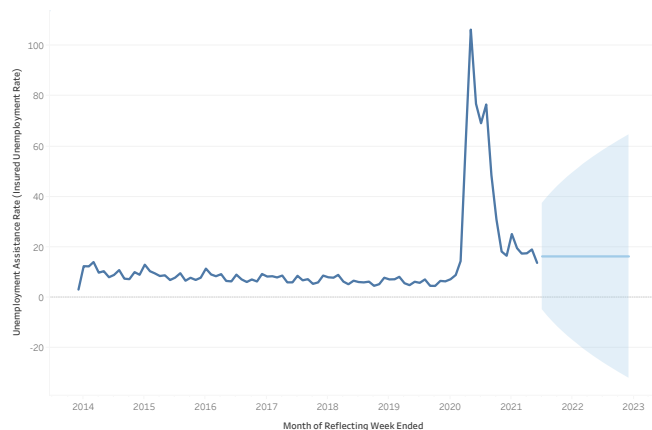


Figure 9 Default Forecast Model

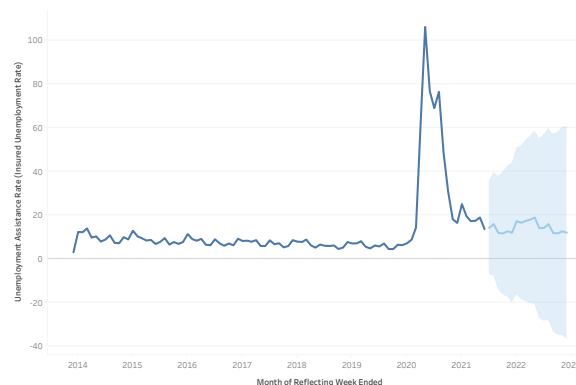


Figure 10 Custom Forecast Model

Filter [Month of Reflecting Week Ended]

Relative dates

Range of dates

Starting date

Ending date

Special

Relative dates

01/01/2019 to 31/12/2024

Years

Quarters

Months

Weeks

Days

Hours

Minutes

Previous year

This year

Next year

Last

6

years

Next

3

years

Year to date

Anchor relative to Today

Include null values

Reset

Apply

Cancel

OK

Figure 11 Relative Dates Filter

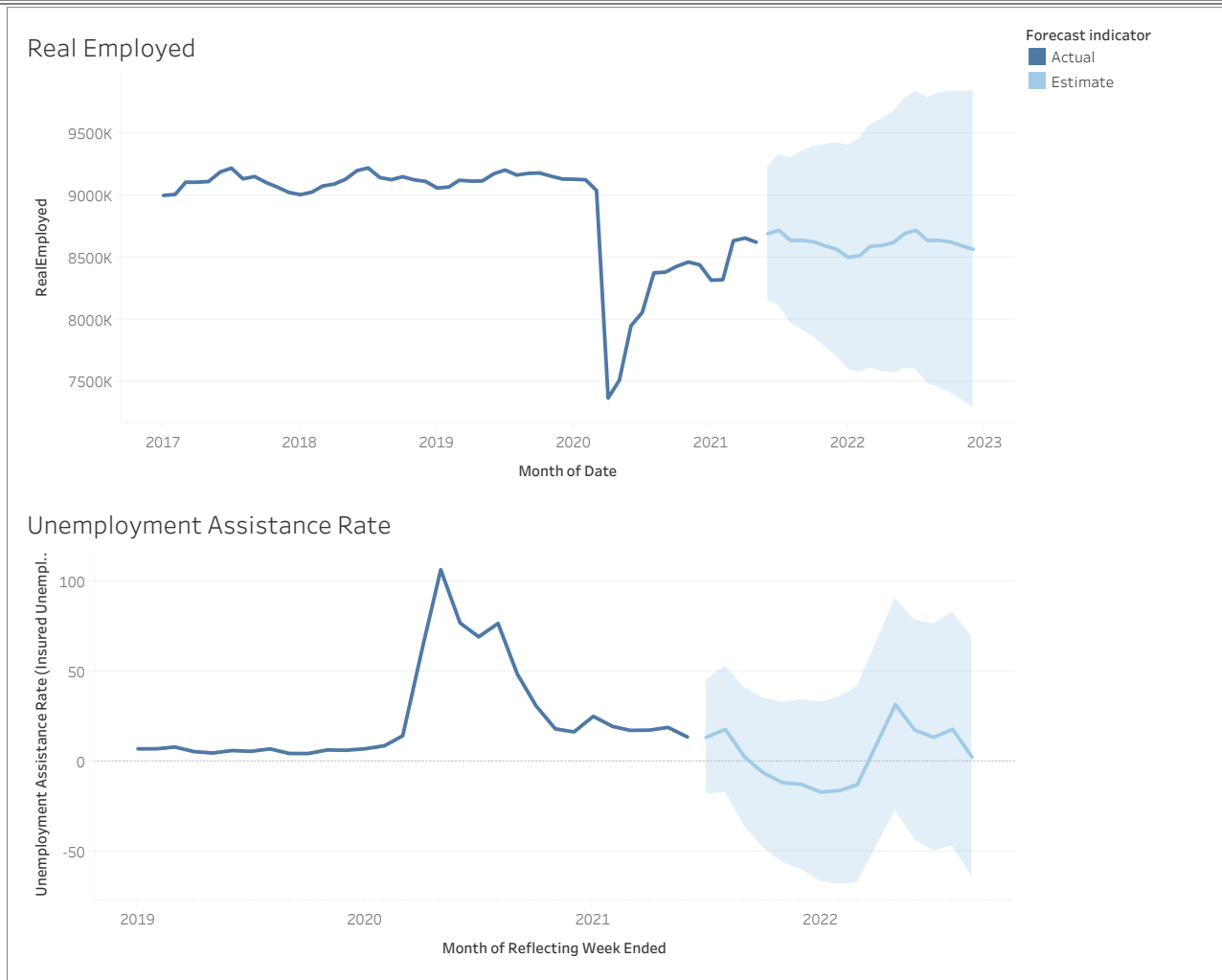


Figure 12 Dashboard View of Both The Charts

Key Insights from the dashboard

- Both employment levels and unemployment assistance rates were relatively stable from 2017 to early 2020.
- A significant event, likely the COVID-19 pandemic, caused a dramatic shift in both metrics around early 2020. Employment levels sharply dropped while unemployment assistance rates spiked dramatically.
- The charts show a clear inverse relationship between employment and unemployment assistance rates. As employment fell, unemployment assistance surged.
- Both charts show signs of recovery post-2020, but neither has fully returned to pre-pandemic levels. Employment has been gradually increasing, while unemployment assistance rates have decreased from their peak but remain higher than pre-2020 levels.
- Both charts show considerable uncertainty in their forecasts, indicated by the wide light blue areas. This suggests difficulty in predicting future trends accurately for both metrics.

Loading Dimension Table

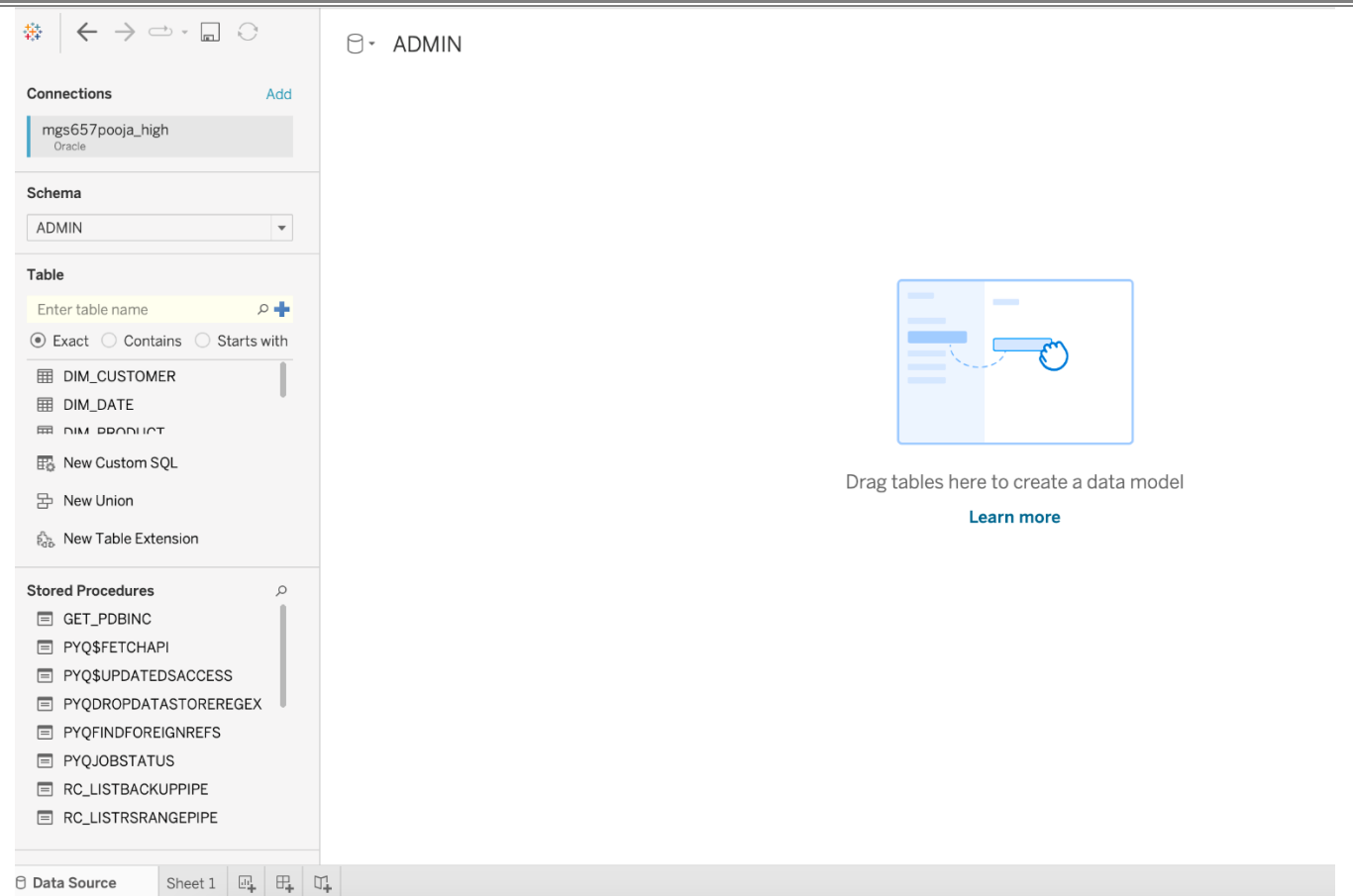


Figure 13 Successful Connection to the Oracle Datawarehouse

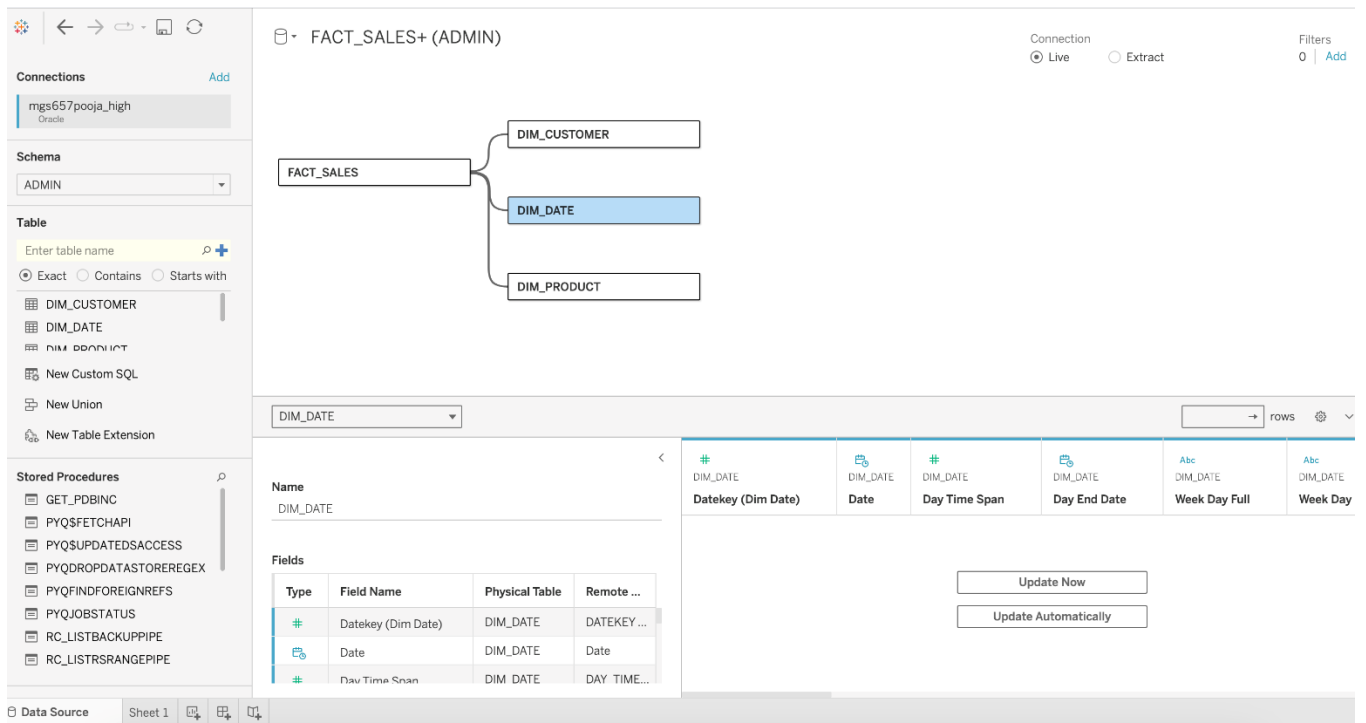


Figure 14 Pulling up the required tables for analysis.

Loading Dimension Table

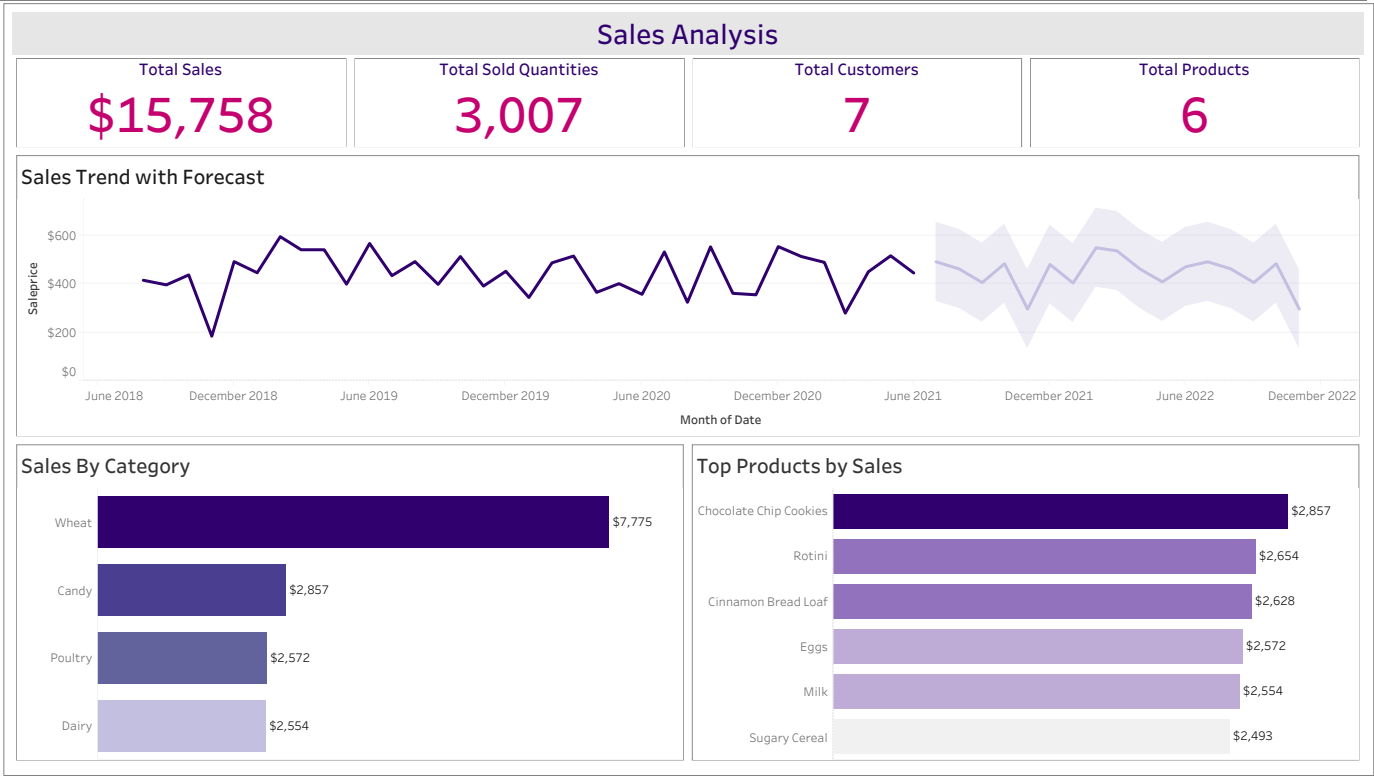


Figure 15 Sales Trend Analysis Dashboard

- The dashboard offers a comprehensive view of sales performance, focusing on total sales, customer engagement, and product performance.
- The sales trend analysis shows consistent revenue streams, with a stable outlook predicted by the forecast.
- Wheat is the most successful category, generating nearly half the revenue, while other categories like Candy and Poultry also show promise.
- On the product level, Chocolate Chip Cookies emerge as the top performer, emphasizing the popularity of sweet treats.
- Insights suggest opportunities to expand the customer base (currently only 7 customers) and capitalize on high-performing categories and products to further boost revenue.
- Overall, the dashboard provides actionable insights to refine sales strategies and target growth areas effectively.