PROJECT REPORT

TEAM ID	PNT2022TMID21204
PROJECT NAME	RETAIL STORE STOCK INVENTORY ANALYTICS

INDEX

1. INTRODUCTION

1.1 PROJECT OVERVIEW

This project aims to create an analytical dashboard called Retail store stock inventory analytics for managing any organization's inventory system. The Inventory Analytics Dashboard is used to manage an organization's stock with the help of a technology system. This system can be used to store inventory details, perform stock maintenance, update inventory based on sales data, and generate sales and inventory reports. Individual aspects of the sales and inventory management system are classified in this project. We are solving various problems affecting direct sales management and purchase management in this system. A large retail store may run out of stock on an important item if inventory is not properly controlled.

1.2 PURPOSE

The primary goal of inventory management is to assist businesses in easily and efficiently managing inventory ordering, stocking, storing, and using. We 'll always know what items are in stock, how many there are, and where they are if we manage the inventory effectively. Strong inventory management enables us to understand how we use our inventory and how demand for it changes over time. We can zero in on exactly what we require and we can eliminate what is unnecessary. That is practising inventory control with inventory management. Inventory control, by the way, is the balancing act of always having enough stock to meet demand while spending the least amount of money on ordering and carrying inventory.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

Products are considered to be the organization's business resources. This includes managing the product in an appropriate way to review it at any time as needed. As a result, it is essential to have an analytical dashboard that can generate reports and keep track of the stock balance and details about the organization's purchases. Prior to developing this project, we researched two existing Inventory Management Systems on the market, which helped us gain knowledge for the development of our project. This software is only used by large organisations, so we devised a solution that can be used by small businesses to manage their inventory in manufacturing plants. We decided to include some of the common and key features that should be included in every inventory management system after analysing the other inventory management systems.

2.2 REFERENCES

The existing research papers related to our project are listed below.

i) Inventory management for retail companies: A literature review and current trends.

Link: https://ieeexplore.ieee.org/document/9447350.

Year: March 2021.

Authors: Jorge Andres Espinoza Aguirre, Rodrigo Arcentales-Carrion, Mario Pena, Cinthya Vanessa Munoz Macas.

Description:

This article aims to analyse and present a large body of literature on inventory management, which includes numerous definitions and fundamental concepts for the retail industry. A systematic review of the literature was conducted to identify the main trends and indicators of inventory management in Small and Medium-sized Enterprises (SMEs). This study spans five years, from 2015 to 2019, and focuses specifically on the retail sector. The primary findings of this research are the leading inventory management systems and

models, the Key Performance Indicators (KPIs) for their proper management, and the advantages and disadvantages of selecting or adopting an efficient inventory control and management system.

ii) Analysis of Retailer Inventory and Financial Performance.

Link: https://scholarworks.uvm.edu/hcoltheses/363/

Year: May 2020.

Authors: Maria Pitari.

Description:
This paper attempts to recreate the regression model and results presented in Kesavan and Mani (2013) in order to examine the relationship between inventory growth and on-year-ahead earnings for public retailers in the United States. Furthermore, this paper aims to extend Kesavan and Mani's (2013) findings by applying their model to recent data to see if results vary as a function of different macroeconomic conditions.

iii) Research paper on Inventory management system.

Link: https://www.irjet.net/archives/V5/i4/IRJET-V5I448.pdf

Year: April 2018.

Authors: Punam Khobragade, Roshni Selokar, Rina Maraskolhe, Prof.Manjusha Talmale.

Description:
Inventory Management System (IMS) is software that assists businesses that operate hardware stores in keeping track of sales and purchases. Mismanaged inventory leads to dissatisfied customers, excess cash in warehouses, and slower sales. This project eliminates paper work, human errors, manual delays, and accelerates the process. The Inventory Management System will be able to track sales and available inventory, as well as notify the store owner when it is time to reorder and how much to purchase.

iv) Performance improvement of inventory management system processes by an automated warehouse management system.

Link:
https://www.semanticscholar.org/paper/Performance-Improvement-of-Inventory-Management-by-Atieh-Kaylani/7e67cc15f09618b8b70f1eb4e07120dab754e207.

Year: 2015.

Authors: Anas M. Atieh, Hazem Kaylani, Yousef Al-abdallat, Abeer Qaderi, Luma Ghoul, Lina Jaradat, Iman Hdairis.

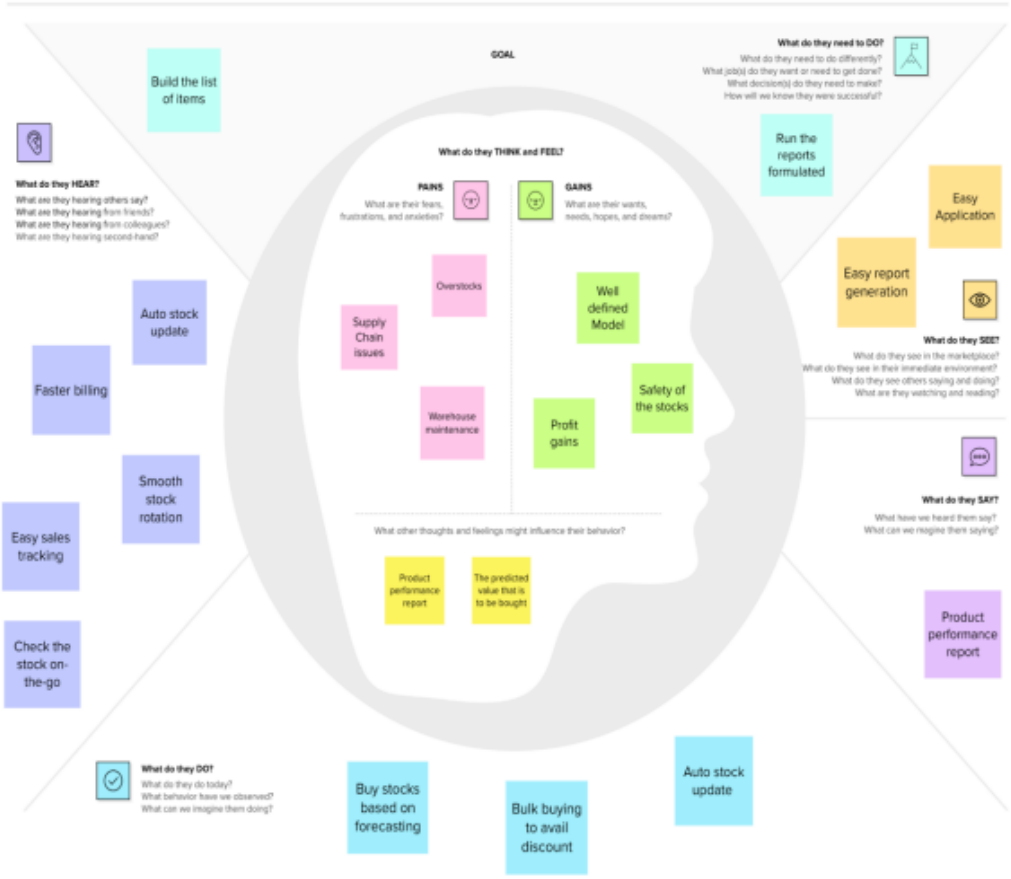
Description:
This study looks at the impact of a warehouse management system on supply chain performance, with the goal of providing a less resource-intensive, more efficient, and dependable inventory management system. Before developing software to handle the necessary transactions, the supply chain procedures used in the warehouse were reviewed. The software was tested for its ability to improve work flow and provide timely and efficient handling.

2.3 PROBLEM STATEMENT DEFINITION

Excess inventory causes several serious business and operational issues for retailers. Excess inventory occurs when a company or store orders more inventory than it is required. Most businesses are burdened by the costs of carrying excess inventory. A large inventory means high working capital costs, operational costs, and a complicated operation; a small inventory means lost sales, unhappy customers, and a tarnished brand.

3. IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP



3.2 IDEATION AND BRAINSTORMING

The following are the steps taken for brainstorming and idea generation:

Step 1: Team Gathering, Collaboration and Select the Problem Statement.

Step 2: Brainstorm, Idea Listing and Grouping.

Step 3: Idea Prioritization.

The images attached below provide us with additional information about the ideas we generated as well as the things we prioritised in order to develop an efficient analytics system.

Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

1

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

To improve the poor inventory control management in retail stores

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

Aishwarya K S

Amutha P

Raghavi Preeti A J

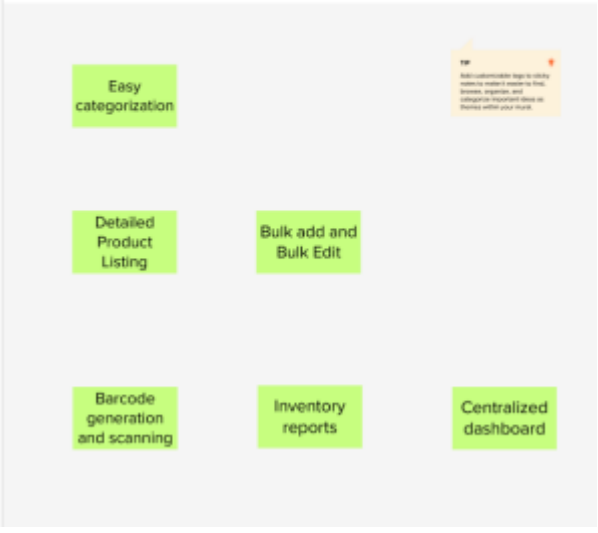
Shalini Priya R

3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

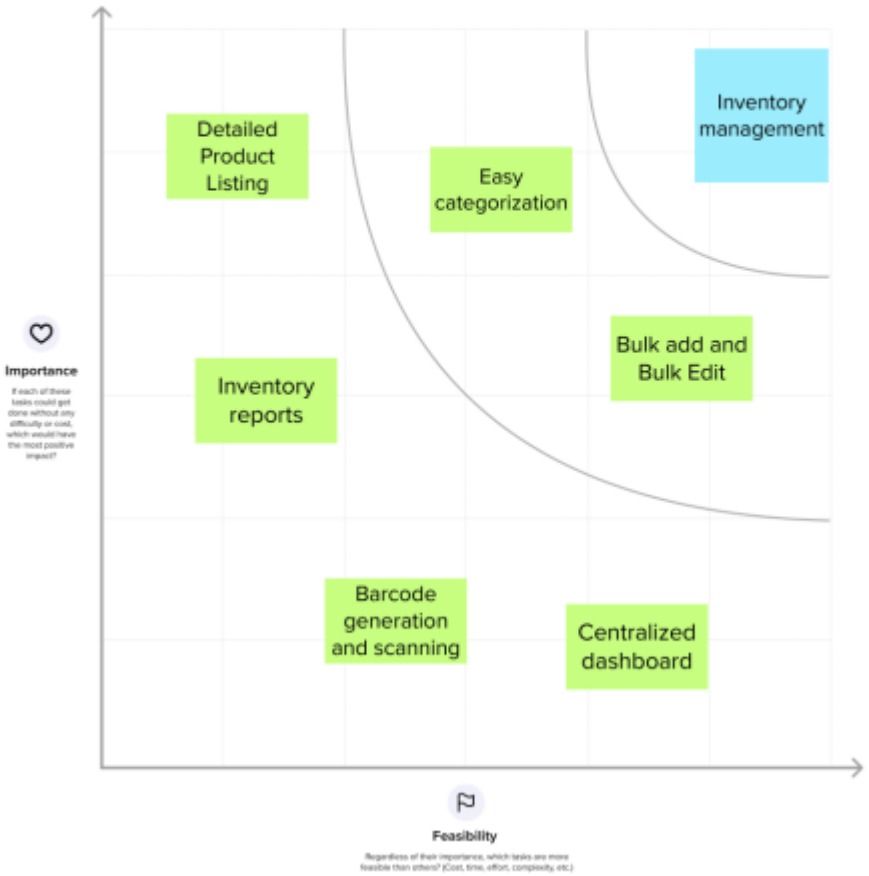


4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

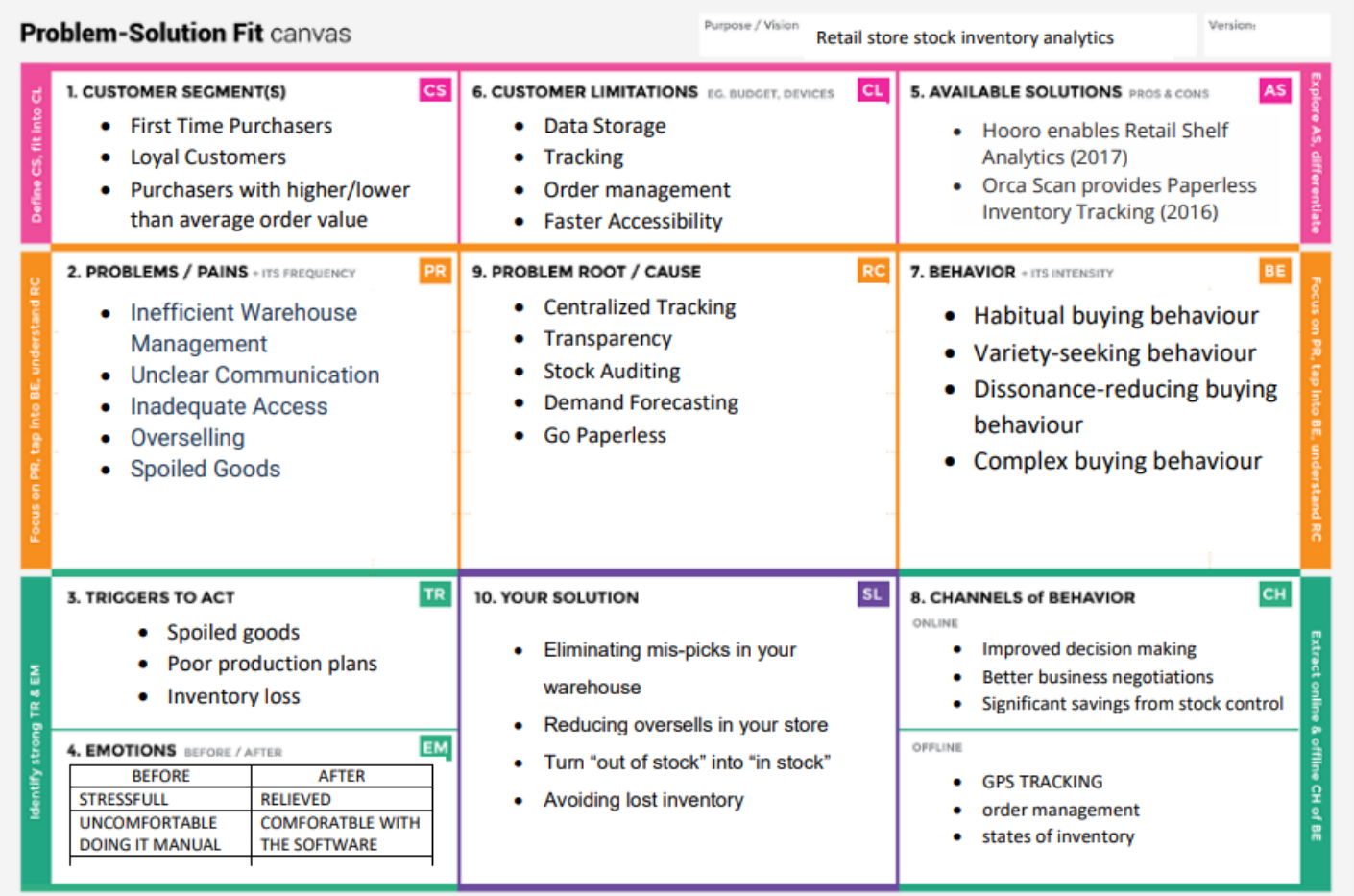
20 minutes



3.3 PROPOSED SOLUTION

S.No	PARAMETER	DESCRIPTION
1.	Problem Statement (Problem to be solved)	To manage the retail store stock inventory efficiently and predict the demand and sales of the stocks.
2.	Idea / Solution description	By managing inventory, retailers meet customer demand without running out of stock or carrying excess supply.
3.	Novelty / Uniqueness	➢ Generate sales report based on the stocks sold out. ➢ Sales and demand forecasting in order to avoid shortage and over stocking of stocks. ➢ Notification on stock shortage.
4.	Social Impact / Customer Satisfaction	➢ Inventory management is vital for retailers because the practice helps them increase profits.
		➢ Customers will get more varieties, proper availability of the stocks on time.
5.	Business Model (Revenue Model)	➢ Improve the decision-making process oriented at reducing costs and increasing revenues. ➢ Retailers are able to understand the deepest customer needs and adjust their offering to meet shoppers' demands.
6.	Scalability of the Solution	This is to improve the profit for Retail Store owners and enhance their business wide and make more profit.

3.4 PROBLEM SOLUTION FIT



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

Following are the functional requirements of the proposed solution.

FR No	FUNCTIONAL REQUIREMENT (Epic)	SUB REQUIREMENT (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail and create a password.
FR-2	User Confirmation	Confirmation via Email.
FR-3	User login	Login using their own credentials.
FR-4	Stock updating	➢ Checking the availability of the stocks. ➢ Adding or removing the stocks.
FR-5	Stock Management	➢ Analyze the stocks. ➢ Notification on shortage of stocks.
FR-6	Report Generation	Sales report generation using IBM Cognos.

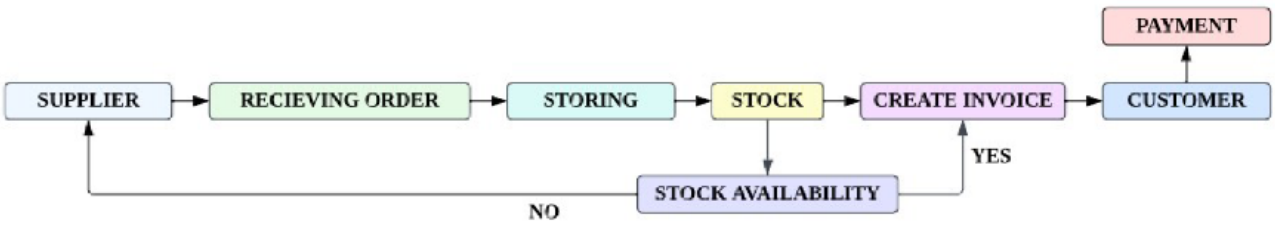
4.2 NON FUNCTIONAL REQUIREMENTS

Following are the non-functional requirements of the proposed solution.

FR No	NON-FUNCTIONAL REQUIREMENT	DESCRIPTION
NFR-1	Usability	Stock management is made easier using simple user interface.
NFR-2	Security	Email and password is the login credential used for authentication.
NFR-3	Reliability	➢ Analyze and display the accurate number of stocks available. ➢ Notify whenever required about the stocks.
NFR-4	Performance	Managing bulks stocks with proper storage and processing it in right time. Frequently updating the stock availability
NFR-5	Availability	➢ Stock information can be viewed whenever required. ➢ Stock information updated now and then.
NFR-6	Scalability	New features can be added based on the requirement.

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION AND TECHNICAL ARCHITECTURE

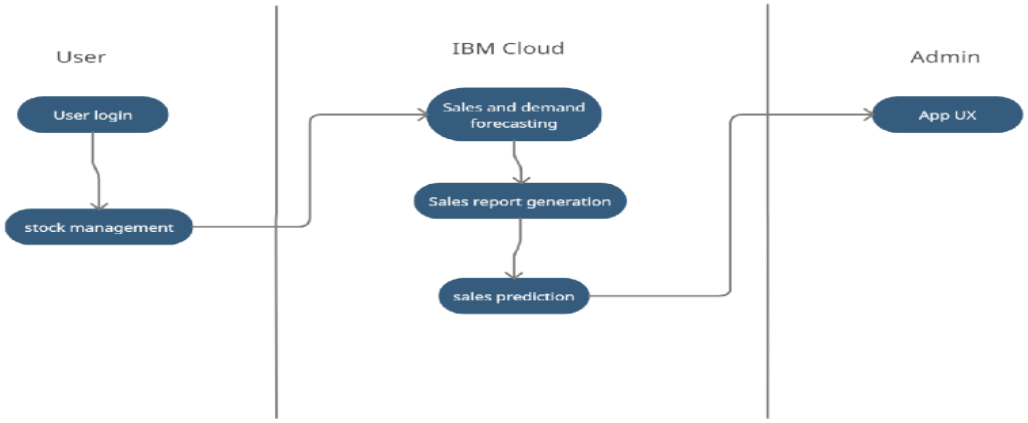


Table 1: Components and technologies

S.No	COMPONENT	DESCRIPTION	TECHNOLOGY
1.	User Interface	Web user interface	HTML, CSS
2.	Application Logic-1	Sales and demand prediction	Python
3.	Application Logic-2	Sales report generation	IBM Cognos
4.	File Storage	Storing of sales report	IBM object storage
5.	Machine Learning Model	Purpose of Machine Learning Model	Regression model
6.	Infrastructure (Server /Cloud)	Application Deployment on Cloud	IBM Cloud

Table 2: Application characteristics

S.No	CHARACTERISTICS	DESCRIPTION	TECHNOLOGY
1.	Open-Source Frameworks	To visualize the data over a period of time and ensure reports are generated accurately.	IBM Cognos Analytics
2.	Scalable Architecture	The scalability of the application is ensured by multiple user access at the same time and 3 tier architecture will be implemented.	IBM Cloud
3.	Availability	The application will be available anytime.	IBM Cloud
4.	Performance	The user knows how to maintain the inventory to increase profits.	Regression model

5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer Retailer	Registration	USN-1	As a user, I may register for the application by providing my email address, password, and password confirmation.	I can access my account / dashboard.	High	Sprint-1
		USN-2	After I've registered for the application, I will receive a confirmation email.	I can receive confirmation email.	High	Sprint-1
	Login	USN-3	As a user, I may access the programme by providing my email address and password.	I can login into application using my credentials.	High	Sprint-1
	Dashboard	USN-4	As a user, I may access my dashboard and do stock forecasting and analysis.	I can view my dashboard and perform necessary changes.	High	Sprint-2
		USN-5	As a user I can generate reports based on product sales	I can generate the reports for the stock.	High	Sprint-2
	Stock Prediction	USN-6	As a user, I can forecast when a product will go out of supply and when it will have less stock.	I can do prediction analysis based on the report.	High	Sprint-3
	Re-Ordering stock	USN-7	As a user, I have the option to reorder stocks depending on forecasts and notifications.	I can reorder stocks upon notification.	Medium	Sprint-4
	Invoice generation	USN-8	As a user, I may create invoices that include taxes, discounts, and credits.	I can generate the invoice.	High	Sprint-4

6. PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Aishwarya, Shalini Priya
Sprint-1	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Aishwarya, Shalini Priya
Sprint-2	Registartion through Facebook	USN-3	As a user, I can register for the application through Facebook	2	Low	Aishwarya, Shalini Priya
Sprint-1	Registartion through gmail	USN-4	As a user, I can register for the application through Gmail	2	Medium	Aishwarya, Shalini Priya
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Aishwarya, Shalini Priya
Sprint-2	Dashboard	USN-6	As a user, I can view the stocks in the dashboard.	5	High	Amudha, Ragavi Preethi
Sprint-2	View the statictics	USN-7	As a user, I must be able to view the statistics suggestion.	3	High	Amudha, Ragavi Preethi
Sprint-3	Viewing the information	USN-8	As a user, A simple diagram consisting of all the information must be visible.	2	Low	Amudha, Ragavi Preethi
Sprint-2	Updating stock	USN-9	As a user, I must be able to edit the number of stocks.	2	Low	Amudha,

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
						Ragavi Preethi
Sprint-3	Confirmation befire deleting	USN-10	As a user, I must have double confirmation before deleting all the data.	3	Medium	Amudha, Ragavi Preethi
Sprint-4	Notifications	USN-11	As a user, I must get notification about the stock that is rapidly depleting.	5	High	Amudha, Ragavi Preethi
Sprint-3	Stock Prediction	USN-12	As a user, I can predict out of stock and less stock for a product.	5	Medium	Aishwarya, Ragavi Preethi
Sprint-4	Invoice generation	USN-13	As a user, I can generate invoice calculating taxes. discount and calculate credits.	5	High	Shalini Priya, Amudha
Sprint-4	Discount System	USN-14	As u user, I can provide discount based on the credit points.	3	Medium	Amudha, Ragvi Preethi,Shalini Priya
Sprint-3	Report generation	USN-15	As a user, I can generate reports based on the product sales.	5	High	Aishwarya, Amudha, Ragavi Preethi

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	6	6 Days	24 Oct 2022	29 Oct 2022	6	29 Oct 2022
Sprint-2	12	6 Days	31 Oct 2022	05 Nov 2022	12	05 Nov 2022
Sprint-3	15	6 Days	07 Nov 2022	12 Nov 2022	15	12 Nov 2022
Sprint-4	13	6 Days	14 Nov 2022	19 Nov 2022	13	19 Nov 2022

7. CODING AND SOLUTION

7.1 DATA COLLECTION AND PREPARATION

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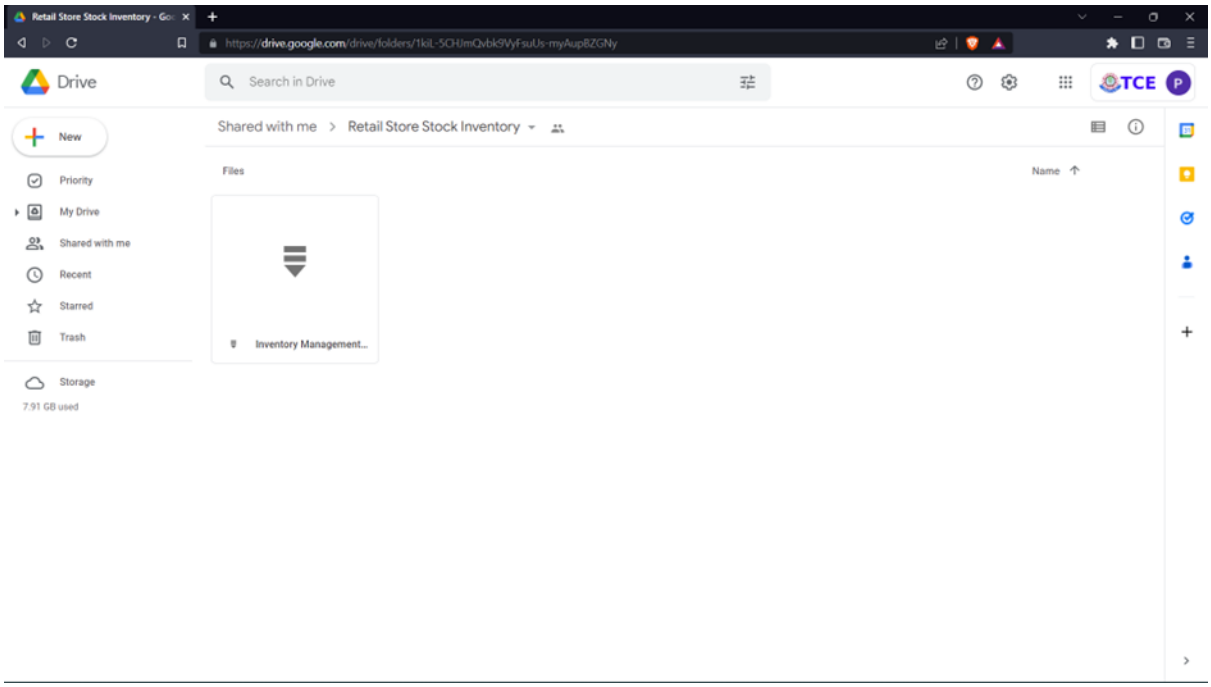

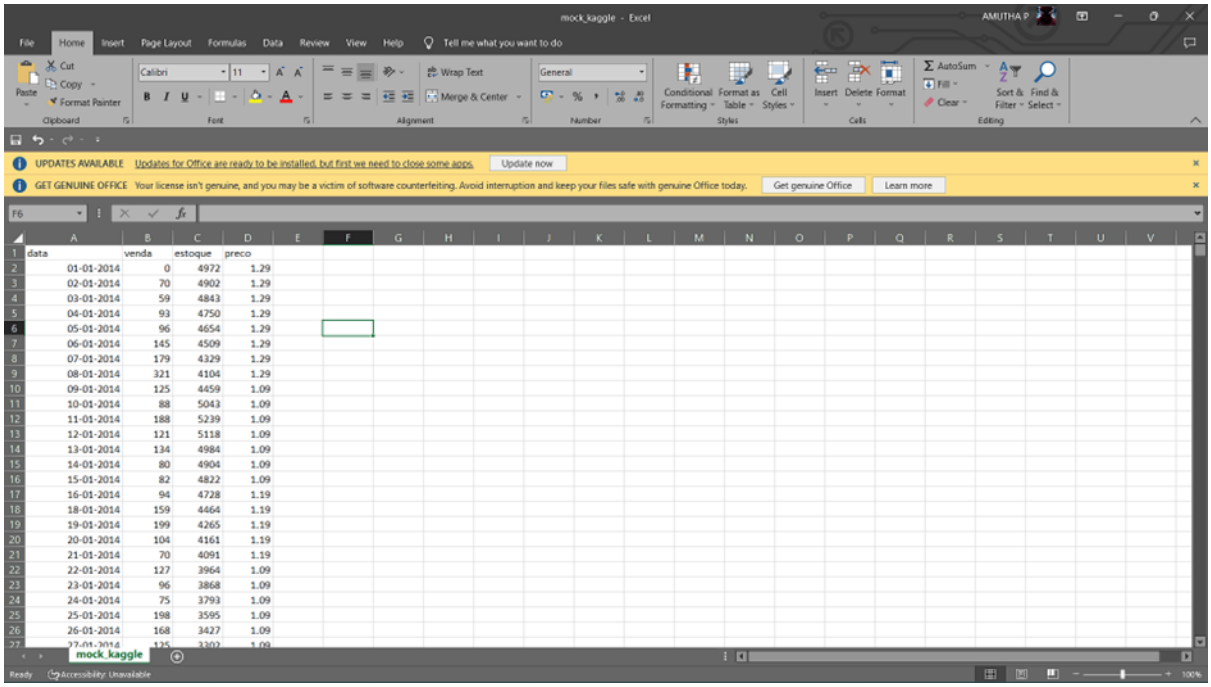

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03-01-2014	59	4843	1.29
04-01-2014	93	4750	1.29
05-01-2014	96	4654	1.29
06-01-2014	145	4509	1.29
07-01-2014	179	4329	1.29
08-01-2014	321	4104	1.29
09-01-2014	125	4459	1.09
10-01-2014	88	5043	1.09
11-01-2014	188	5239	1.09
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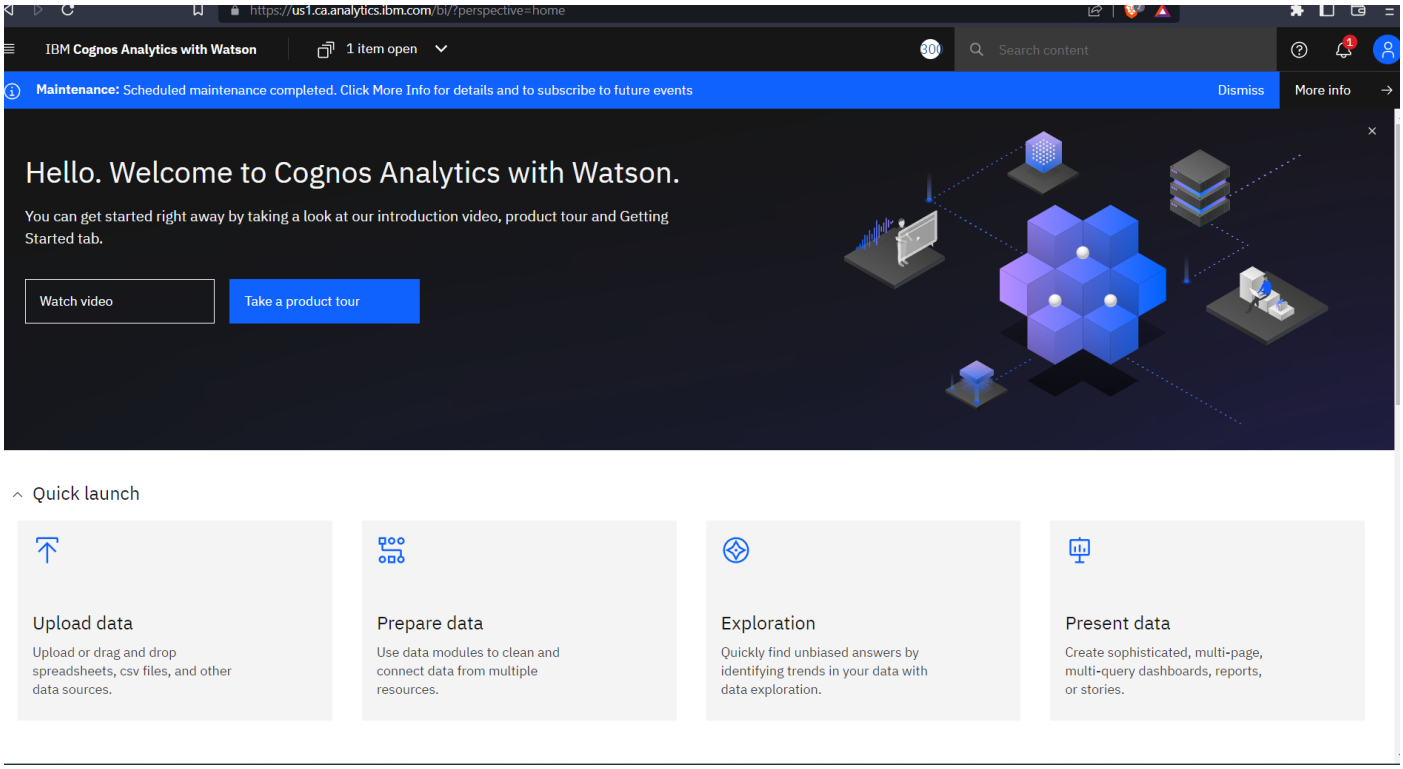

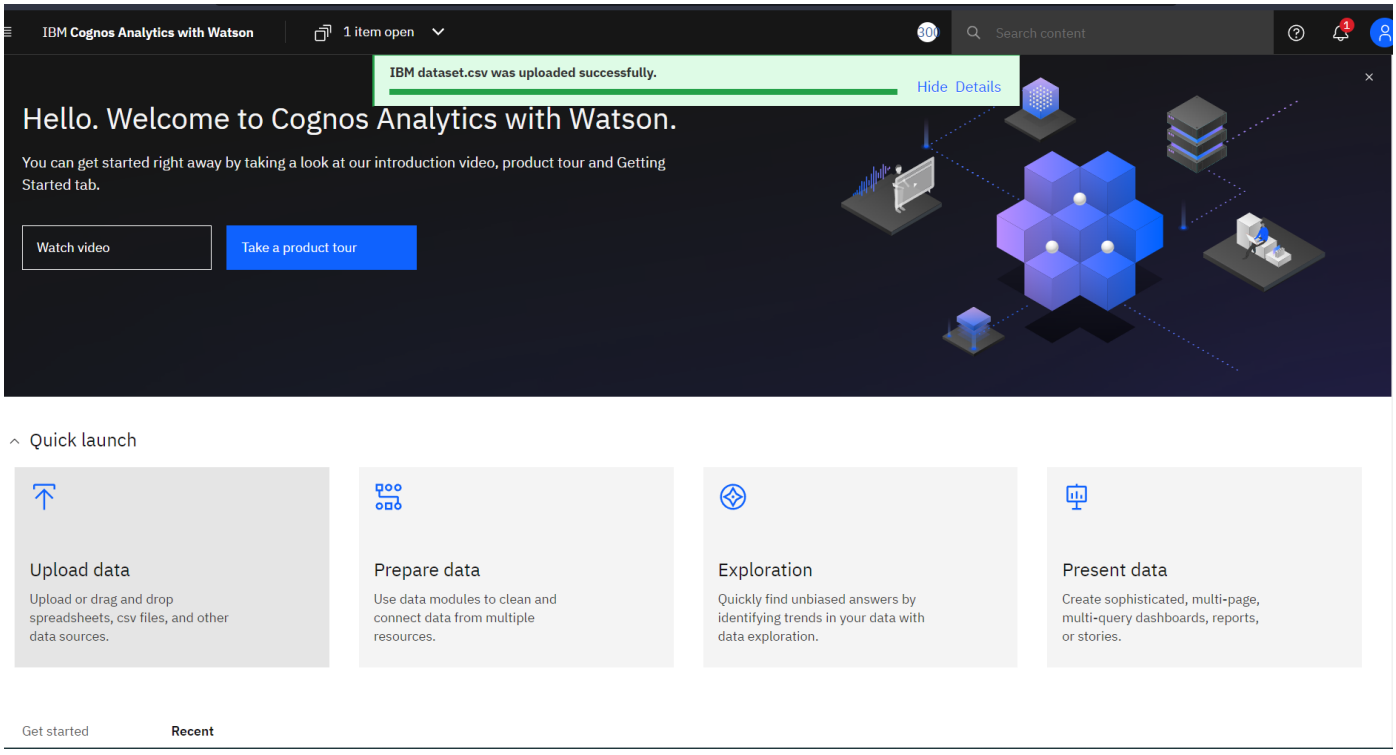

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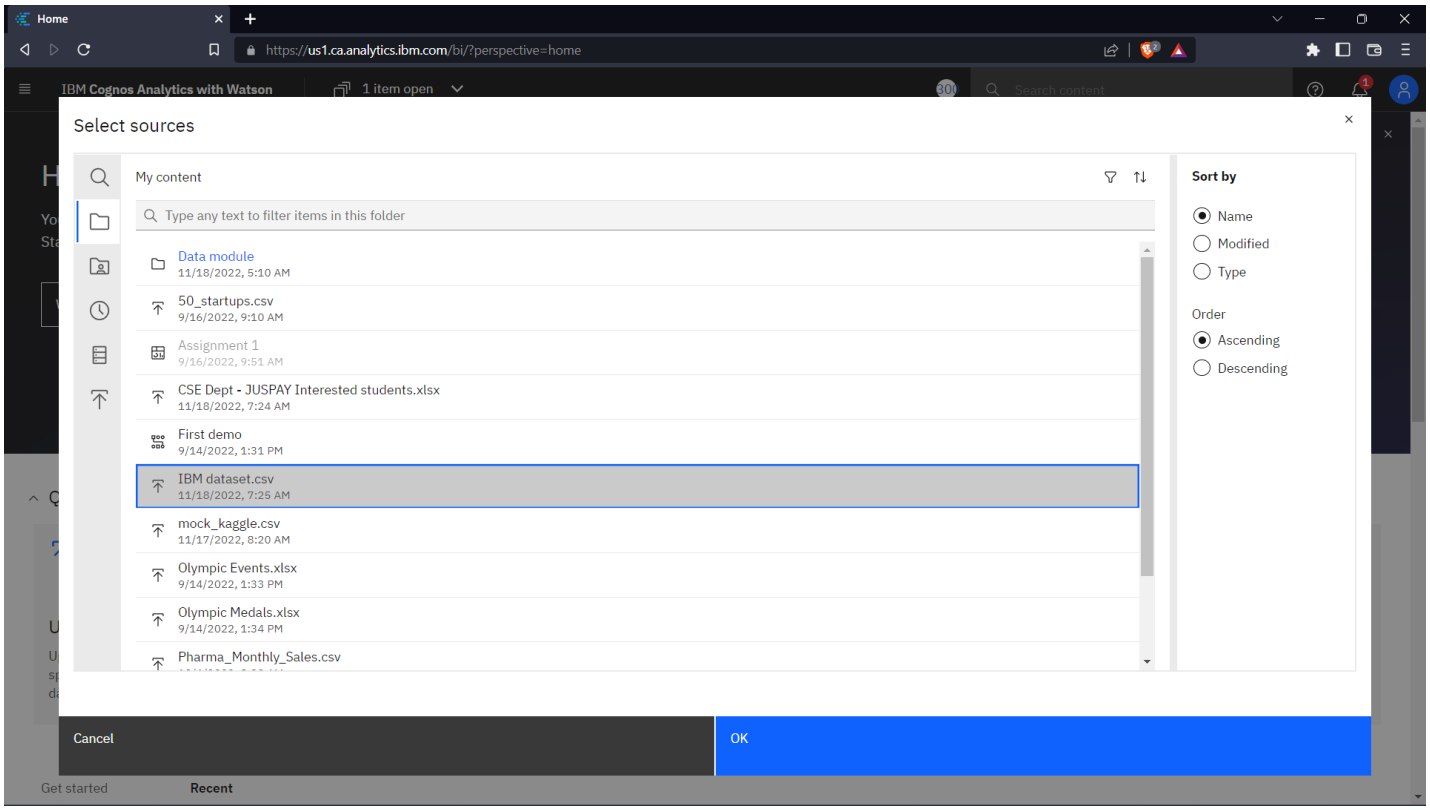

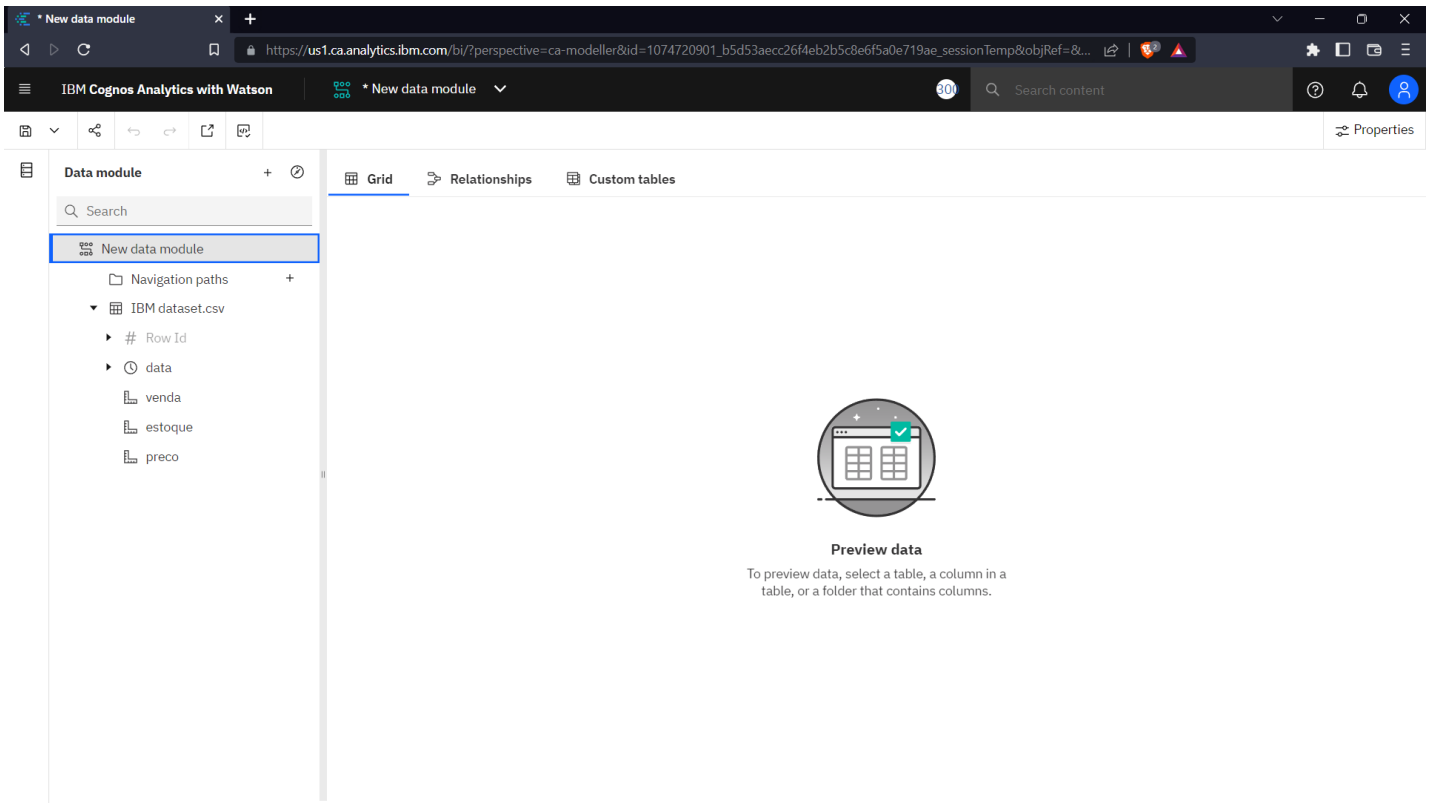

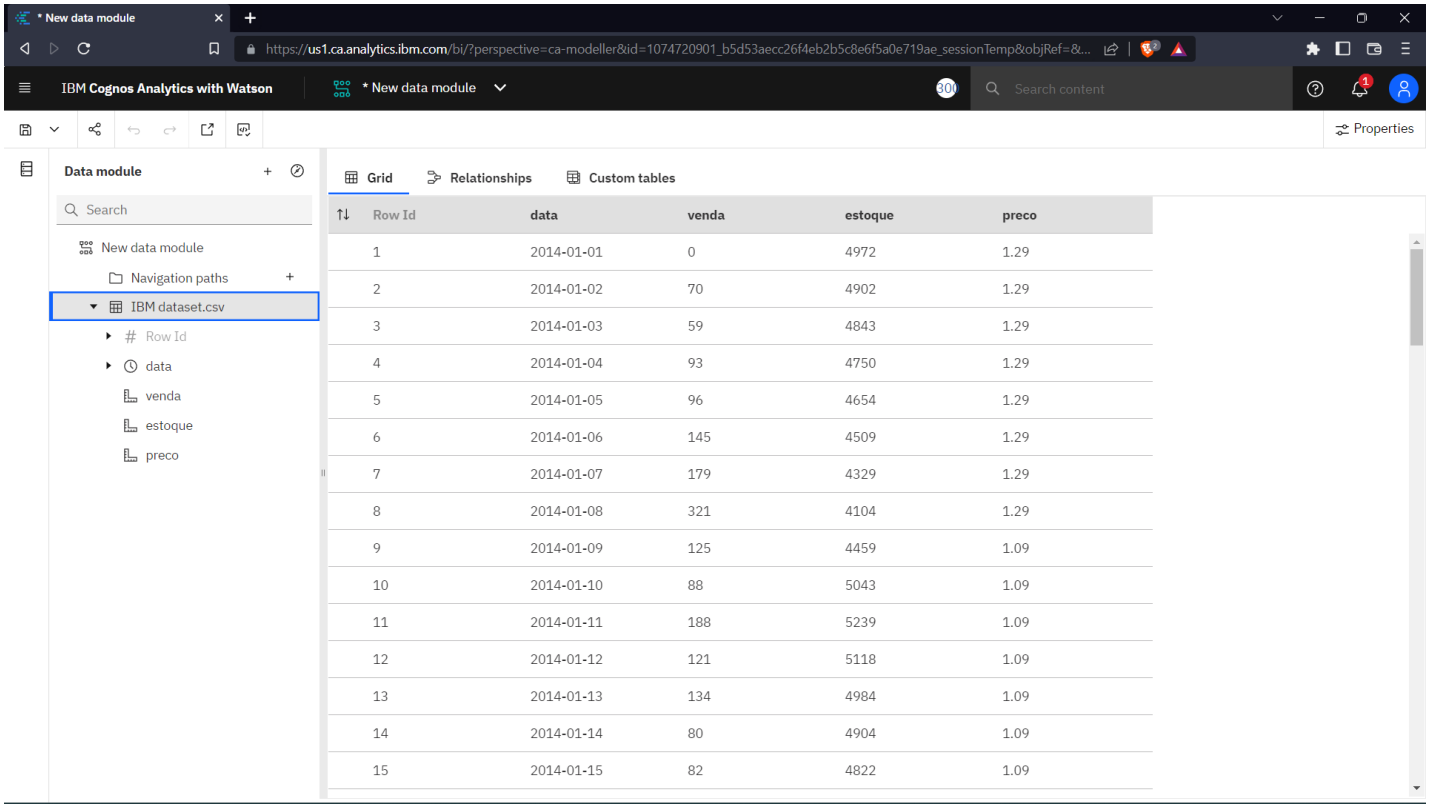
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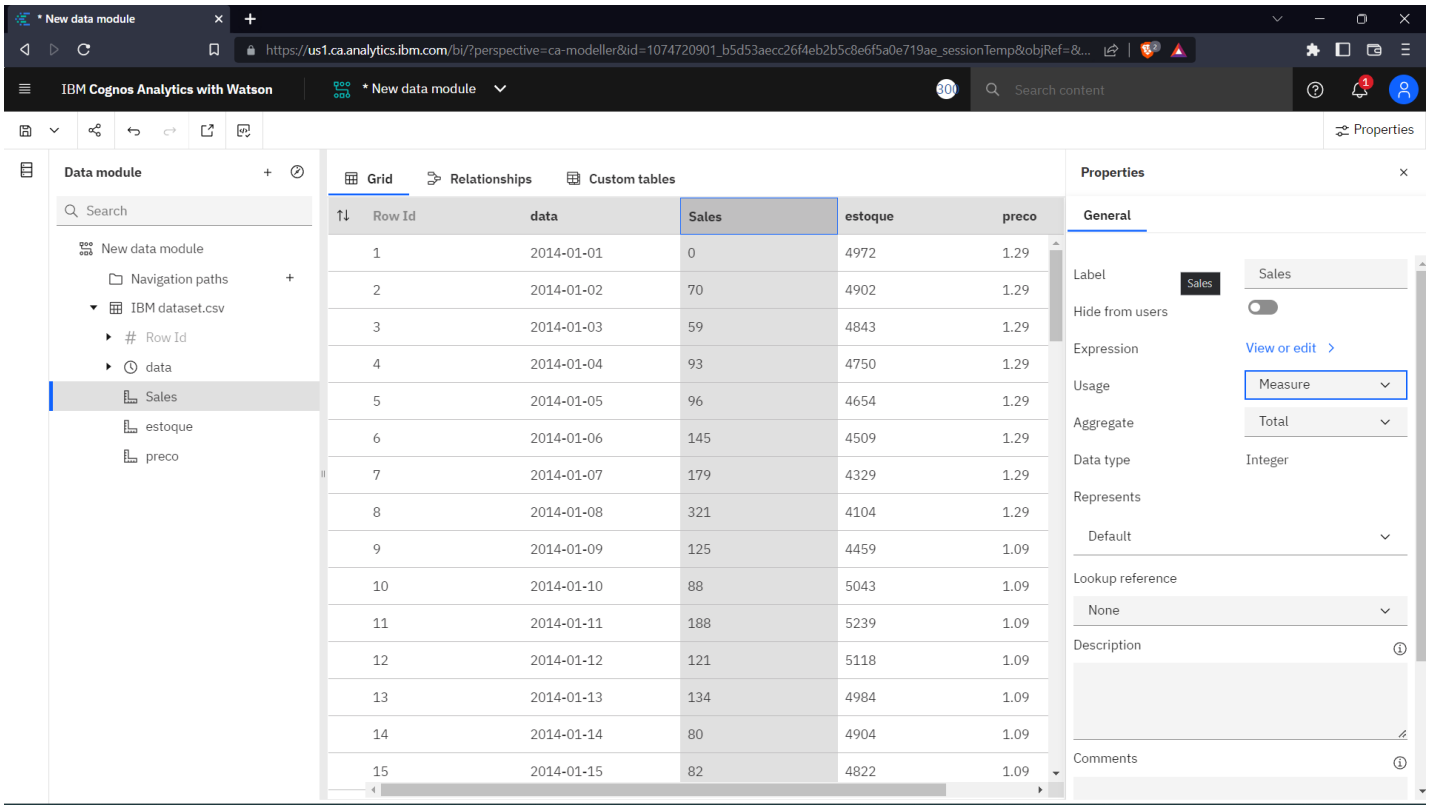
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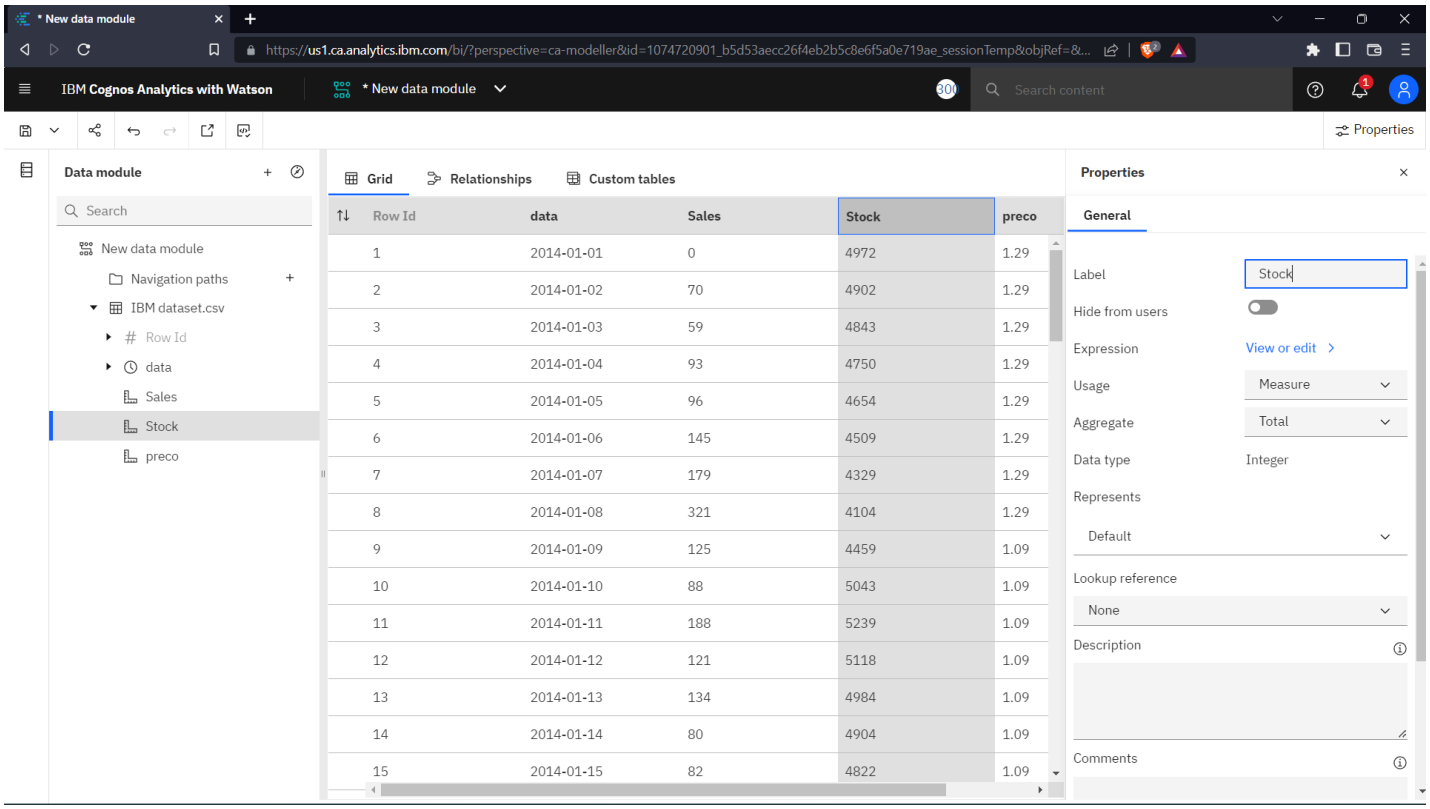
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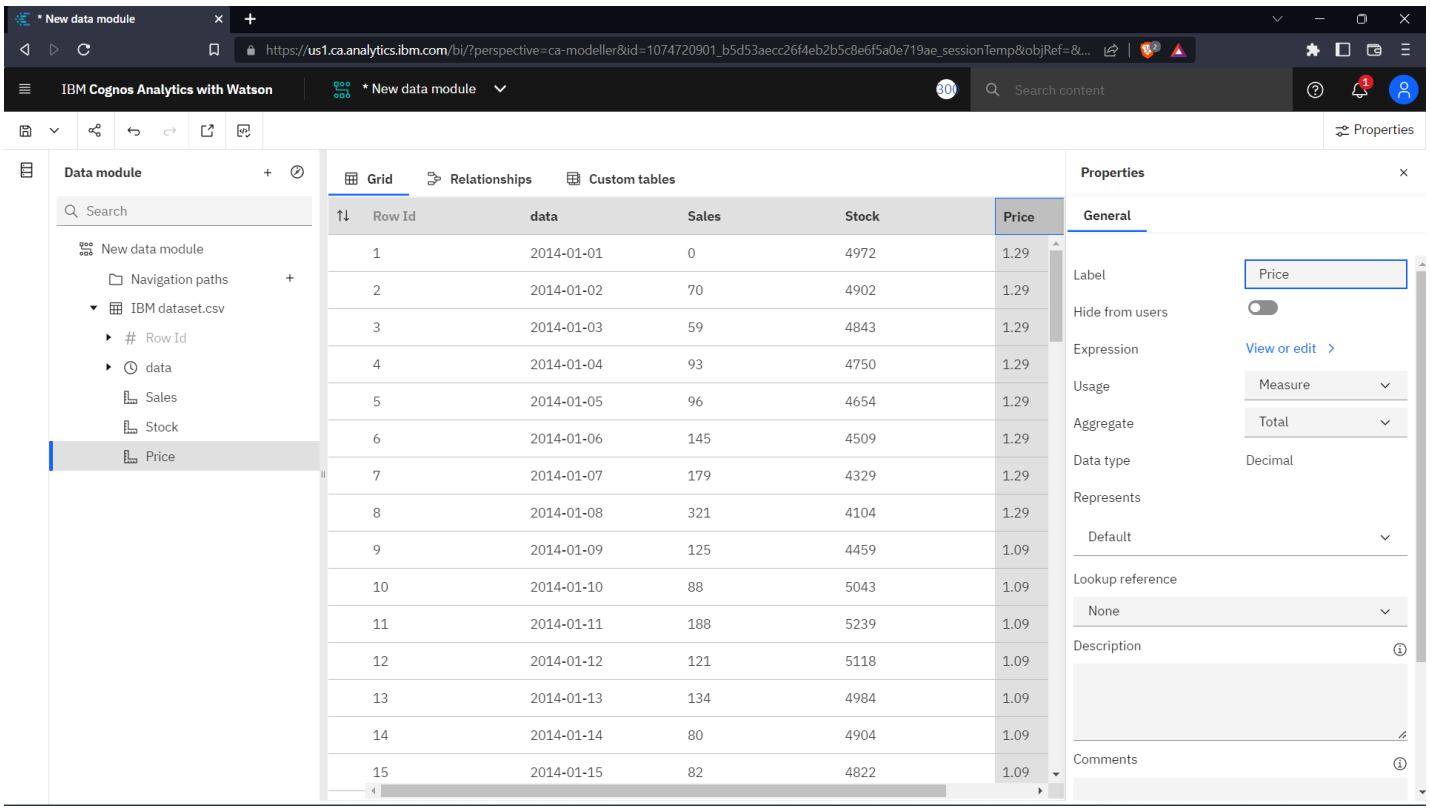
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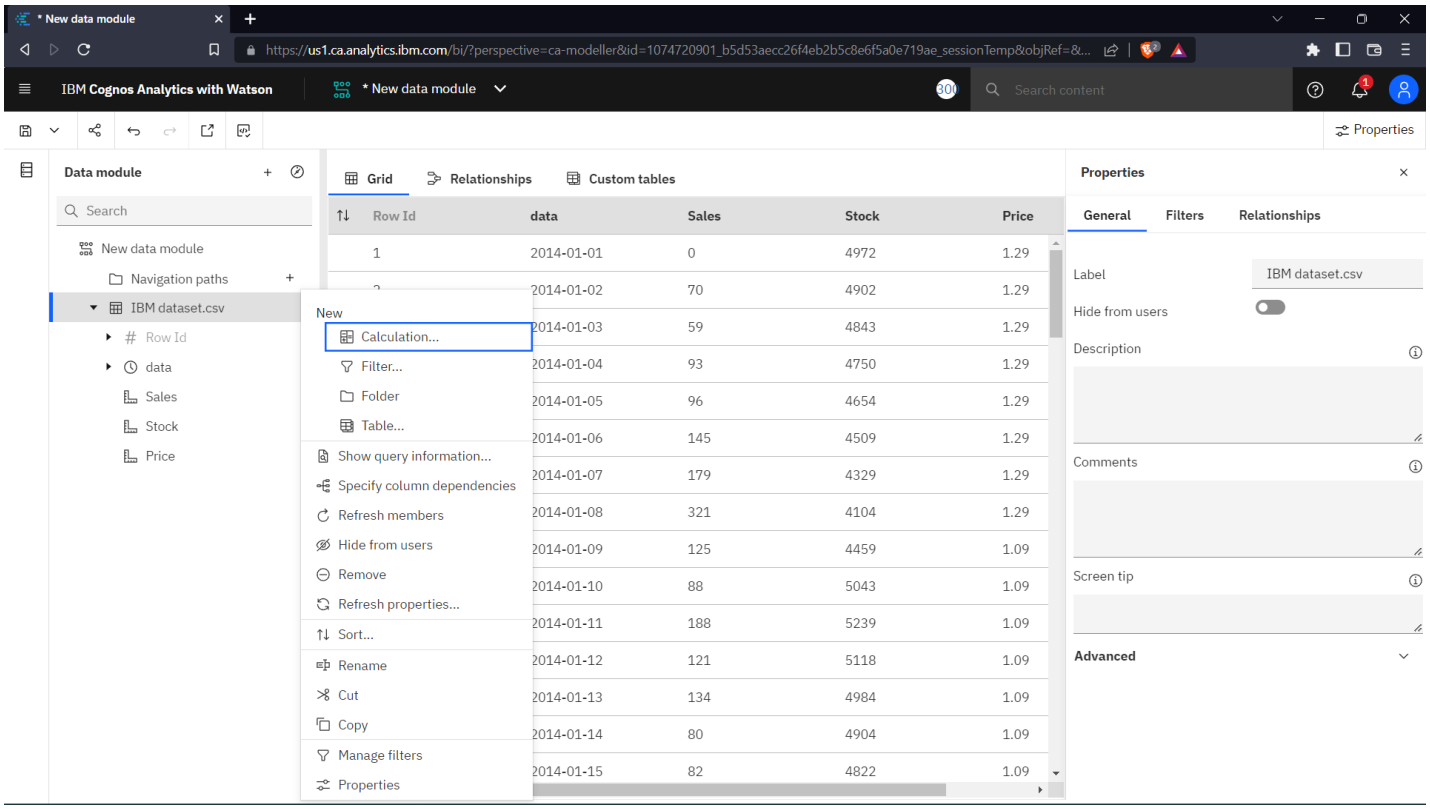

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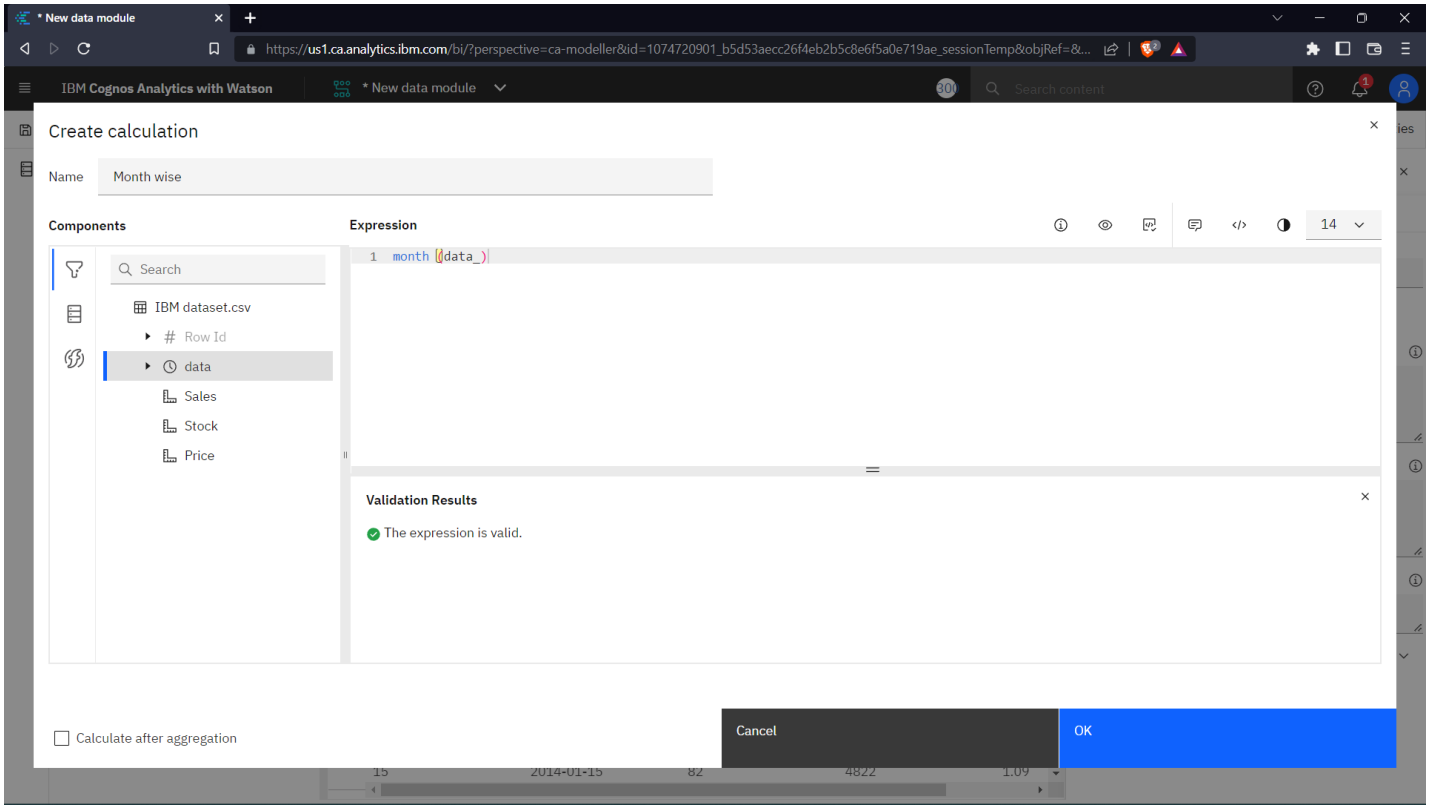

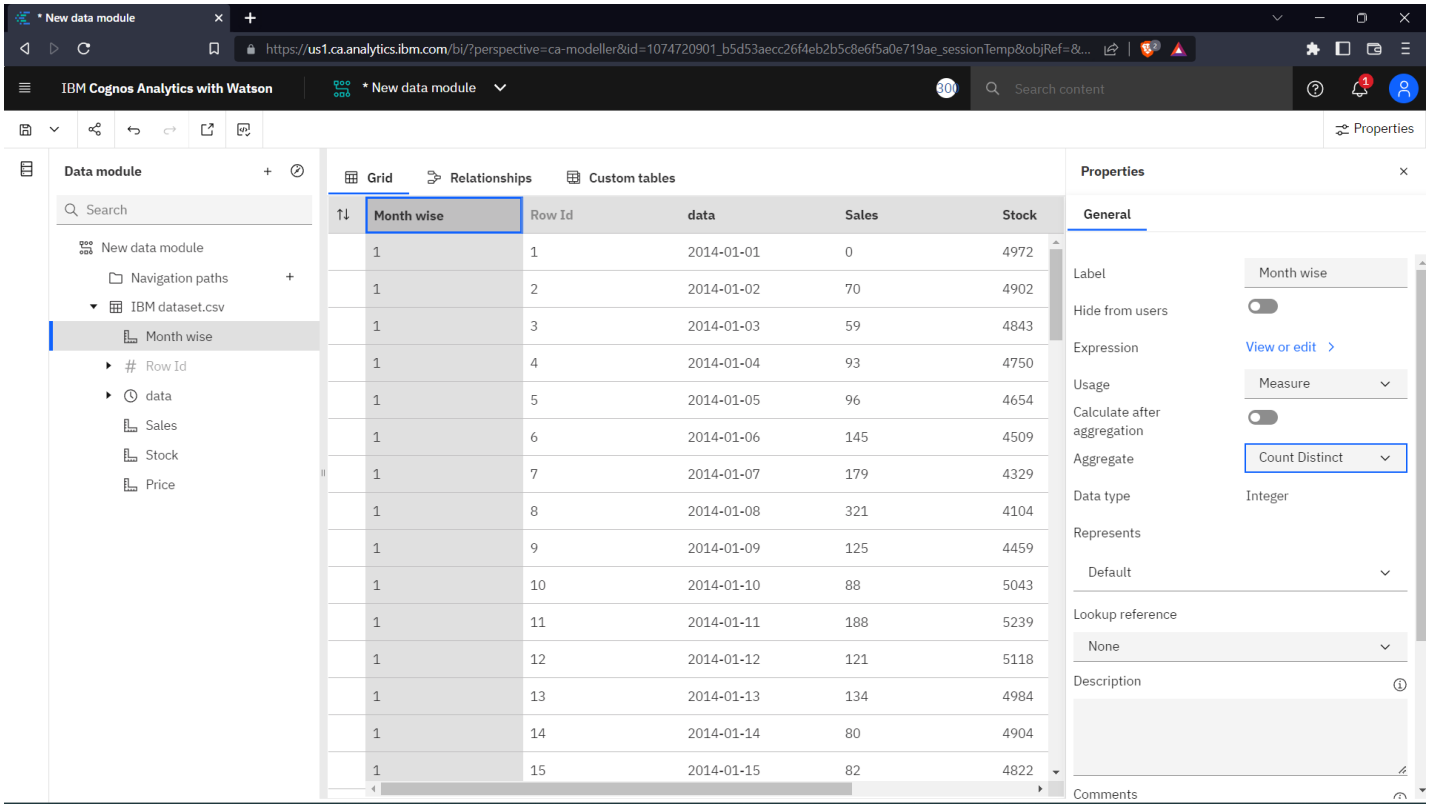
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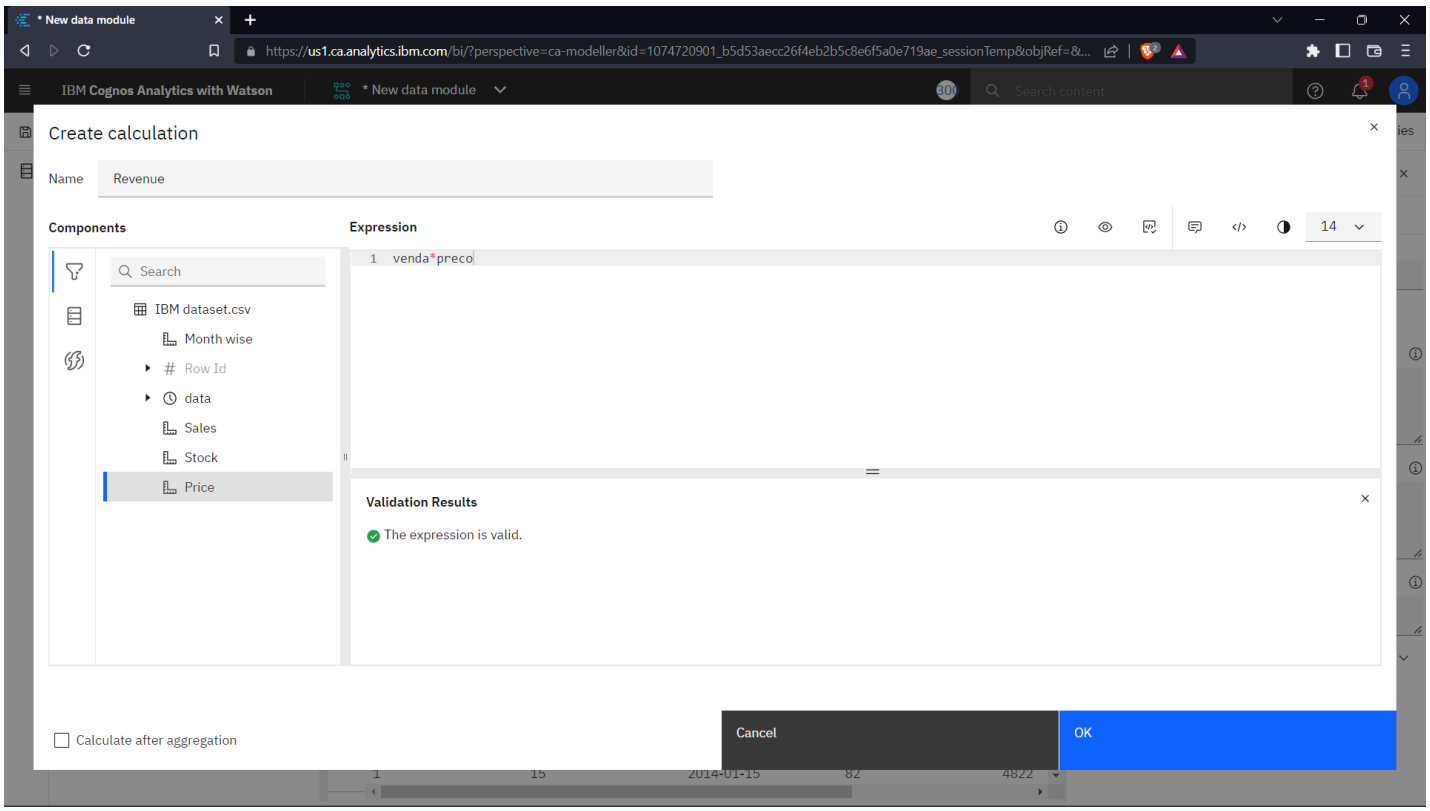
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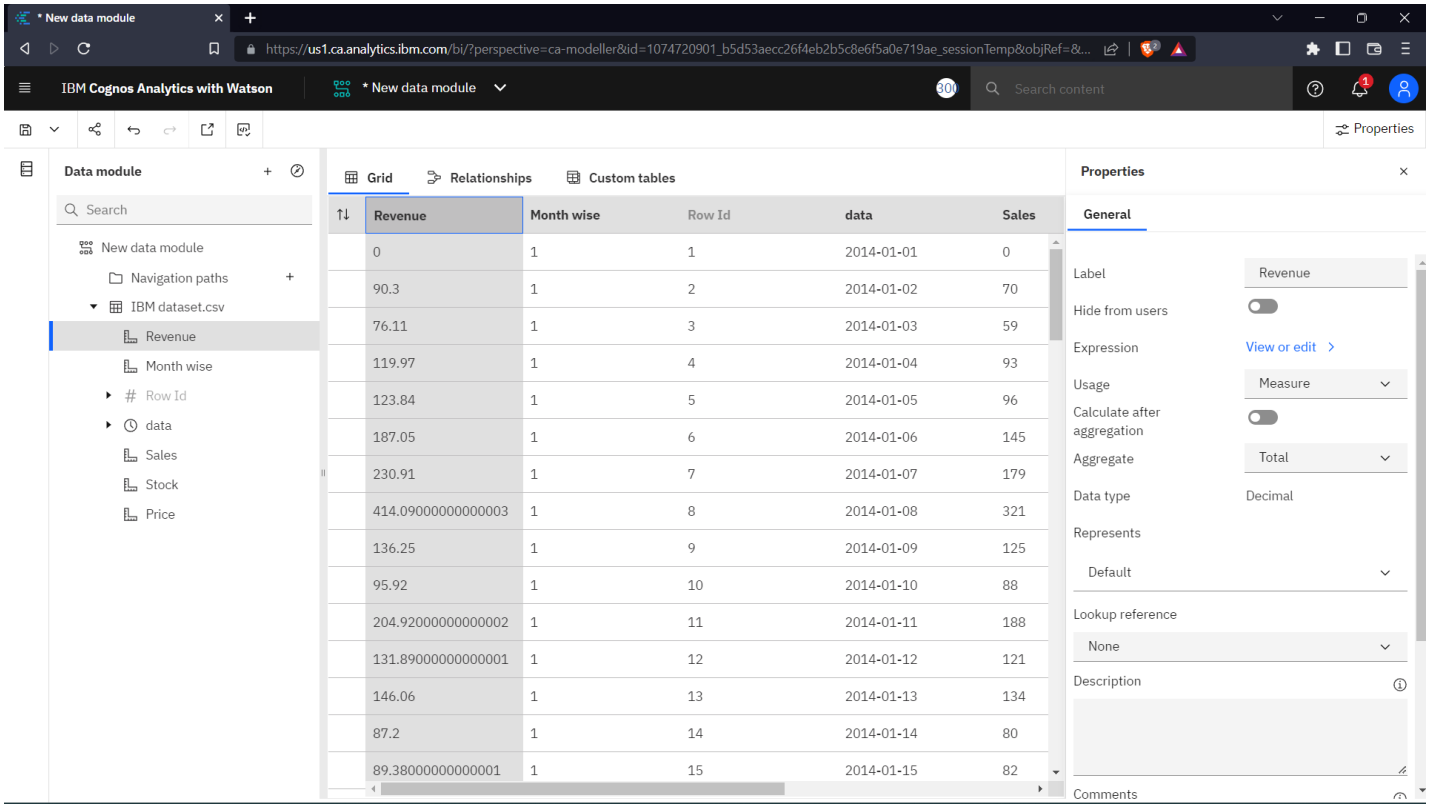
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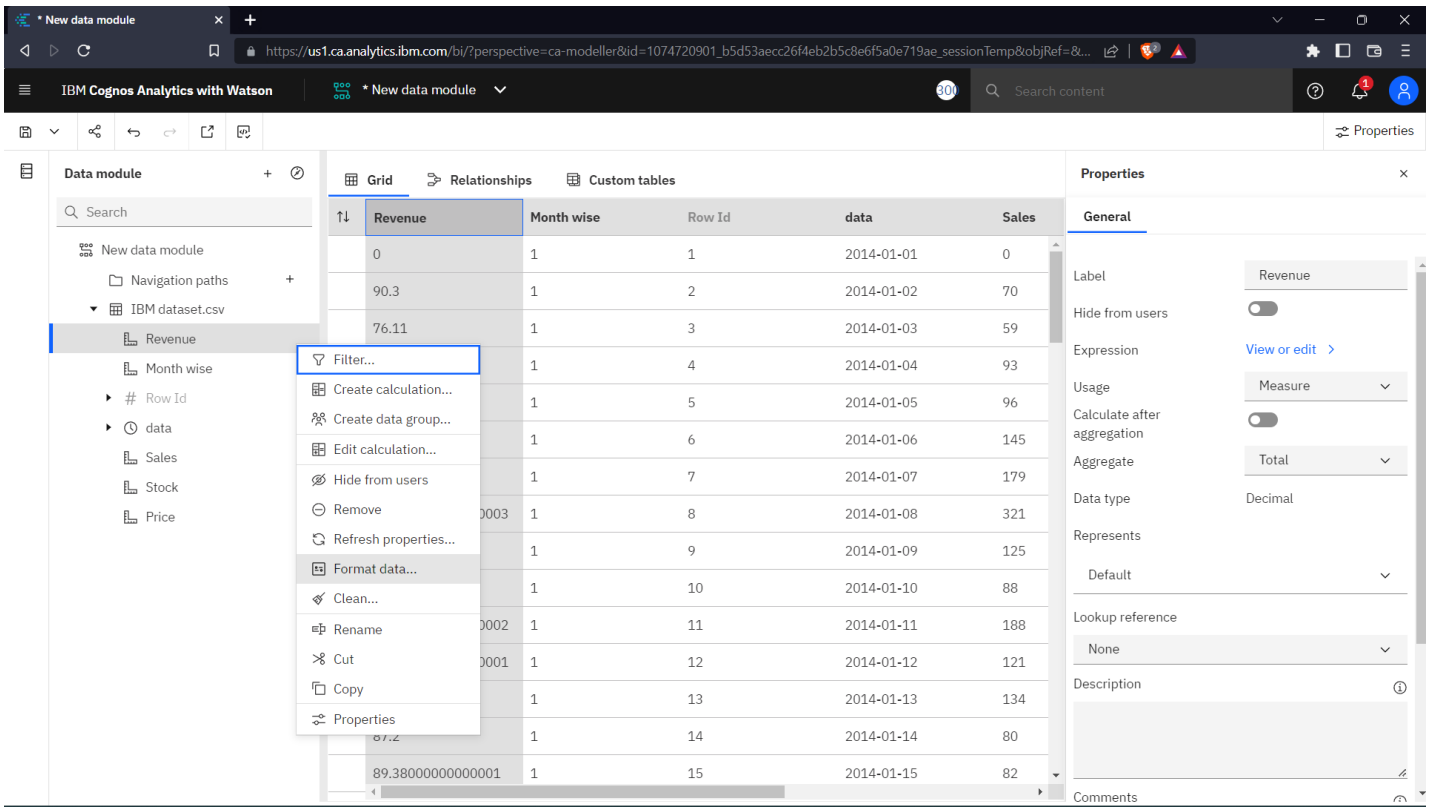
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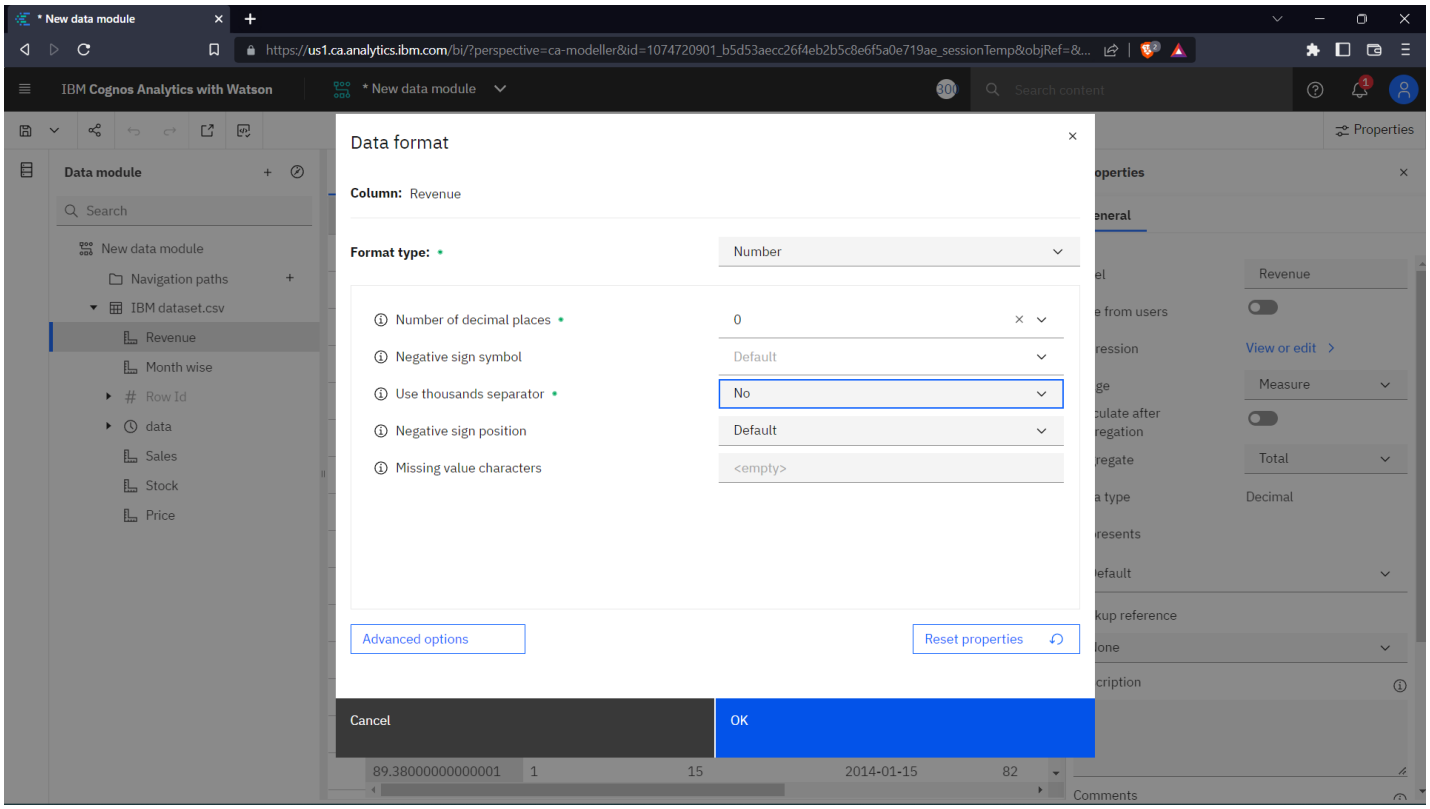
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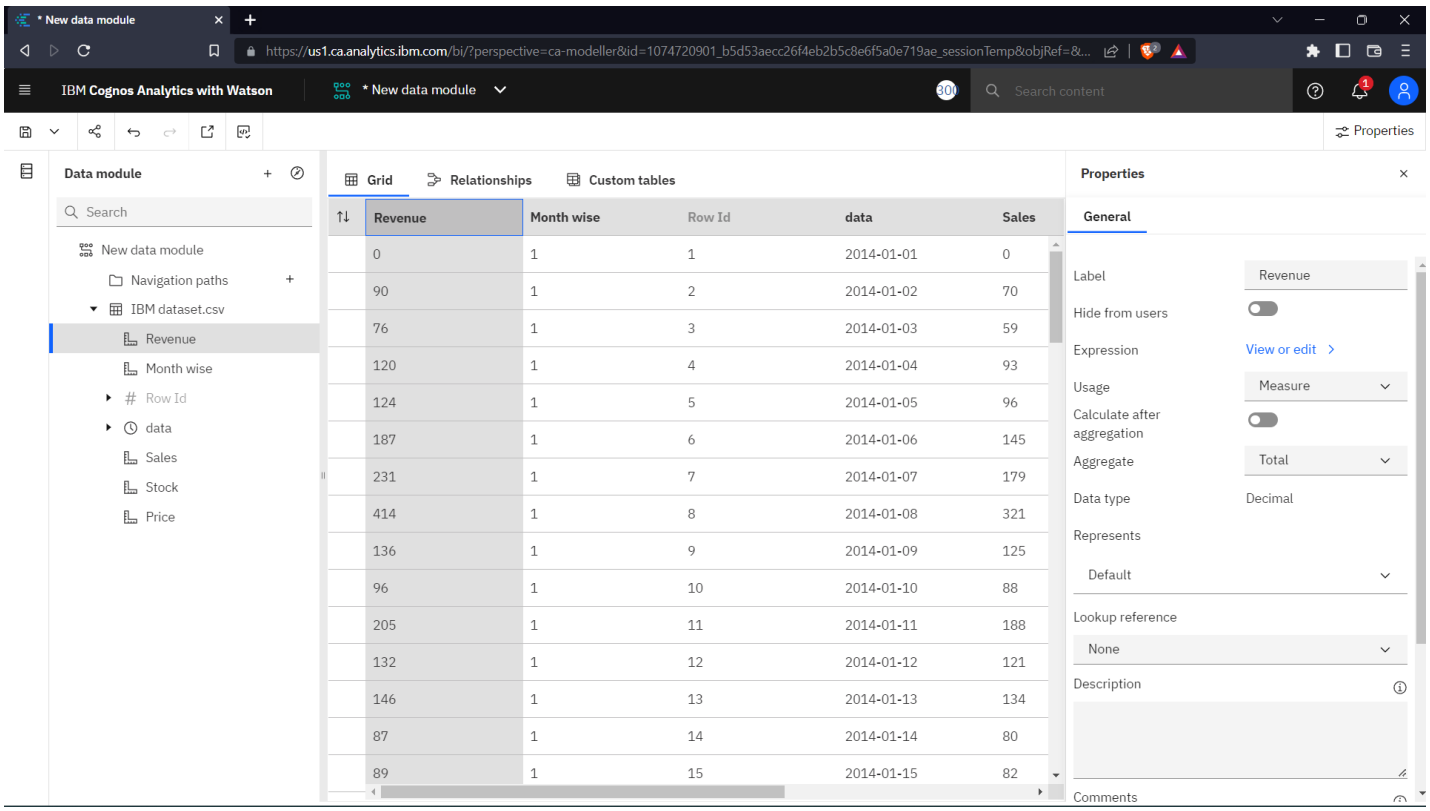
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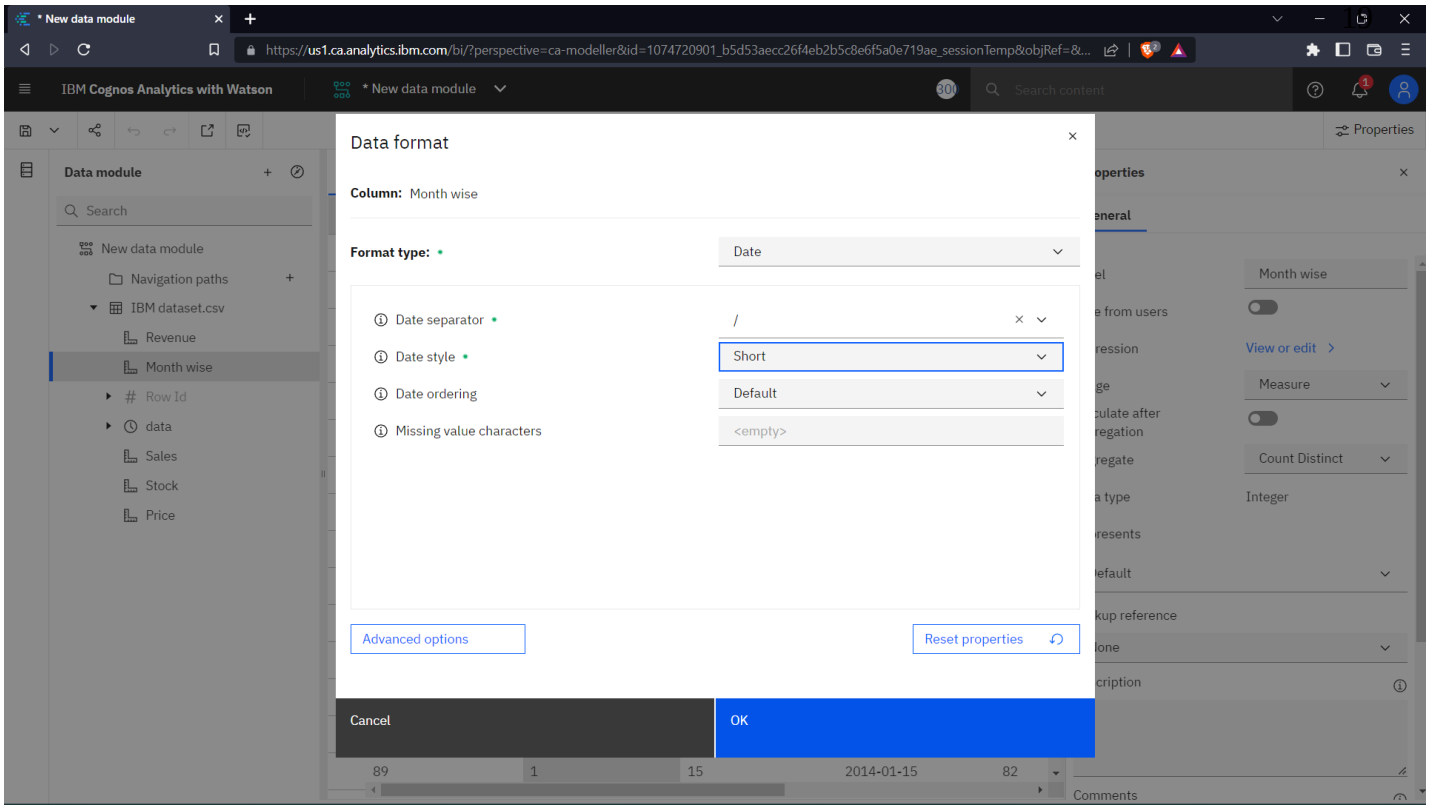
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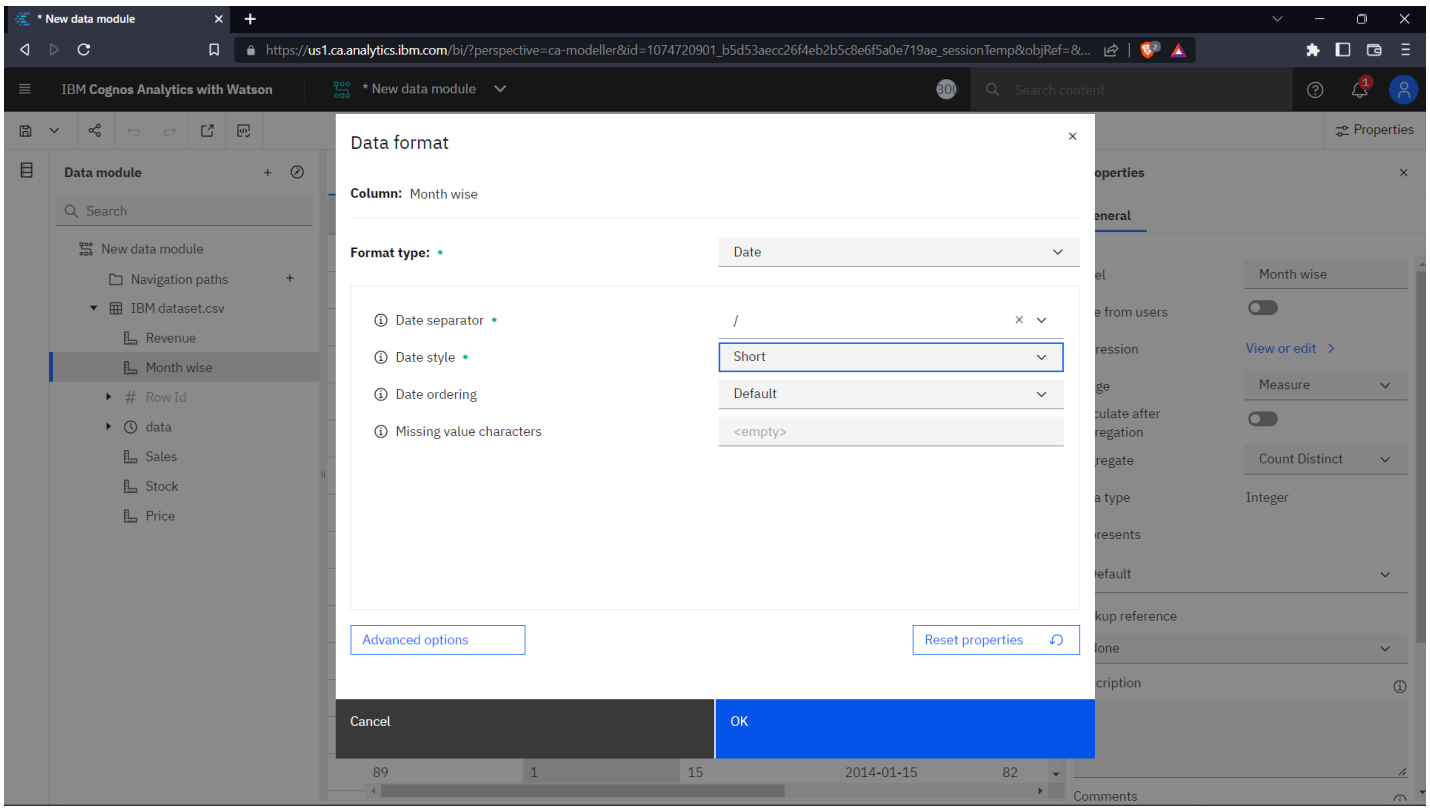
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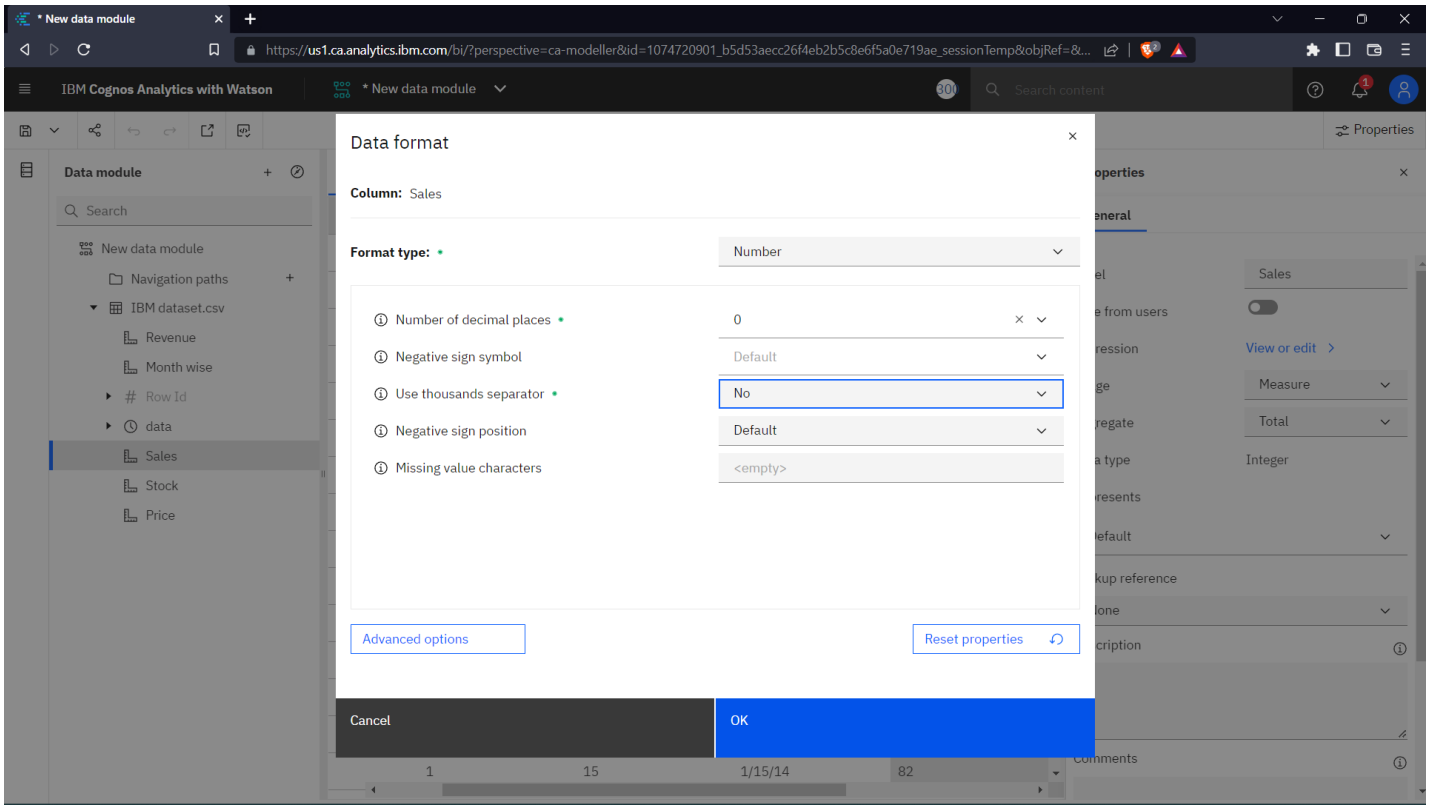
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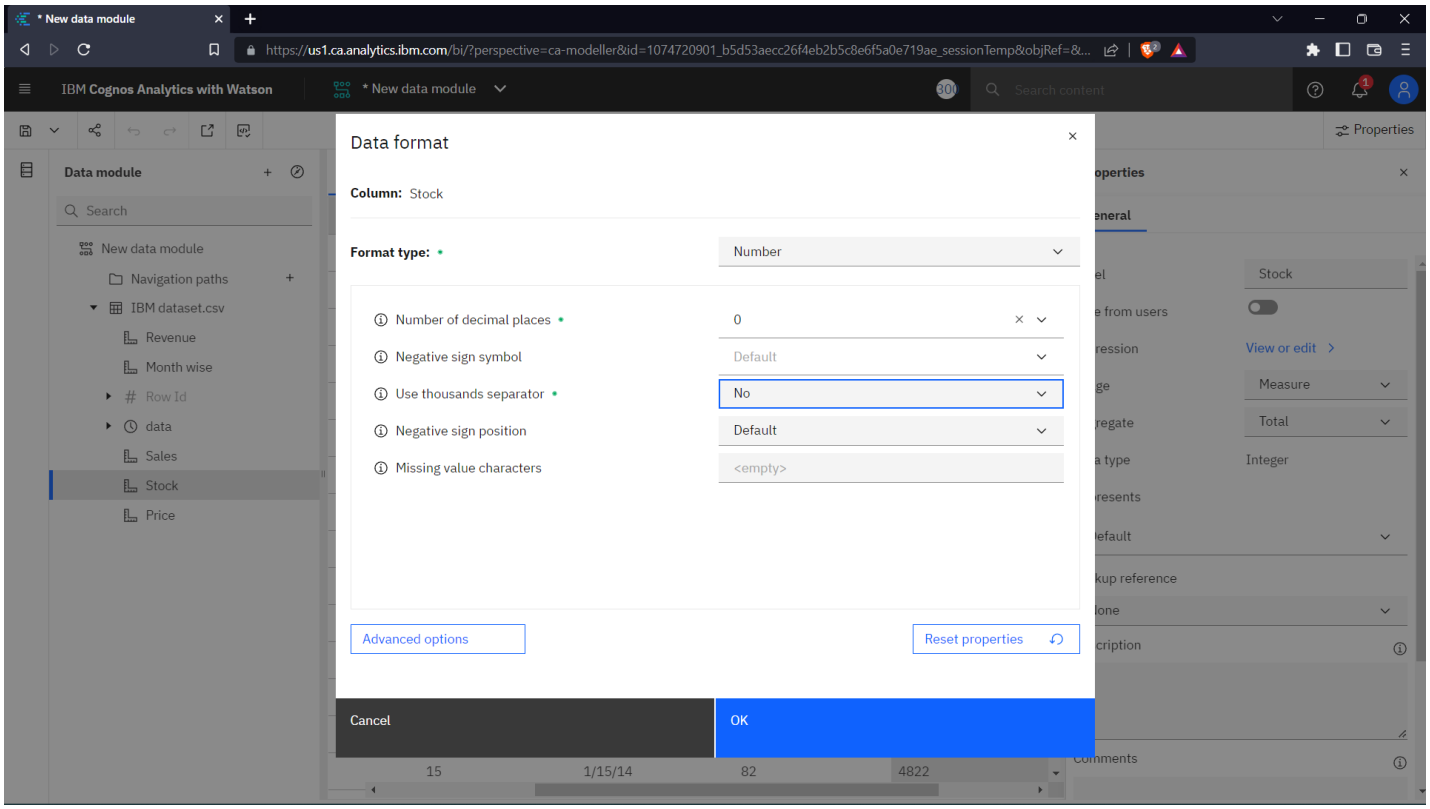
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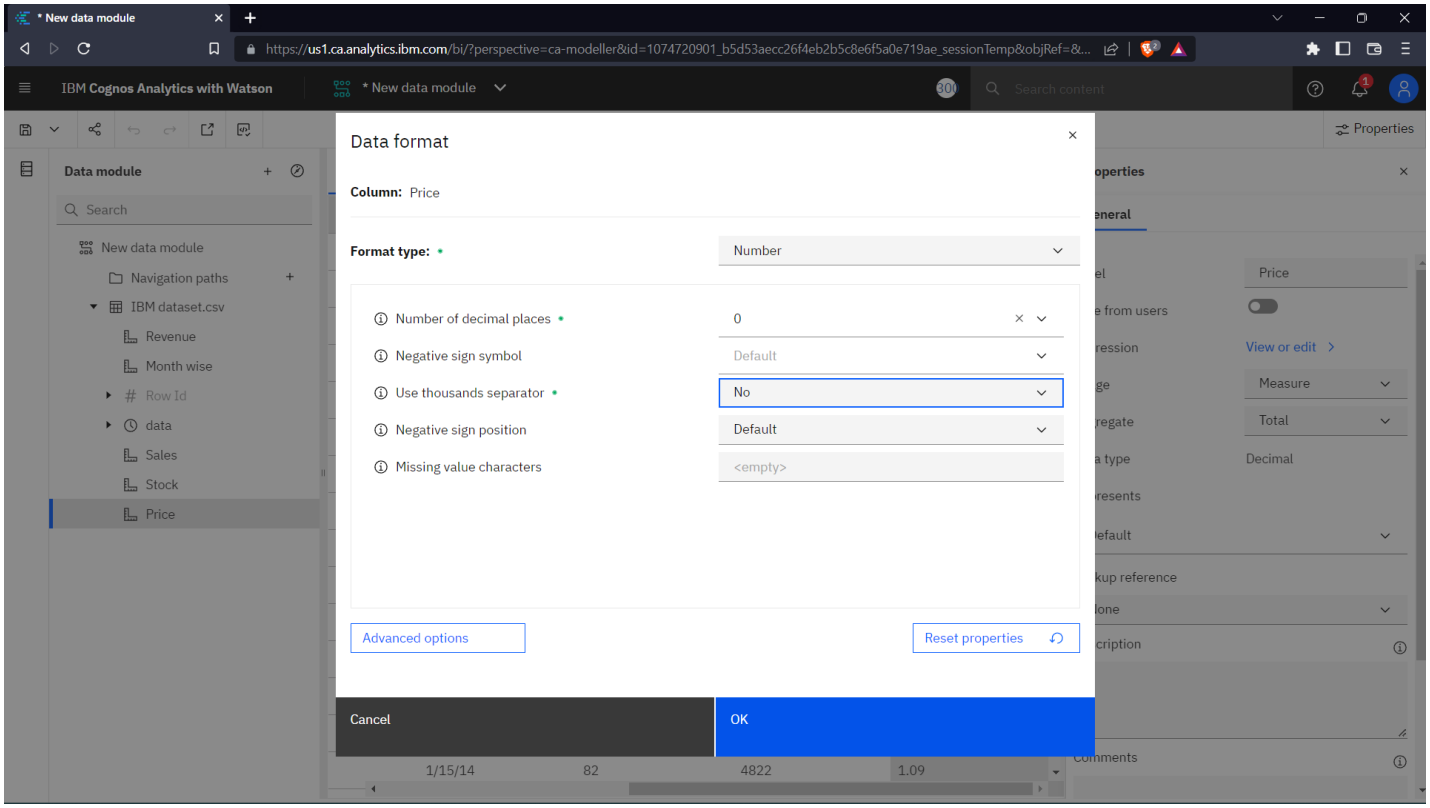
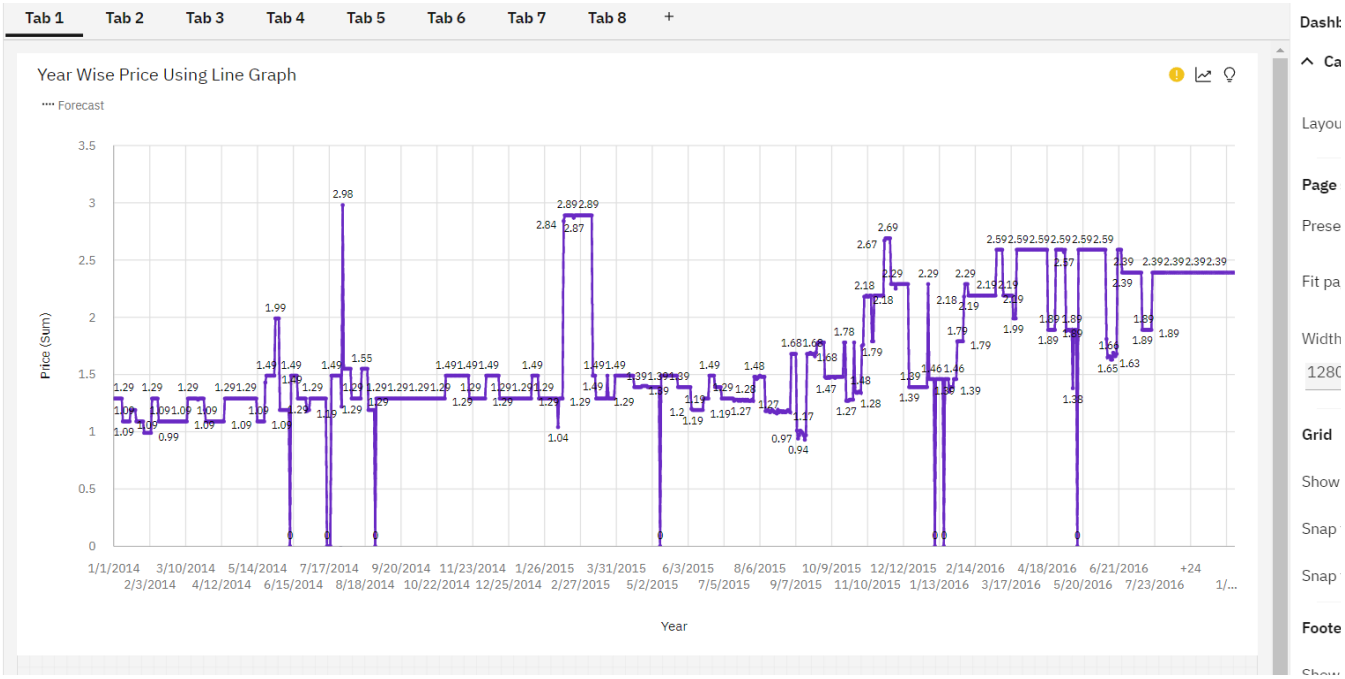
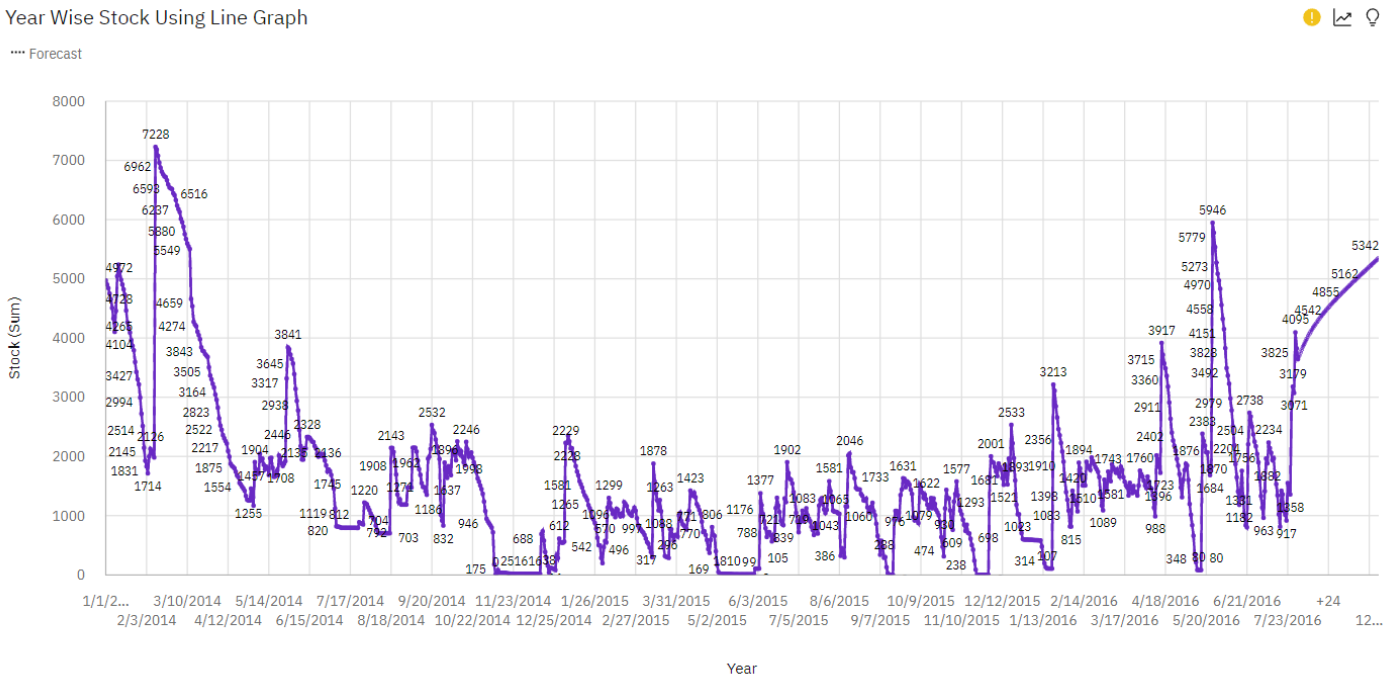


7.2 DATA EXPLORATION

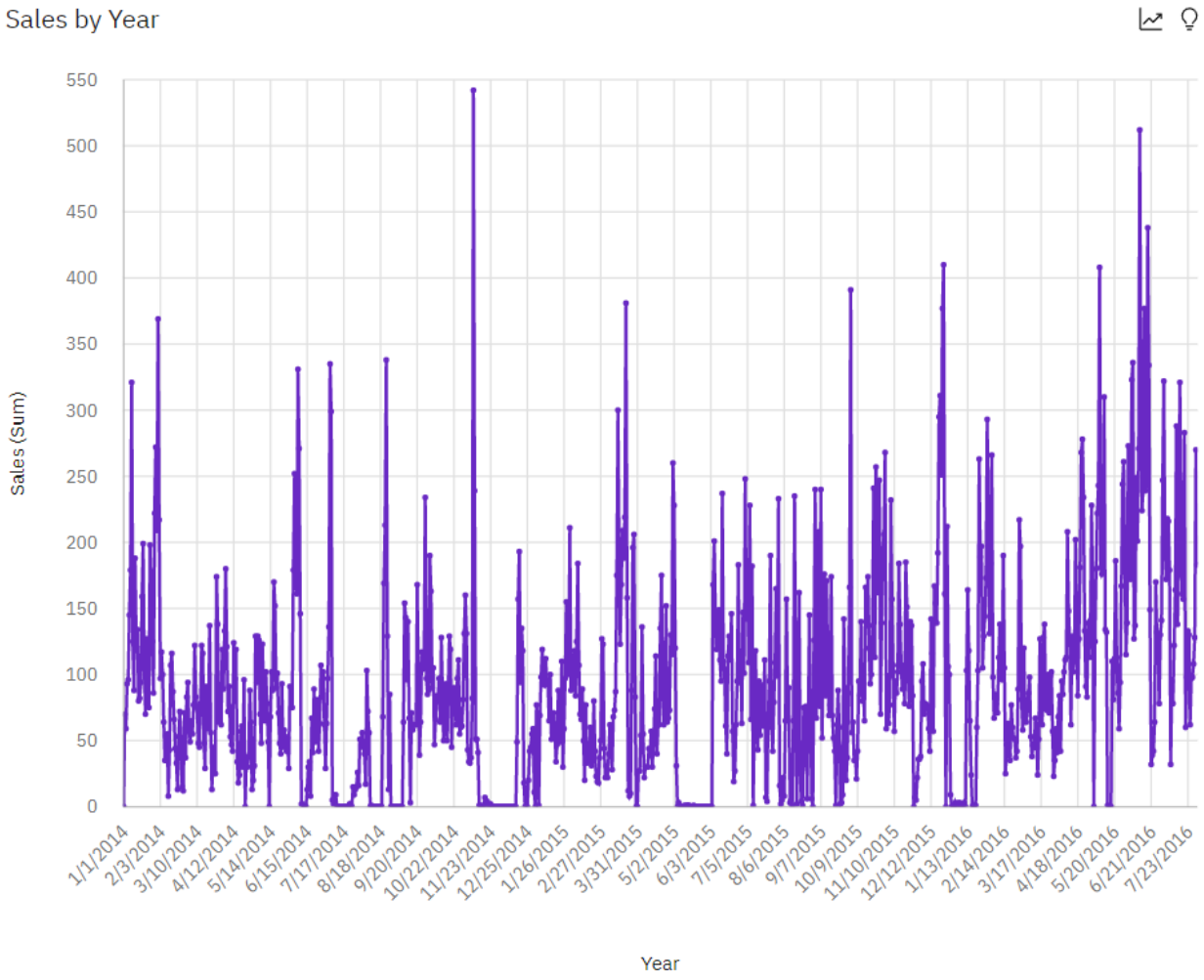
Year wise price using Line Graph



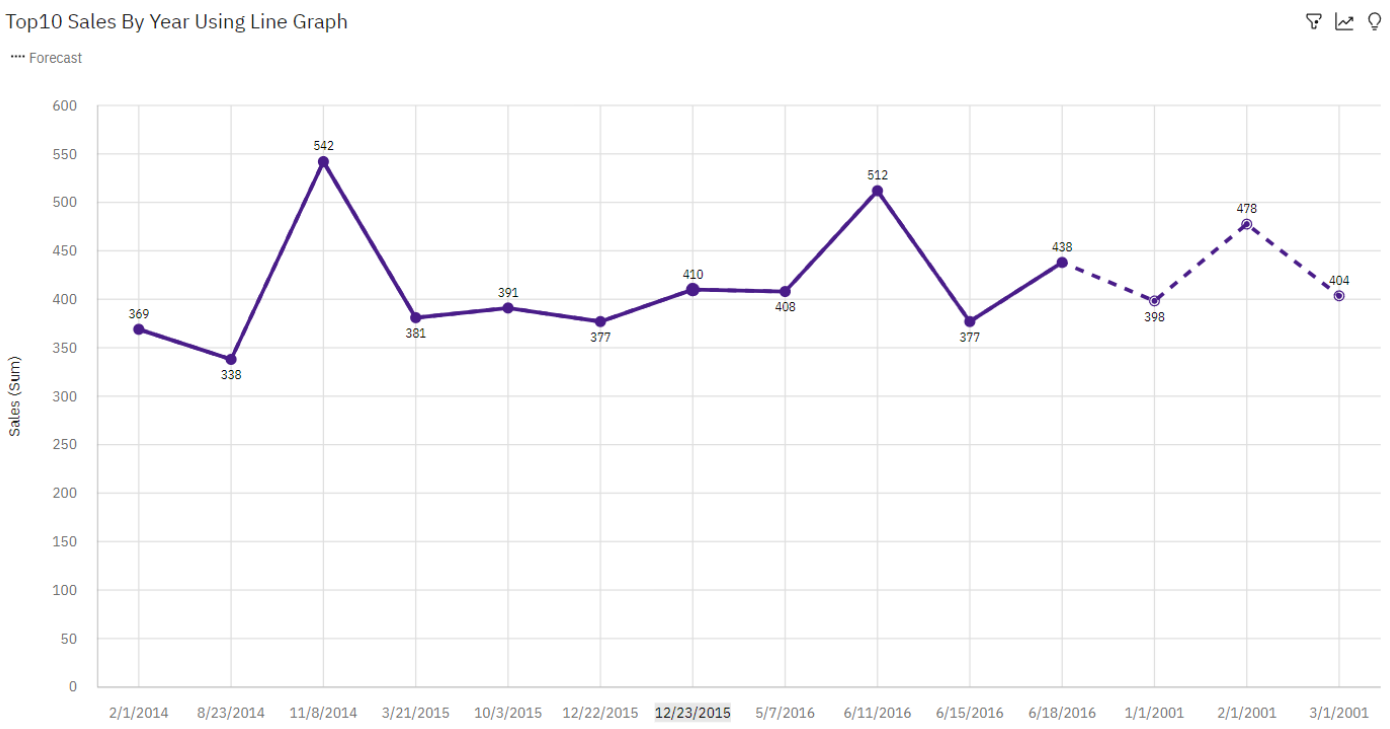
Year wise stock line graph



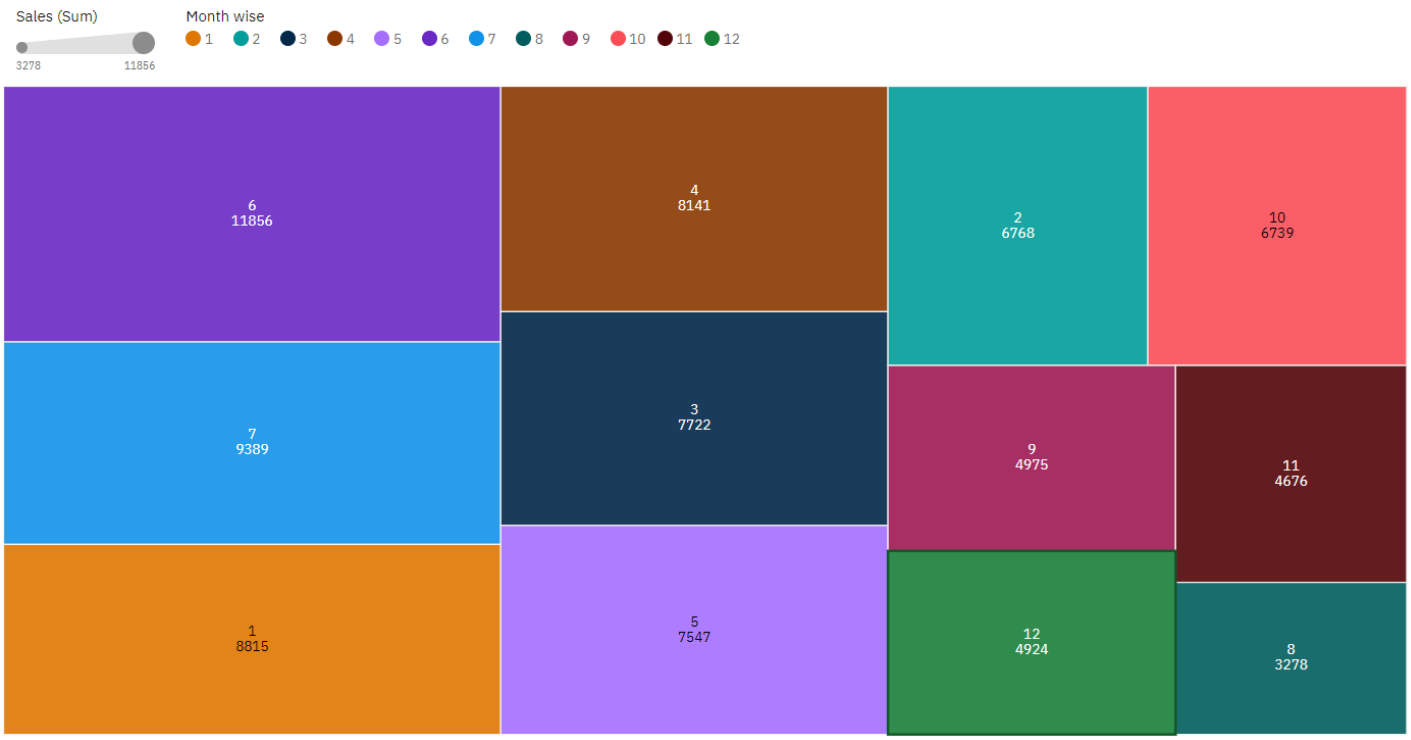
Year wise sales line graph



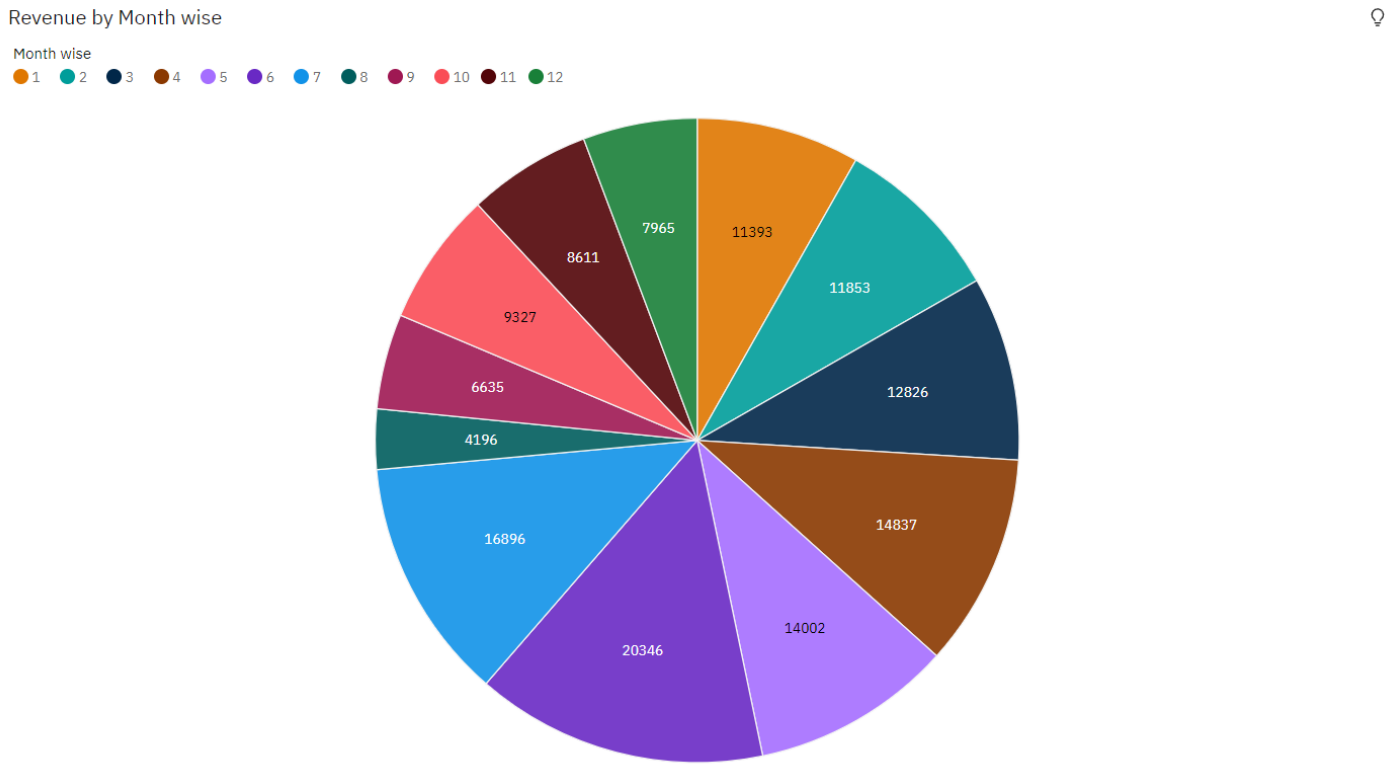
Top 10 sales using line graph



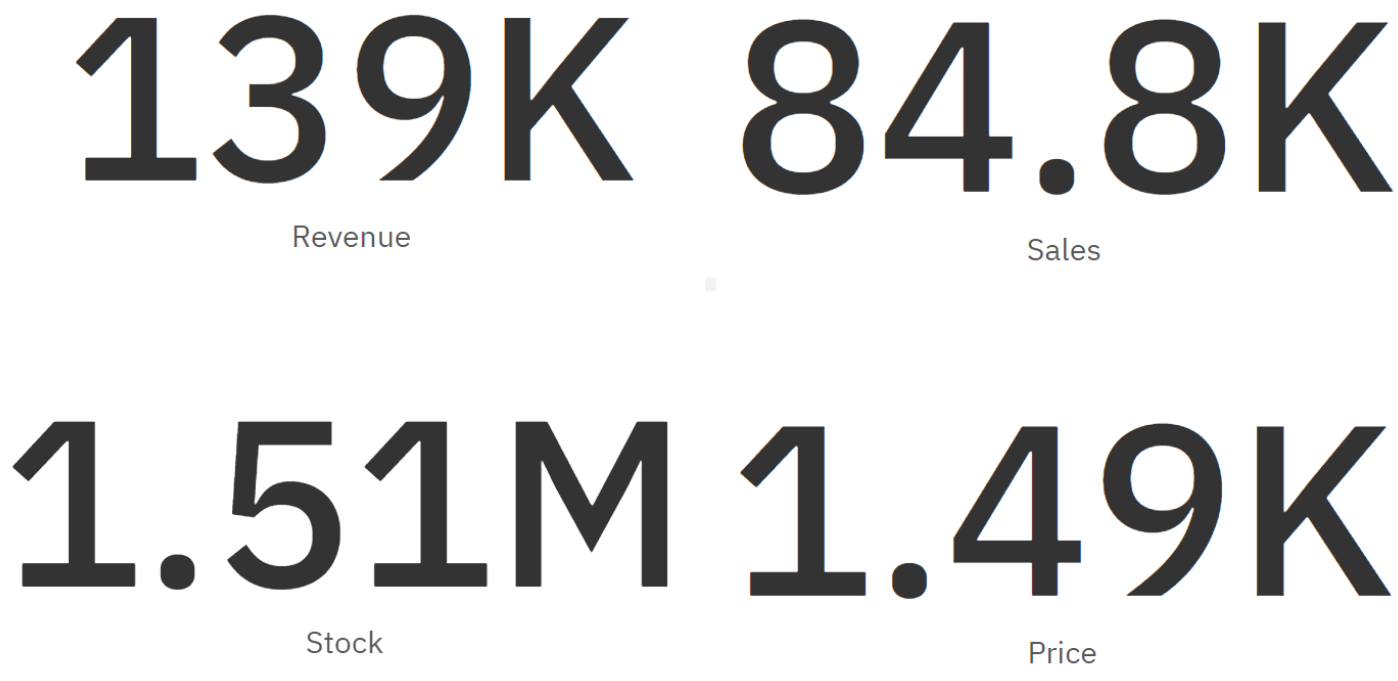
Monthly sales tree map



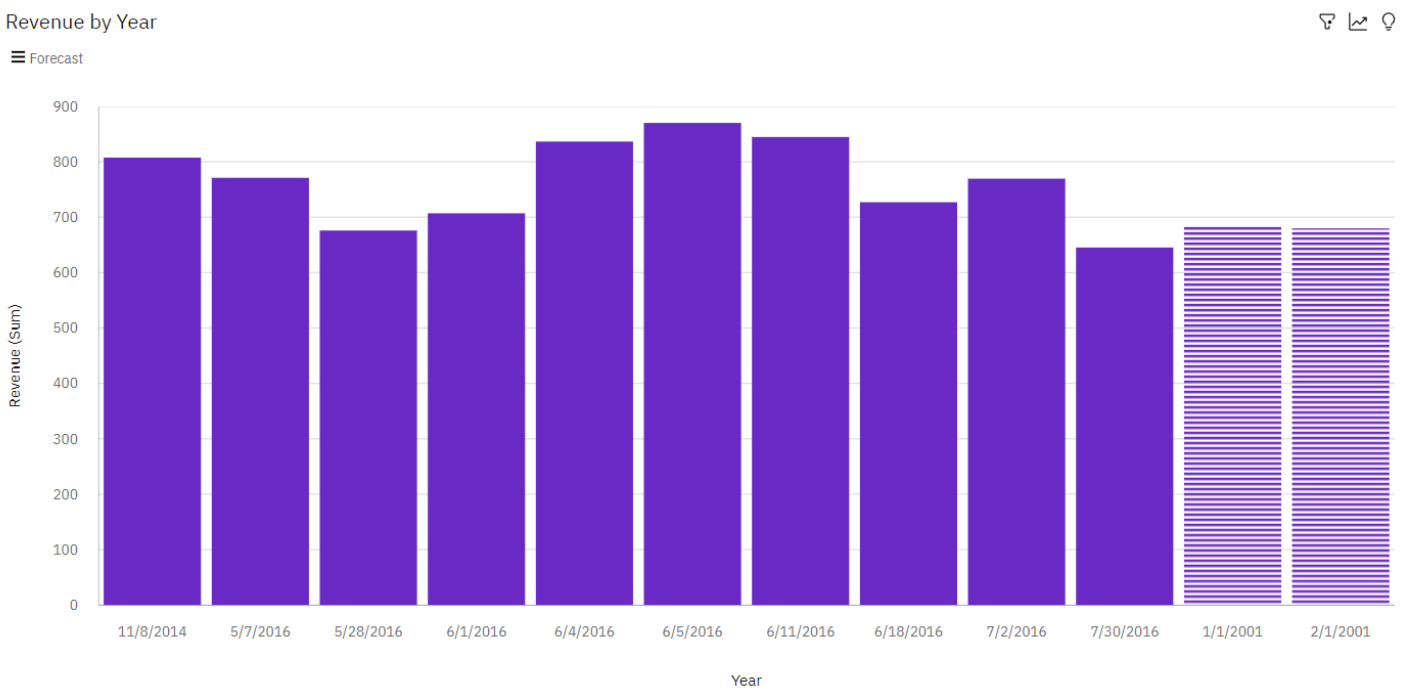
Month wise revenue using pie chart



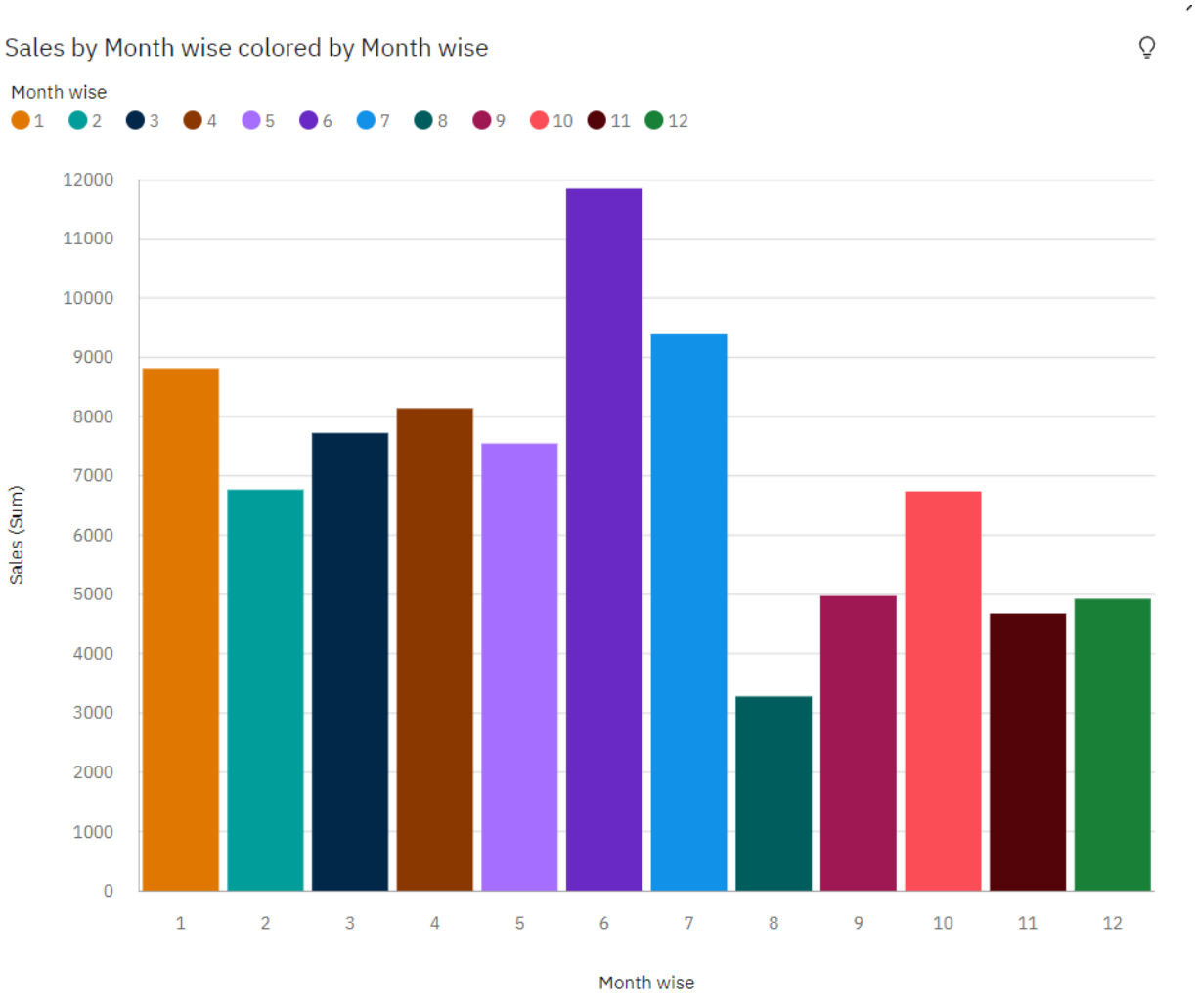
Summary of revenue, sales, stock and price



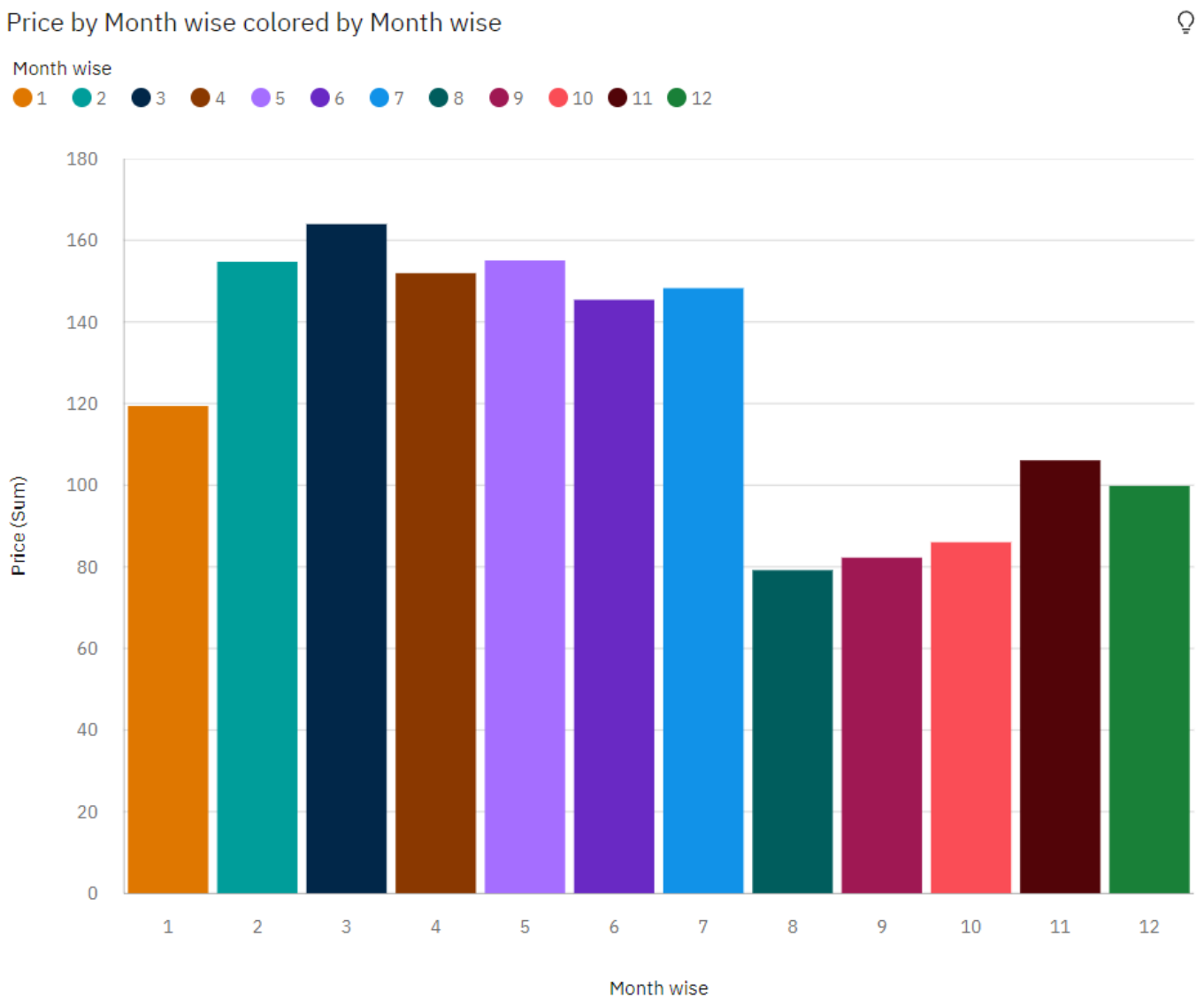
Revenue by year



Month wise sales



Month wise price



8. PERFORMANCE TESTING

S NO	PARAMETER	SCREENSHOT / VALUES
1.	Dashboard design	No of Visualizations / Graphs - 7
2.	Data Responsiveness	Yes
3.	Amount Data to Rendered (DB2 Metrics)	No
4.	Utilization of Data Filters	Yes
5.	Effective User Story	No of Scene Added - 7
6.	Descriptive Reports	No of Visualizations / Graphs - 7

9. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

1. It helps to maintain the right amount of stocks.
2. With the aid of a good inventory management system, we can easily organize our warehouse.
3. It saves time and money.
4. Inventory management software can help to greatly increase the efficiency and productivity of a business.
5. A well-structured inventory management system leads to improved customer retention.
6. Reduction in holding costs.
7. A good inventory management strategy will allow the manager to be flexible and adapt to situations as they arise.

DISADVANTAGES

1. Some methods and strategies of inventory management can be relatively complex and difficult to understand on the part of the staff.
2. Even with an efficient inventory management method, you can control but not eliminate business risk.
3. Holding inventory can sometimes result to a greater risk of loss to devaluation.

10. CONCLUSION

Inventory ensures that an organisation has the right products available at the right time for customers to make on-demand purchases. An accurate inventory system can determine the monetary value of an organization's inventory. The organization's inventory management method can aid in determining the proper management of the organization's inventory. Keeping the right amount of stock on hand is also important in elevating the business. Thus, by presenting and analysing various factors involved in the production of a product, this retail store stock inventory analytics will assist business personnel in making sound decisions.

11. FUTURE SCOPE

Currently, the analytics project focuses solely on visualisation. This can be combined with the machine learning model to make predictions as well. A fully developed web application with prediction capabilities

will be extremely beneficial to all small and medium-sized businesses. The company's revenue can be increased as a result of this.

12. APPENDIX

Github link: https://github.com/IBM-EPBL/IBM-Project-25476-1659964846