INDIVIDUAL PROJECT DATABASE FOUNDATIONS

INVENTORY MODEL DESIGN DATABASE

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Assumptions and Data Cleaning Part +Normalization and Data Modelling

1) DATA MUNGING:

Each of these tables were then created according to the fields using R and selecting particular fields into particular entities. There were many duplicates for each of the tables and duplicates were removed using Remove Duplicates in Excel. The R code used is as below:

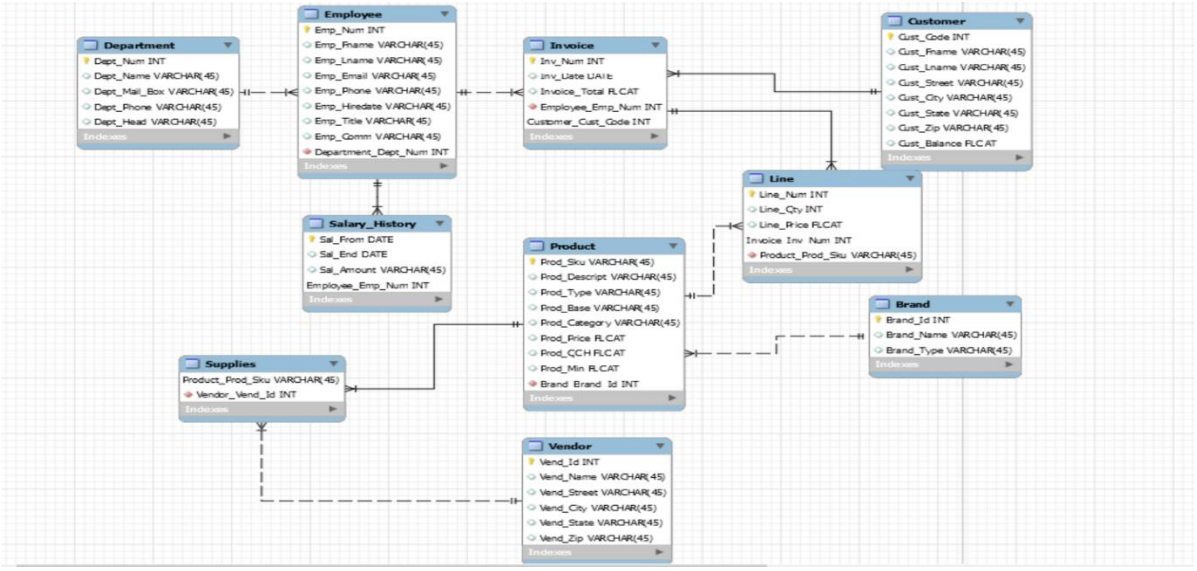
There were many special characters like $,~ etc and NULL Values which were present. The Special Characters were removed and the rows containing the NULL Values were completely removed except in Salary_History Table.

2) NORMALIZATION:

I looked at the data and started Normalizing the data, but I faced a lot of problems while trying to do it. So the first thing I did was to visualize the whole data by preparing the data model and then choosing the appropriate Primary & Foreign Keys.

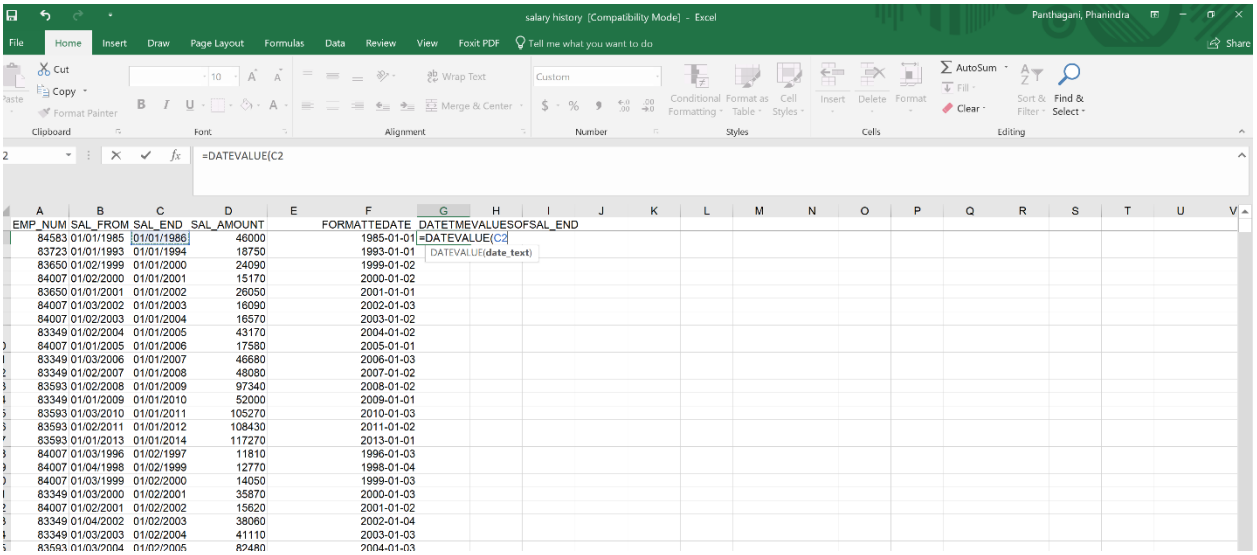
3) DATA MODEL

The data model looked as below:



4) SALARY_HISTORY TABLE FORMATTING

The Salary_History table had date in the wrong format by default like mm/dd/yyyy . It was changed to the proper MySQL format which is (YYYY-DD-MM) which was done in excel. For this I used the DATEVALUE function(Julian Date) in Excel and then using Custom Format to change the date to YYYY-DD-MM. A snapshot is shown below.



DEALING WITH NULL VALUES IN SALARY_HISTORY:

All NULL Values in Salary_History were replaced with 1999-09-12 this date because MySQL doesn't import NULL Values and this was used in the Queries. For example in the first Query this date was used for Sal_End=1999-09-12

QUESTIONS:

What to Do:

1. Start understanding the data by normalizing the provided datasets using the Data Dictionary.

   Remember that this takes up to 80% of your time in completing this project, so start early.

Ans: The dataset was imported in R and then exported into excel after forming the 10 different tables as given in the document. The R code is present at the end of the document named as SPLITTING INTO DIFFERENT TABLES R CODE :

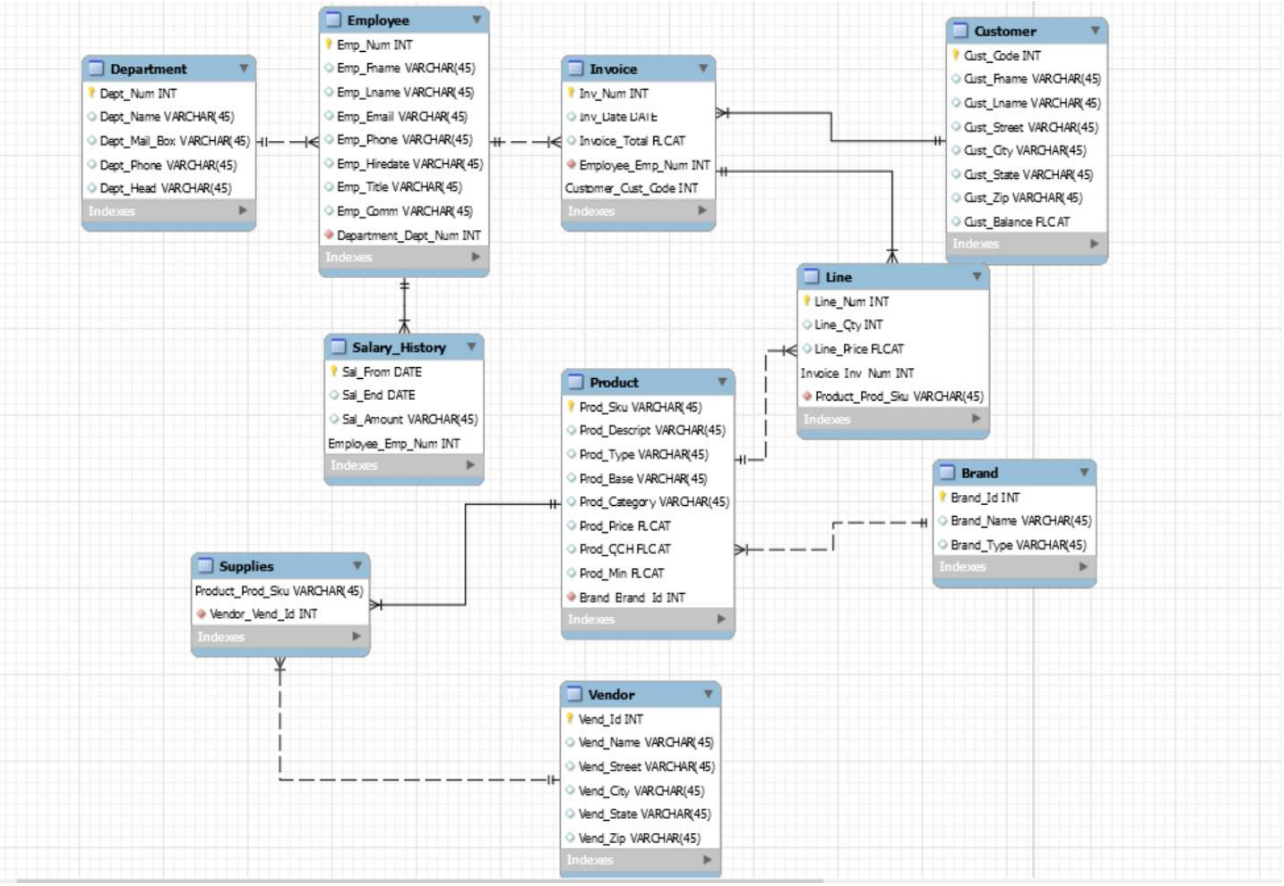
I looked at the data and started Normalizing the data, but I faced a lot of problems while trying to do it. So the first thing I did was to visualize the whole data by preparing the data model and then choosing the appropriate Primary & Foreign Keys.

2. Then clean (data munging) each of the corresponding tables, inserting flags, removing bad characters, and filling in missing data fields with known values where appropriate.

   Ans: The data cleaning was done by importing the data in R and then exporting into excel. Foreign Characters like?, ~ etc. were removed and data was cleaned. The R file is attached along with the Report.

3. Create a Logical and Physical Model using Erwin or DBeaver.

   Ans: Logical & Physical model is as below in the next page:



4. Implement in your choice of DBMS (MySQL, MSSQL, or Oracle) (Please remember that Oracle Online has a table size limitation) by importing the cleaned data. Don't forget to place all required CONSTRAINTS, FOREIGN KEYS, and PRIMARY KEYS.

Ans: The DBMS used was MySQL. Forward engineering was done after creating the ER diagram using data model. CONSTRAINTS, FOREIGN KEYS, and PRIMARY KEYS were implemented in the data model.

5. Write SQL Queries to produce the results in answering the below questions. **Include both the SQL Query code and output results in your final report.**
6. Perform a linear regression using R or other preferred statistical application. Interpret the regression analysis to arrive at a suitable forecast.

   Multiple models with AIC & BIC.
7. Write and submit a report of your findings with all diagrams, graphs, output, and recommendations through eLearning Turnitin by Dec 7, 2018 at 11:59 PM.

QUERIES:

1. Write a query to display the current salary for each employee in department 300. Assume that only current employees are kept in the system, and therefore the most current salary for each employee is the entry in the salary history with a NULL end date. Sort the output in descending order by salary amount.

   Ans:

   Query:

```
SELECT S.Employee_Emp_Num as EMP_ID,E.Emp_Fname as First_Name,E.Emp_Lname as Last_name,S.Sal_Amount as Current_Salary
FROM salary_history S INNER JOIN employee E
ON S.Employee_Emp_Num=E.Emp_Num
WHERE S.Sal_End = '1999-09-12' AND E.Department_Dept_Num=300 ORDER BY Sal_Amount DESC;
```

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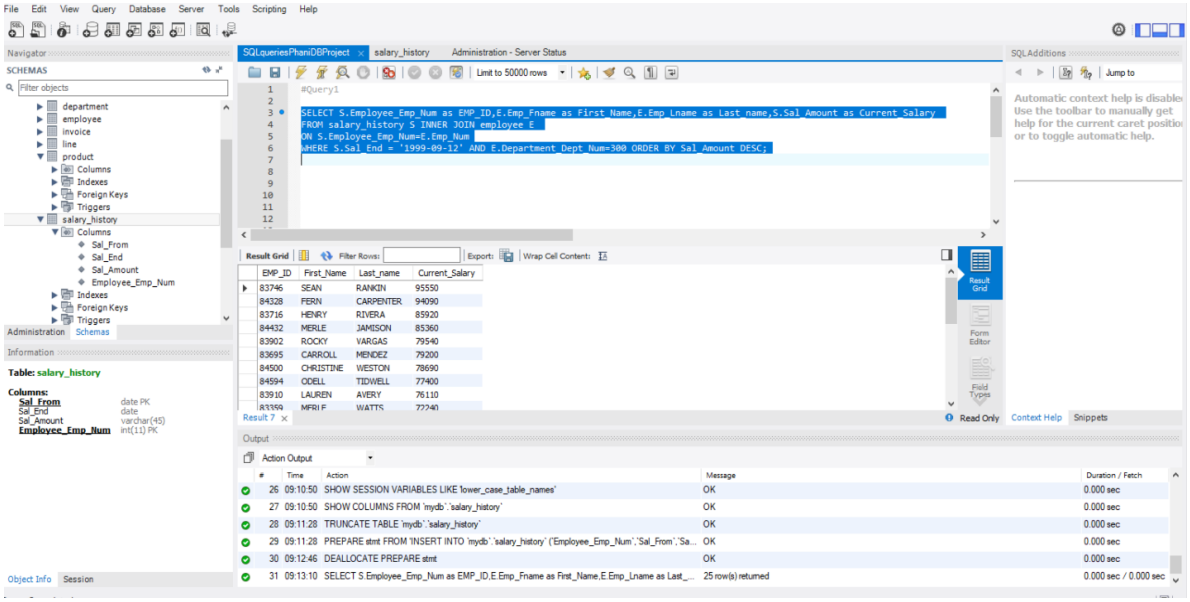
Ouptut :



Since its only 25 rows pasting the Output.

EMP_ID	First_Name	Last_name	Current_Salary
83746	SEAN	RANKIN	95550
84328	FERN	CARPENTER	94090
83716	HENRY	RIVERA	85920
84432	MERLE	JAMISON	85360
83902	ROCKY	VARGAS	79540
83695	CARROLL	MENDEZ	79200
84500	CHRISTINE	WESTON	78690
84594	ODELL	TIDWELL	77400
83910	LAUREN	AVERY	76110
83359	MERLE	WATTS	72240
83790	LAVINA	ACEVEDO	72000
83433	RONNA	NORWOOD	68870
84521	DELFINA	JUDD	66000
83653	LEEANN	HORN	61920
83738	PORTER	STACY	58200
83788	LANA	DOWDY	56760
83867	TRACIE	KELLY	56750
84234	LUISA	MINER	54720
83637	TANIKA	CRANE	52870
83877	STEPHAINE	DUNLAP	52650
84035	HAL	FISHER	51600
83729	CORRINA	RAMEY	48500
83732	SAMMY	DIGGS	44720

83644	WILLA	MAXWELL	43200
83312	ROSALBA	BAKER	42400

2. Write a query to display the starting salary for each employee. The starting salary would be the entry in the salary history with the oldest salary start date for each employee. Sort the output by employee number.

Query:

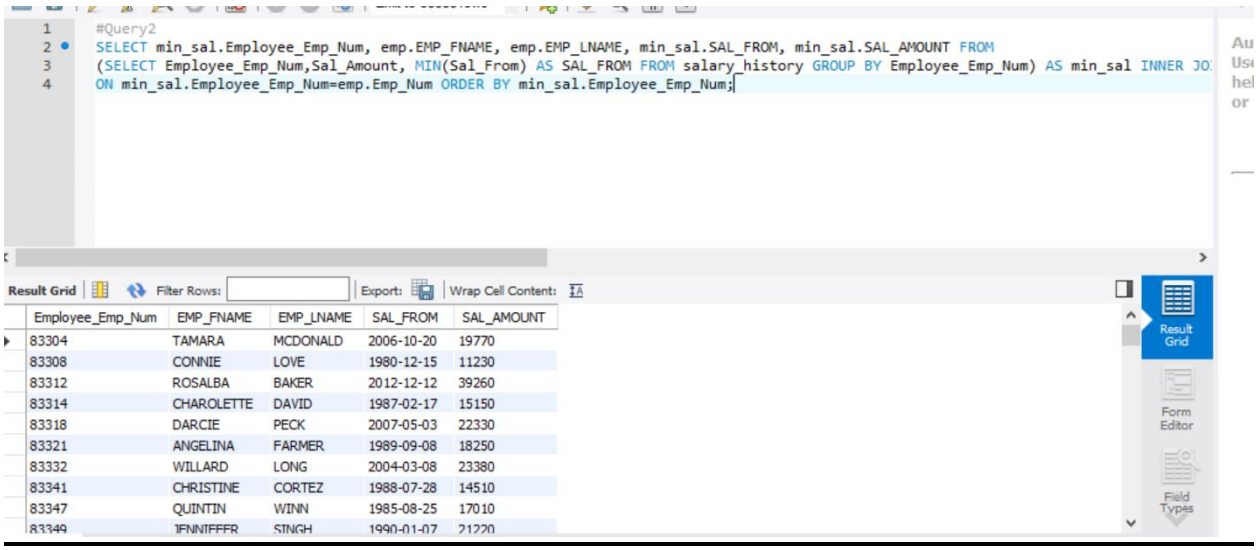
SELECT min_sal.Employee_Emp_Num, emp.EMP_FNAME, emp.EMP_LNAME, min_sal.SAL_FROM, min_sal.SAL_AMOUNT FROM

(SELECT Employee_Emp_Num,Sal_Amount, MIN(Sal_FROM) AS SAL_FROM FROM salary_history GROUP BY Employee_Emp_Num) AS min_sal INNER JOIN employee emp

ON min_sal.Employee_Emp_Num=emp.Emp_Num

ORDER BY min_sal.Employee_Emp_Num;

Ouptut:



363 rows were returned.They will be attached as Query2Output.CSV

3. Write a query to display the invoice number, line numbers, product SKUs, product descriptions, and brand ID for sales of sealer and top coat products of the same brand on the same invoice.

Query:

```
SELECT line.Invoice_Inv_Num, line.LINE_NUM, line.Product_Prod_Sku, p1.PROD_DESCRIPT,p1.Brand_Brand_Id
FROM line line INNER JOIN(SELECT DISTINCT p.PROD_SKU,p.PROD_DESCRIPT,p.Brand_Brand_Id FROM product p WHERE p.PROD_CATEGORY = 'Top Coat') p1
ON line.Product_Prod_Sku=p1.PROD_SKU INNER JOIN(SELECT DISTINCT p.PROD_SKU,p.PROD_DESCRIPT,p.Brand_Brand_Id FROM product p WHERE p.PROD_CATEGORY = 'Sealer') p2
ON line.Product_Prod_Sku=p2.PROD_SKU WHERE p1.Brand_Brand_Id=p2.Brand_Brand_Id;
```

Output:

0 rows were returned. I went back and cross check if there any sealer and top coat products of the same brand on the same invoice.

4. The Binder Prime Company wants to recognize the employee who sold the most of their products during a specified period. Write a query to display the employee number, employee first name, employee last name, e-mail address, and total units sold for the employee who sold the most Binder Prime brand products between November 1, 2015, and December 5, 2015. If there is a tie for most units sold, sort the output by employee last name.

Query

```
SELECT emp_num, First_name, LASt_name, email, tot_q  FROM (SELECT SUM(l1.Line_Qty)
AS tot_q ,emp1.Emp_Num AS emp_num, emp1.EMP_FNAME AS First_name,
emp1.EMP_LNAME AS LASt_name,  emp1.EMP_EMAIL AS email  FROM line l1 INNER
JOIN invoice in1
ON l1.Invoice_Inv_Num=in1.Inv_Num INNER JOIN employee emp1
ON in1.Employee_Emp_Num=emp1.Emp_Num INNER JOIN product p1
ON l1.Product_Prod_Sku=p1.PROD_SKU INNER JOIN brAND b1
ON b1.Brand_Id=p1.Brand_Brand_Id WHERE b1.BRAND_NAME = 'BINDER PRIME' AND
in1.Inv_Num not like '-%'
GROUP BY emp1.Emp_Num) q1 WHERE tot_q = (SELECT MAX(abc1.tot_q) FROM
(SELECT SUM(l1.Line_Qty) AS tot_q ,emp1.Emp_Num AS emp_num,
emp1.EMP_FNAME AS First_name, emp1.EMP_LNAME AS LASt_name, emp1.EMP_EMAIL
AS email FROM line l1 INNER JOIN invoice in1
ON l1.Invoice_Inv_Num=in1.Inv_Num INNER JOIN employee emp1
ON in1.Employee_Emp_Num=emp1.Emp_Num INNER JOIN product p1 ON
l1.Product_Prod_Sku=p1.PROD_SKU INNER JOIN brAND b1
ON b1.Brand_Id=p1.Brand_Brand_Id
WHERE b1.BRAND_NAME = 'BINDER PRIME' AND in1.Inv_Num not like '-%'
AND in1.INV_DATE between ('2015-11-01') AND ('2015-12-05') GROUP BY emp1.Emp_Num)
abc1)
ORDER BY LASt_name;
```

Output:

0 rows

We see from INVOICE table that there is no invoice for the year 2015 and that's why we are getting empty output.

To check if the Query is right, I removed the inv.INV_DATE between part and checked if the query is returning any rows. I could get rows returned when I Removed the INV_DATE constraint , I got 2 rows as Output as below:

emp_num	First_name	LASt_name	email	tot_q
84078	DIEGO	ERWIN	E.DIEGO98@LGCOMPANY.COM	27
84106	FELICE	SAMUEL	S.FELICE98@LGCOMPANY.COM	27

5. Write a query to display the customer code, first name, and last name of all customers who have had at least one invoice completed by employee 83649 and at least one invoice completed by employee 83677. Sort the output by customer last name and then first name.

Query:

```
SELECT a.Cust_Code, a.cust_lname, a.cust_fname FROM (SELECT c.Cust_Code,
c.cust_fname, c.cust_lname FROM customer c INNER JOIN
invoice i ON c.Cust_Code = i.Customer_Cust_Code WHERE i.Employee_Emp_Num = 83649) a
INNER JOIN
(SELECT c.Cust_Code, c.cust_fname,c.cust_lname
FROM customer c INNER JOIN invoice i ON c.Cust_Code = i.Customer_Cust_Code WHERE
i.Employee_Emp_Num = 83677) b
ON a.Cust_Code=b.Cust_Code ORDER BY a.cust_lname, a.cust_fname;
```

Ouput:

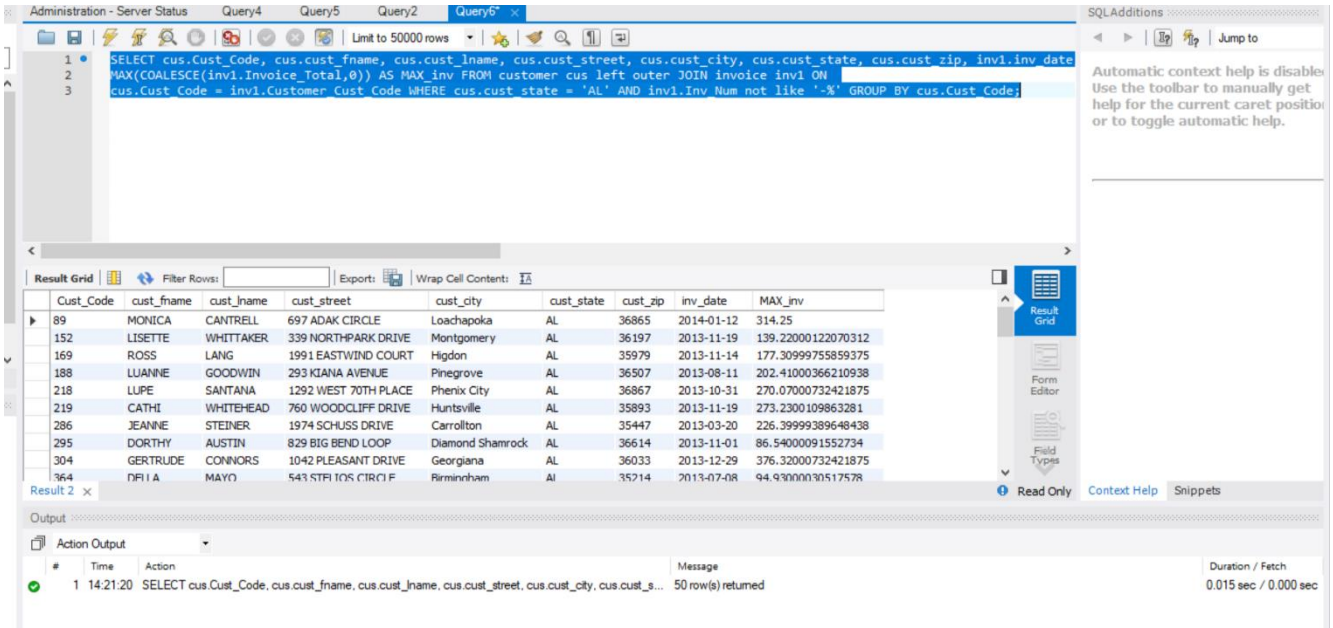
0 rows returned.

6. LargeCo is planning a new promotion in Alabama (AL) and wants to know about the largest purchases made by customers in that state. Write a query to display the customer code, customer first name, last name, full address, invoice date, and invoice total of the largest purchase made by each customer in Alabama. Be certain to include any customers in Alabama who have never made a purchase (their invoice dates should be NULL and the invoice totals should display as 0).

Query:

SELECT cus.Cust_Code, cus.cust_fname, cus.cust_lname, cus.cust_street, cus.cust_city, cus.cust_state, cus.cust_zip, inv1.inv_date, MAX(COALESCE(inv1.Invoice_Total,0)) AS MAX_inv FROM customer cus left outer JOIN invoice inv1 ON cus.Cust_Code = inv1.Customer_Cust_Code WHERE cus.cust_state = 'AL' AND inv1.Inv_Num not like '-%' GROUP BY cus.Cust_Code;

Output:



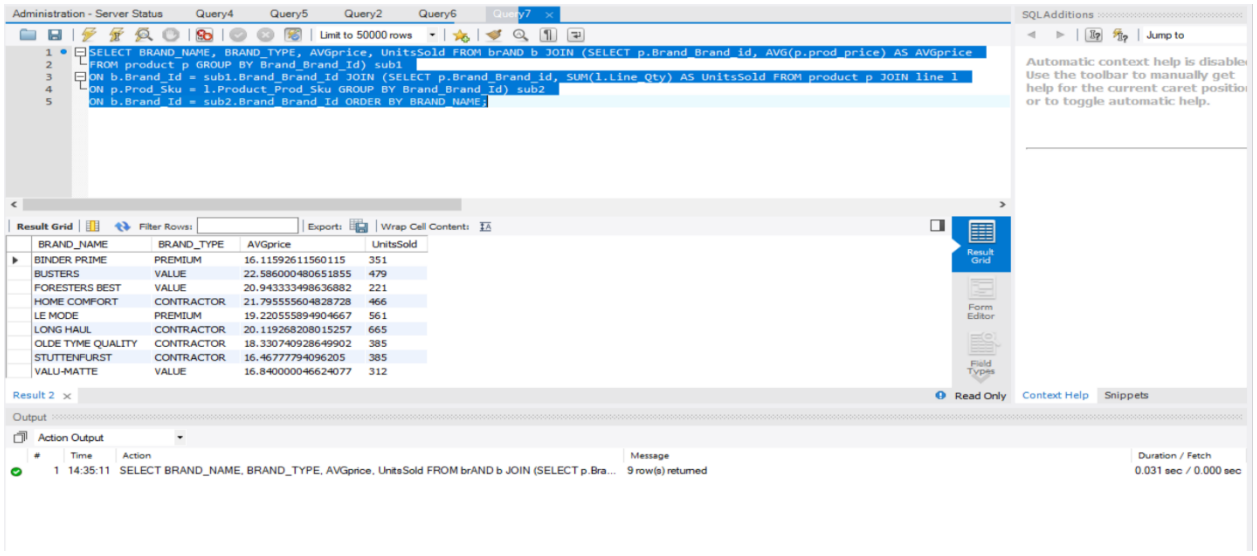
50 rows were returned, and output is attached in OutputQuery6.csv

7. One of the purchasing managers is interested in the impact of product prices on the sale of products of each brand. Write a query to display the brand name, brand type, average price of products of each brand, and total units sold of products of each brand. Even if a product has been sold more than once, its price should only be included once in the calculation of the average price. However, you must be careful because multiple products of the same brand can have the same price, and each of those products must be included in the calculation of the brand's average price.

Query:

```
SELECT BRAND_NAME, BRAND_TYPE, AVGprice, UnitsSold FROM brAND b JOIN
(SELECT p.Brand_Brand_id, AVG(p.prod_price) AS AVGprice
FROM product p GROUP BY Brand_Brand_Id) sub1
ON b.Brand_Id = sub1.Brand_Brand_Id JOIN (SELECT p.Brand_Brand_id, SUM(l.Line_Qty)
AS UnitsSold FROM product p JOIN line l
ON p.Prod_Sku = l.Product_Prod_Sku GROUP BY Brand_Brand_Id) sub2
ON b.Brand_Id = sub2.Brand_Brand_Id ORDER BY BRAND_NAME;
```

Output:



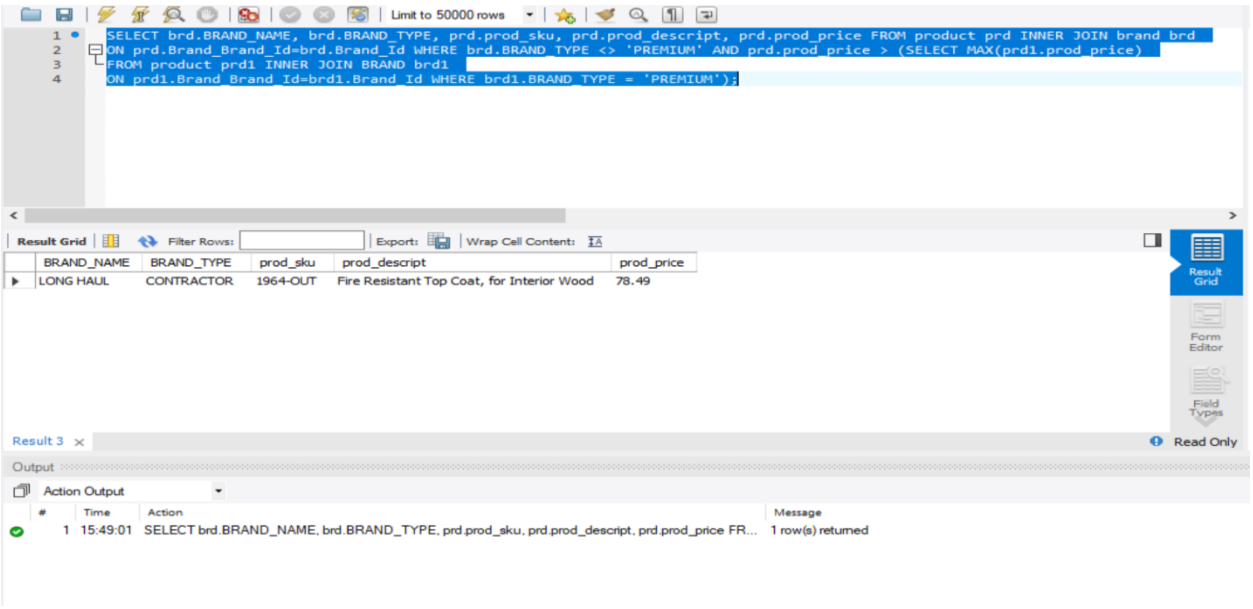
9 rows were returned as attached.

8. The purchasing manager is still concerned about the impact of price on sales. Write a query to display the brand name, brand type, product SKU, product description, and price of any products that are not a premium brand, but that cost more than the most expensive premium brand products.

Query:

```
SELECT brd.BRAND_NAME, brd.BRAND_TYPE, prd.prod_sku, prd.prod_descript,
prd.prod_price FROM product prd INNER JOIN brand brd
ON prd.Brand_Brand_Id=brd.Brand_Id WHERE brd.BRAND_TYPE <> 'PREMIUM'
AND prd.prod_price > (SELECT MAX(prd1.prod_price)
FROM product prd1 INNER JOIN BRAND brd1
ON prd1.Brand_Brand_Id=brd1.Brand_Id
WHERE brd1.BRAND_TYPE = 'PREMIUM');
```

Ouptut:



There is only 1 such brand name, brand type, product SKU, product description, and price of any products that are not a premium brand, but that cost more than the most expensive premium brand products

BRAND_NAME	BRAND_TYPE	prod_sku	prod_descript	prod_price
LONG HAUL	CONTRACTOR	1964-OUT	Fire Resistant Top Coat, for Interior Wood	78.49

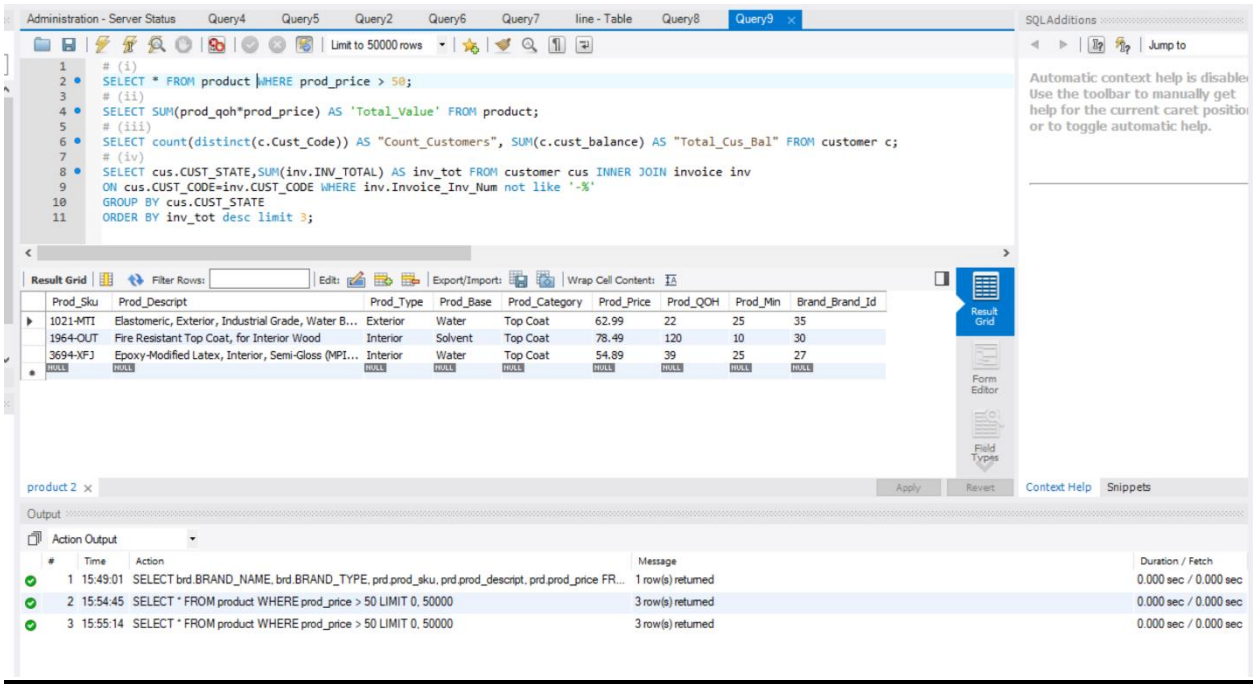
9. Using SQL descriptive statistics functions calculate the value of the following items:

a. What are the products that have a price greater than $50?

Query:

SELECT * FROM product WHERE prod_price > 50;

Output:



There are 3 products with price greater than $50 as below

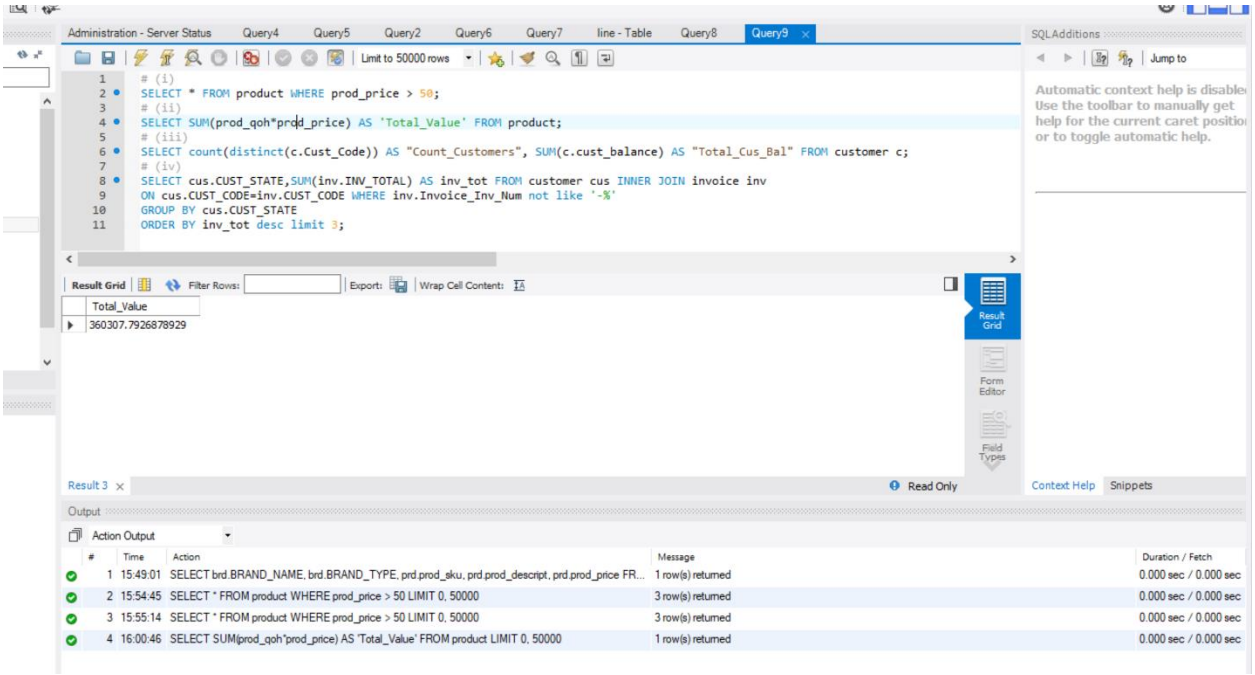
Prod_Sku	Prod_Descript	Prod_Type	Prod_Base	Prod_Category	Prod_Price
1021-MTI	Elastomeric, Exterior, Industrial Grade, Water Based	Exterior	Water	Top Coat	62.99
1964-OUT	Fire Resistant Top Coat, for Interior Wood	Interior	Solvent	Top Coat	78.49
3694-XFJ	Epoxy-Modified Latex, Interior, Semi-Gloss (MPI Gloss Level 5)	Interior	Water	Top Coat	54.89

b. What is total value of our entire inventory on hand?

Query:

SELECT SUM(prod_qoh*prod_price) AS 'Total_Value' FROM product;

Output:



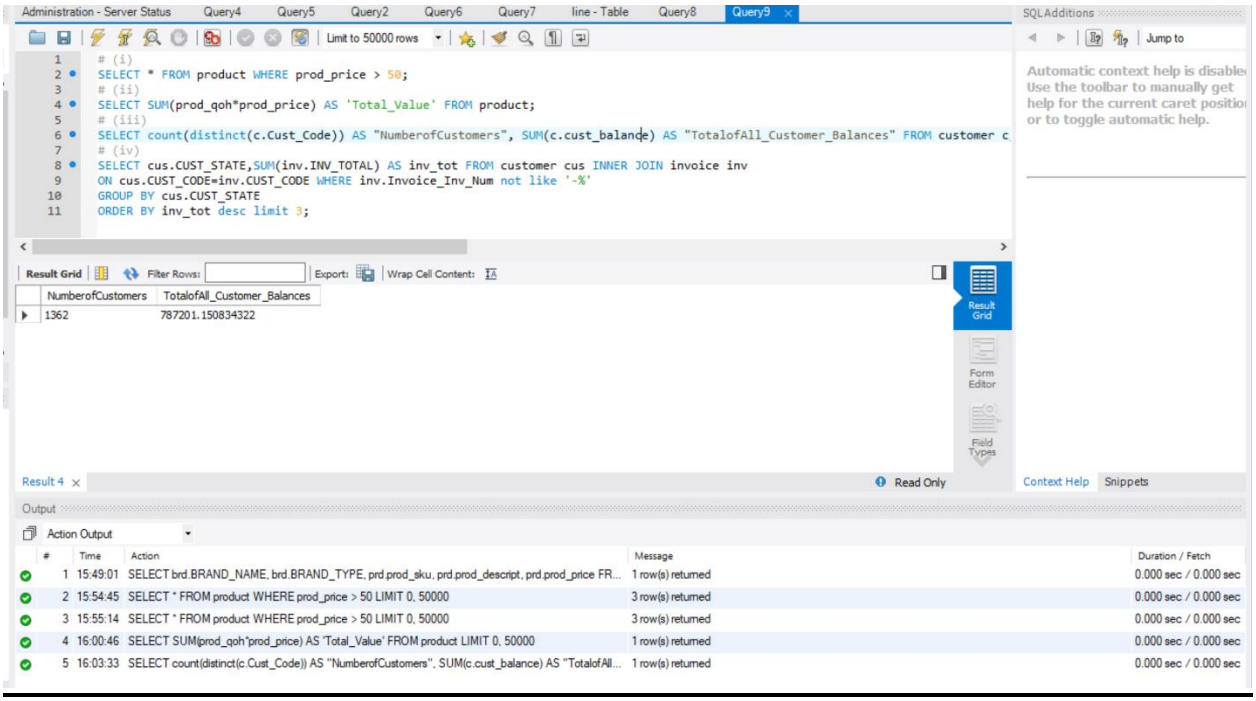
The total value of the inventory is : $360307.7926878929

c. How many customers do we presently have and what is the total of all customer balances?

Query:

```
SELECT count(distinct(c.Cust_Code)) AS "NumberofCustomers", SUM(c.cust_balance)
AS "TotalofAll_Customer_Balances"
FROM customer c;
```

Output:



There are a total of 1362 customers and the

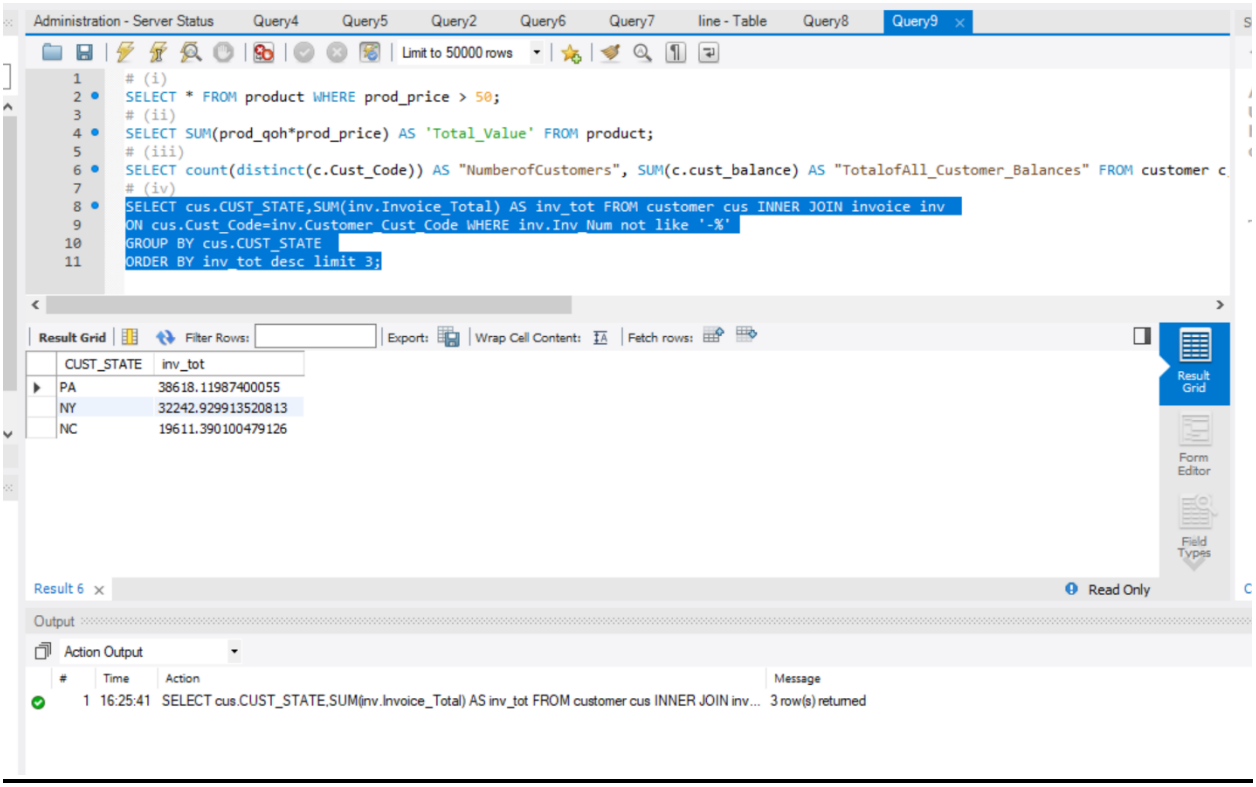
Total of all Customer Balances is $787201.150834322

d. What are to top three states that buy the most product in dollars from the company?

Query:

```
SELECT cus.CUST_STATE,SUM(inv.Invoice_Total) AS inv_tot FROM customer cus
INNER JOIN invoice inv
ON cus.Cust_Code=inv.Customer_Cust_Code WHERE inv.Inv_Num not like '-%'
GROUP BY cus.CUST_STATE
ORDER BY inv_tot desc limit 3;
```

Output:



The top 3 states that buy the most product in dollars from the company are PA,NY and NC with the invoice totals as below:

CUST_STATE	inv_tot
PA	38618.12
NY	32242.93
NC	19611.39

10. Using predictive statistics calculate what the predicted forecast of sales for the next year based on the INV_DATE (independent) and INV_TOTAL (dependent). Remember that you will need to convert the INV_DATE from the MS SQL Server stored date value to the expect Julian date, since numbers in MS SQL are stored as the number of days since 1/1/1900 with the fraction as the portion of a day (if you are using a different DBMS use the appropriate code for conversion.)

```
declare @d1 datetime
```

```
set @d1 = 41867

select @d1

select CONVERT(varchar(20),@d1,120)
```

or if you want to do it in one statement:

```
select CONVERT(varchar(25),cast(41867 as datetime),120)
```

Analyze your results from the linear regression, and provide the R^2, model, coefficients, and the confidence interval for your analysis.

Ans:

I converted the DATETIME values to Julian Date Time and then used R to evaluate various models.

The R Code gave very bad results as our data is time series data.

Hence, I converted the whole data into months and used the same for prediction. Please find the model summary and Results below

SUMMARY OUTPUT
REGRESSION

Regression Statistics	
Multiple R	0.03802
R Square	0.00145
Adjusted R Square	0.0007
Standard Error	128.892
Observations	1346

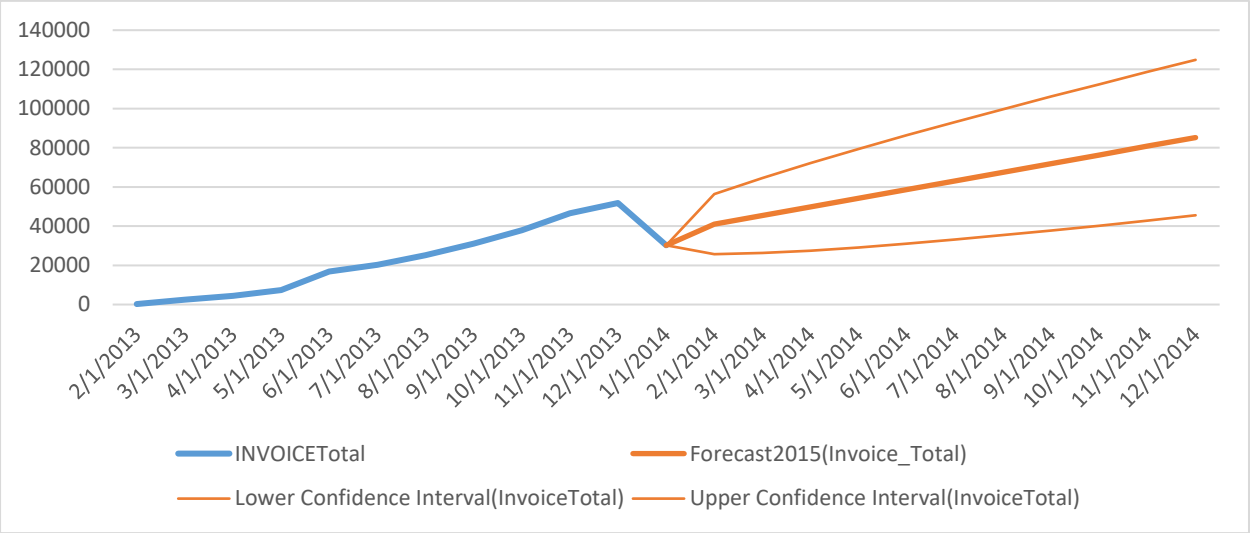
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	32322.66263	32322.66263	1.945597976	0.163292475
Residual	1344	22328178.34	16613.22793		
Total	1345	22360501			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	-2567.4	1986.876061	-1.292174585	0.196518821	-6465.106377
41317	0.06669	0.047813537	1.394846936	0.163292475	-0.027104715

2015 Forecasting Invoice Total:

The given data is a time-series , hence I used excel to use time-series to forecast of next year sales based on the monthly sum total of sales and dividing into monthly chunks.



MODEL SUMMARY FOR R

From the above table, We see that linear model has the highest R^2 and hence is the best model. We have the least AIC,BIC values from which we select the best model with the least values. Here the linear model has the AIC BIC values with 17099.97,17115.62.

Model Name	R^2	Alkaline Information Criteria(AIC)	Bayesian Information Criteria(BIC)
Model_Linear	0.01357	17099.97	17115.62
Model_Quadratic	0.01356	17099.98	17115.63
Model_Cubic	0.0006201	17099.98	17115.63
Model_Differencing Time Series)	4.877e-05	17995	18010.65

SUMMARY OF MODEL_LINEAR

```
C:/Data Analytics/FALL2018UTD/BAwithR_LingGe/Assignments/HW3/
> summary(Model_Linear)

Call:
lm(formula = inv_total ~ inv_date, data = Invoice)

Residuals:
     Min       1Q   Median       3Q      Max
-203.46 -102.57  -13.67   77.55  488.89

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -2.475e+03  1.970e+03  -1.256    0.209
inv_date     6.445e-02  4.741e-02   1.360    0.174

Residual standard error: 128.7 on 1360 degrees of freedom
Multiple R-squared:  0.001357,  Adjusted R-squared:  0.0006231
F-statistic: 1.849 on 1 and 1360 DF,  p-value: 0.1742

> AIC(Model_Linear)
[1] 17099.97
> BIC(Model_Linear)
[1] 17115.62
>
```

SUMMARY OF MODEL_QUADRATIC

```
C:/Data Analytics/FALL2018UTD/BAwithR_LingGe/Assignments/HW3/
> summary(Model_Quadratic)

Call:
lm(formula = inv_total ~ I(inv_date^2), data = Invoice)

Residuals:
    Min      1Q  Median      3Q     Max
-203.46 -102.58  -13.66   77.54  488.90

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)   -1.136e+03  9.856e+02  -1.153    0.249
I(inv_date^2)  7.756e-07  5.707e-07   1.359    0.174

Residual standard error: 128.7 on 1360 degrees of freedom
Multiple R-squared:  0.001356,  Adjusted R-squared:  0.0006216
F-statistic: 1.846 on 1 and 1360 DF,  p-value: 0.1744

> AIC(Model_Quadratic)
[1] 17099.98
> BIC(Model_Quadratic)
[1] 17115.63
>
```

SUMMARY OF MODEL_CUBIC

C:/Data Analytics/FALL2018UTD/BAwithR_LingGe/Assignments/HW3/

```
> summary(Model_Cubic)

Call:
lm(formula = inv_total ~ I(inv_date^3), data = Invoice)

Residuals:
    Min      1Q  Median      3Q     Max
-203.46 -102.59  -13.66   77.54  488.90

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)   -6.897e+02  6.574e+02  -1.049    0.294
I(inv_date^3)  1.244e-11  9.162e-12   1.358    0.175

Residual standard error: 128.7 on 1360 degrees of freedom
Multiple R-squared:  0.001354,  Adjusted R-squared:  0.0006201
F-statistic: 1.844 on 1 and 1360 DF,  p-value: 0.1747

> AIC(Model_Cubic)
[1] 17099.98
> BIC(Model_Cubic)
[1] 17115.63
```

SUMMARY OF MODEL_DIFFERENCING

C:/Data Analytics/FALL2018UTD/BAwithR_LingGe/Assignments/HW3/

```
> summary(Model_Differencing)

Call:
lm(formula = diff(inv_total) ~ diff(inv_date), data = Invoice)

Residuals:
    Min      1Q  Median      3Q     Max
-616.06 -117.79    0.88  120.52  544.83

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    -0.006656   4.867366  -0.001    0.999
diff(inv_date) -0.015095   0.058632  -0.257    0.797

Residual standard error: 179.6 on 1359 degrees of freedom
Multiple R-squared:  4.877e-05, Adjusted R-squared:  -0.000687
F-statistic: 0.06628 on 1 and 1359 DF,  p-value: 0.7969

> AIC(Model_Differencing)
[1] 17995
> BIC(Model_Differencing)
[1] 18010.65
```

R Code for Prediction:

Question10DB

Phanindra

December 7, 2018

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
library(data.table)
library(DBI)
library(RSQLite)
library(tidyverse)

## -- Attaching packages ---------------------------- tidyverse 1.2.1 --

## v ggplot2 3.1.0     v purrr   0.2.5
## v tibble  1.4.2     v dplyr   0.7.8
## v tidyr   0.8.2     v stringr 1.3.1
## v readr   1.1.1     v forcats 0.3.0

## -- Conflicts ------------------------------- tidyverse_conflicts() --
## x dplyr::between()   masks data.table::between()
## x dplyr::filter()    masks stats::filter()
## x dplyr::first()     masks data.table::first()
## x dplyr::lag()       masks stats::lag()
## x dplyr::last()      masks data.table::last()
## x purrr::transpose() masks data.table::transpose()

library(ggplot2)
library(lmtest)

## Loading required package: zoo

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
library(sandwich)
library(margins)
library(partykit)

## Loading required package: grid

## Loading required package: libcoin

## Loading required package: mvtnorm

library(plm)

## Loading required package: Formula

##
## Attaching package: 'plm'

## The following objects are masked from 'package:dplyr':
##
##     between, lag, lead

## The following object is masked from 'package:data.table':
##
##     between

library(dplyr)


Invoice <- fread("Invoice.csv")
View(Invoice)
inv_date <- Invoice$`JULIAN INV_DATE`
class(inv_date)

## [1] "integer"

inv_date <- as.numeric( Invoice$`JULIAN INV_DATE`)
class(inv_date)

## [1] "numeric"

inv_total <- Invoice$INV_TOTAL
class(inv_total)

## [1] "numeric"

Model_Linear<- lm(inv_total~ inv_date, data=Invoice)
summary(Model_Linear)#Multiple R-squared:  0.001357,    Adjusted R-squared:
0.0006231

##
## Call:
## lm(formula = inv_total ~ inv_date, data = Invoice)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -203.46 -102.57  -13.67   77.55  488.89
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2.475e+03  1.970e+03  -1.256    0.209
## inv_date     6.445e-02  4.741e-02   1.360    0.174
##
## Residual standard error: 128.7 on 1360 degrees of freedom
## Multiple R-squared:  0.001357,   Adjusted R-squared:  0.0006231
## F-statistic: 1.849 on 1 and 1360 DF,  p-value: 0.1742
```

```
AIC(Model_Linear)#17099.97
```

```
## [1] 17099.97
```

```
BIC(Model_Linear)#17115.62
```

```
## [1] 17115.62
```

```
Model_Quadratic <- lm(inv_total~ I(inv_date^2), data=Invoice)
summary(Model_Quadratic)#Multiple R-squared:  0.001356, Adjusted R-squared:
0.0006216
```

```
##
## Call:
## lm(formula = inv_total ~ I(inv_date^2), data = Invoice)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -203.46 -102.58  -13.66   77.54  488.90
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -1.136e+03  9.856e+02  -1.153    0.249
## I(inv_date^2)  7.756e-07  5.707e-07   1.359    0.174
##
## Residual standard error: 128.7 on 1360 degrees of freedom
## Multiple R-squared:  0.001356,   Adjusted R-squared:  0.0006216
## F-statistic: 1.846 on 1 and 1360 DF,  p-value: 0.1744
```

```
AIC(Model_Quadratic)#17099.98
```

```
## [1] 17099.98
```

```
BIC(Model_Quadratic)#17115.63
```

```
## [1] 17115.63
```

```
Model_Cubic <- lm(inv_total~ I(inv_date^3), data=Invoice)
summary(Model_Cubic)#Multiple R-squared:  0.001354, Adjusted R-squared:  0.00
06201
```

```
##
## Call:
## lm(formula = inv_total ~ I(inv_date^3), data = Invoice)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -203.46 -102.59  -13.66   77.54  488.90
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -6.897e+02  6.574e+02  -1.049    0.294
## I(inv_date^3)  1.244e-11  9.162e-12   1.358    0.175
##
## Residual standard error: 128.7 on 1360 degrees of freedom
## Multiple R-squared:  0.001354,   Adjusted R-squared:  0.0006201
## F-statistic: 1.844 on 1 and 1360 DF,  p-value: 0.1747
```

```
AIC(Model_Cubic)#17099.98
```

```
## [1] 17099.98
```

```
BIC(Model_Cubic)#17115.63
```

```
## [1] 17115.63
```

```
Model_Differencing <- lm(diff(inv_total)~ diff(inv_date), data=Invoice)
summary(Model_Differencing)#Multiple R-squared:  4.877e-05, Adjusted R-square
d:  -0.000687
```

```
##
## Call:
## lm(formula = diff(inv_total) ~ diff(inv_date), data = Invoice)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -616.06 -117.79    0.88  120.52  544.83
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -0.006656   4.867366  -0.001    0.999
## diff(inv_date) -0.015095   0.058632  -0.257    0.797
##
## Residual standard error: 179.6 on 1359 degrees of freedom
## Multiple R-squared:  4.877e-05,  Adjusted R-squared:  -0.000687
## F-statistic: 0.06628 on 1 and 1359 DF,  p-value: 0.7969
```

```
AIC(Model_Differencing)#17995
```

```
## [1] 17995
```

```
BIC(Model_Differencing)#18010.65
```

```
## [1] 18010.65
```

The best model based on prediction came out to be Linear model. Using it for predicting the values for 2015.

```
#The Julian date for 2/12/2013 based on the previous invoice is 41317. Julian
 date is the number of days since 1/1/1990.
#So for 1/1/2015 Julian Date=41317+(Days difference between 2/12/2013 and 1/1
/1990)
Juliandate2015firstday <- 41317+(365-(28+31))+365 #41988
Juliandate2015lastday <- Juliandate2015firstday+365
JulianVector2015 <- seq(from=Juliandate2015firstday,to=Juliandate2015lastday,
by=1)

#Predicting values for 2015
InvoiceTotal2015 <- predict(Model_Linear,data=JulianVector2015)


PredictedValuesfor2015=list("JulianDate2015"=JulianVector2015,"Predicted2015I
NVTOTAL"=InvoiceTotal2015)
```

SPLITTING INTO DIFFERENT TABLES R CODE :

RDatabaseBUAN6320

Phanindra

November 28, 2018

```
dataset2<- read.delim("BUAN6320-DataSet2.txt",header=TRUE,sep="\t",
           dec = ".", fill = TRUE, comment.char = "")
dataset3<-read.delim("BUAN6320-DataSet3.txt",header=TRUE,sep="\t",
           dec = ".", fill = TRUE, comment.char = "")
dataset4<-read.delim("BUAN6320-DataSet4.txt",header=TRUE,sep="\t",
           dec = ".", fill = TRUE, comment.char = "")
dataset2omitted <- na.omit(dataset2)
dataset3omitted <- na.omit(dataset3)
dataset4omitted <- na.omit(dataset4)
#Dataset3 has columns X,X.1,X.2 which have all NA values, SO they have to be
removed.
dataset3removedX <- dataset3[,-c(18,19,20)]
dataset3omitted <- na.omit(dataset3removedX)
```

```
#Now dataset3 has all the 252 observations which were present initially.
library(dplyr)

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

vendor <- dataset3omitted %>%
  dplyr::select(VEND_STREET,VEND_NAME,VEND_STATE,VEND_CITY,VEND_ID,VEND_ZIP)
#Now exporting the vendor file as a CSV file
write.csv(vendor,file="vendor.csv")

#Now finding the customer table as designed
customer <- dataset2omitted %>%
  dplyr::select(CUST_CODE,CUST_FNAME,CUST_LNAME,CUST_STREET,CUST_CITY,CUST_ST
ATE,CUST_ZIP,CUST_BALANCE)
write.csv(customer,file="customer.csv")

#Getting the data for brand
brand <- dataset3omitted %>%
  dplyr::select(BRAND_NAME,BRAND_TYPE,BRAND_ID)
write.csv(brand,file="brand.csv")
#Getting data for product
product <- dataset3omitted %>%
  dplyr::select(PROD_SKU,PROD_DESCRIPT,PROD_TYPE,PROD_BASE,PROD_CATEGORY,PROD
_PRICE,PROD_QOH,PROD_MIN,BRAND_ID)
write.csv(product,file="product.csv")

##Getting invoice
invoice <- dataset2omitted %>%
  dplyr::select(INV_NUM,INV_DATE,INV_TOTAL,EMPLOYEE_ID,CUST_CODE)
write.csv(invoice,file="invoice.csv")




##After getting all the csv files, duplicates were removed in excel using rem
ove duplicates in Data tab.
#Getting data for department
Department <- dataset4omitted %>%
  dplyr :: select ( DEPT_NUM, DEPT_NAME, DEPT_MAIL_BOX, DEPT_PHONE, SUPV_EMP_
NUM)
write.csv(Department, file= "Department.csv")
```

```
##Getting salary history
Salary_history <- dataset4omitted %>%
  dplyr :: select (SAL_FROM,SAL_END,SAL_AMOUNT,EMP_NUM)
write.csv(Salary_history, file= "Salary_history.csv")

##Getting line
line <- dataset2omitted %>%
  dplyr :: select (LINE_NUM,LINE_QTY,LINE_PRICE,INV_NUM,PROD_SKU)
write.csv(line, file= "line.csv")

##Supplies
Supplies <- dataset3omitted %>%
  dplyr :: select (PROD_SKU,VEND_ID)
write.csv(Supplies,file="supplies.csv")
```