MARKET BASKET INSIGHTS

PHASE 3 Document Submission.

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Loading and Pre-Processing Dataset :

INTRODUCTION:

- ❖ Loading and preprocessing data for market basket analysis typically involves handling transactional data, which consists of items purchased together by customers.
- ❖ This kind of data is usually in the form of a transactional database, with each row representing a transaction and the items bought in that transaction.

Here's a general guide on how to load and preprocess data for market basket analysis:

Data Loading:

Load the transactional data into your environment. This can be done using various methods depending on the format of your data, such as CSV, Excel, or database connections.

Load the Data:

If using Python, you can use the pandas library to load data from CSV or Excel files:

PYTHON CODE:

```
import pandas as pd

df = pd.read_excel('g:\Assignment-1_Data.xlsx')

# Display the first few rows

print(df.head())

# View data types and missing values

print(df.info())
```

OUTPUT:

```
  BillNo                              Itemname  Quantity              Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6
2010-12-01 08:26:00

1  536365                 WHITE METAL LANTERN         6 2010-12-01
08:26:00

2  536365       CREAM CUPID HEARTS COAT HANGER         8
2010-12-01 08:26:00

3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
2010-12-01 08:26:00

4  536365       RED WOOLLY HOTTIE WHITE HEART.         6
2010-12-01 08:26:00


   Price  CustomerID        Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 522064 entries, 0 to 522063
Data columns (total 7 columns):
 #   Column      Non-Null Count   Dtype
___ -_____     ____________  ___-
 0   BillNo      522064 non-null  object
 1   Itemname    520609 non-null  object
 2   Quantity    522064 non-null int64
 3   Date        522064 non-null  datetime64[ns]
 4   Price        522064 non-null  float64
 5   CustomerID  388023 non-null  float64
 6   Country      522064 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(1), object(3)
memory usage: 27.9+ MB
None
```

Data Understanding:

Understand the structure and content of your data. Ensure that the data is clean and organized. Remove any unnecessary columns or information that is not relevant to the analysis.

Data Preprocessing:

Data preprocessing is a crucial step in market basket analysis that involves transforming raw transactional data into a suitable format for association rule mining.

Here are some essential data preprocessing steps for market basket insights:

Data Cleaning:

- ✓ Remove duplicate transactions.
- ✓ Handle missing values by either removing the corresponding records or imputing values based on the context.
- ✓ Deal with outliers if necessary.

PYTHON CODE:

```
import pandas as pd

# Load the data

df = pd.read_excel('g:\Assignment-1_Data.xlsx')

# Replace 'path_to_your_file.xlsx' with the actual path to your Excel file
# Display the first few rows of the data
print("Original Data:")
print(df.head())
# Data cleaning
# Remove duplicates
df.drop_duplicates(inplace=True)
# Handle missing values
if df.isnull().values.any():
    df.dropna(inplace=True)
# Alternatively, you can choose to impute the missing values
# Example of handling outliers
# Define a function to identify and remove outliers
def remove_outliers(data, col):
    q1 = data[col].quantile(0.25)
    q3 = data[col].quantile(0.75)
    iqr = q3 - q1
    lower_bound = q1 - 1.5 * iqr
    upper_bound = q3 + 1.5 * iqr
    data = data[(data[col] > lower_bound) & (data[col] < upper_bound)]
    return data
# Example usage to remove outliers from a specific column 'quantity'
# df = remove_outliers(df, 'quantity')
# Display the cleaned data
```

```
print("\nCleaned Data:")

print(df.head())
```

OUTPUT:

```
Original Data:
   BillNo                    Itemname                          Quantity      Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER        6    2010-12-01 08:26:00
1  536365   WHITE METAL LANTERN                       6    2010-12-01 08:26:00
2  536365   CREAM CUPID HEARTS COAT HANGER            8    2010-12-01 08:26:00
3  536365   KNITTED UNION FLAG HOT WATER BOTTLE       6    2010-12-01 08:26:00
4  536365   RED WOOLLY HOTTIE WHITE HEART.            6    2010-12-01 08:26:00

   Price  CustomerID         Country
0  2.55      17850.0  United Kingdom
1  3.39      17850.0  United Kingdom
2  2.75      17850.0  United Kingdom
3  3.39      17850.0  United Kingdom
4  3.39      17850.0  United Kingdom

Cleaned Data:
   BillNo                    Itemname  Quantity                    Date  \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER       6 2010-12-01 08:26:00
1  536365    WHITE METAL LANTERN                     6 2010-12-01 08:26:00
2  536365    CREAM CUPID HEARTS COAT HANGER          8 2010-12-01 08:26:00
3  536365    KNITTED UNION FLAG HOT WATER BOTTLE     6 2010-12-01 08:26:00
4  536365    RED WOOLLY HOTTIE WHITE HEART.          6 2010-12-01 08:26:00

   Price  CustomerID         Country
0  2.55      17850.0  United Kingdom
1  3.39      17850.0  United Kingdom
2  2.75      17850.0  United Kingdom
3  3.39      17850.0  United Kingdom
4  3.39      17850.0  United Kingdom
```

Transaction Aggregation:

Aggregate the data at the transaction level if the data contains multiple entries for the same transaction. This step is essential to avoid duplication and ensure that each transaction is unique.

PYTHON CODE:

```
import pandas as pd

# Load the transactional data
```

```
df = pd.read_excel('g:\Assignment-1_Data.xlsx')
# Display the first few rows of the data
print("Original Data:")
print(df.head())
# Transaction Aggregation
aggregated_data = df.groupby('CustomerID')['Itemname'].apply(list).reset_index(name='Items_List')
# Display the aggregated data
print("\nAggregated Data:")
print(aggregated_data.head())
```

OUTPUT:

```
Original Data:
   BillNo                            Itemname  Quantity                Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6 2010-12-01 08:26:00
1  536365                  WHITE METAL LANTERN         6 2010-12-01 08:26:00
2  536365       CREAM CUPID HEARTS COAT HANGER         8 2010-12-01 08:26:00
3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6 2010-12-01 08:26:00
4  536365       RED WOOLLY HOTTIE WHITE HEART.         6 2010-12-01 08:26:00

   Price  CustomerID         Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom

Aggregated Data:
   CustomerID                                         Items_List
0     12346.0                   [MEDIUM CERAMIC TOP STORAGE JAR]
1     12347.0 [BLACK CANDELABRA T-LIGHT HOLDER, AIRLINE BAG ...
```

```
2     12349.0  [PARISIENNE CURIO CABINET, SWEETHEART WALL TID...
3     12350.0 [CHOCOLATE THIS WAY METAL SIGN, METAL SIGN NEI...
4     12352.0  [WOODEN HAPPY BIRTHDAY GARLAND, PINK DOUGHNUT ...
```

Transaction Encoding:

Convert the transactional data into a suitable format, such as a one-hot encoded matrix. Each row corresponds to a transaction, and each column corresponds to an item, with a value of 1 representing the presence of the item in the transaction and 0 indicating its absence.

PYTHON CODE:

```
import pandas as pd

# Load the transactional data

df = pd.read_excel('g:\Assignment-1_Data.xlsx')

# Display the first few rows of the data

print("Original Data:")

print(df.head())

# Transaction Encoding

encoded_data = df.groupby('CustomerID')['Itemname'].value_counts().unstack().fillna(0)

encoded_data = encoded_data.applymap(lambda x: 1 if x > 0 else 0)

# Display the encoded data

print("\nEncoded Data:")

print(encoded_data.head())
```

OUTPUT:

```
Original Data:

  BillNo                          Itemname  Quantity             Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6
2010-12-01 08:26:00
1  536365                  WHITE METAL LANTERN         6 2010-12-01
08:26:00
2  536365       CREAM CUPID HEARTS COAT HANGER         8
2010-12-01 08:26:00
3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
2010-12-01 08:26:00
4  536365       RED WOOLLY HOTTIE WHITE HEART.         6
2010-12-01 08:26:00


   Price  CustomerID         Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom
Encoded Data:
Itemname    MEDIUM CERAMIC TOP STORAGE JAR  AIRLINE
BAG VINTAGE JET SET BROWN \
CustomerID
12346.0                                 1                0
12347.0                                 0                1
12349.0                                 0                0
12350.0                                 0                0
12352.0                                 0                0
```

```
Itemname    ALARM CLOCK BAKELIKE RED RED
TOADSTOOL LED NIGHT LIGHT  \
CustomerID
12346.0                  0                 0
12347.0                  1                 1
12349.0                  0                 0
12350.0                  0                 0
12352.0                  0                 1
```

```
Itemname    3D DOG PICTURE PLAYING CARDS  REGENCY
CAKESTAND 3 TIER  \
CustomerID
12346.0                    0              0
12347.0                    1              1
12349.0                    0              1
12350.0                    0              0
12352.0                    0              1
```

```
Itemname    SMALL HEART MEASURING SPOONS  AIRLINE
BAG VINTAGE TOKYO 78 \
CustomerID
12346.0                    0                0
12347.0                    1                1
12349.0                    0                0
12350.0                    0                0
12352.0                    0                0
```

```
Itemname    ALARM CLOCK BAKELIKE CHOCOLATE
WOODLAND CHARLOTTE BAG  ... \
CustomerID                                            ...
12346.0                         0               0  ...
12347.0                         1               1  ...
12349.0                         0               0  ...
12350.0                         0               0  ...
12352.0                         0               0  ...

Itemname    PURPLE FRANGIPANI HAIRCLIP  GOLD PRINT
PAPER BAG  \
CustomerID
12346.0                       0              0
12347.0                       0              0
12349.0                       0              0
12350.0                       0              0
12352.0                       0              0

Itemname    LILAC FEATHERS CURTAIN  SET/3 TALL GLASS
CANDLE HOLDER PINK  \
CustomerID
12346.0                     0                        0
12347.0                     0                        0
12349.0                     0                        0
12350.0                     0                        0
```

```
12352.0                        0                             0

Itemname    FLOWER SHOP DESIGN MUG  CAPIZ
CHANDELIER  \
CustomerID
12346.0                        0              0
12347.0                        0              0
12349.0                        0              0
12350.0                        0              0
12352.0                        0              0

Itemname    BLUE NEW BAROQUE FLOCK CANDLESTICK  \
CustomerID
12346.0                                 0
12347.0                                 0
12349.0                                 0
12350.0                                 0
12352.0                                 0

Itemname    CAT WITH SUNGLASSES BLANK CARD  RED
PURSE WITH PINK HEART  \
CustomerID
12346.0                              0                    0
12347.0                              0                    0
12349.0                              0                    0
```

```
12350.0                    0               0
12352.0                    0               0

Itemname   SCALLOP SHELL SOAP DISH
CustomerID
12346.0                0
12347.0                0
12349.0                0
12350.0                0
12352.0                0
[5 rows x 3846 columns]
```

Data Transformation:

Convert the transaction data into a transaction matrix or a transaction list, depending on the requirements of the chosen association rule mining algorithm.

PYTHON CODE:

```
import pandas as pd
# Load the transactional data
df = pd.read_excel('g:\Assignment-1_Data.xlsx')
# Display the first few rows of the data
print("Original Data:")
print(df.head())
# Transaction Aggregation
aggregated_data = df.groupby('CustomerID')['Itemname'].apply(list).reset_index(name='Items_List')
```

```
# Data Transformation
transactions = aggregated_data['Items_List'].tolist()
# Display the transformed data
print("\nTransformed Data:")
for idx, transaction in enumerate(transactions, start=1):
    print(f"Transaction {idx}: {transaction}")
```

OUTPUT:

```
Original Data:
   BillNo                              Itemname  Quantity                Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6
2010-12-01 08:26:00
1  536365                 WHITE METAL LANTERN         6 2010-12-01
08:26:00
2  536365       CREAM CUPID HEARTS COAT HANGER         8 20
10-12-01 08:26:00
3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
2010-12-01 08:26:00
4  536365       RED WOOLLY HOTTIE WHITE HEART.         6 201
0-12-01 08:26:00

   Price  CustomerID         Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom

Transformed Data:
Transaction 1: ['MEDIUM CERAMIC TOP STORAGE JAR']
Transaction 2: ['BLACK CANDELABRA T-LIGHT HOLDER', 'AIR
LINE BAG VINTAGE JET SET BROWN', 'COLOUR GLASS. STA
R T-LIGHT HOLDER', 'MINI PAINT SET VINTAGE', 'CLEAR DR
AWER KNOB ACRYLIC EDWARDIAN', 'PINK DRAWER KNOB
ACRYLIC EDWARDIAN', 'GREEN DRAWER KNOB ACRYLIC E
```

DWARDIAN', 'RED DRAWER KNOB ACRYLIC EDWARDIAN', 'PURPLE DRAWERKNOB ACRYLIC EDWARDIAN', 'BLUE DRAWER KNOB ACRYLIC EDWARDIAN', 'ALARM CLOCK BAKELIKE CHOCOLATE', 'ALARM CLOCK BAKELIKE GREEN', 'ALARM CLOCK BAKELIKE RED', 'ALARM CLOCK BAKELIKE PINK', 'ALARM CLOCK BAKELIKE ORANGE', 'FOUR HOOK WHITE LOVEBIRDS', 'BLACK GRAND BAROQUE PHOTO FRAME', 'BATHROOM METAL SIGN', 'LARGE HEART MEASURING SPOONS', 'BOX OF 6 ASSORTED COLOUR TEASPOONS', 'BLUE 3 PIECE POLKADOT CUTLERY SET', 'RED 3 PIECE RETROSPOT CUTLERY SET', 'PINK 3 PIECE POLKADOT CUTLERY SET', 'EMERGENCY FIRST AID TIN', 'SET OF 2 TINS VINTAGE BATHROOM', 'SET/3 DECOUPAGE STACKING TINS', 'BOOM BOX SPEAKER BOYS', 'RED TOADSTOOL LED NIGHT LIGHT', '3D DOG PICTURE PLAYING CARDS', 'BLACK EAR MUFF HEADPHONES', 'CAMOUFLAGE EAR MUFF HEADPHONES', 'PINK NEW BAROQUECANDLESTICK CANDLE', 'BLUE NEW BAROQUE CANDLESTICK CANDLE', 'BLACK CANDELABRA T-LIGHT HOLDER', 'WOODLAND CHARLOTTE BAG', 'AIRLINE BAG VINTAGE JET SET BROWN', 'AIRLINE BAG VINTAGE JET SET WHITE', 'SANDWICH BATH SPONGE', 'ALARM CLOCK BAKELIKE CHOCOLATE', 'ALARM CLOCK BAKELIKE GREEN', 'ALARM CLOCK BAKELIKE RED', 'ALARM CLOCK BAKELIKE PINK', 'ALARM CLOCK BAKELIKE ORANGE', 'SMALL HEART MEASURING SPOONS', '72 SWEETHEART FAIRY CAKE CASES', '60 TEATIME FAIRY CAKE CASES', 'PACK OF 60 MUSHROOM CAKE CASES', 'PACK OF 60 SPACEBOY CAKE CASES', 'TEA TIME OVEN GLOVE', 'RED RETROSPOT OVEN GLOVE', 'RED RETROSPOT OVEN GLOVE DOUBLE', 'SET/2 RED RETROSPOT TEA TOWELS', 'REGENCY CAKESTAND 3 TIER', 'BOX OF 6 ASSORTED COLOUR TEASPOONS', 'MINI LADLE LOVE HEART RED', 'CHOCOLATE CALCULATOR', 'TOOTHPASTE TUBE PEN', 'SET OF 2 TINS VINTAGE BATHROOM', 'RED TOADSTOOL LED NIGHT LIGHT', '3D DOG PICTURE PLAYING CARDS', 'AIRLINE BAG VINTAGE JET SET WHITE', 'AIRLINE BAG VINTAGE JET SET RED', 'AIRLINE BAG VINTAGE TOKYO 78', 'AIRLINE BAG VINTAGE JET SET BROWN', 'RED RETROSPOT PURSE', 'I

```
CE CREAM SUNDAE LIP GLOSS', 'VINTAGE HEADS AND TAI
LS CARD GAME', 'HOLIDAY FUN LUDO', 'TREASURE ISLAND
BOOK BOX', 'WATERING CAN PINK BUNNY', 'RED DRAWER
KNOB ACRYLIC EDWARDIAN', 'LARGE HEART MEASURING
SPOONS', 'SMALL HEART MEASURING SPOONS', 'PACK OF 6
0 DINOSAUR CAKE CASES', 'RED RETROSPOT OVEN GLOVE
DOUBLE', 'REGENCY CAKESTAND 3 TIER', 'ROSES REGENCY
TEACUP AND SAUCER', 'RED TOADSTOOL LED NIGHT LIGH
T', 'MINI PAINT SET VINTAGE', '3D SHEET OF DOG STICKERS'
, '3D SHEET OF CAT STICKERS', 'SMALL FOLDING SCISSOR(P
OINTED EDGE)', 'GIFT BAG PSYCHEDELIC APPLES', 'SET OF
2 TINS VINTAGE BATHROOM', 'RABBIT NIGHT LIGHT', 'REG
ENCY TEA STRAINER', 'REGENCY TEA PLATE GREEN', 'REG
ENCY TEA PLATE PINK', 'REGENCY TEA PLATE ROSES', 'RE
GENCY TEAPOT ROSES', 'REGENCY SUGAR BOWL GREEN', '
REGENCY MILK JUG PINK', 'AIRLINE BAG VINTAGE TOKYO
78', 'AIRLINE BAG VINTAGE JET SET BROWN', 'VICTORIAN S
EWING KIT', 'NAMASTE SWAGAT INCENSE', 'TRIPLE HOOK
ANTIQUE IVORY ROSE', 'SMALL HEART MEASURING SPOO
NS', '3D DOG PICTURE PLAYING CARDS', 'FEATHER PEN,CO
AL BLACK', 'ALARM CLOCK BAKELIKE RED', 'ALARM CLOC
K BAKELIKE CHOCOLATE', 'SET OF 60 VINTAGE LEAF CAKE
CASES', 'SET 40 HEART SHAPE PETIT FOUR CASES', 'AIRLINE
BAG VINTAGE JET SET BROWN', 'AIRLINE BAG VINTAGE JE
T SET RED', 'AIRLINE BAG VINTAGE JET SET WHITE', 'AIRLI
NE BAG VINTAGE TOKYO 78', 'AIRLINE BAG VINTAGE WOR
LD CHAMPION', 'WOODLAND DESIGN  COTTON TOTE BAG', '
WOODLAND CHARLOTTE BAG', 'ALARM CLOCK BAKELIKE
RED', 'TRIPLE HOOK ANTIQUE IVORY ROSE', 'SINGLE ANTIQ
UE ROSE HOOK IVORY', 'TEA TIME OVEN GLOVE', '72 SWEE
THEART FAIRY CAKE CASES', '60 TEATIME FAIRY CAKE CA
SES', 'PACK OF 60 DINOSAUR CAKE CASES', 'REGENCY CAK
ESTAND 3 TIER', 'REGENCY MILK JUG PINK', '3D DOG PICTU
RE PLAYING CARDS', 'REVOLVER WOODEN RULER', 'VINTA
GE HEADS AND TAILS CARD GAME', 'RED REFECTORY CLO
CK', 'MINI LIGHTS WOODLAND MUSHROOMS', 'PINK GOOSE
FEATHER TREE 60CM', 'MADRAS NOTEBOOK MEDIUM', 'AIR
```

```
LINE BAG VINTAGE WORLD CHAMPION', 'AIRLINE BAG VIN
TAGE JET SET BROWN', 'AIRLINE BAG VINTAGE TOKYO 78',
'AIRLINE BAG VINTAGE JET SET RED', 'BIRDCAGE DECORA
TION TEALIGHT HOLDER', 'CHRISTMAS METAL TAGS ASSO
RTED', 'REGENCY CAKESTAND 3 TIER', 'REGENCY TEAPOT
ROSES', 'TEA TIME DES TEA COSY', 'TEA TIME KITCHEN APR
ON', 'TEA TIME OVEN GLOVE', 'PINK REGENCY TEACUP AN
D SAUCER', 'GREEN REGENCY TEACUP AND SAUCER', '3D D
OG PICTURE PLAYING CARDS', 'RABBIT NIGHT LIGHT', 'RED
TOADSTOOL LED NIGHT LIGHT', 'TREASURE ISLAND BOOK
BOX', 'VINTAGE HEADS AND TAILS CARD GAME', 'MINI PLA
YING CARDS DOLLY GIRL', 'MINI PLAYING CARDS SPACEB
OY', 'PLAYING CARDS KEEP CALM & CARRY ON', 'REVOLVE
R WOODEN RULER', 'WOODEN SCHOOL COLOURING SET', '
MINI PAINT SET VINTAGE', 'TRADITIONAL KNITTING NANC
Y', 'TRIPLE HOOK ANTIQUE IVORY ROSE', 'PANTRY HOOK S
PATULA', 'PANTRY HOOK BALLOON WHISK', 'PANTRY HOO
K TEA STRAINER', 'ROSES REGENCY TEACUP AND SAUCER',
'ALARM CLOCK BAKELIKE CHOCOLATE', 'ALARM CLOCK B
AKELIKE PINK', 'ALARM CLOCK BAKELIKE GREEN', 'ALAR
M CLOCK BAKELIKE RED', 'PACK OF 60 MUSHROOM CAKE
CASES', 'PACK OF 60 SPACEBOY CAKE CASES', 'SET OF 60 VI
NTAGE LEAF CAKE CASES', '60 TEATIME FAIRY CAKE CASE
S', '72 SWEETHEART FAIRY CAKE CASES', 'SMALL HEART M
EASURING SPOONS', 'LARGE HEART MEASURING SPOONS', '
WOODLAND CHARLOTTE BAG', 'REGENCY TEA STRAINER',
'FOOD CONTAINER SET 3 LOVE HEART', 'CLASSIC CHROME
BICYCLE BELL', 'BICYCLE PUNCTURE REPAIR KIT', 'BOOM B
OX SPEAKER BOYS', 'PINK NEW BAROQUECANDLESTICK C
ANDLE', 'RED TOADSTOOL LED NIGHT LIGHT', 'RABBIT NIG
HT LIGHT', 'WOODLAND CHARLOTTE BAG', 'PINK GOOSE FE
ATHER TREE 60CM', 'CHRISTMAS TABLE SILVER CANDLE S
PIKE', 'MINI PLAYING CARDS SPACEBOY', 'MINI PLAYING C
ARDS DOLLY GIRL']
```

Data Integration:

Integrate the preprocessed transactional data with any additional relevant information, such as customer demographics or product attributes, that can enrich the analysis and provide deeper insights.

PYTHON CODE:

```
import pandas as pd

# Load transactional data

df_transactions = pd.read_excel('g:\Assignment-1_Data.xlsx')

# Load supplementary data

df_supplementary = pd.read_excel('g:\Assignment-1_Data.xlsx')

# Display the first few rows of each dataset

print("CustomerId:")

print(df_transactions.head())

print("\nSupplementary Data:")

print(df_supplementary.head())

# Merge the datasets based on a common key

merged_data = pd.merge(df_transactions, df_supplementary, on='common_key_column', how='inner')

# Display the merged data

print("\nMerged Data:")

print(merged_data.head())
```

OUTPUT:

```
CustomerId:

   BillNo                        Itemname  Quantity               Date \

0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6
2010-12-01 08:26:00
```

```
1  536365                WHITE METAL LANTERN         6 2010-12-01
08:26:00
2  536365       CREAM CUPID HEARTS COAT HANGER         8
2010-12-01 08:26:00
3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
2010-12-01 08:26:00
4  536365       RED WOOLLY HOTTIE WHITE HEART.         6
2010-12-01 08:26:00

   Price  CustomerID         Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom

Supplementary Data:
   BillNo                             Itemname  Quantity                Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6
2010-12-01 08:26:00
1  536365                WHITE METAL LANTERN         6 2010-12-01
08:26:00
2  536365       CREAM CUPID HEARTS COAT HANGER         8
2010-12-01 08:26:00
3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
2010-12-01 08:26:00
```

```
4  536365       RED WOOLLY HOTTIE WHITE HEART.        6
2010-12-01 08:26:00


   Price  CustomerID         Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom
```

Data Splitting:

Split the preprocessed data into training and testing datasets, especially if you plan to build predictive models or evaluate the performance of the association rules on unseen data.

PYTHON CODE:

```
import pandas as pd
from sklearn.model_selection import train_test_split
# Load the data
df = pd.read_excel('g:\Assignment-1_Data.xlsx')
# Display the first few rows of the data
print("Original Data:")
print(df.head())
# Split the data into training and testing sets
train_data, test_data = train_test_split(df, test_size=0.2, random_state=42)  # Adjust test_size as needed
# Display the shape of the split datasets
print("\nTrain Data Shape:", train_data.shape)
print("Test Data Shape:", test_data.shape)
```

OUTPUT:

```
Original Data:
   BillNo                          Itemname  Quantity              Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6
2010-12-01 08:26:00
1  536365                 WHITE METAL LANTERN         6 2010-12-01
08:26:00
2  536365       CREAM CUPID HEARTS COAT HANGER         8
2010-12-01 08:26:00
3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
2010-12-01 08:26:00
4  536365       RED WOOLLY HOTTIE WHITE HEART.         6
2010-12-01 08:26:00

   Price  CustomerID         Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom

Train Data Shape: (417651, 7)
Test Data Shape: (104413, 7)
```

Data Exploration:

Perform exploratory data analysis to gain insights into the data, such as frequent item sets, popular item combinations, and item support.

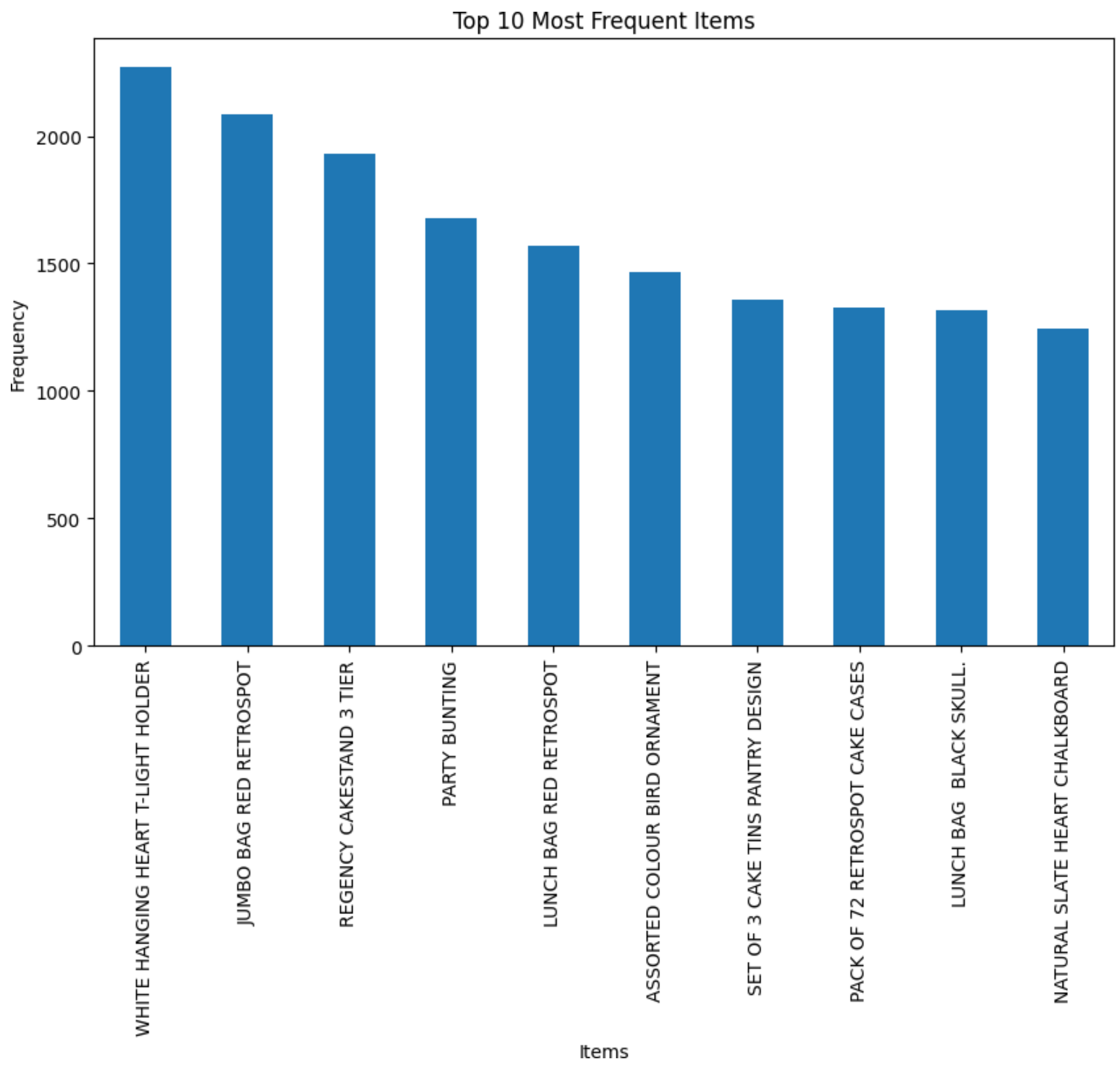
PYTHON CODE:

```
import pandas as pd

import matplotlib.pyplot as plt

# Load the data

df = pd.read_excel('g:\Assignment-1_Data.xlsx') # Replace 'path_to_your_file.xlsx' with the actual path to your Excel file

# Display the first few rows of the data

print("Original Data:")

print(df.head())

# Exploratory Data Analysis

# Calculate item frequencies

item_counts = df['Itemname'].value_counts()

# Visualize the top N most frequent items

N = 10

# You can adjust this value to show more or fewer items

top_items =  item_counts.head(N)

plt.figure(figsize=(10, 6))

top_items.plot(kind='bar')

plt.title(f'Top {N} Most Frequent Items')

plt.xlabel('Items')

plt.ylabel('Frequency')

plt.show()
```

OUTPUT:

Original Data:

```
   BillNo                           Itemname  Quantity              Date \
0  536365   WHITE HANGING HEART T-LIGHT HOLDER         6
2010-12-01 08:26:00
1  536365                  WHITE METAL LANTERN         6 2010-12-01
08:26:00
2  536365       CREAM CUPID HEARTS COAT HANGER         8
2010-12-01 08:26:00
3  536365  KNITTED UNION FLAG HOT WATER BOTTLE         6
2010-12-01 08:26:00
4  536365       RED WOOLLY HOTTIE WHITE HEART.         6
2010-12-01 08:26:00


   Price  CustomerID         Country
0   2.55     17850.0  United Kingdom
1   3.39     17850.0  United Kingdom
2   2.75     17850.0  United Kingdom
3   3.39     17850.0  United Kingdom
4   3.39     17850.0  United Kingdom
```



Data Visualization:

Data visualize them using suitable plots or graphs to communicate the insights effectively.

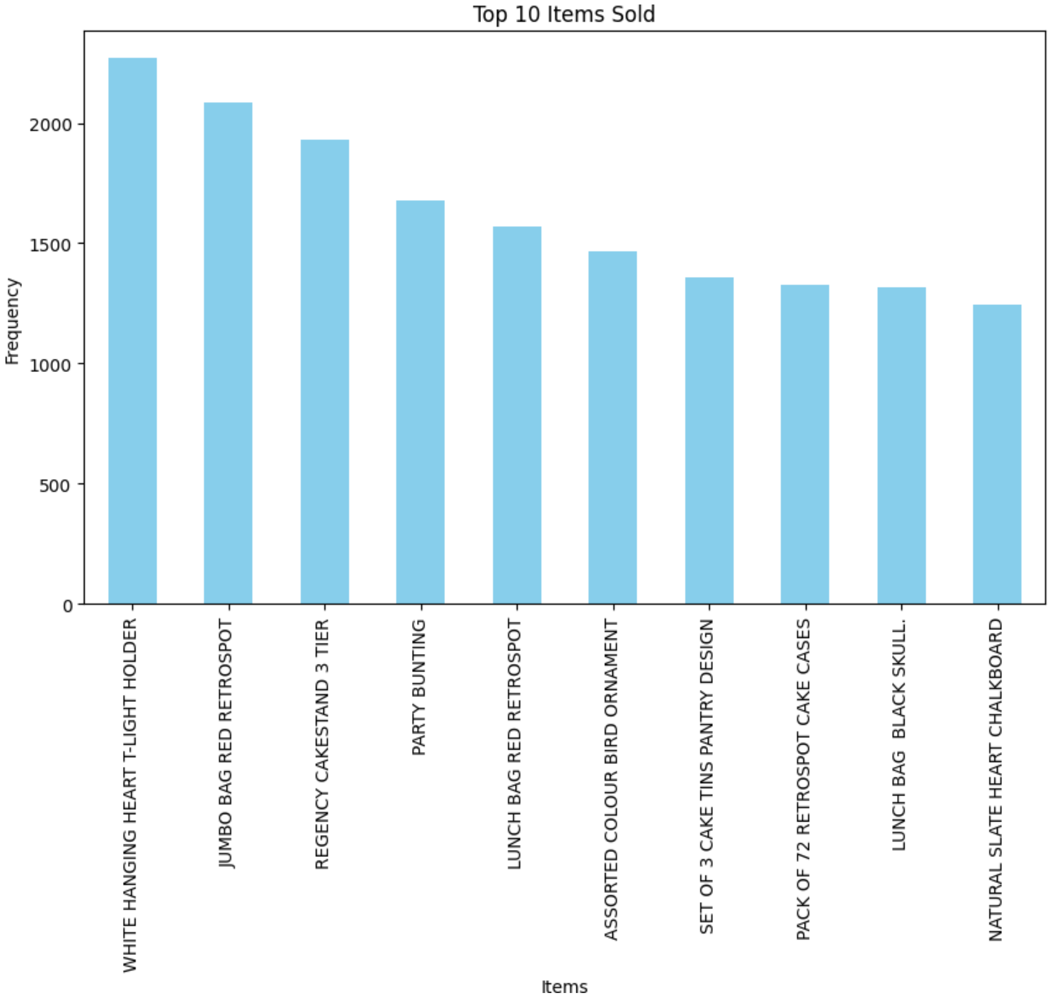
PYTHON CODE:

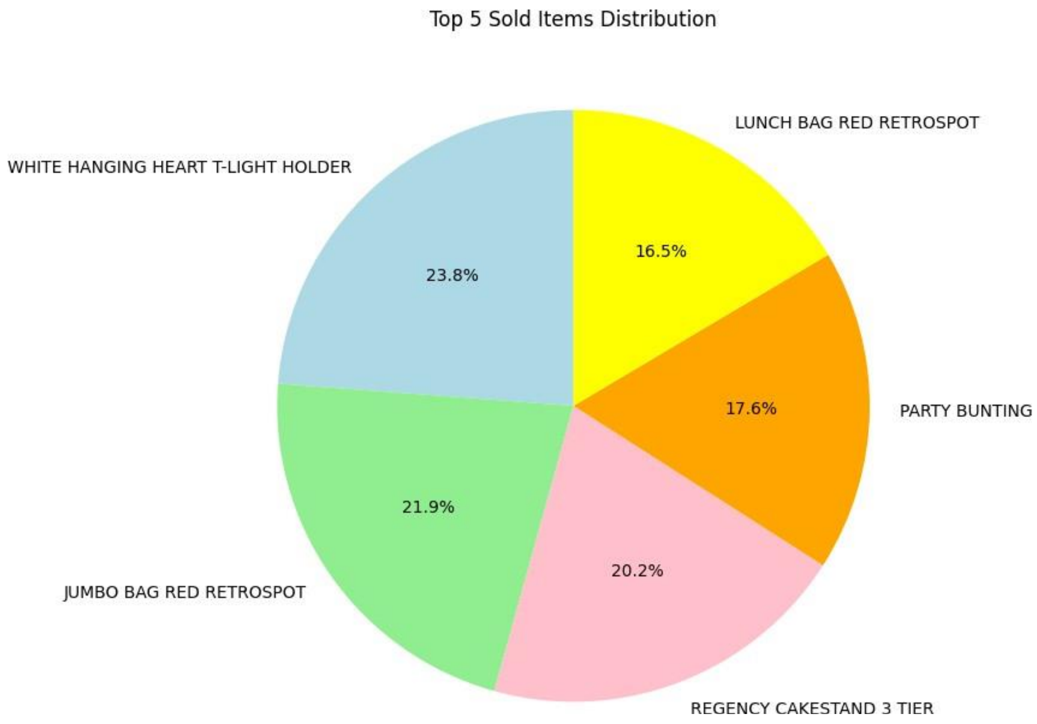
```
import pandas as pd

import matplotlib.pyplot as plt

# Load the data

df = pd.read_excel('g:\Assignment-1_Data.xlsx')
```

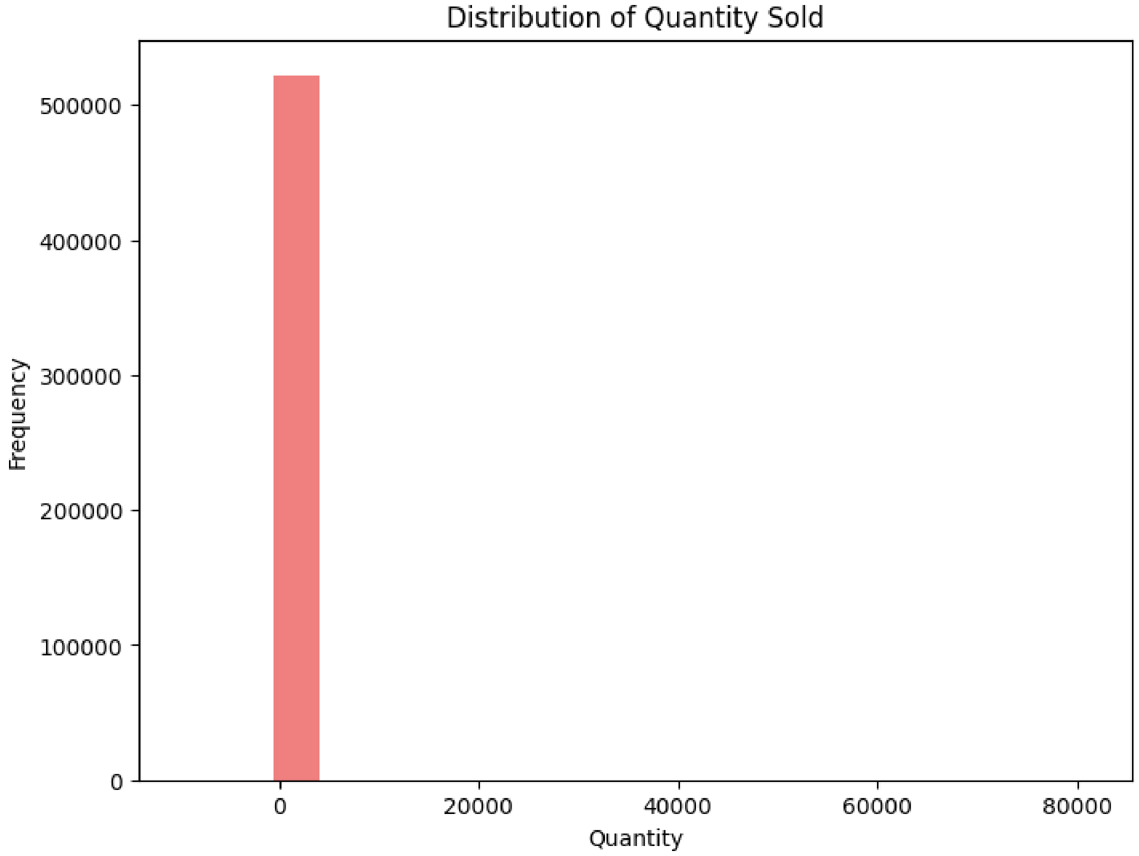
```
# Example of Data Visualization
# Bar plot for top N items
top_items = df['Itemname'].value_counts().nlargest(10)
plt.figure(figsize=(10,6))
top_items.plot(kind='bar', color='skyblue')
plt.title('Top 10 Items Sold')
plt.xlabel('Items')
plt.ylabel('Frequency')
plt.show()
# Example of Pie Chart
plt.figure(figsize=(8,8))
df['Itemname'].value_counts().nlargest(5).plot(kind='pie', autopct='%1.1f%%', startangle=90, colors=['lightblue', 'lightgreen', 'pink', 'orange', 'yellow'])
plt.title('Top 5 Sold Items Distribution')
plt.ylabel('')
plt.show()
# Example of Histogram
plt.figure(figsize=(8,6))
plt.hist(df['Quantity'], bins=20, color='lightcoral')
plt.title('Distribution of Quantity Sold')
plt.xlabel('Quantity')
plt.ylabel('Frequency')
plt.show()
# Example of Scatter Plot
```

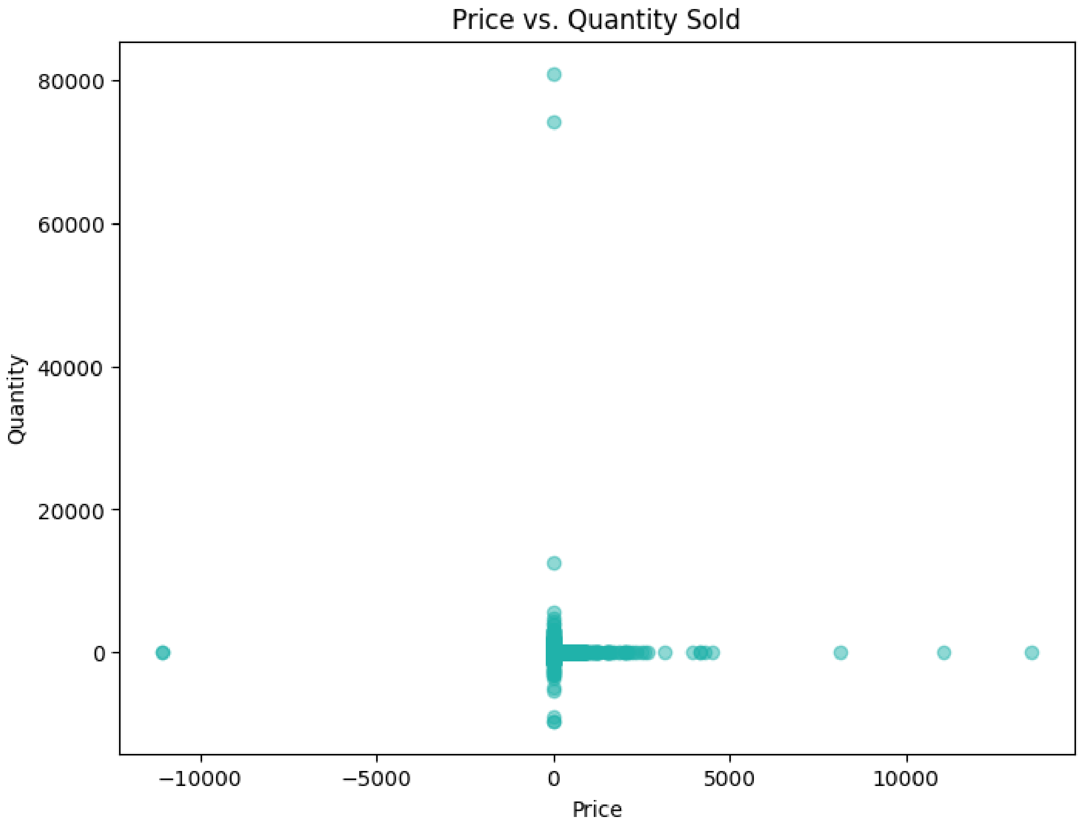
```
plt.figure(figsize=(8,6))
plt.scatter(df['Price'], df['Quantity'], color='lightseagreen', alpha=0.5)
plt.title('Price vs. Quantity Sold')
plt.xlabel('Price')
plt.ylabel('Quantity')
plt.show()
```

OUTPUT:




Top 5 Sold Items Distribution
LUNCH BAG RED RETROSPOT
WHITE HANGING HEART T-LIGHT HOLDER
16.5%
23.8%
17.6%
PARTY BUNTING
21.9%
20.2%
JUMBO BAG RED RETROSPOT
REGENCY CAKESTAND 3 TIER


Distribution of Quantity Sold
Frequency
500000
400000
300000
200000
100000
0
0
20000
40000
60000
80000
Quantity



Conclusion:

- In conclusion, the process of loading and preprocessing data for market basket analysis involves several crucial steps. It begins with the loading of transactional data, followed by a thorough understanding of its structure and content.
- Preprocessing steps include data transformation into a binary matrix format, handling missing values, and removing redundancy. Encoding transactions through techniques like one-hot encoding prepares the data for exploration.
- Exploratory data analysis is then conducted to identify frequent item sets, popular item combinations, and item support. This is followed by

the application of association rule mining techniques such as the Apriori algorithm or FP-growth algorithm to uncover significant patterns within the dataset. Results are subsequently filtered based on parameters like support, confidence, and lift to extract meaningful insights.

- Finally, the interpretation of the findings is vital, and effective visualization techniques such as plots or graphs are employed to communicate the discovered patterns and insights efficiently.
- By following these steps, one can gain valuable insights into customer behavior and preferences, enabling businesses to make informed decisions and improve their market strategies.