DAT200 CA3 2022

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Imports

In [57]:
```
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split, GridSearchCV, RandomizedSearchCV
from sklearn.metrics import f1_score
from sklearn.preprocessing import StandardScaler
from scipy import stats

import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
import numpy as np
```

Reading data

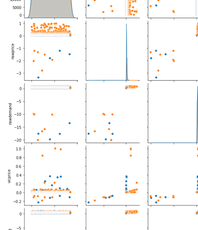
In [23]:
```
raw_data = pd.read_csv('train.csv') # Naming the train data "raw_data"
test_data = pd.read_csv('test.csv') # Naming the test data "test_data"
```

Data exploration and visualisation

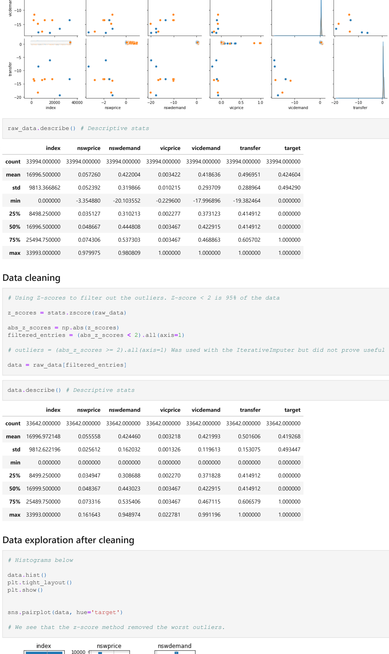
In [3]:
```
# Histograms below

raw_data.hist()
plt.tight_layout()
plt.show()

# Pairplots below
sns.pairplot(raw_data, hue='target')
```



Out[3]:
```
<seaborn.axisgrid.PairGrid at 0x2550d169a30>
```



In [4]:
```
raw_data.describe() # Descriptive stats
```

Out[4]:

	index	nswprice	nswdemand	vicprice	vicdemand	transfer	target
count	33994.000000	33994.000000	33994.000000	33994.000000	33994.000000	33994.000000	33994.000000
mean	16996.500000	0.057260	0.422004	0.003422	0.418636	0.496951	0.424604
std	9813.366862	0.052392	0.319866	0.010215	0.293709	0.288964	0.494290
min	0.000000	-3.354880	-20.103552	-0.229600	-17.996896	-19.382464	0.000000
25%	8498.250000	0.035127	0.310213	0.002277	0.373123	0.414912	0.000000
50%	16996.500000	0.048667	0.444808	0.003467	0.422915	0.414912	0.000000
75%	25494.750000	0.074306	0.537303	0.003467	0.468863	0.605702	1.000000
max	33993.000000	0.979975	0.980809	1.000000	1.000000	1.000000	1.000000

Data cleaning

In [50]:
```
# Using Z-scores to filter out the outliers. Z-score < 2 is 95% of the data

z_scores = stats.zscore(raw_data)

abs_z_scores = np.abs(z_scores)
filtered_entries = (abs_z_scores < 2).all(axis=1)

# outliers = (abs_z_scores >= 2).all(axis=1) Was used with the IterativeImputer but did not prove useful

data = raw_data[filtered_entries]
```

In [51]:
```
data.describe() # Descriptive stats
```

Out[51]:

	index	nswprice	nswdemand	vicprice	vicdemand	transfer	target
count	33642.000000	33642.000000	33642.000000	33642.000000	33642.000000	33642.000000	33642.000000
mean	16996.972148	0.055558	0.424460	0.003218	0.421993	0.501606	0.419268
std	9812.622196	0.025612	0.162032	0.001326	0.119613	0.153075	0.493447
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	8499.250000	0.034947	0.308688	0.002270	0.371828	0.414912	0.000000
50%	16999.500000	0.048367	0.443023	0.003467	0.422915	0.414912	0.000000
75%	25489.750000	0.073316	0.535406	0.003467	0.467115	0.606579	1.000000
max	33993.000000	0.161643	0.948974	0.022781	0.991196	1.000000	1.000000

Data exploration after cleaning

In [40]:
```
# Histograms below

data.hist()
plt.tight_layout()
plt.show()


sns.pairplot(data, hue='target')

# We see that the z-score method removed the worst outliers.
```

Out[40]:
```
<seaborn.axisgrid.PairGrid at 0x25532105be0>
```

Data preprocessing

In [86]:
```
X = data.iloc[:, 1:]
y = data.target
```

Train test split

In [85]:
```
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.3, random_state=1, stratify=y)

print(X_train.shape, X_test.shape, y_train.shape, y_test.shape)
```

```
(23549, 6) (10093, 6) (23549,) (10093,)
```

Scaling

In [83]:
```
sc = StandardScaler()
sc.fit(X_train)


# Transform (standardise) both X_train and X_test with mean and STD from
# training data
X_train_sc = sc.transform(X_train)
X_test_sc = sc.transform(X_test)

# I did not use the scaled data at first, but after some testing, I ended up with a slightly better result when
# furthermore, I tried to do a grid search but it took me 4 hours and did not increase the accuracy by much
# Below I am using the relevant values I had gotten from the grid search
```

Modelling

In [ ]:
```
forest = RandomForestClassifier(criterion='entropy',
                                max_features='auto',
                                n_estimators=250,
                                random_state=1,
                                n_jobs=-1,
                                bootstrap=True
                               )

forest.fit(X_train_sc, y_train)
```

Out[ ]:
```
RandomForestClassifier(bootstrap=False, criterion='entropy', n_estimators=250,
                       n_jobs=-1, random_state=1)
```

Evaluation

In [87]:
```
print('Forest training data accuracy: {0:.2f}'.format(forest.score(X_train_sc, y_train)))

print('Forest test data accuracy: {0:.2f}'.format(forest.score(X_test_sc, y_test)))
```

```
Forest training data accuracy: 1.00
Forest test data accuracy: 0.79
```

Kaggle submission

In [81]:
```
pred_forest = forest.predict(X_test_sc)

score_forest = f1_score(y_test, pred_forest, average='weighted')
print(f'\nRandom Forest Score: {score_forest:%}')
```

```
Random Forest Score: 0.794919369092653?
```

In [82]:
```
forest = RandomForestClassifier(criterion='entropy',
                                max_features='auto',
                                n_estimators=250,
                                random_state=1,
                                n_jobs=-1,
                                bootstrap=True)

forest.fit(X, y)

# Predicting and inserting the results into a file named "submission_n"

submission_16 = forest.predict(test_data)
df_submission_16 = pd.DataFrame(submission_16)
df_submission_16.reset_index(level=0, inplace=True)

df_submission_16.columns = ['index', 'target']
df_submission_16.to_csv('submission_16.csv', index=False)
```