In [1]:

```python
import pandas as pd
import numpy as np
from sklearn import preprocessing
import matplotlib.pyplot as plt
plt.rc("font", size=14)
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
import seaborn as sns
sns.set(style="white")
sns.set(style="whitegrid", color_codes=True)
```

In [2]:

```python
data = pd.read_excel(r"C:\Users\djbro\OneDrive\Desktop\Logistic Regression Project\Bank.
data = data.dropna()
print(data.shape)
print(list(data.columns))
```

```
(41188, 21)
['age', 'job', 'marital', 'education', 'default', 'housing', 'loan', 'contact', 'month',
'day_of_week', 'duration', 'campaign', 'pdays', 'previous', 'poutcome', 'emp_var_rate',
'cons_price_idx', 'cons_conf_idx', 'euribor3m', 'nr_employed', 'y']
```

In [3]:

```python
data.head()
```

Out[3]:

	age	job	marital	education	default	housing	loan	contact	month	day_of_week	...	camp
0	44	blue-collar	married	basic.4y	unknown	yes	no	cellular	aug	thu	...	
1	53	technician	married	unknown	no	no	no	cellular	nov	fri	...	
2	28	management	single	university.degree	no	yes	no	cellular	jun	thu	...	
3	39	services	married	high.school	no	no	no	cellular	apr	fri	...	
4	55	retired	married	basic.4y	no	yes	no	cellular	aug	fri	...	

5 rows × 21 columns

In [4]:

```python
#education
data['education'].unique()
#reduce predictor variables by grouping
data['education']=np.where(data['education'] =='basic.9y', 'Basic', data['education'])
data['education']=np.where(data['education'] =='basic.6y', 'Basic', data['education'])
data['education']=np.where(data['education'] =='basic.4y', 'Basic', data['education'])
```

In [5]:

```python
data['education'].unique()
```

Out[5]:

```
array(['Basic', 'unknown', 'university.degree', 'high.school',
       'professional.course', 'illiterate'], dtype=object)
```

In [6]:

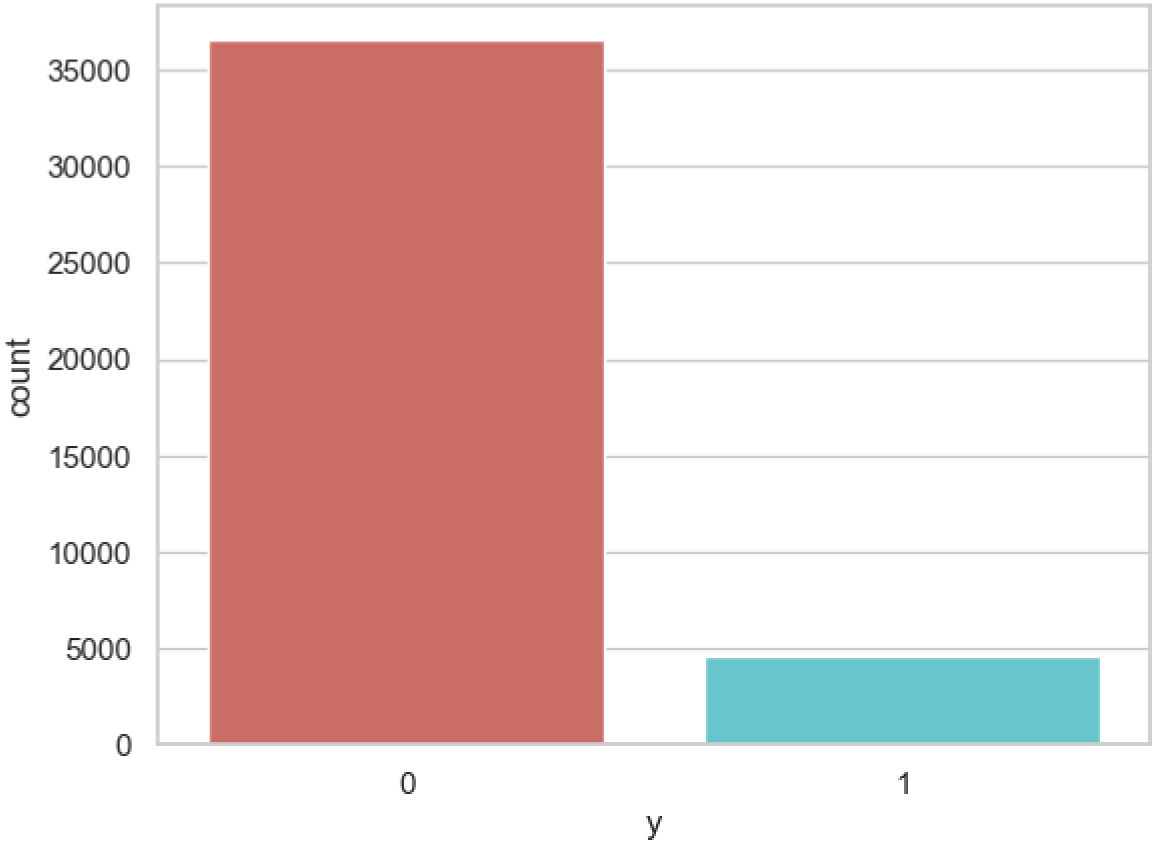
```python
#Data Exploration. y - has the client subscribed a term deposit
data['y'].value_counts()
```

Out[6]:

```
0    36548
1     4640
Name: y, dtype: int64
```

In [7]:

```python
sns.countplot(x='y',data=data,palette='hls')
plt.show()
plt.savefig
```



Out[7]:

```
<function matplotlib.pyplot.savefig(*args, **kwargs)>
```

In [8]:

```
#prints percentages
count_no_sub = len(data[data['y']==0])
count_sub = len(data[data['y']==1])
pct_of_no_sub = count_no_sub/(count_no_sub+count_sub)
print("percentage of no subscription is", pct_of_no_sub*100)
pct_of_sub = count_sub/(count_no_sub+count_sub)
print("percentage of subscription", pct_of_sub*100)
```

```
percentage of no subscription is 88.73458288821988
percentage of subscription 11.265417111780131
```

In [9]:

```
#classes are imbalanced, this could cause issues for out analysis. Address later
```

In [10]:

```
data.groupby('y').mean()
```

Out[10]:

	age	duration	campaign	pdays	previous	emp_var_rate	cons_price_idx	cons_conf_idx	euribor3m
y									
0	39.911185	220.844807	2.633085	984.113878	0.132374	0.248875	93.603757	-40.593097	3.81149
1	40.913147	553.191164	2.051724	792.035560	0.492672	-1.233448	93.354386	-39.789784	2.12313

In [11]:

```
data.groupby('job').mean()
```

Out[11]:

	age	duration	campaign	pdays	previous	emp_var_rate	cons_price_idx	cons_conf_idx
job								
admin.	38.187296	254.312128	2.623489	954.319229	0.189023	0.015563	93.534054	-40.245433
blue-collar	39.555760	264.542360	2.558461	985.160363	0.122542	0.248995	93.656656	-41.375816
entrepreneur	41.723214	263.267857	2.535714	981.267170	0.138736	0.158723	93.605372	-41.283654

housemaid	45.500000	250.454717	2.639623	960.579245	0.137736	0.433396	93.676576	-39.495283
management	42.362859	257.058140	2.476060	962.647059	0.185021	-0.012688	93.522755	-40.489466
retired	62.027326	273.712209	2.476744	897.936047	0.327326	-0.698314	93.430786	-38.573081
self-employed	39.949331	264.142153	2.660802	976.621393	0.143561	0.094159	93.559982	-40.488107
services	37.926430	258.398085	2.587805	979.974049	0.154951	0.175359	93.634659	-41.290048
student	25.894857	283.683429	2.104000	840.217143	0.524571	-1.408000	93.331613	-40.187543
technician	38.507638	250.232241	2.577339	964.408127	0.153789	0.274566	93.561471	-39.927569
unemployed	39.733728	249.451677	2.564103	935.316568	0.199211	-0.111736	93.563781	-40.007594
unknown	45.563636	239.675758	2.648485	938.727273	0.154545	0.357879	93.718942	-38.797879

In [12]:
```
data.groupby('marital').mean()
```

Out[12]:

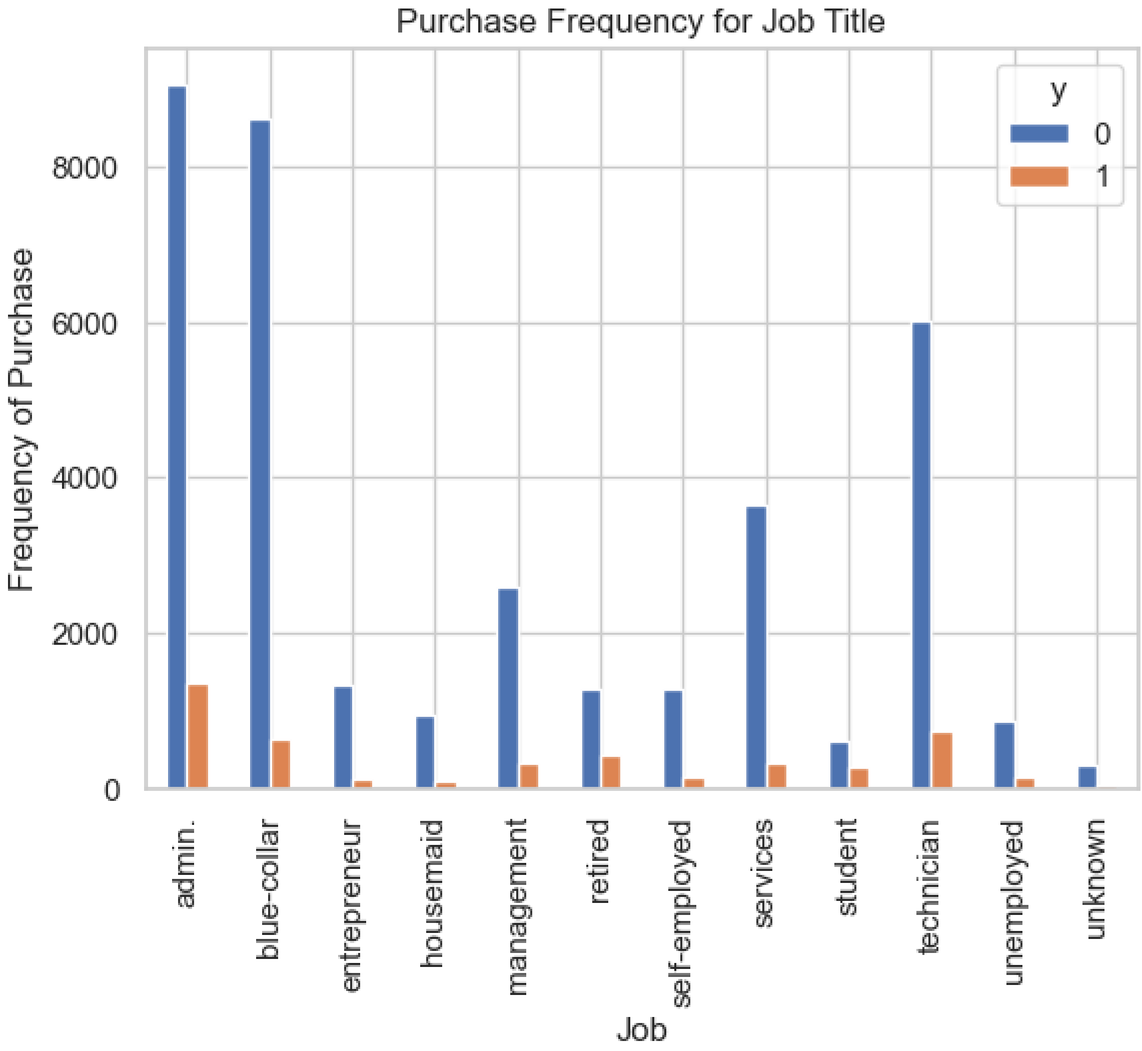
	age	**duration**	**campaign**	**pdays**	**previous**	**emp_var_rate**	**cons_price_idx**	**cons_conf_idx**	**eu**
marital									
divorced	44.899393	253.790330	2.61340	968.639853	0.168690	0.163985	93.606563	-40.707069	
married	42.307165	257.438623	2.57281	967.247673	0.155608	0.183625	93.597367	-40.270659	
single	33.158714	261.524378	2.53380	949.909578	0.211359	-0.167989	93.517300	-40.918698	
unknown	40.275000	312.725000	3.18750	937.100000	0.275000	-0.221250	93.471250	-40.820000	

In [13]:
```
data.groupby('education').mean()
```

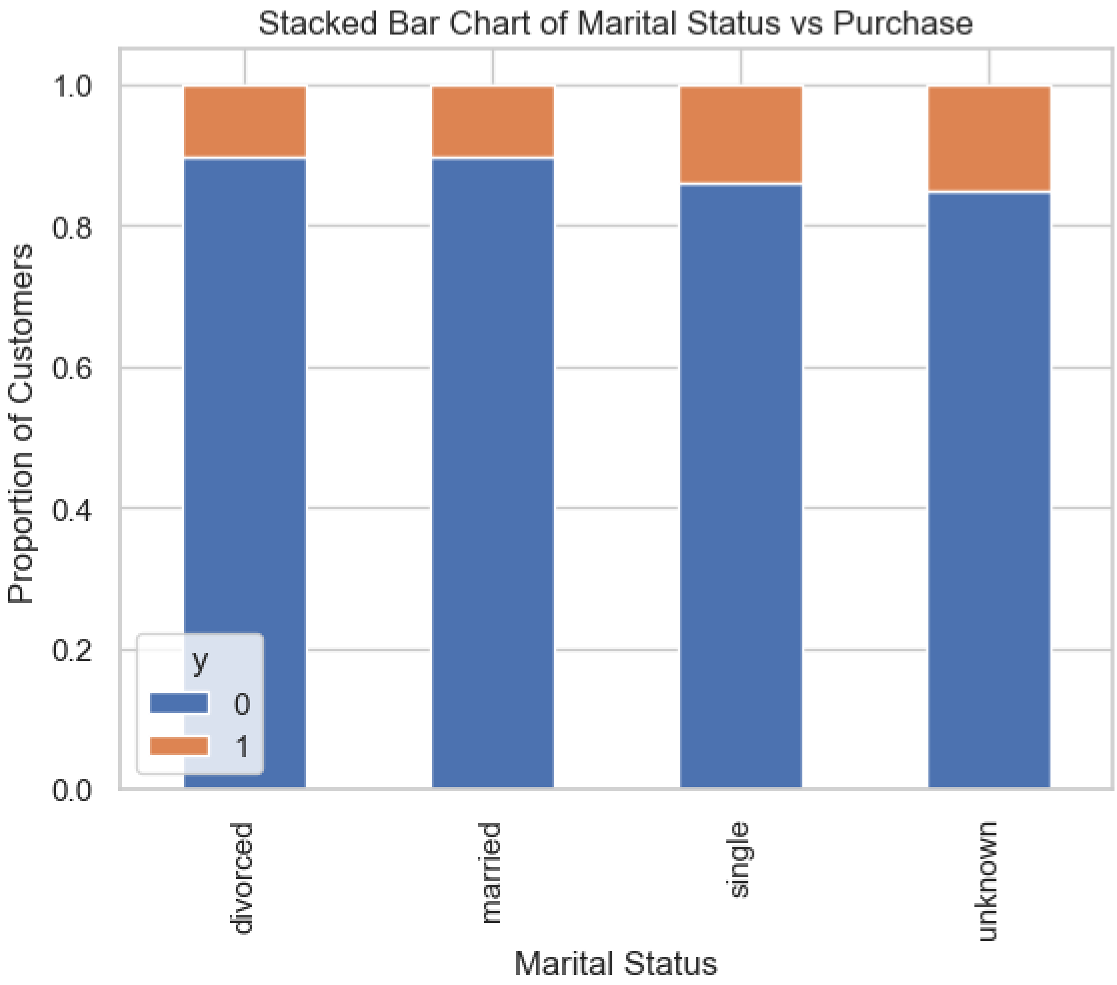
Out[13]:

	age	**duration**	**campaign**	**pdays**	**previous**	**emp_var_rate**	**cons_price_idx**	**cons_co**
education								
Basic	42.163910	263.043874	2.559498	974.877967	0.141053	0.191329	93.639933	-40.9
high.school	37.998213	260.886810	2.568576	964.358382	0.185917	0.032937	93.584857	-40.9
illiterate	48.500000	276.777778	2.277778	943.833333	0.111111	-0.133333	93.317333	-39.9
professional.course	40.080107	252.533855	2.586115	960.765974	0.163075	0.173012	93.569864	-40.1
university.degree	38.879191	253.223373	2.563527	951.807692	0.192390	-0.028090	93.493466	-39.9
unknown	43.481225	262.390526	2.596187	942.830734	0.226459	0.059099	93.658615	-39.8

In [14]:
```
%matplotlib inline
pd.crosstab(data.job,data.y).plot(kind='bar')
plt.title('Purchase Frequency for Job Title')
plt.xlabel('Job')
plt.ylabel('Frequency of Purchase')
plt.savefig('purchase_fre_job')
```

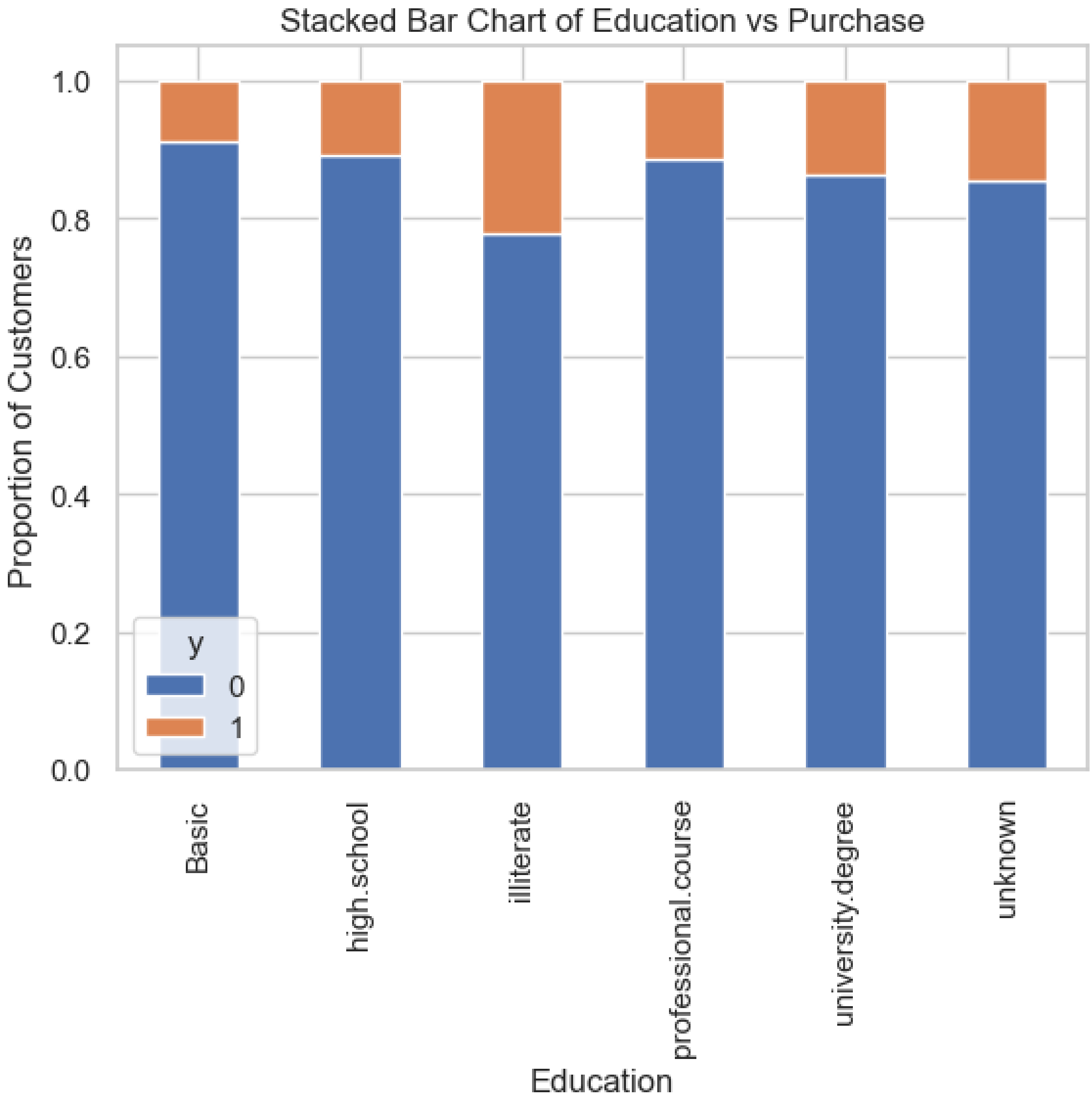


In [15]:
```
table=pd.crosstab(data.marital,data.y)
table.div(table.sum(1).astype(float), axis=0).plot(kind='bar', stacked=True)
plt.title('Stacked Bar Chart of Marital Status vs Purchase')
plt.xlabel('Marital Status')
plt.ylabel('Proportion of Customers')
plt.savefig('mariral_vs_pur_stack')
```



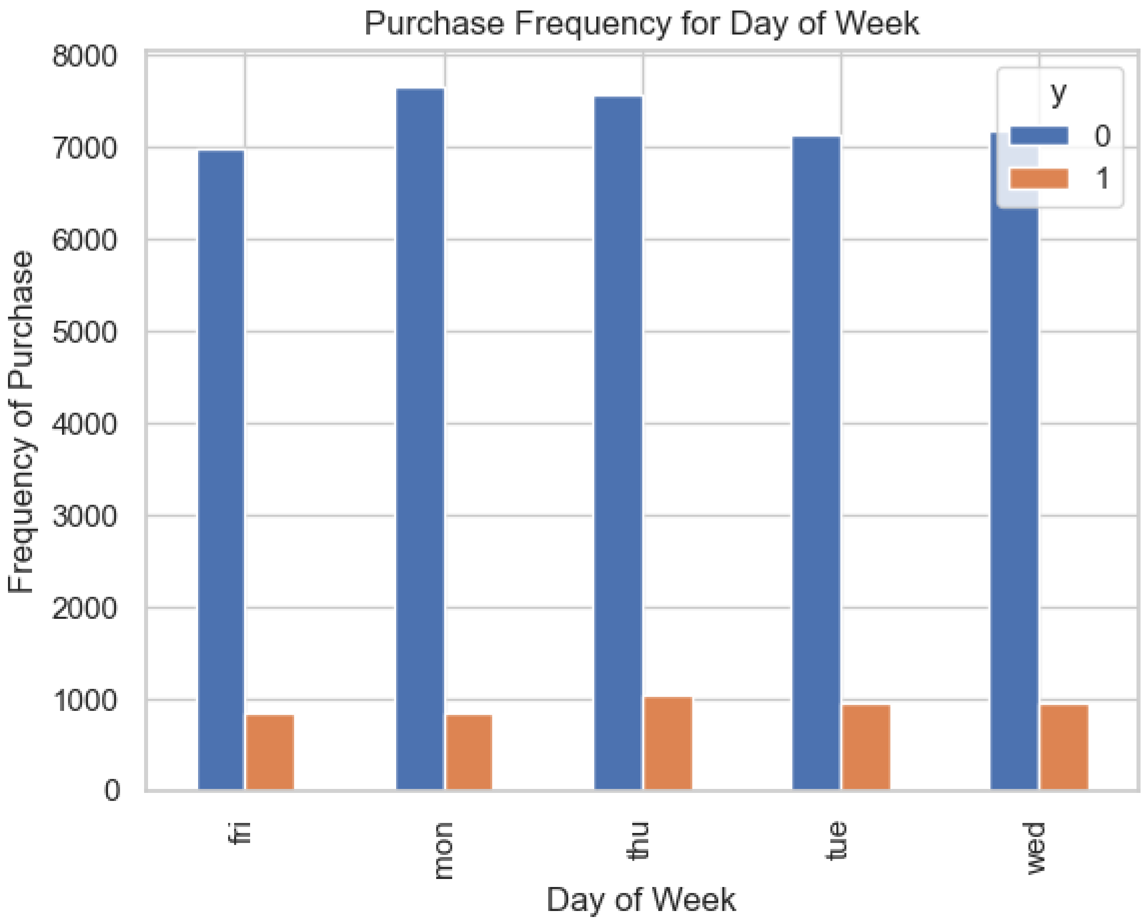
In [16]:

```
table=pd.crosstab(data.education,data.y)
table.div(table.sum(1).astype(float), axis=0).plot(kind='bar', stacked=True)
plt.title('Stacked Bar Chart of Education vs Purchase')
plt.xlabel('Education')
plt.ylabel('Proportion of Customers')
plt.savefig('edu_vs_pur_stack')
```



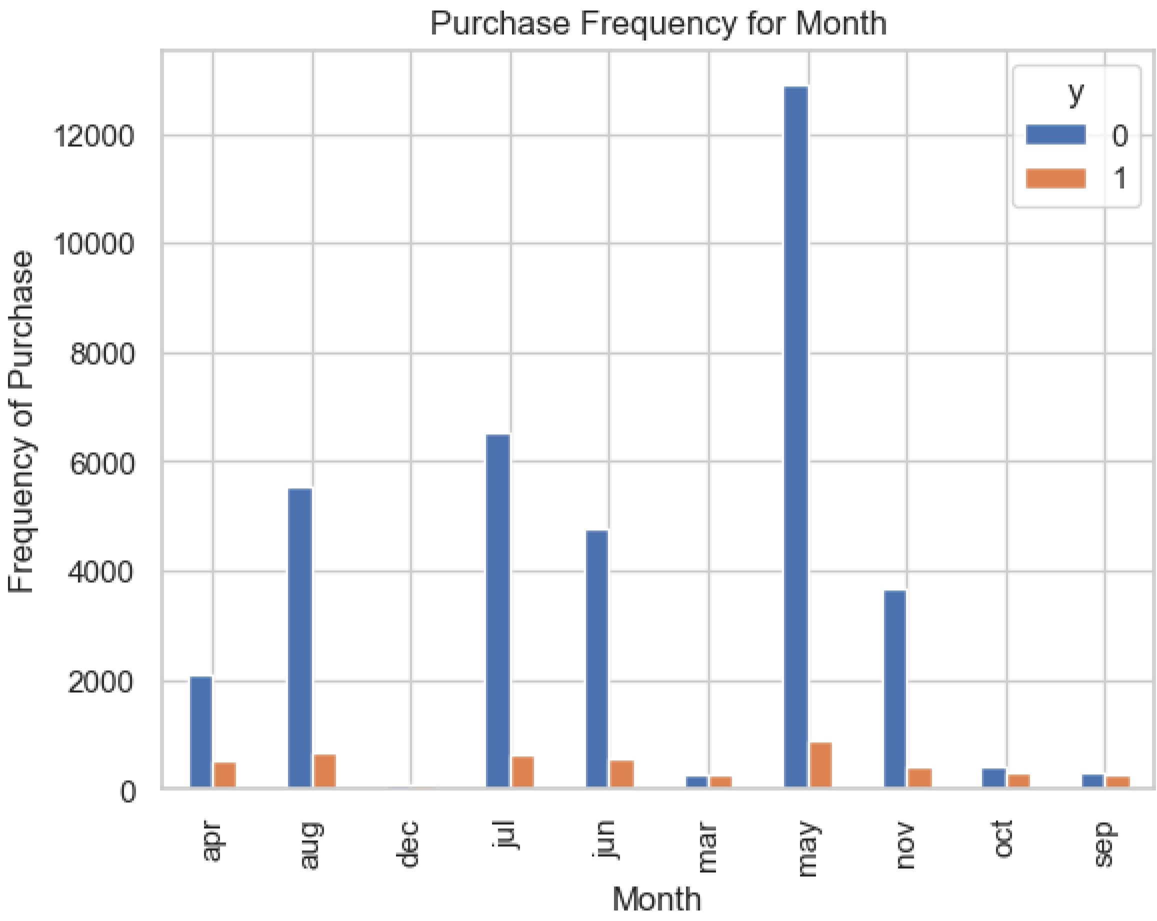
In [17]:

```
pd.crosstab(data.day_of_week,data.y).plot(kind='bar')
plt.title('Purchase Frequency for Day of Week')
plt.xlabel('Day of Week')
plt.ylabel('Frequency of Purchase')
plt.savefig('pur_dayofweek_bar')
```



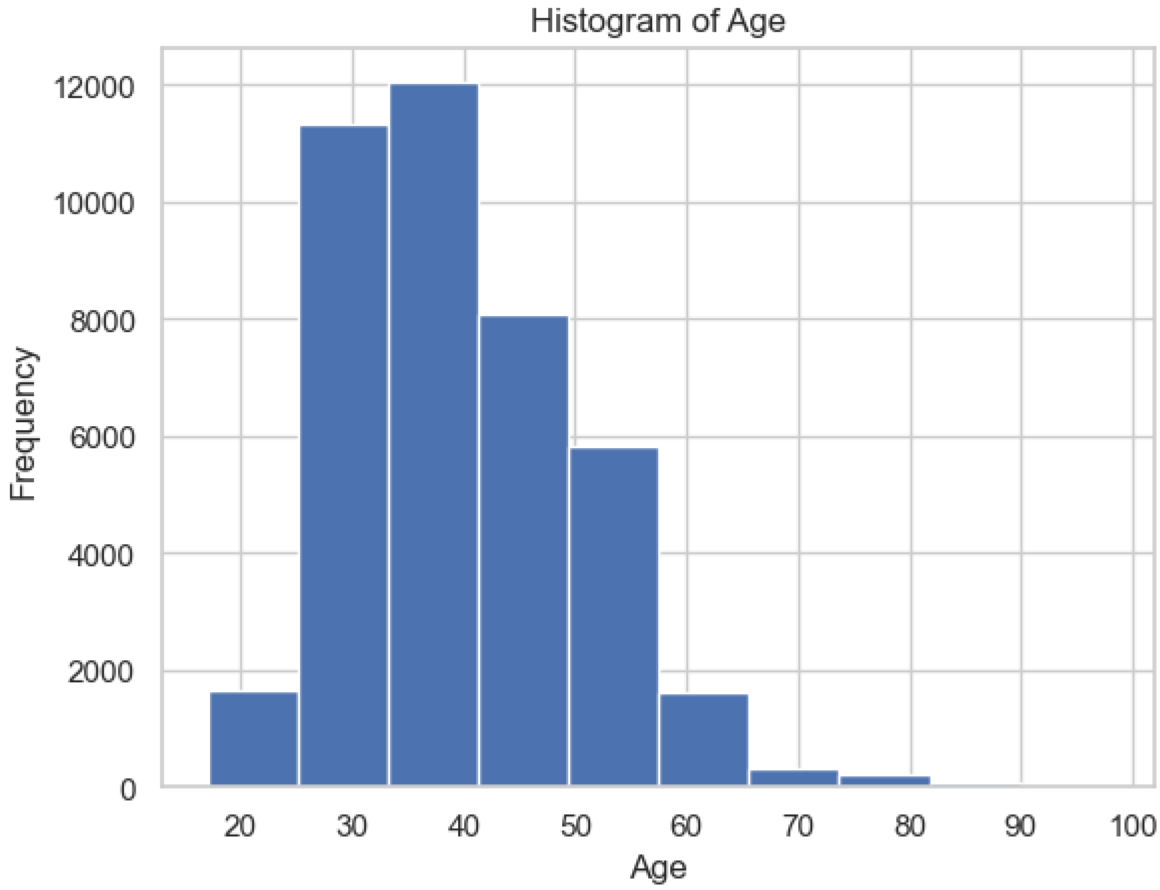
In [18]:

```
pd.crosstab(data.month,data.y).plot(kind='bar')
plt.title('Purchase Frequency for Month')
plt.xlabel('Month')
plt.ylabel('Frequency of Purchase')
plt.savefig('pur_fre_month_bar')
```

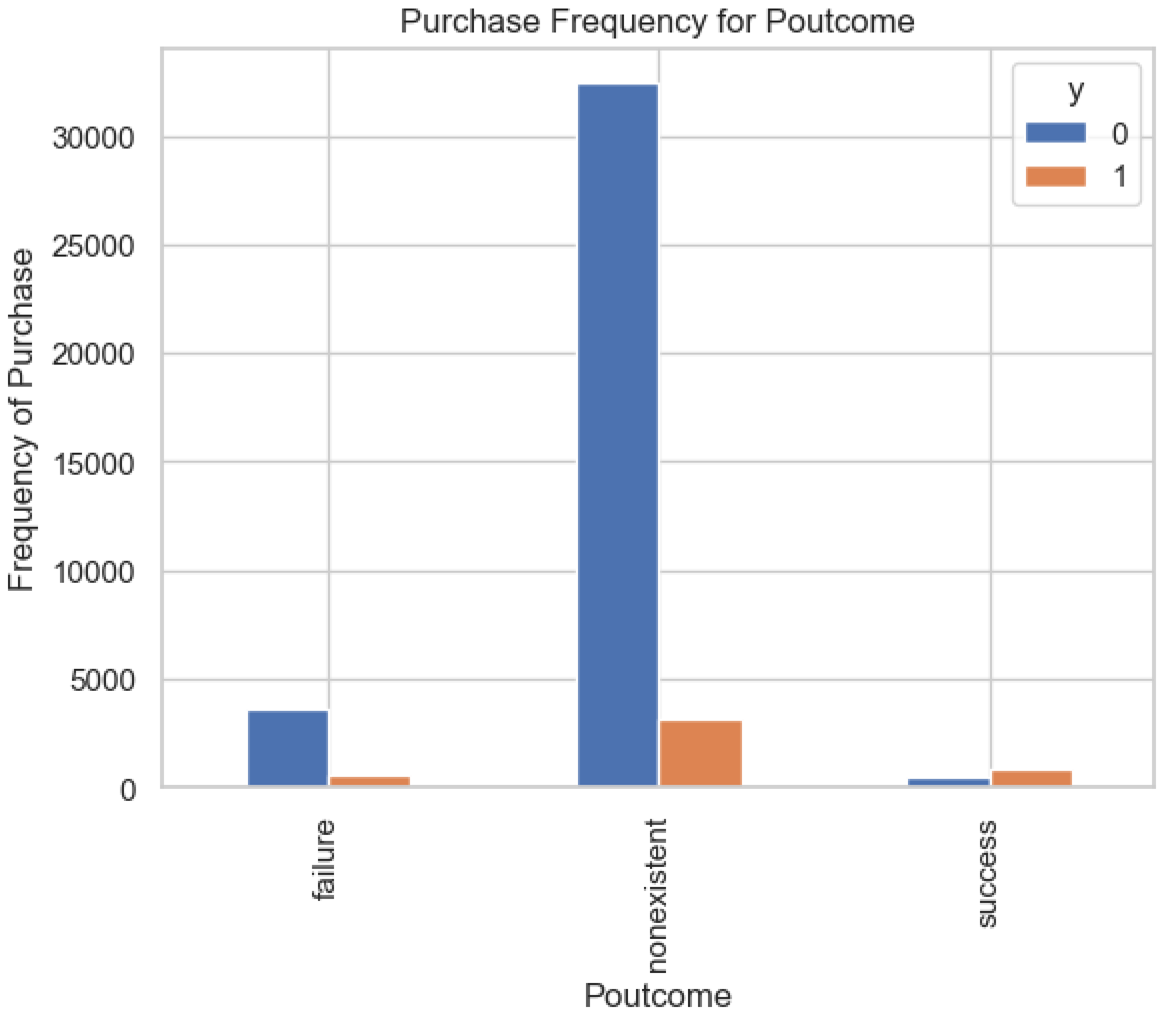


In [19]:

```
data.age.hist()
plt.title('Histogram of Age')
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.savefig('hist_age')
```



In [20]:
```
pd.crosstab(data.poutcome,data.y).plot(kind='bar')
plt.title('Purchase Frequency for Poutcome')
plt.xlabel('Poutcome')
plt.ylabel('Frequency of Purchase')
plt.savefig('pur_fre_pout_bar')
```



In [21]:
```
#create dummy variables, get ready for analysis
cat_vars=['job','marital','education','default','housing','loan','contact','month','day_
for var in cat_vars:
    cat_list='var'+'_'+var
    cat_list = pd.get_dummies(data[var], prefix=var)
    data1=data.join(cat_list)
    data=data1
cat_vars=['job','marital','education','default','housing','loan','contact','month','day_
data_vars=data.columns.values.tolist()
to_keep=[i for i in data_vars if i not in cat_vars]
```

In [22]:
```
data_final=data[to_keep]
data_final.columns.values
```

Out[22]:
```
array(['age', 'duration', 'campaign', 'pdays', 'previous', 'emp_var_rate',
       'cons_price_idx', 'cons_conf_idx', 'euribor3m', 'nr_employed', 'y',
       'job_admin.', 'job_blue-collar', 'job_entrepreneur',
       'job_housemaid', 'job_management', 'job_retired',
       'job_self-employed', 'job_services', 'job_student',
       'job_technician', 'job_unemployed', 'job_unknown',
       'marital_divorced', 'marital_married', 'marital_single',
       'marital_unknown', 'education_Basic', 'education_high.school',
       'education_illiterate', 'education_professional.course',
       'education_university.degree', 'education_unknown', 'default_no',
       'default_unknown', 'default_yes', 'housing_no', 'housing_unknown',
       'housing_yes', 'loan_no', 'loan_unknown', 'loan_yes',
       'contact_cellular', 'contact_telephone', 'month_apr', 'month_aug',
       'month_dec', 'month_jul', 'month_jun', 'month_mar', 'month_may',
       'month_nov', 'month_oct', 'month_sep', 'day_of_week_fri',
       'day_of_week_mon', 'day_of_week_thu', 'day_of_week_tue',
       'day_of_week_wed', 'poutcome_failure', 'poutcome_nonexistent',
       'poutcome_success'], dtype=object)
```

In [23]:

```
#Over-sampling using SMOTE
#With our training data created, I’ll up-sample the
#no-subscription using the SMOTE algorithm
#(Synthetic Minority Oversampling Technique). At a high level, SMOTE:

#Works by creating synthetic samples from the minor class
#(no-subscription) instead of creating copies.
#Randomly choosing one of the k-nearest-neighbors
#and using it to create a similar, but randomly tweaked, new observations.
```

In [24]:

```
#!pip install imblearn
X = data_final.loc[:, data_final.columns != 'y']
y = data_final.loc[:, data_final.columns == 'y']
from imblearn.over_sampling import SMOTE
os = SMOTE(random_state=0)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=0)
columns = X_train.columns
os_data_X,os_data_y=os.fit_resample(X_train, y_train)
os_data_X = pd.DataFrame(data=os_data_X,columns=columns )
os_data_y= pd.DataFrame(data=os_data_y,columns=['y'])
# we can Check the numbers of our data
print("length of oversampled data is ",len(os_data_X))
print("Number of no subscription in oversampled data",len(os_data_y[os_data_y['y']==0]))
print("Number of subscription",len(os_data_y[os_data_y['y']==1]))
print("Proportion of no subscription data in oversampled data is ",len(os_data_y[os_data
print("Proportion of subscription data in oversampled data is ",len(os_data_y[os_data_y[
```

```
length of oversampled data is  51134
Number of no subscription in oversampled data 25567
Number of subscription 25567
Proportion of no subscription data in oversampled data is  0.5
Proportion of subscription data in oversampled data is  0.5
```

In [25]:

```
#Recursive Feature Elimination
#Recursive Feature Elimination (RFE) is based on the
#idea to repeatedly construct a model and choose either
#the best or worst performing feature, setting the feature aside
#and then repeating the process with the rest of the features.
#This process is applied until all features in the dataset are exhausted.
#The goal of RFE is to select features by
#recursively considering smaller and smaller sets of features.
```

In [26]:

```
data_final_vars=data_final.columns.values.tolist()
y=['y']
X=[i for i in data_final_vars if i not in y]
from sklearn.feature_selection import RFE
from sklearn.linear_model import LogisticRegression
logreg = LogisticRegression()
rfe = RFE(logreg, n_features_to_select=20)
rfe = rfe.fit(os_data_X, os_data_y.values.ravel())
print(rfe.support_)
print(rfe.ranking_)
```

```
C:\Users\djbro\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:814: Conver
genceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
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```

```
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
C:\Users\djbro\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:814: Conver
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```

```
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

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Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
[False False False False False False False False False False False False
 False False False False False False False False False False  True  True
  True  True  True  True False  True  True  True False False False  True
  True  True  True  True  True False False False False False False False
 False False False False False  True  True  True  True  True False False
 False]
[36 38 31 40 32 28 30 34 37 35 15  8  9 11 14 19 13 12 18 10 16 17  1  1
  1  1  1  1 41  1  1  1  3  2 42  1  1  1  1  1  1  5  4 24 20 27 22 25
 33 23 21 39 29  1  1  1  1  1  7  6 26]
```

In [27]:

```
cols=['euribor3m', 'job_blue-collar', 'job_housemaid', 'marital_unknown', 'education_ill
      'contact_cellular', 'contact_telephone', 'month_apr', 'month_aug', 'month_dec', 'm
      'month_may', 'month_nov', 'month_oct', "poutcome_failure", "poutcome_success"]
X=os_data_X[cols]
y=os_data_y['y']
```

In [28]:

```
import statsmodels.api as sm
logit_model=sm.Logit(y,X)
result=logit_model.fit()
print(result.summary2())
```

```
Optimization terminated successfully.
         Current function value: 0.455664
         Iterations 7
                           Results: Logit
=====================================================================
Model:                Logit             Pseudo R-squared:  0.343
Dependent Variable:   y                 AIC:               46639.8230
Date:                 2022-12-23 19:48  BIC:               46816.6671
No. Observations:     51134             Log-Likelihood:    -23300.
Df Model:             19                LL-Null:           -35443.
Df Residuals:         51114             LLR p-value:       0.0000
Converged:            1.0000            Scale:             1.0000
No. Iterations:       7.0000
---------------------------------------------------------------------
                      Coef.  Std.Err.    z     P>|z|   [0.025  0.975]
---------------------------------------------------------------------
euribor3m             0.1612   0.0082  19.7747 0.0000  0.1452  0.1772
job_blue-collar      -0.9965   0.0381 -26.1297 0.0000 -1.0713 -0.9218
job_housemaid        -1.6294   0.1377 -11.8333 0.0000 -1.8992 -1.3595
marital_unknown      -1.1078   0.4206  -2.6341 0.0084 -1.9321 -0.2835
education_illiterate  0.2400   0.6653   0.3607 0.7183 -1.0640  1.5440
default_no            0.7992   0.0371  21.5471 0.0000  0.7265  0.8719
default_unknown      -0.4594   0.0569  -8.0728 0.0000 -0.5710 -0.3479
contact_cellular      1.5089   0.0442  34.1712 0.0000  1.4224  1.5955
contact_telephone    -0.3741   0.0574  -6.5139 0.0000 -0.4866 -0.2615
month_apr            -2.1779   0.0546 -39.8720 0.0000 -2.2849 -2.0708
month_aug            -3.6210   0.0529 -68.4507 0.0000 -3.7247 -3.5173
month_dec            -1.7432   0.1714 -10.1703 0.0000 -2.0792 -1.4073
month_jul            -3.4498   0.0529 -65.1525 0.0000 -3.5536 -3.3460
month_jun            -2.0963   0.0529 -39.5915 0.0000 -2.2001 -1.9925
month_mar            -1.0951   0.0955 -11.4692 0.0000 -1.2823 -0.9080
month_may            -2.5263   0.0441 -57.2399 0.0000 -2.6128 -2.4398
month_nov            -3.6154   0.0577 -62.6966 0.0000 -3.7285 -3.5024
month_oct            -1.0519   0.0856 -12.2918 0.0000 -1.2196 -0.8842
poutcome_failure     -0.8995   0.0462 -19.4669 0.0000 -0.9901 -0.8090
poutcome_success      2.4584   0.0662  37.1260 0.0000  2.3286  2.5882
```

```
=====================================================================
```

In [29]:

```python
cols=['euribor3m', 'job_blue-collar', 'job_housemaid', 'marital_unknown',
      'month_apr', 'month_aug','month_dec', 'month_jul', 'month_jun', 'month_mar',
      'month_may', 'month_nov', 'month_oct', "poutcome_failure", "poutcome_success"]
X=os_data_X[cols]
y=os_data_y['y']
logit_model=sm.Logit(y,X)
result=logit_model.fit()
print(result.summary2())
```

```
Optimization terminated successfully.
         Current function value: 0.547517
         Iterations 7
                         Results: Logit
=================================================================
Model:              Logit            Pseudo R-squared: 0.210
Dependent Variable: y                AIC:              56023.4279
Date:               2022-12-23 19:48 BIC:              56156.0610
No. Observations:   51134            Log-Likelihood:   -27997.
Df Model:           14               LL-Null:          -35443.
Df Residuals:       51119            LLR p-value:      0.0000
Converged:          1.0000           Scale:            1.0000
No. Iterations:     7.0000
-----------------------------------------------------------------
                  Coef.  Std.Err.    z    P>|z|   [0.025  0.975]
-----------------------------------------------------------------
euribor3m         0.1726   0.0055  31.1226 0.0000  0.1617  0.1835
job_blue-collar  -1.0759   0.0360 -29.9188 0.0000 -1.1464 -1.0055
job_housemaid    -1.6935   0.1293 -13.1020 0.0000 -1.9468 -1.4401
marital_unknown  -1.1130   0.4136  -2.6909 0.0071 -1.9237 -0.3023
month_apr        -0.2659   0.0413  -6.4304 0.0000 -0.3469 -0.1848
month_aug        -1.6699   0.0393 -42.4910 0.0000 -1.7470 -1.5929
month_dec        -0.1384   0.1606  -0.8615 0.3889 -0.4532  0.1764
month_jul        -1.6077   0.0391 -41.1478 0.0000 -1.6843 -1.5311
month_jun        -1.3552   0.0394 -34.4030 0.0000 -1.4324 -1.2779
month_mar         0.7367   0.0859   8.5772 0.0000  0.5684  0.9050
month_may        -1.5298   0.0302 -50.7231 0.0000 -1.5889 -1.4707
month_nov        -1.7486   0.0467 -37.4203 0.0000 -1.8402 -1.6570
month_oct         0.4962   0.0751   6.6080 0.0000  0.3490  0.6434
poutcome_failure  0.0002   0.0419   0.0051 0.9960 -0.0819  0.0823
poutcome_success  3.1910   0.0595  53.6367 0.0000  3.0744  3.3076
=================================================================
```

In [30]:

```python
#repeat until we have all p values <0.05
cols=['euribor3m', 'job_blue-collar', 'job_housemaid', 'marital_unknown',
      'month_apr', 'month_aug', 'month_jul', 'month_jun', 'month_mar',
      'month_may', 'month_nov', 'month_oct', "poutcome_success"]
X=os_data_X[cols]
y=os_data_y['y']
logit_model=sm.Logit(y,X)
result=logit_model.fit()
print(result.summary2())
```

```
Optimization terminated successfully.
         Current function value: 0.547524
         Iterations 7
                         Results: Logit
=================================================================
Model:              Logit            Pseudo R-squared: 0.210
Dependent Variable: y                AIC:              56020.1698
Date:               2022-12-23 19:48 BIC:              56135.1184
No. Observations:   51134            Log-Likelihood:   -27997.
Df Model:           12               LL-Null:          -35443.
Df Residuals:       51121           LLR p-value:      0.0000
Converged:          1.0000          Scale:            1.0000
No. Iterations:     7.0000
-----------------------------------------------------------------
                  Coef.  Std.Err.    z     P>|z|   [0.025  0.975]
-----------------------------------------------------------------
euribor3m         0.1724   0.0055  31.4003 0.0000  0.1617  0.1832
job_blue-collar  -1.0762   0.0359 -29.9391 0.0000 -1.1466 -1.0057
job_housemaid    -1.6957   0.1293 -13.1138 0.0000 -1.9491 -1.4422
marital_unknown  -1.1129   0.4136  -2.6908 0.0071 -1.9235 -0.3023
month_apr        -0.2656   0.0406  -6.5373 0.0000 -0.3452 -0.1860
month_aug        -1.6692   0.0390 -42.7615 0.0000 -1.7457 -1.5927
month_jul        -1.6069   0.0389 -41.3527 0.0000 -1.6830 -1.5307
month_jun        -1.3545   0.0392 -34.5684 0.0000 -1.4312 -1.2777
month_mar         0.7370   0.0856   8.6103 0.0000  0.5692  0.9047
month_may        -1.5292   0.0295 -51.9183 0.0000 -1.5869 -1.4714
month_nov        -1.7479   0.0457 -38.2800 0.0000 -1.8374 -1.6584
month_oct         0.4965   0.0746   6.6582 0.0000  0.3503  0.6427
poutcome_success  3.1895   0.0594  53.7165 0.0000  3.0731  3.3059
=================================================================
```

In [31]:

```python
from sklearn.linear_model import LogisticRegression
from sklearn import metrics
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=0)
logreg = LogisticRegression()
logreg.fit(X_train, y_train)
```

Out[31]:

```
LogisticRegression()
```

In [32]:

```python
y_pred = logreg.predict(X_test)
print('Accuracy of logistic regression classifier on test set: {:.2f}'.format(logreg.sco
```

```
Accuracy of logistic regression classifier on test set: 0.83
```

In [33]:

```python
from sklearn.metrics import confusion_matrix
confusion_matrix = confusion_matrix(y_test, y_pred)
print(confusion_matrix)
```

```
[[6810  856]
 [1757 5918]]
```

In [34]:

```python
from sklearn.metrics import classification_report
print(classification_report(y_test, y_pred))
```

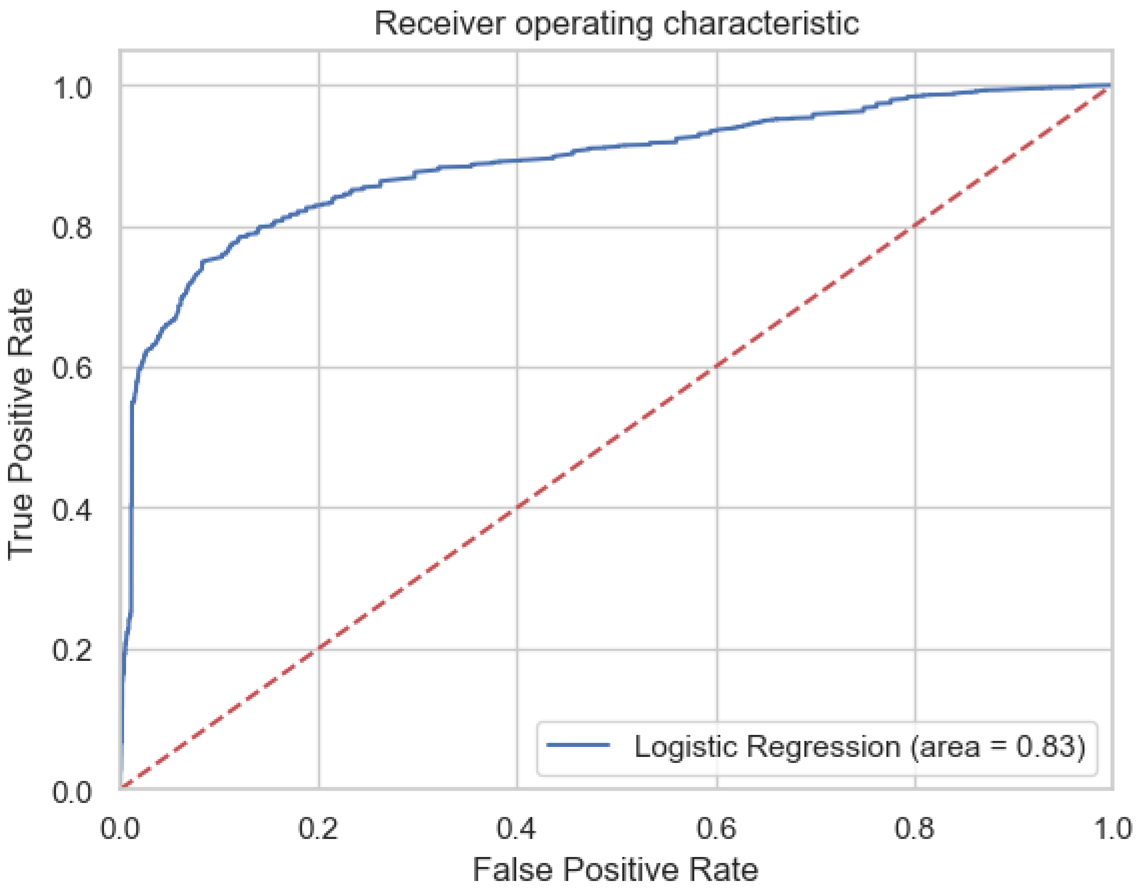
```
              precision    recall  f1-score   support

           0       0.79      0.89      0.84      7666
           1       0.87      0.77      0.82      7675

    accuracy                           0.83     15341
   macro avg       0.83      0.83      0.83     15341
weighted avg       0.83      0.83      0.83     15341
```

In [35]:

```python
from sklearn.metrics import roc_auc_score
from sklearn.metrics import roc_curve
logit_roc_auc = roc_auc_score(y_test, logreg.predict(X_test))
fpr, tpr, thresholds = roc_curve(y_test, logreg.predict_proba(X_test)[:,1])
plt.figure()
plt.plot(fpr, tpr, label='Logistic Regression (area = %0.2f)' % logit_roc_auc)
plt.plot([0, 1], [0, 1],'r--')
plt.xlim([0.0, 1.0])
plt.ylim([0.0, 1.05])
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('Receiver operating characteristic')
plt.legend(loc="lower right")
plt.savefig('Log_ROC')
plt.show()
```


Receiver operating characteristic
True Positive Rate
False Positive Rate
Logistic Regression (area = 0.83)