In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df=pd.read_csv(r"C:\Users\skumar2\OneDrive - Business Services North America\Desktop\sp\Credit EDA Case Study\application_data.cs
```

In [3]:
```
empt_col=df.isna().sum()
empt_col=empt_col.loc[empt_col.values>df.shape[0]*0.1].index
```

In [4]:
```
df.drop(labels=empt_col,axis=1,inplace=True)
len(df.columns)
```

Out[4]:
```
65
```

In [5]:
```
emty_lst=[]
for col in df.columns:
    if col.startswith('FLAG'):
        emty_lst.append(col)
```

In [6]:
```
df.drop(columns=emty_lst,inplace=True)
```

In [7]:
```
df
```

Out[7]:

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_ANNUITY	AMT_GOOD
0	100002	1	Cash loans	M	0	202500.0	406597.5	24700.5	
1	100003	0	Cash loans	F	0	270000.0	1293502.5	35698.5	1
2	100004	0	Revolving loans	M	0	67500.0	135000.0	6750.0	
3	100006	0	Cash loans	F	0	135000.0	312682.5	29686.5	
4	100007	0	Cash loans	M	0	121500.0	513000.0	21865.5	
...	...	...	...	...	...	...	...	...	
307506	456251	0	Cash loans	M	0	157500.0	254700.0	27558.0	
307507	456252	0	Cash loans	F	0	72000.0	269550.0	12001.5	
307508	456253	0	Cash loans	F	0	153000.0	677664.0	29979.0	
307509	456254	1	Cash loans	F	0	171000.0	370107.0	20205.0	
307510	456255	0	Cash loans	F	0	157500.0	675000.0	49117.5	

307511 rows × 37 columns

In [8]:
```
df['CODE_GENDER'].value_counts()
```

Out[8]:
```
F      202448
M      105059
XNA         4
Name: CODE_GENDER, dtype: int64
```

In [9]:
```
df.loc[df['CODE_GENDER']=='XNA','CODE_GENDER']="F"
```

In [10]:
```
df['ORGANIZATION_TYPE'].value_counts()
```

Out[10]:

Business Entity Type 3	67992
XNA	55374
Self-employed	38412
Other	16683
Medicine	11193
Business Entity Type 2	10553
Government	10404
School	8893
Trade: type 7	7831
Kindergarten	6880
Construction	6721
Business Entity Type 1	5984
Transport: type 4	5398
Trade: type 3	3492
Industry: type 9	3368
Industry: type 3	3278
Security	3247
Housing	2958
Industry: type 11	2704
Military	2634
Bank	2507
Agriculture	2454
Police	2341
Transport: type 2	2204
Postal	2157
Security Ministries	1974
Trade: type 2	1900
Restaurant	1811
Services	1575
University	1327
Industry: type 7	1307
Transport: type 3	1187
Industry: type 1	1039
Hotel	966
Electricity	950
Industry: type 4	877
Trade: type 6	631
Industry: type 5	599
Insurance	597
Telecom	577
Emergency	560
Industry: type 2	458
Advertising	429
Realtor	396

```
Culture                    379
Industry: type 12          369
Trade: type 1              348
Mobile                     317
Legal Services             305
Cleaning                   260
Transport: type 1          201
Industry: type 6           112
Industry: type 10          109
Religion                    85
Industry: type 13           67
Trade: type 4               64
Trade: type 5               49
Industry: type 8            24
Name: ORGANIZATION_TYPE, dtype: int64
```

In [11]:
```
df=df.loc[df['ORGANIZATION_TYPE']!='XNA']
```

In [12]:
```
df
```

Out[12]:

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_ANNUITY	AMT_GOOD
0	100002	1	Cash loans	M	0	202500.0	406597.5	24700.5	
1	100003	0	Cash loans	F	0	270000.0	1293502.5	35698.5	1
2	100004	0	Revolving loans	M	0	67500.0	135000.0	6750.0	
3	100006	0	Cash loans	F	0	135000.0	312682.5	29686.5	
4	100007	0	Cash loans	M	0	121500.0	513000.0	21865.5	
...	...	...	...	...	...	...	...	...	
307504	456248	0	Cash loans	F	0	153000.0	331920.0	16096.5	
307506	456251	0	Cash loans	M	0	157500.0	254700.0	27558.0	
307508	456253	0	Cash loans	F	0	153000.0	677664.0	29979.0	
307509	456254	1	Cash loans	F	0	171000.0	370107.0	20205.0	
307510	456255	0	Cash loans	F	0	157500.0	675000.0	49117.5	

252137 rows × 37 columns

In [13]:
```
df.dropna(thresh=df.shape[1]-df.shape[1]*0.05,inplace=True)
```

```
C:\Users\local_skumar2\Temp\ipykernel_12616\1024939465.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.dropna(thresh=df.shape[1]-df.shape[1]*0.05,inplace=True)
```

In [14]:
```
df
```

Out[14]:

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_ANNUITY	AMT_GOOD
0	100002	1	Cash loans	M	0	202500.0	406597.5	24700.5	
1	100003	0	Cash loans	F	0	270000.0	1293502.5	35698.5	1
2	100004	0	Revolving loans	M	0	67500.0	135000.0	6750.0	
3	100006	0	Cash loans	F	0	135000.0	312682.5	29686.5	
4	100007	0	Cash loans	M	0	121500.0	513000.0	21865.5	
...	...	...	...	...	...	...	...	...	
307504	456248	0	Cash loans	F	0	153000.0	331920.0	16096.5	
307506	456251	0	Cash loans	M	0	157500.0	254700.0	27558.0	
307508	456253	0	Cash loans	F	0	153000.0	677664.0	29979.0	
307509	456254	1	Cash loans	F	0	171000.0	370107.0	20205.0	
307510	456255	0	Cash loans	F	0	157500.0	675000.0	49117.5	

251031 rows × 37 columns

In [15]:
```
q1,q2,q3=np.percentile(df['AMT_INCOME_TOTAL'],[25,50,75])
IQR=q3-q1
lx=q1 - 1.5*IQR
Ux=q3 + 1.5*IQR
```

In [16]:
```
df=df.loc[(df['AMT_INCOME_TOTAL']>lx) & (df['AMT_INCOME_TOTAL']<Ux)]
```

In [17]:
```
df
```

Out[17]:

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_ANNUITY	AMT_GOOD
0	100002	1	Cash loans	M	0	202500.0	406597.5	24700.5	
1	100003	0	Cash loans	F	0	270000.0	1293502.5	35698.5	1
2	100004	0	Revolving loans	M	0	67500.0	135000.0	6750.0	
3	100006	0	Cash loans	F	0	135000.0	312682.5	29686.5	
4	100007	0	Cash loans	M	0	121500.0	513000.0	21865.5	
...	...	...	...	...	...	...	...	...	
307504	456248	0	Cash loans	F	0	153000.0	331920.0	16096.5	
307506	456251	0	Cash loans	M	0	157500.0	254700.0	27558.0	
307508	456253	0	Cash loans	F	0	153000.0	677664.0	29979.0	
307509	456254	1	Cash loans	F	0	171000.0	370107.0	20205.0	
307510	456255	0	Cash loans	F	0	157500.0	675000.0	49117.5	

238589 rows × 37 columns

DATA CLEANING END

In [18]:
```
bins=np.arange(0,round(df['AMT_INCOME_TOTAL'].max()),25000)
```

In [19]:
```
slot=['0-25000','25000-50000','50000-75000','75000-100000','100000-125000','125000-150000','150000-175000','175000-200000','2000(
```

In [20]:
```
df['AMT_INCOME_TOTAL_RANGE']=pd.cut(df['AMT_INCOME_TOTAL'],bins,labels=slot)
```

```
C:\Users\local_skumar2\Temp\ipykernel_12616\3491733786.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df['AMT_INCOME_TOTAL_RANGE']=pd.cut(df['AMT_INCOME_TOTAL'],bins,labels=slot)
```

In [21]:
```
df
```

Out[21]:

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_ANNUITY	AMT_GOOD
0	100002	1	Cash loans	M	0	202500.0	406597.5	24700.5	
1	100003	0	Cash loans	F	0	270000.0	1293502.5	35698.5	1
2	100004	0	Revolving loans	M	0	67500.0	135000.0	6750.0	
3	100006	0	Cash loans	F	0	135000.0	312682.5	29686.5	
4	100007	0	Cash loans	M	0	121500.0	513000.0	21865.5	
...	...	...	...	...	...	...	...	...	
307504	456248	0	Cash loans	F	0	153000.0	331920.0	16096.5	
307506	456251	0	Cash loans	M	0	157500.0	254700.0	27558.0	
307508	456253	0	Cash loans	F	0	153000.0	677664.0	29979.0	
307509	456254	1	Cash loans	F	0	171000.0	370107.0	20205.0	
307510	456255	0	Cash loans	F	0	157500.0	675000.0	49117.5	

238589 rows × 38 columns

In [22]:
```
emp_lst=[]
for col1 in df.columns:
    if col1.endswith('CIRCLE'):
        emp_lst.append(col1)

emp_lst
```

Out[22]:
```
['OBS_30_CNT_SOCIAL_CIRCLE',
 'DEF_30_CNT_SOCIAL_CIRCLE',
 'OBS_60_CNT_SOCIAL_CIRCLE',
 'DEF_60_CNT_SOCIAL_CIRCLE']
```

In [23]:
```
df.drop(labels=emp_lst,axis=1,inplace=True)
```

```
C:\Users\local_skumar2\Temp\ipykernel_12616\3078154860.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.drop(labels=emp_lst,axis=1,inplace=True)
```

In [24]:
```
df
```

Out[24]:

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_ANNUITY	AMT_GOOD
0	100002	1	Cash loans	M	0	202500.0	406597.5	24700.5	
1	100003	0	Cash loans	F	0	270000.0	1293502.5	35698.5	1
2	100004	0	Revolving loans	M	0	67500.0	135000.0	6750.0	
3	100006	0	Cash loans	F	0	135000.0	312682.5	29686.5	
4	100007	0	Cash loans	M	0	121500.0	513000.0	21865.5	
...	...	...	...	...	...	...	...	...	
307504	456248	0	Cash loans	F	0	153000.0	331920.0	16096.5	
307506	456251	0	Cash loans	M	0	157500.0	254700.0	27558.0	
307508	456253	0	Cash loans	F	0	153000.0	677664.0	29979.0	
307509	456254	1	Cash loans	F	0	171000.0	370107.0	20205.0	
307510	456255	0	Cash loans	F	0	157500.0	675000.0	49117.5	

238589 rows × 34 columns

In [25]:
```
emp_lst1=[]
for col1 in df.columns:
```

```
    if col1.find('REGION_NOT')>1:
        emp_lst1.append(col1)

emp_lst1
```

Out[25]:
```
['REG_REGION_NOT_LIVE_REGION',
 'REG_REGION_NOT_WORK_REGION',
 'LIVE_REGION_NOT_WORK_REGION']
```

In [26]:
```
df.drop(columns=emp_lst1,axis=1,inplace=True)
```

```
C:\Users\local_skumar2\Temp\ipykernel_12616\480866958.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.drop(columns=emp_lst1,axis=1,inplace=True)
```

In [27]:
```
df0=df.loc[df['TARGET']==0]
df1=df.loc[df['TARGET']==1]
```

In [28]:
```
pd.options.display.max_columns=None
```

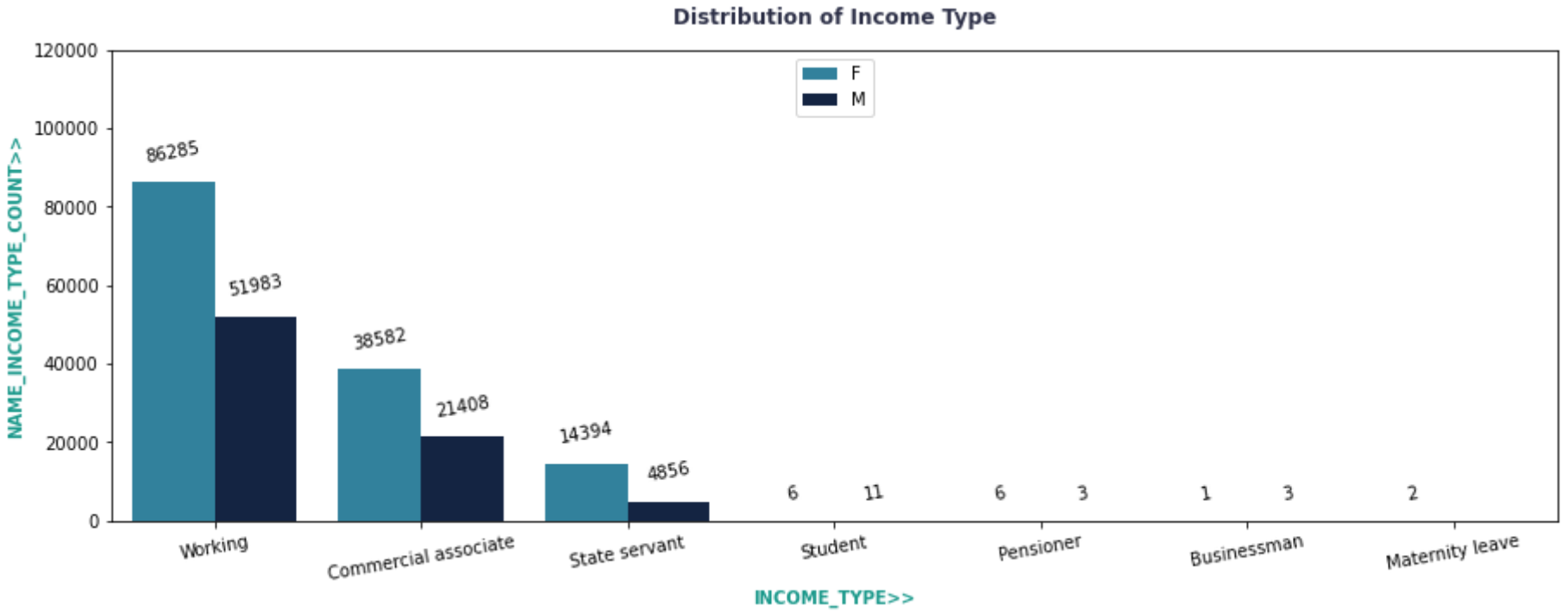
TARGET (0) wise visualization

In [29]:
```
df0.columns
```

Out[29]:
```
Index(['SK_ID_CURR', 'TARGET', 'NAME_CONTRACT_TYPE', 'CODE_GENDER',
       'CNT_CHILDREN', 'AMT_INCOME_TOTAL', 'AMT_CREDIT', 'AMT_ANNUITY',
       'AMT_GOODS_PRICE', 'NAME_TYPE_SUITE', 'NAME_INCOME_TYPE',
       'NAME_EDUCATION_TYPE', 'NAME_FAMILY_STATUS', 'NAME_HOUSING_TYPE',
       'REGION_POPULATION_RELATIVE', 'DAYS_BIRTH', 'DAYS_EMPLOYED',
       'DAYS_REGISTRATION', 'DAYS_ID_PUBLISH', 'CNT_FAM_MEMBERS',
       'REGION_RATING_CLIENT', 'REGION_RATING_CLIENT_W_CITY',
       'WEEKDAY_APPR_PROCESS_START', 'HOUR_APPR_PROCESS_START',
       'REG_CITY_NOT_LIVE_CITY', 'REG_CITY_NOT_WORK_CITY',
       'LIVE_CITY_NOT_WORK_CITY', 'ORGANIZATION_TYPE', 'EXT_SOURCE_2',
       'DAYS_LAST_PHONE_CHANGE', 'AMT_INCOME_TOTAL_RANGE'],
      dtype='object')
```

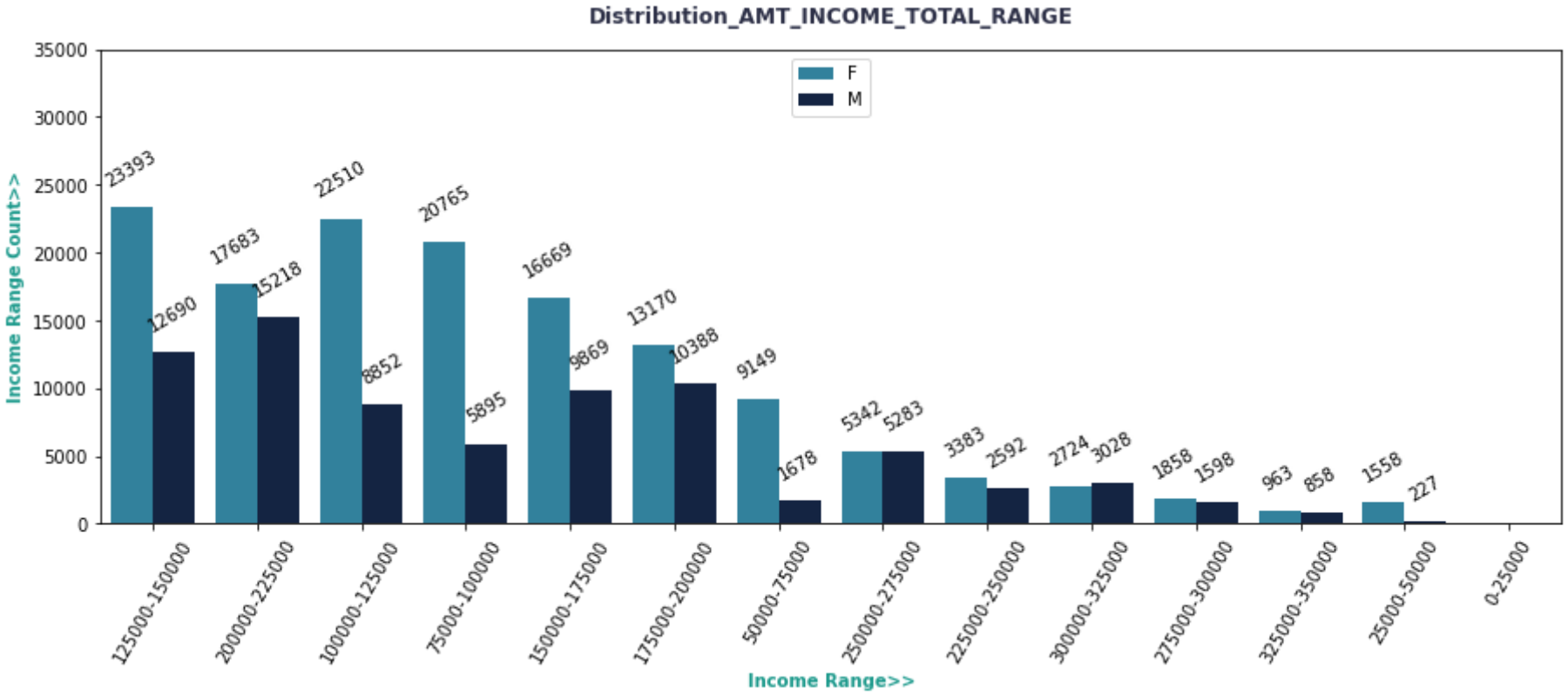
Income Type wise count

In [30]:
```
plt.figure(figsize=(15,5))
c={'F':'#208AAE',
  'M':'#0D2149'}
ax =sns.countplot(data=df0,x='NAME_INCOME_TYPE',order=df0['NAME_INCOME_TYPE'].value_counts().index,hue='CODE_GENDER',palette=c)
#ax = sns.countplot(x='User', hue='C', data=df)
for container in ax.containers:
    ax.bar_label(container,color='black',weight='normal',rotation=10,padding=10)
plt.legend(loc=9)
plt.xticks(rotation=10)
plt.yticks(np.arange(0,df0['NAME_INCOME_TYPE'].value_counts()[0],20000))
plt.title("Distribution of Income Type",pad=15,fontdict={'weight':'bold','color':'#2D3047'})
plt.ylabel("NAME_INCOME_TYPE_COUNT>>",fontdict={'weight':'bold','color':'#1B998B'})
plt.xlabel("INCOME_TYPE>>",fontdict={'weight':'bold','color':'#1B998B'})
plt.show()
```



Income range wise count

In [31]:
```
plt.figure(figsize=(15,5))
c={'F':'#208AAE',
  'M':'#0D2149'}
ax =sns.countplot(data=df0,x='AMT_INCOME_TOTAL_RANGE',order=df0['AMT_INCOME_TOTAL_RANGE'].value_counts().index,hue='CODE_GENDER'
#ax = sns.countplot(x='User', hue='C', data=df)
for container in ax.containers:
    ax.bar_label(container,color='black',weight='normal',rotation=30,padding=10)
plt.legend(loc=9)
plt.xticks(rotation=60)
plt.yticks(np.arange(0,df0['AMT_INCOME_TOTAL_RANGE'].value_counts()[0],5000))
plt.title("Distribution_AMT_INCOME_TOTAL_RANGE",pad=15,fontdict={'weight':'bold','color':'#2D3047'})
plt.ylabel("Income Range Count>>",fontdict={'weight':'bold','color':'#1B998B'})
plt.xlabel("Income Range>>",fontdict={'weight':'bold','color':'#1B998B'})

plt.show()
```



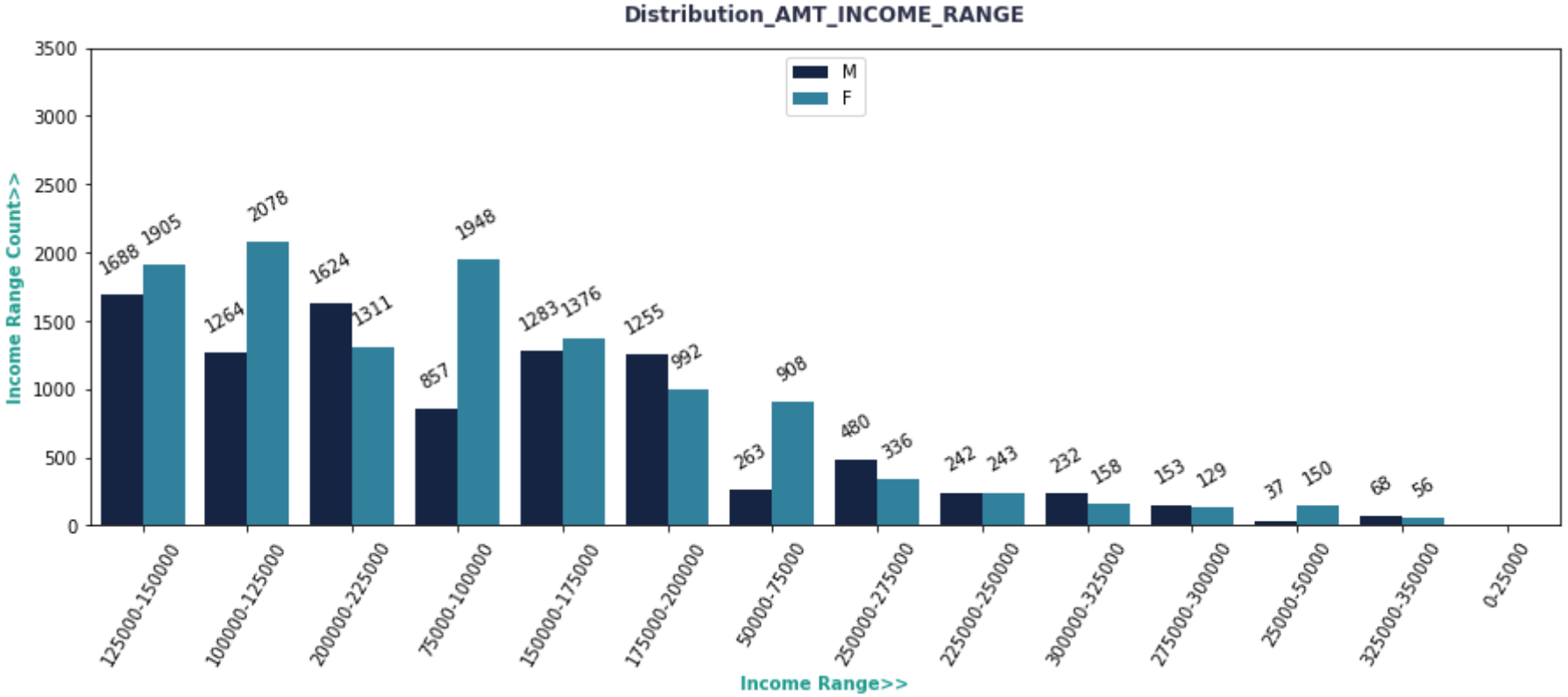
In [ ]:

TARGET (1) wise visualization

Income range wise count

In [32]:
```
plt.figure(figsize=(15,5))
c={'F':'#208AAE',
  'M':'#0D2149'}
ax =sns.countplot(data=df1,x='AMT_INCOME_TOTAL_RANGE',order=df1['AMT_INCOME_TOTAL_RANGE'].value_counts().index,hue='CODE_GENDER'
#ax = sns.countplot(x='User', hue='C', data=df)
for container in ax.containers:
    ax.bar_label(container,color='black',weight='normal',rotation=30,padding=10)
```

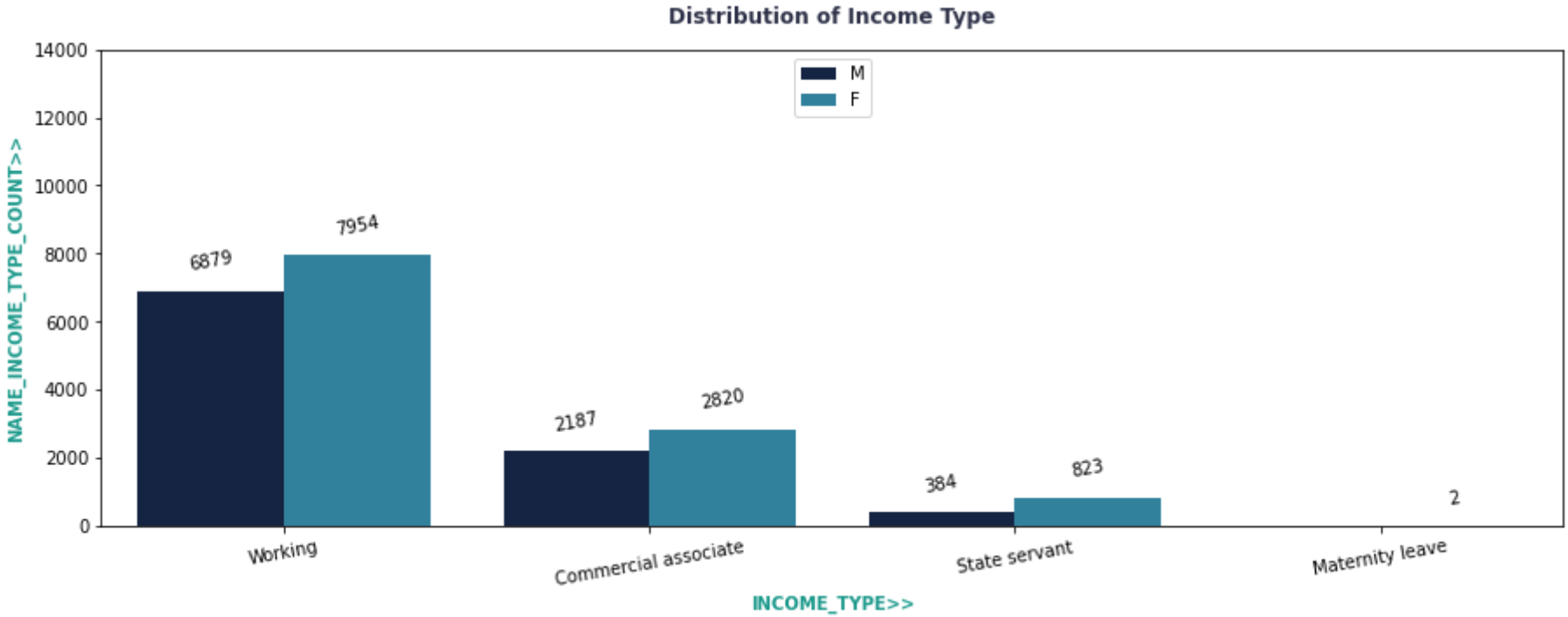
```
plt.legend(loc=9)
plt.xticks(rotation=60)
plt.yticks(np.arange(0,df1['AMT_INCOME_TOTAL_RANGE'].value_counts()[0],500))
plt.title("Distribution_AMT_INCOME_RANGE",pad=15,fontdict={'weight':'bold','color':'#2D3047'})
plt.ylabel("Income Range Count>>",fontdict={'weight':'bold','color':'#1B998B'})
plt.xlabel("Income Range>>",fontdict={'weight':'bold','color':'#1B998B'})

plt.show()
```



Income Type wise count

In [33]:
```
plt.figure(figsize=(15,5))
c={'F':'#208AAE',
  'M':'#0D2149'}
ax =sns.countplot(data=df1,x='NAME_INCOME_TYPE',order=df1['NAME_INCOME_TYPE'].value_counts().index,hue='CODE_GENDER',palette=c)
#ax = sns.countplot(x='User', hue='C', data=df)
```

```
for container in ax.containers:
    ax.bar_label(container,color='black',weight='normal',rotation=10,padding=10)
plt.legend(loc=9)
plt.xticks(rotation=10)
plt.yticks(np.arange(0,df1['NAME_INCOME_TYPE'].value_counts()[0],2000))
plt.title("Distribution of Income Type",pad=15,fontdict={'weight':'bold','color':'#2D3047'})
plt.ylabel("NAME_INCOME_TYPE_COUNT>>",fontdict={'weight':'bold','color':'#1B998B'})
plt.xlabel("INCOME_TYPE>>",fontdict={'weight':'bold','color':'#1B998B'})
plt.show()
```



In [ ]: