

In [15]:

```
import warnings
warnings.filterwarnings("ignore")
```

In [16]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

In [39]:

```
from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
from statsmodels.tsa.arima_model import ARIMA
```

In [40]:

```
df = pd.read_csv('/content/Airline_Passangers.csv')
df.isnull().sum()
```

Out[40]:

```
Month          0
Passengers     0
dtype: int64
```

In [41]:

```
df.head(3)
```

Out[41]:

	Month	Passengers
0	1949-01	112
1	1949-02	118
2	1949-03	132

In [42]:

```
print('df shape: ',df.shape)
print('df columns:', df.columns)
```

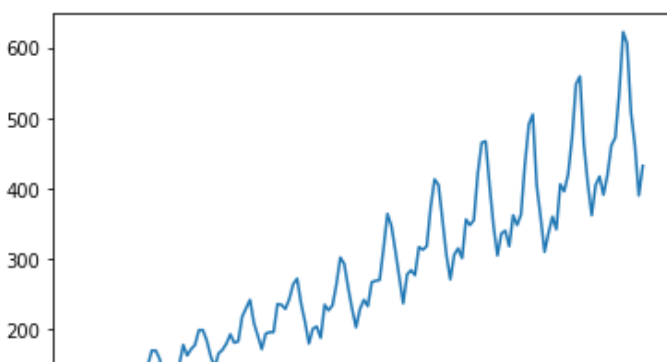
```
df shape: (144, 2)
df columns: Index(['Month', 'Passengers'], dtype='object')
```

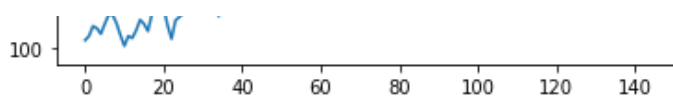
In [43]:

```
df.Passengers.plot()
```

Out[43]:

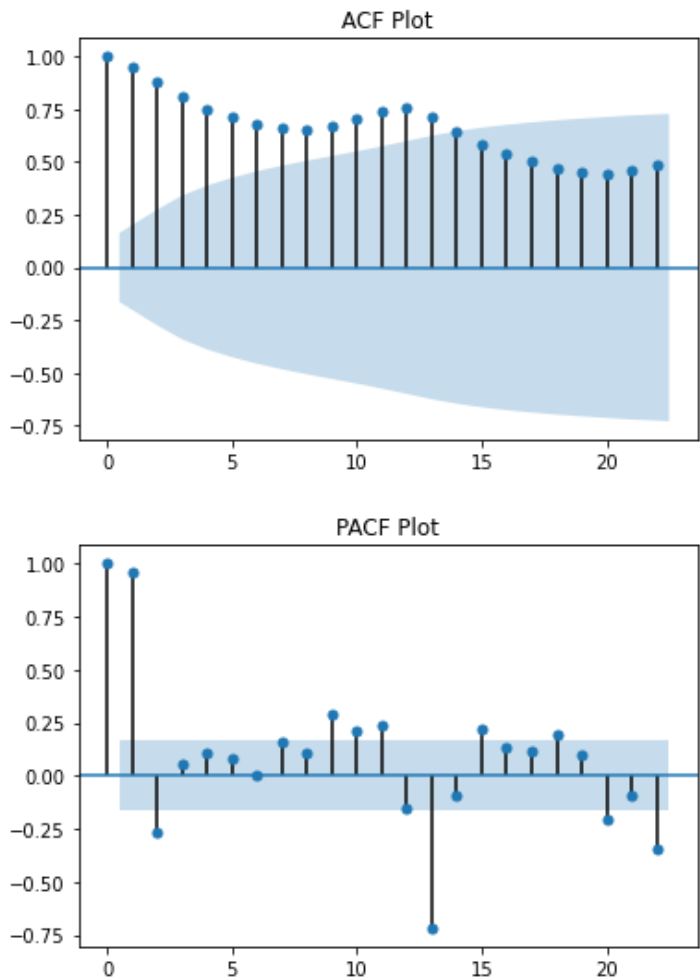
<matplotlib.axes._subplots.AxesSubplot at 0x7f189958f590>





In [44]:

```
acf = plot_acf(df.Passengers, title = 'ACF Plot')
pacf = plot_pacf(df.Passengers, title = 'PACF Plot')
```



Observations:

- ACF reduces to 0 slowly after first few 'q' lags
- PACF reduces to 0 immediately after p = 1 lag

Hence, we choose [p,d,q] = [0,0,1] -> MA method

In [58]:

```
pdq = (0,0,1)
```

In [69]:

```
model = ARIMA(df.Passengers, order = (0,0,1))
```

In [70]:

```
ma_model = model.fit()
ma_model.summary2()
```

Out[70]:

Model:	ARMA	BIC:	1627.7720
Dependent Variable:	Passengers	Log-Likelihood:	-806.43
Date:	2022-08-28 22:38	Scale:	1.0000

No. Observations:	144	Method:	css-mle
Df Model:	2	Sample:	0
Df Residuals:	142		4
Converged:	1.0000	S.D. of innovations:	64.849
No. Iterations:	7.0000	HQIC:	1622.483
AIC:	1618.8625		

	Coef.	Std.Err.	t	P> t	[0.025	0.975]
const	280.6467	10.5788	26.5291	0.0000	259.9126	301.3808
ma.L1.Passengers	0.9642	0.0214	45.0583	0.0000	0.9223	1.0062

	Real	Imaginary	Modulus	Frequency
MA.1	-1.0371	0.0000	1.0371	0.5000

In [71]:

```
ma_model.pvalues
```

Out[71]:

```
const          4.474615e-155
ma.L1.Passengers  0.000000e+00
dtype: float64
```

Since, p-value < 0.05, Therefore MA 1 (Lag q = 1 of ACF) is significant

In [104]: