

```
In [1]: import numpy as np
        from statsmodels.tsa.stattools import acf
        from statsmodels.graphics.tsaplots import plot_acf
        import matplotlib.pyplot as plt
```

```
In [2]: ts = []
        var_acfs = []
        by_ts = []

        for t in range(500, 2500, 3):
            acfs = []
            for i in range(500):
                y = np.random.normal(0, 1, t)
                acfs.append(acf(y))

            acfs = np.array(acfs)
            var_acfs.append(np.var(acfs, axis=0))

            by_ts.append(1/t)
            ts.append(t)
```

```
/usr/local/anaconda3/envs/pTSA/lib/python3.8/site-packages/statsmodels/
tsa/stattools.py:652: FutureWarning: The default number of lags is chan
ging from 40 to min(int(10 * np.log10(nobs)), nobs - 1) after 0.12 is rel
eased. Set the number of lags to an integer to silence this warning.
```

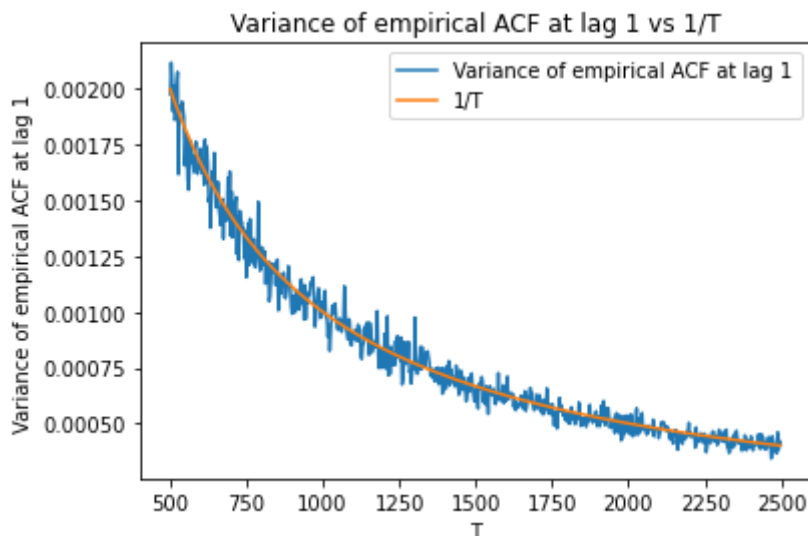
```
warnings.warn(
/usr/local/anaconda3/envs/pTSA/lib/python3.8/site-packages/statsmodels/
tsa/stattools.py:662: FutureWarning: fft=True will become the default a
fter the release of the 0.12 release of statsmodels. To suppress this w
arning, explicitly set fft=False.
warnings.warn(
```

```
In [3]: np.array(var_acfs).shape
```

```
Out[3]: (667, 41)
```

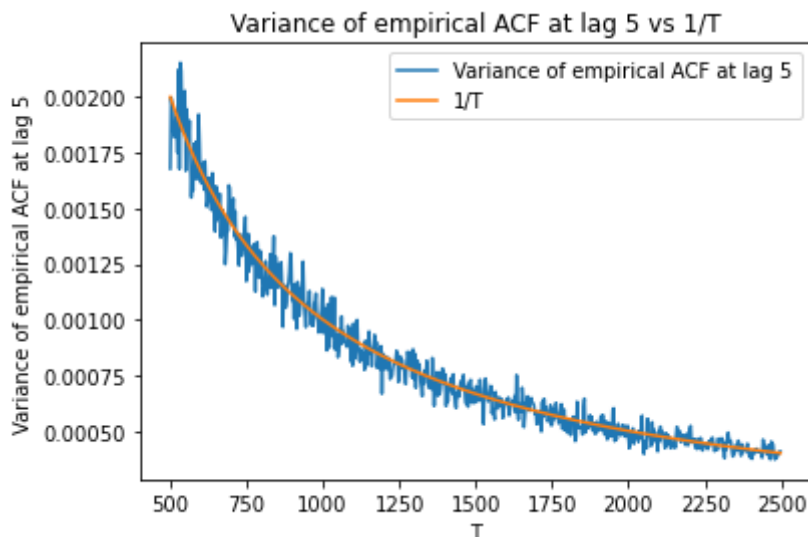
```
In [4]: h=1
plt.plot(ts, np.array(var_acfs).T[h], label=f'Variance of empirical ACF
        at lag {h}')
plt.plot(ts, by_ts, label='1/T')
plt.title(f'Variance of empirical ACF at lag {h} vs 1/T')
plt.xlabel('T')
plt.ylabel(f'Variance of empirical ACF at lag {h}')
plt.legend()
```

Out[4]: <matplotlib.legend.Legend at 0x7f8ee4cc9d90>



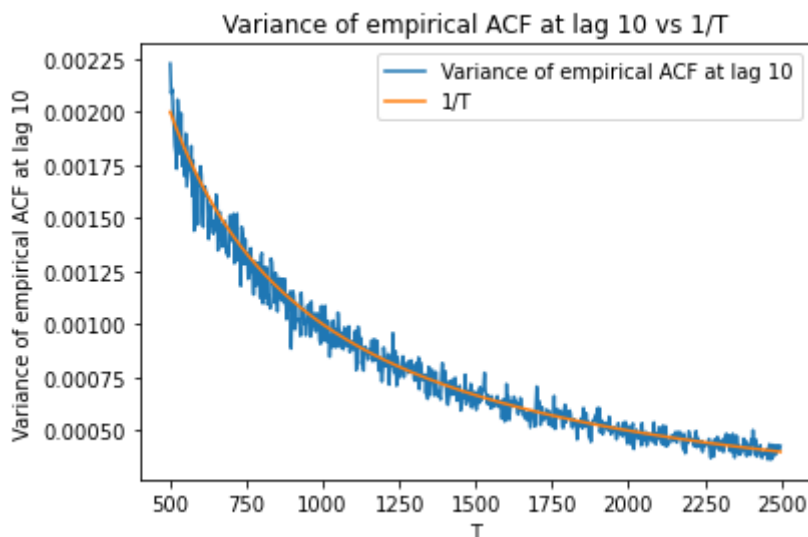
```
In [5]: h=5
plt.plot(ts, np.array(var_acfs).T[h], label=f'Variance of empirical ACF
        at lag {h}')
plt.plot(ts, by_ts, label='1/T')
plt.title(f'Variance of empirical ACF at lag {h} vs 1/T')
plt.xlabel('T')
plt.ylabel(f'Variance of empirical ACF at lag {h}')
plt.legend()
```

Out[5]: <matplotlib.legend.Legend at 0x7f8ee4e58b80>



```
In [6]: h=10
plt.plot(ts, np.array(var_acfs).T[h], label=f'Variance of empirical ACF
at lag {h}')
plt.plot(ts, by_ts, label='1/T')
plt.title(f'Variance of empirical ACF at lag {h} vs 1/T')
plt.xlabel('T')
plt.ylabel(f'Variance of empirical ACF at lag {h}')
plt.legend()
```

Out[6]: <matplotlib.legend.Legend at 0x7f8ee4e6c700>



```
In [7]: h=20
plt.plot(ts, np.array(var_acfs).T[h], label=f'Variance of empirical ACF
at lag {h}')
plt.plot(ts, by_ts, label='1/T')
plt.title(f'Variance of empirical ACF at lag {h} vs 1/T')
plt.xlabel('T')
plt.ylabel(f'Variance of empirical ACF at lag {h}')
plt.legend()
```

Out[7]: <matplotlib.legend.Legend at 0x7f8ee523d8e0>

