MONASH University

ETC3450 — Time Series Econometrics

Assignment 2

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BUSINESS
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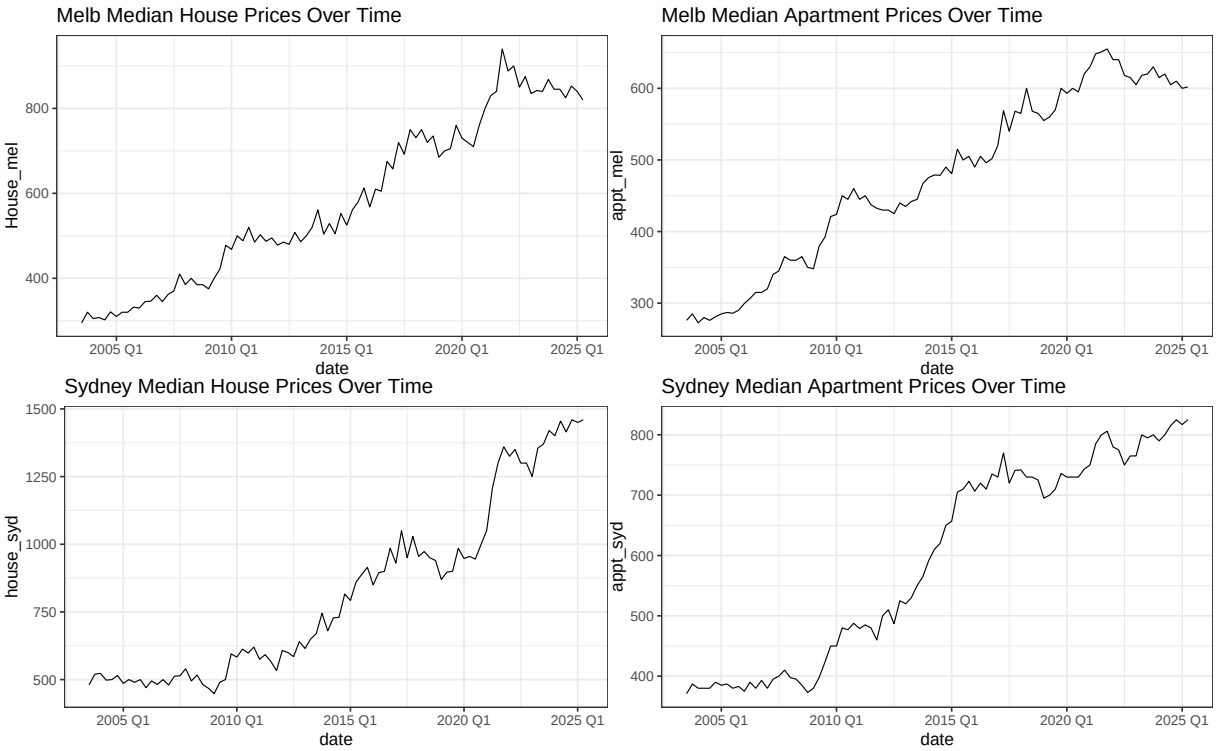
1 Stationarity:

Determine whether series are stationary (use visualisation and hypothesis tests)



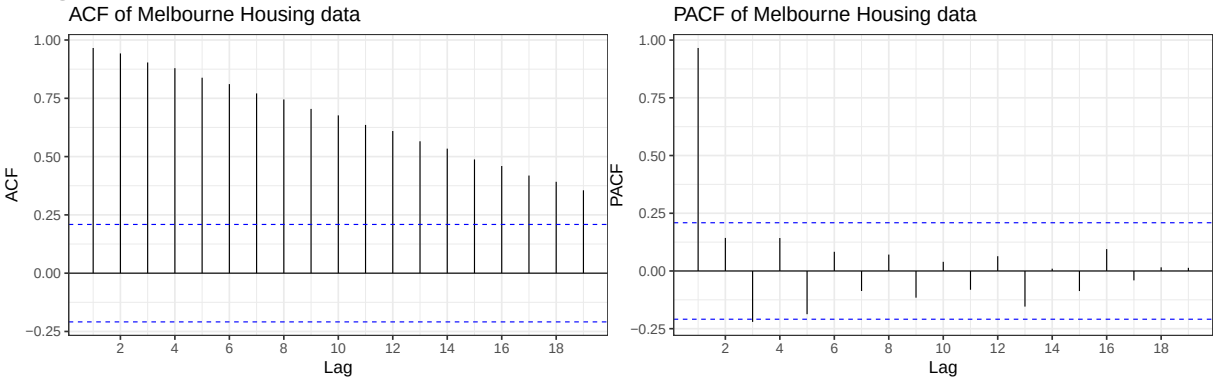
Visually, all series look non-stationary as their means are clearly time dependent and all series exhibit an upwards trend. Doesn't seem to be any seasonality.

1.1 Formal Hypothesis tests

Melbourne Housing Prices

For the ADF test: The τ statistic was given as -0.6, which is greater than the critical value of -2.89 at the 5% significance level. Thus, we fail to reject H_0 and conclude that the series may have a unit root and differencing is necessary.

For the KPSS test: the p-value was given as 0.01, so we reject the null in favour of the series being non stationary, which supports the conclusion from the ADF test.



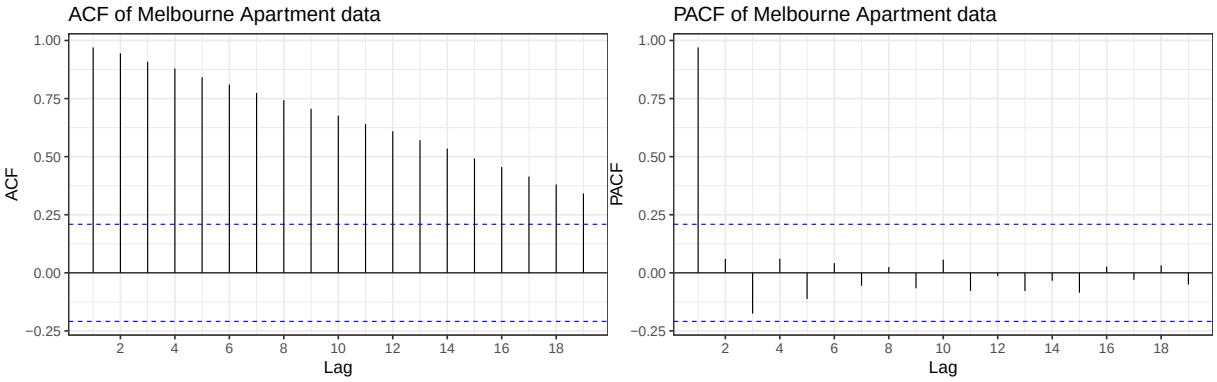
a: *The ACF has very slow decay, indicating non stationarity.*

b: *Significant spike at lag* 1 *in PACF indicates we use* 1 *lag for an ADF test.*

Figure 1: *ACF and PACF plots of Melbourne housing prices*

From the PACF, the strong spike at lag 1 suggests the presence of persistence in the series, which is consistent with non-stationary behaviour. Combined with formal unit root tests, this indicates that the series likely becomes stationary after first order differencing. Therefore, the Melbourne housing series is likely $I(1)$.

Melbourne Apartment Prices

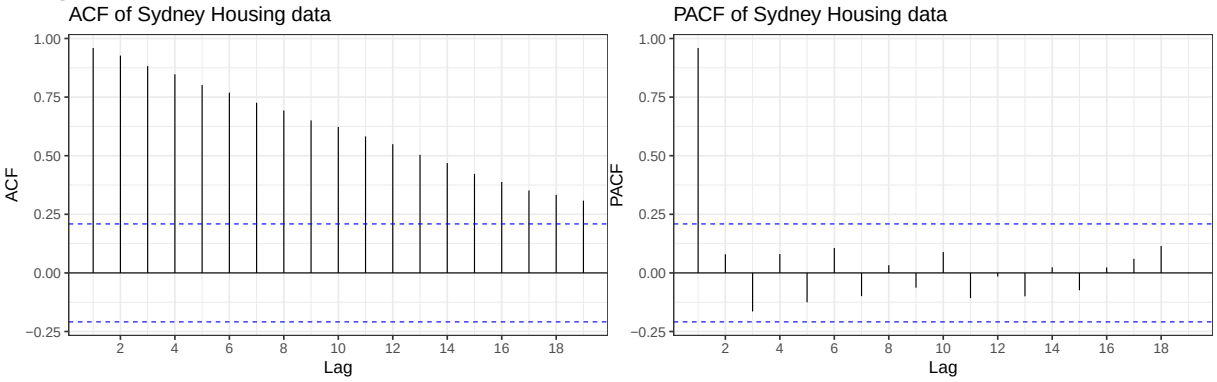


For the ADF test: The τ statistic was given as -1.35, which is greater than the critical value of -2.89 at the 5% significance level. Thus, we fail to reject H_0 and conclude that the series may have a unit root and differencing is necessary.

For the KPSS test: the p-value was given as 0.01, so we reject the null in favour of the series being non stationary, which supports the conclusion from the ADF test.

From the PACF, the strong spike at lag 1 suggests the presence of persistence in the series, which is consistent with non-stationary behaviour. Combined with formal unit root tests, this indicates that the series likely becomes stationary after first differencing. Therefore, the Melbourne apartment series is likely $I(1)$.

Assignment 2



a **b**

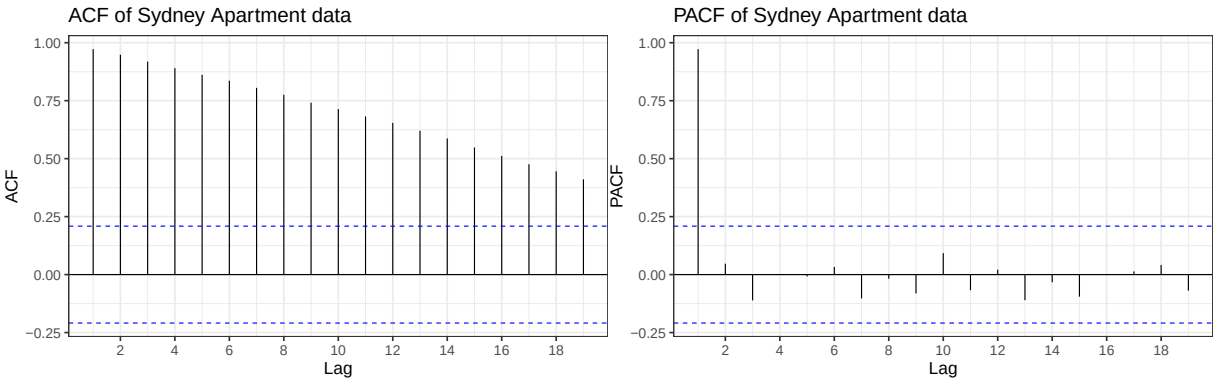
Sydney Housing Prices

For the ADF test: The τ statistic was given as 1.07, which is greater than the critical value of −2.89 at the 5% significance level. Thus, we fail to reject H_0 and conclude that the series may have a unit root and differencing is necessary.

For the KPSS test: the p-value was given as 0.01, so we reject the null in favour of the series being non stationary, which supports the conclusion from the ADF test.

From the PACF, the strong spike at lag 1 suggests the presence of persistence in the series, which is consistent with non-stationary behaviour. Combined with formal unit root tests, this indicates that the series likely becomes stationary after first differencing. Therefore, the Sydney housing series is likely $I(1)$.

Sydney Apartment Prices



For the ADF test: The τ statistic was given as −0.2, which is greater than the critical value of −2.89 at the 5% significance level. Thus, we fail to reject H_0 and conclude that the series may have a unit root and differencing is necessary.

For the KPSS test: the p-value was given as 0.01, so we reject the null in favour of the series being non stationary, which supports the conclusion from the ADF test.

From the PACF, the strong spike at lag 1 suggests the presence of persistence in the series, which is consistent with non-stationary behaviour. Combined with formal unit root tests, this indicates that the series likely becomes stationary after first differencing. Therefore, the Sydney apartment series is likely $I(1)$.

1.2 Conclusion on Stationarity:

All series are determined to be non-stationary and have unit roots. All are integrated of order 1—$I(1)$; meaning that taking the first difference of each series should make each series stationary.