MONASH University

# ETC3450 — Time Series Econometrics

# Assignment 2

**Ari Gestetner**

**Nathan Giofkou**

**Mitchell Evans**

MONASH
BUSINESS
SCHOOL

**Department of Econometrics & Business Statistics**

**20 October 2025**

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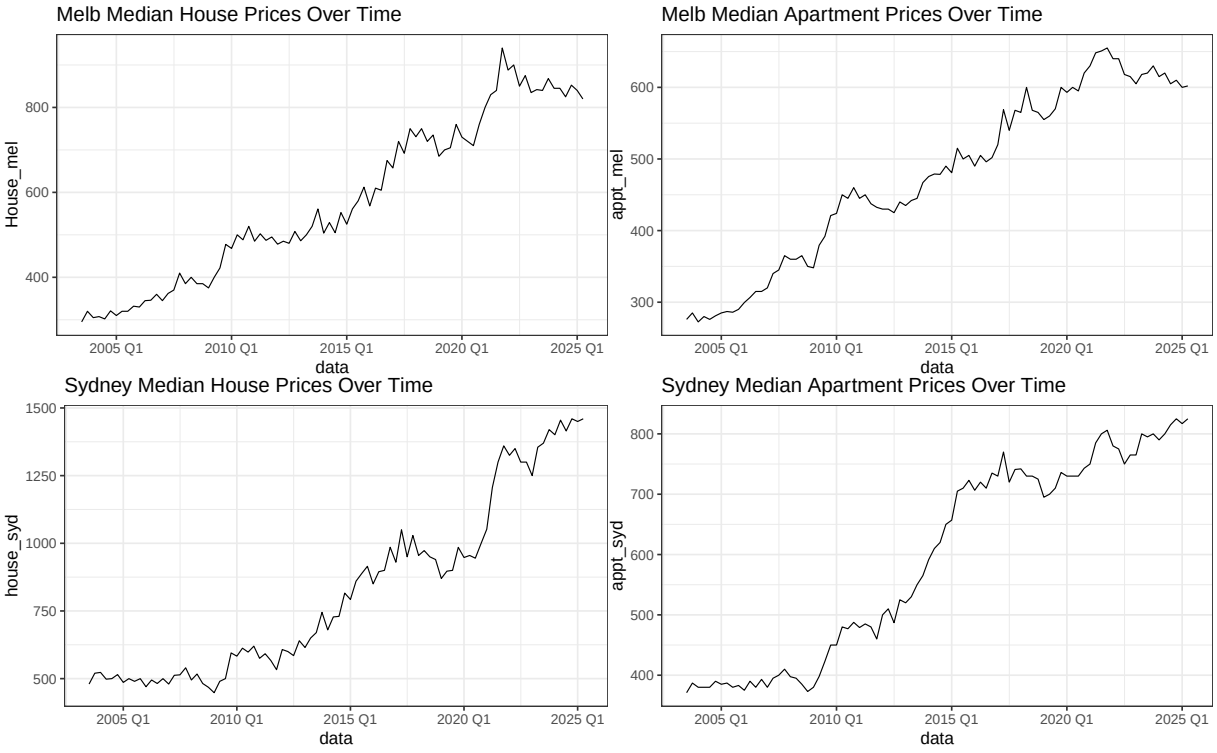
# 1 Housing Data: Time Series Properties

## 1.1 Stationarity:

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



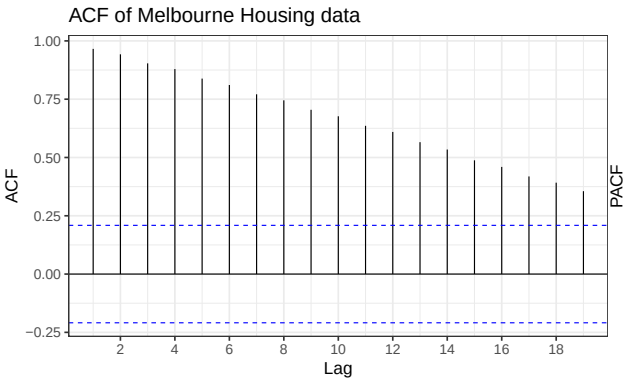

Visually, all series look non-stationary as their means are clearly time dependent and all series exhibit an upwards trend. Doesn't seem to be any seasonality.

## 1.2 Formal Hypothesis tests

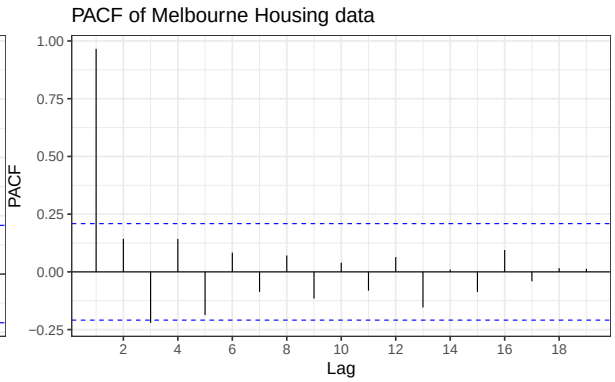
### Melbourne Housing Prices

For the ADF test: The $\tau$ 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.



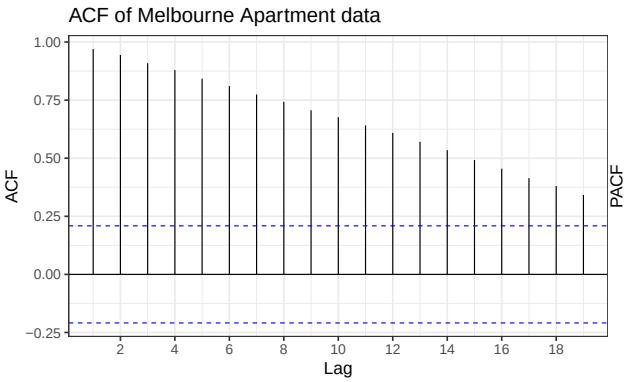

**(a)** *The ACF has very slow decay, indicating non stationarity.*



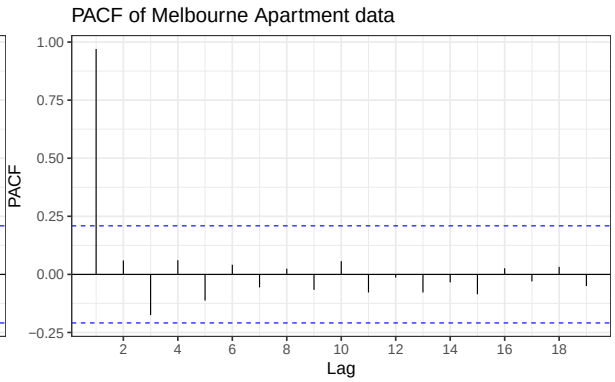

**(a)** *Significant spike at lag* 1 *in PACF indicates we use* 1 *lag for an ADF test.*

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 order differencing. Therefore, the Melbourne housing series is likely $I(1)$.

## Melbourne Apartment Prices




**(a)** *ACF/PACF Plots*




**(a)** *ACF/PACF Plots*

For the ADF test: The $\tau$ 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 $I(1)$.