MONASH University

ETC3450 — Time Series Econometrics

Assignment 2

Ari Gestetner

Nathan Giofkou

Mitchell Evans

MONASH
BUSINESS
SCHOOL

Department of Econometrics & Business Statistics

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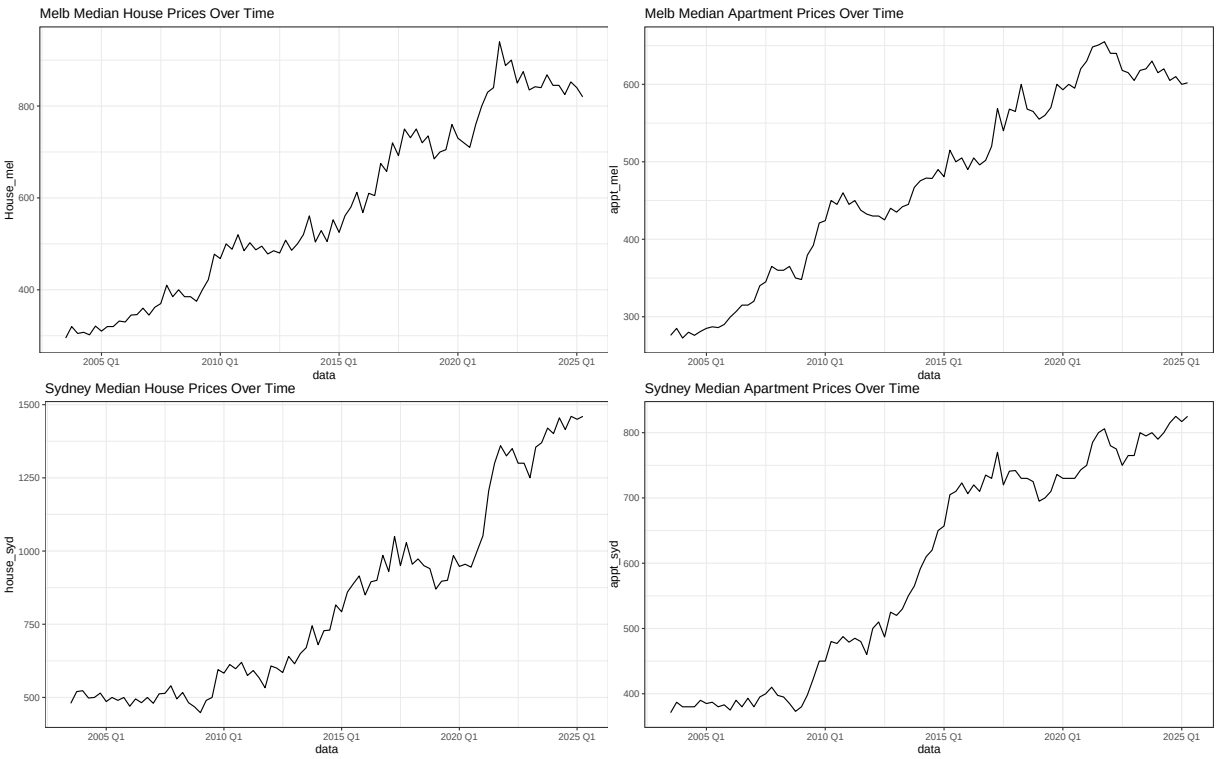
1 Housing Data: Time Series Properties

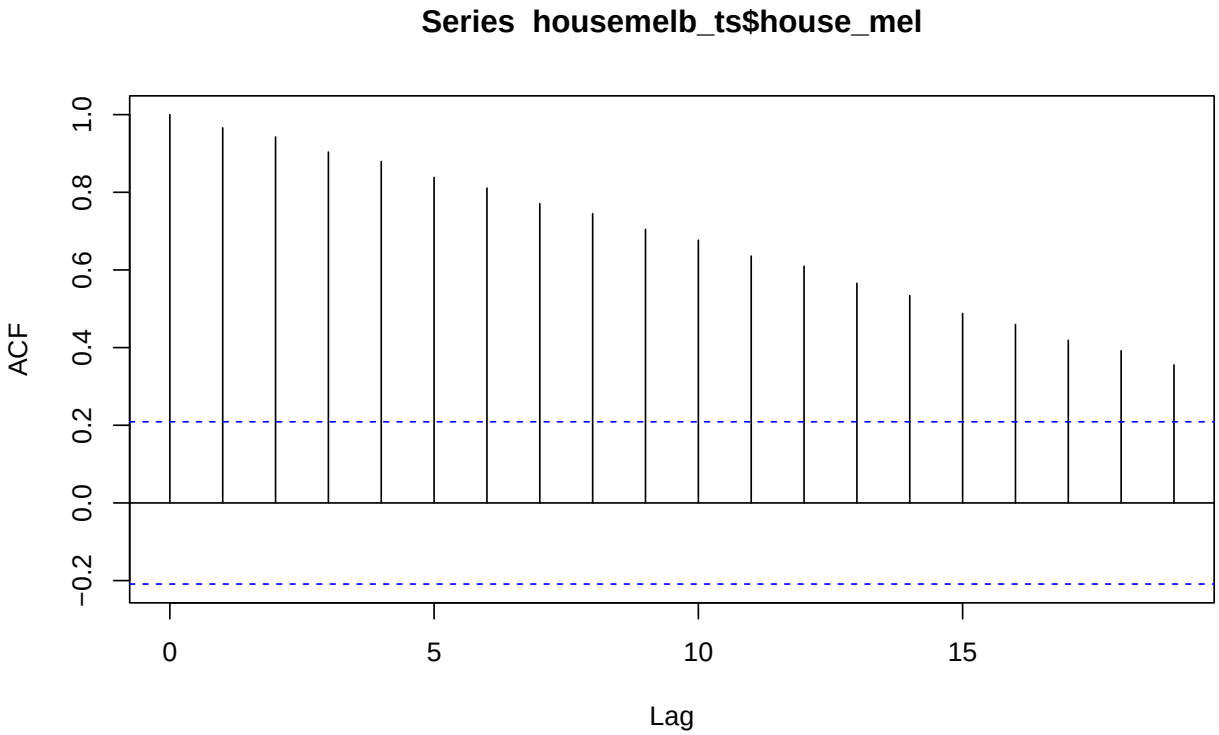
1.1 Stationarity:

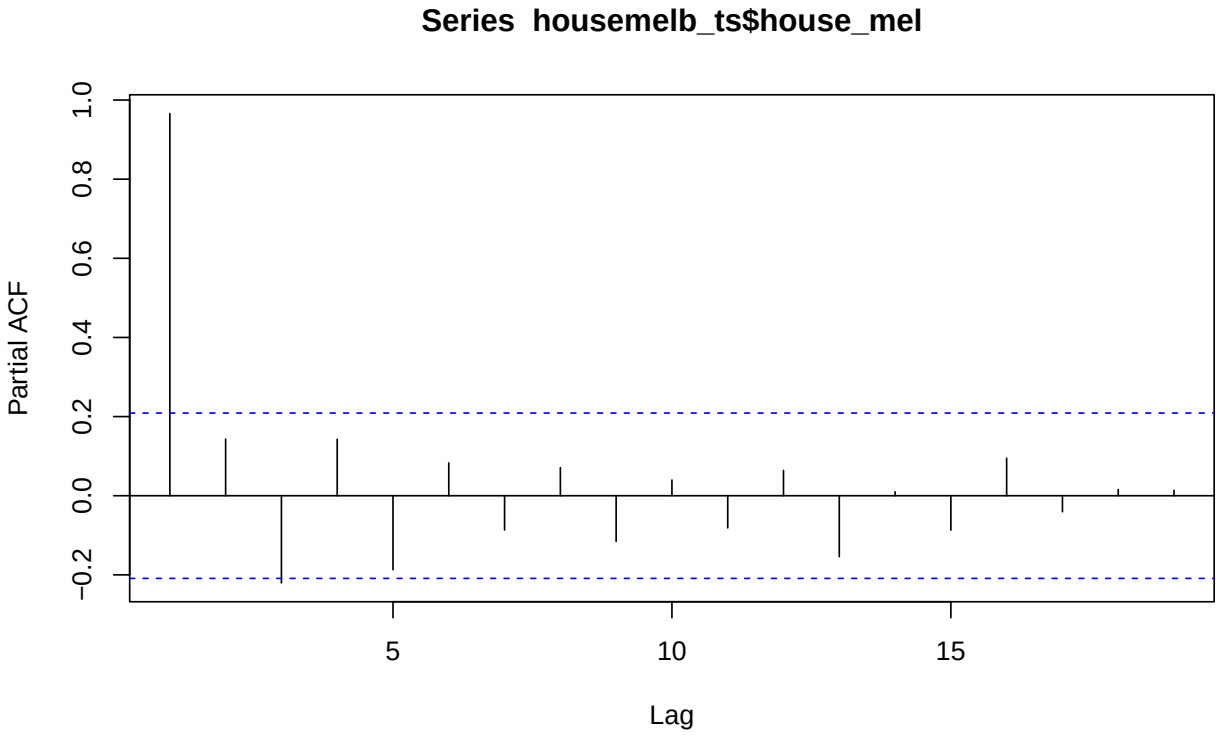
Determine whether series are stationary (use visualisation and hypothesis tests)



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



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##############################################
# Augmented Dickey-Fuller Test Unit Root Test #
##############################################


Test regression drift
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Call:
lm(formula = z.diff ~ z.lag.1 + 1 + z.diff.lag)

Residuals:
    Min      1Q  Median      3Q     Max
-50.347 -16.810  -6.335  13.624  98.301

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) 14.102910   9.283094   1.519    0.133
z.lag.1     -0.009238   0.015292  -0.604    0.547
z.diff.lag  -0.464417   0.097260  -4.775 7.64e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 26.64 on 83 degrees of freedom
Multiple R-squared:  0.222, Adjusted R-squared:  0.2032
F-statistic: 11.84 on 2 and 83 DF,  p-value: 2.993e-05



Value of test-statistic is: -0.6041 4.6527

Critical values for test statistics:
      1pct  5pct 10pct
tau2 -3.51 -2.89 -2.58
phi1  6.70  4.71  3.86


    KPSS Test for Level Stationarity

data:  na.omit(housemelb_ts$house_mel)
KPSS Level = 2.2331, Truncation lag parameter = 3, p-value = 0.01
```

Significant spike at lag 1 indicates we use 1 lag for an ADF test

Very slowly decays, indicating non stationarity

For the ADF test: The τ statistic was given as -0.60, which is greater than the critical value of -2.89 at the 5% significance level. Thus, we fail to reject H0 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 house_mel series is likely $I(1)$.