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Components of Time Series Data

Components of a Time Series

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The components of a time series are:

- **Level**
- **Trend**
- **Seasonal**
- **Cyclical**
- **Random**

The random component is the only non-systematic component

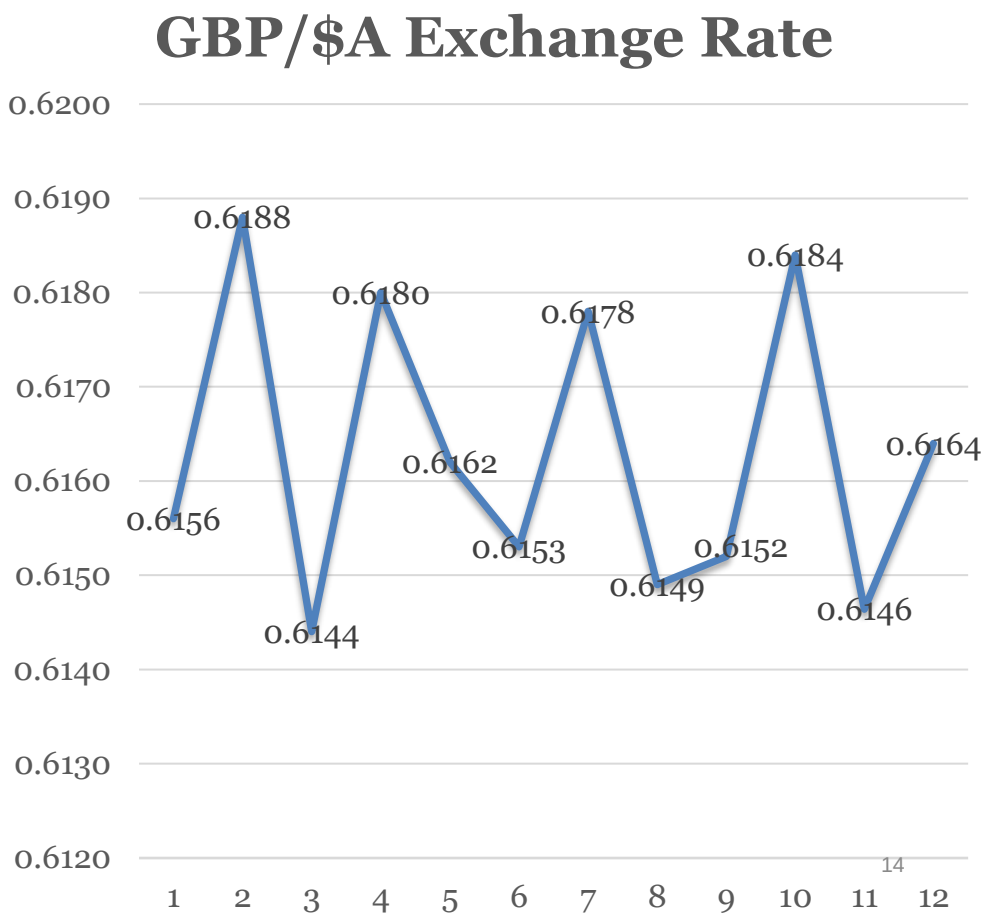
Level

Indicates the **underlying value** of the series on the vertical axis for a given time period.

The level of the time series **may be constant** over time or may change with the influence of the other components.

If the level **remains relatively constant over the entire time series a horizontal data pattern is observed**

Data: GBP/$A exchange rate
For 12 days in January 2017



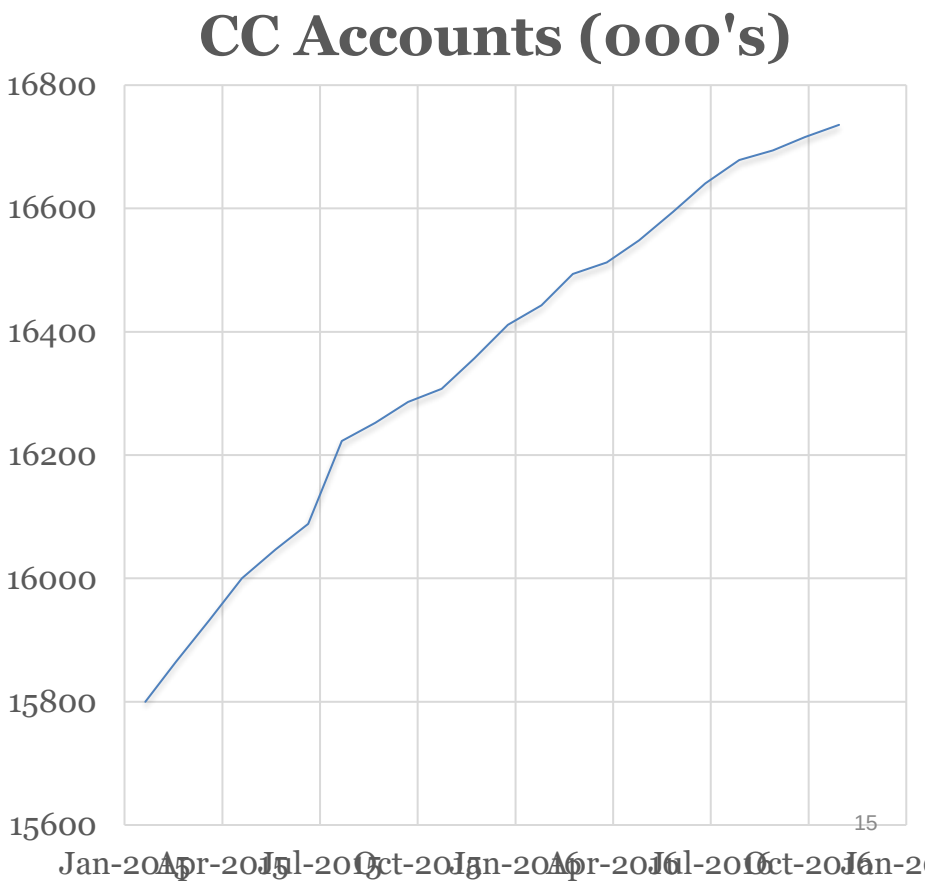
Trend

Tendency for the underlying level of the time series to **systematically increase or decrease** from period to period

The trend **need not be consistent** over the entire time series or linear.

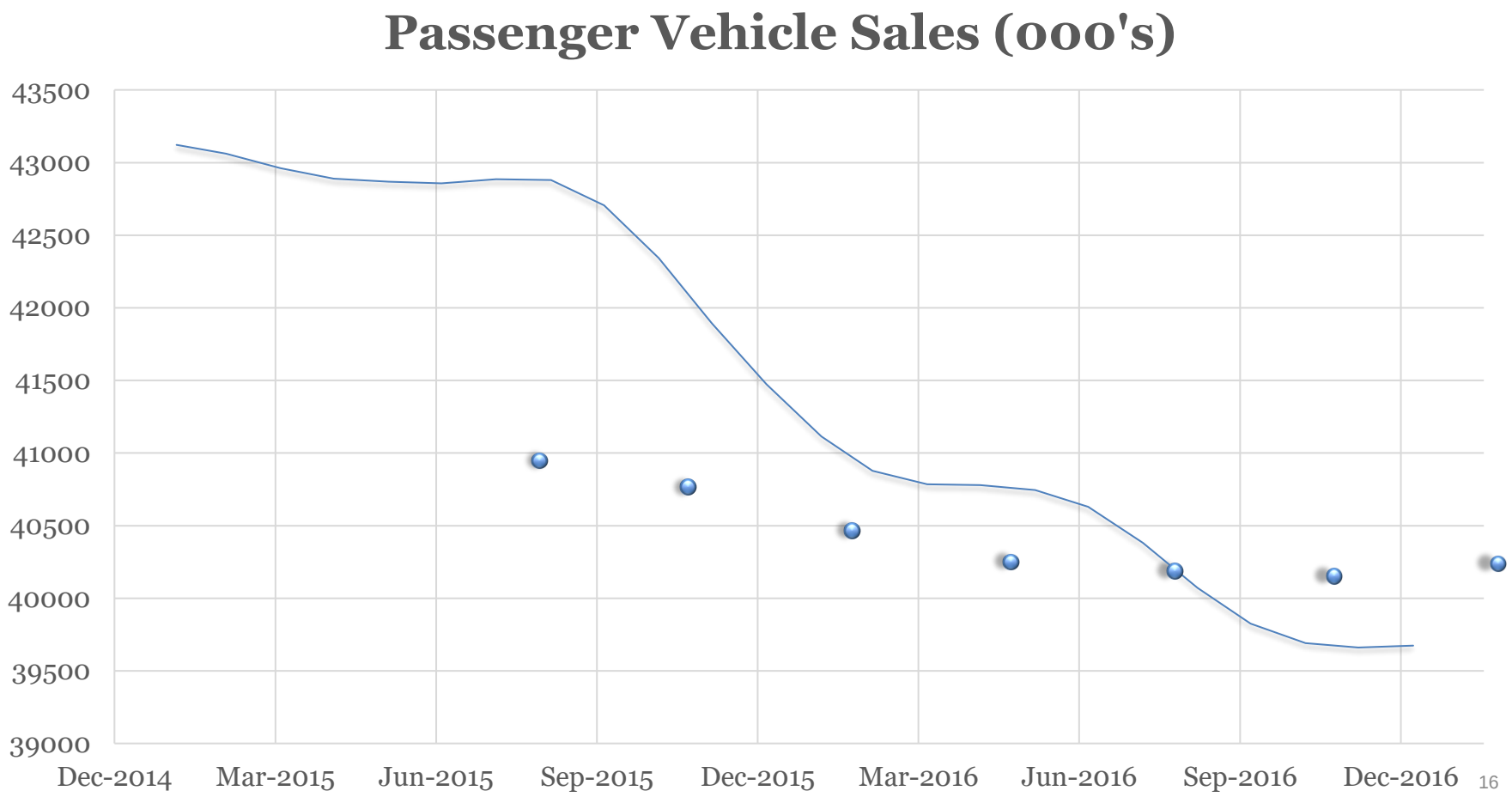
Trends are usually caused by **population changes, technology changes, market expansions etc.**

Data: Number of Credit Card Accounts (000s) monthly, Jan 2015 – Oct 2016



Further Trend Example

Data: Passenger Vehicle Sales (Australia), monthly 000's



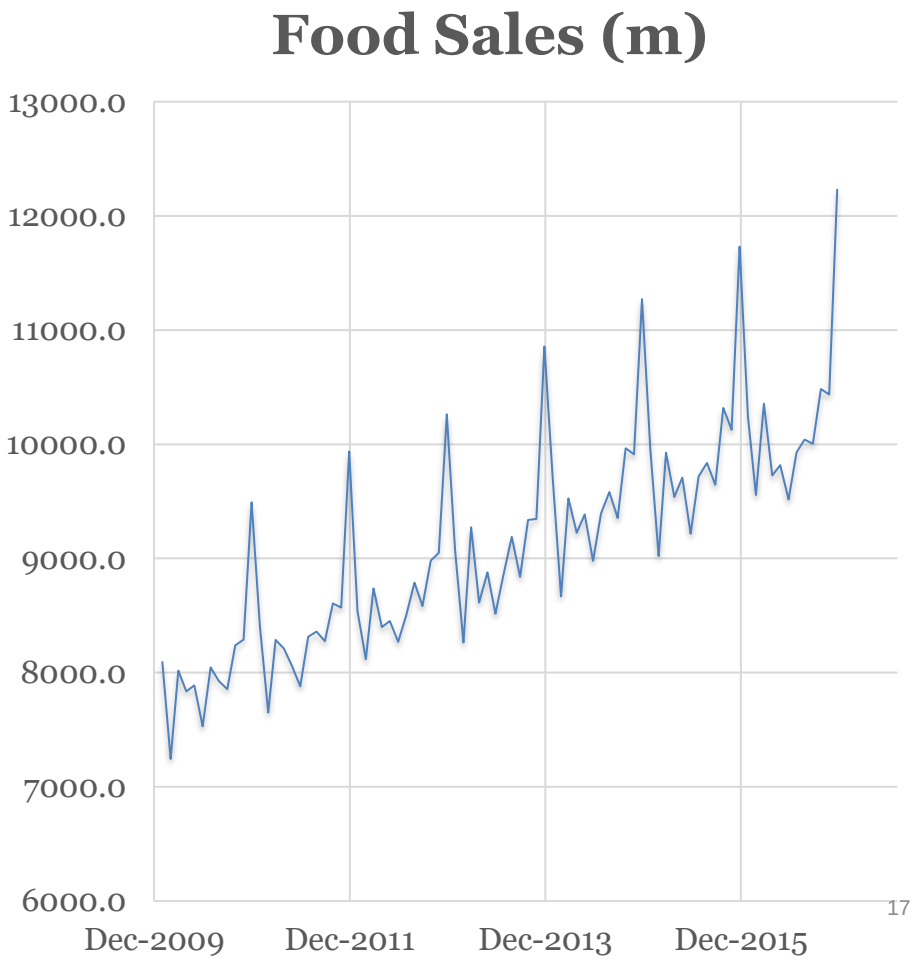
Seasonality

Systematic and repeatable fluctuations in the time series that usually occur within a **well defined time period** (year, week).

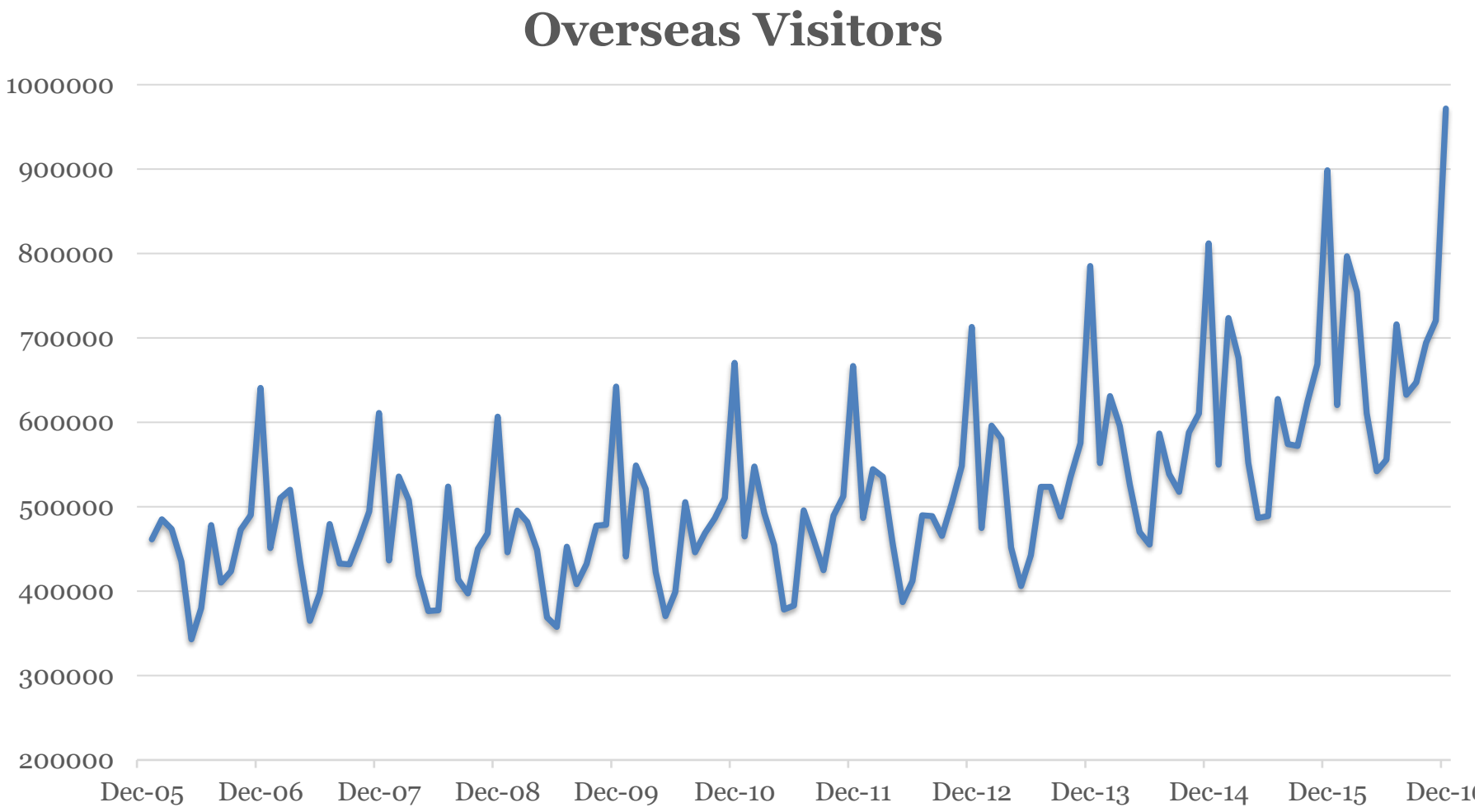
Fluctuations typically repeat themselves in **future iterations of the set time period**

Occurs due to **weather** or **institutional reasons** e.g.: holidays, special celebrations or accounting periods

Data: Food Sales ($m), NSW quarterly Jan-2010 to Dec-2016



Further Seasonal Example



Cyclical

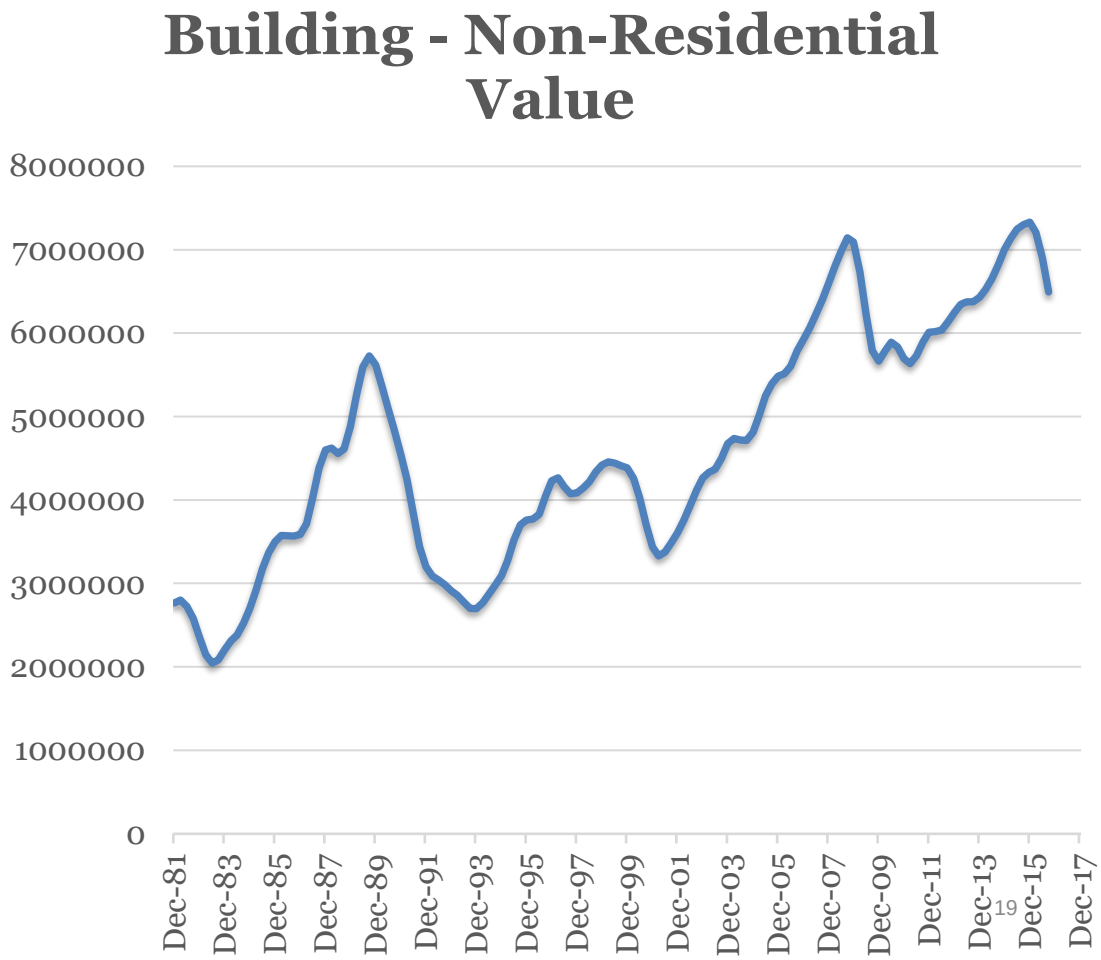
Similar to seasonal fluctuations but the cycle period is **not as regular as seasonality**

This makes the cyclical component **difficult to predict**

It is usually **subjectively assessed**

Generally the **economic cycle** will influence the cyclical behaviour of the series.

Data: Non-residential value, Aust. quarterly Dec-81 to Dec 16



Random

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The random component is **non-systematic** and **not able to be predicted** with any accuracy

Typically the random component incorporates effects on the time series that **cannot be explained by the variables** that influence the systematic components

Includes **one-off effects** such as introduction of GST, cataclysmic events (e.g.: **a tsunami**) or difficult to observe and quantify effects such as **confidence and security**

The extent of the random component will determine the **maximum level of forecast accuracy achievable**