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Interactive data visualisation in HMRC

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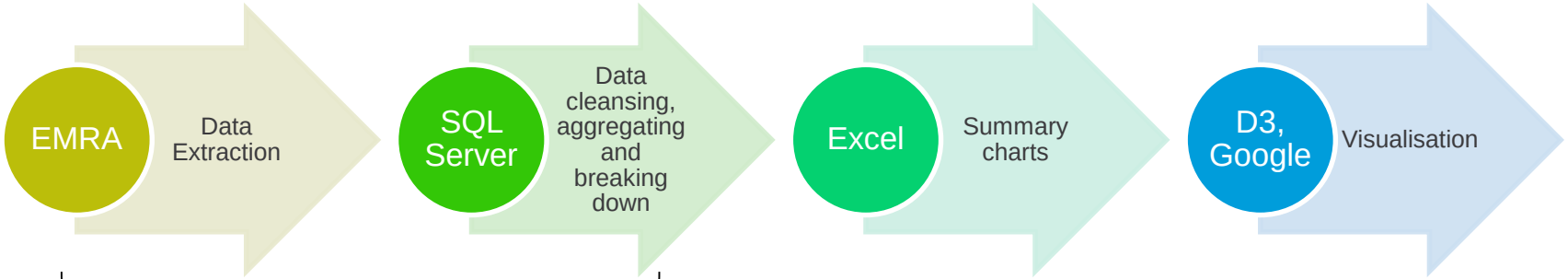
Using visualisations

- Today's showcase session covers:
  - Some D3 visualisation tools used for EMRA analysis internally, running in JavaScript.
  - Weaving R with HTML using R Studio, R Markdown, KnitR, and Leaflet applications to produce reproducible interactive HTML for external statistical publications.

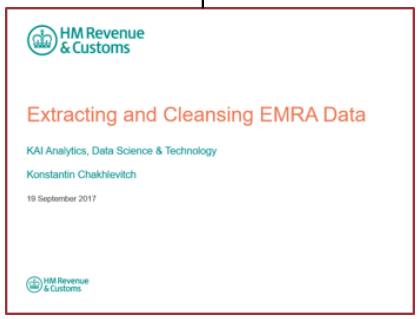
- To allow easier sharing with internal and external customers we have developed web services (Google tools / GitLab / GitHub) to host some of our applications.

EMRA Visualisations (1)

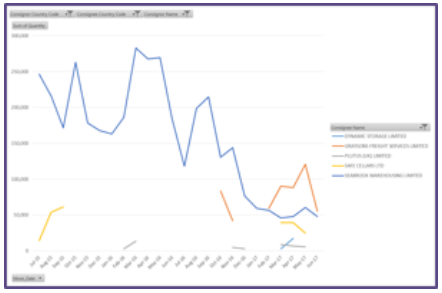
Process:



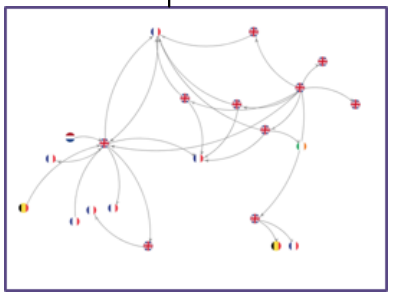
Products:



Documentation on best practice



Time Series charts



Supply Chain Visualisations

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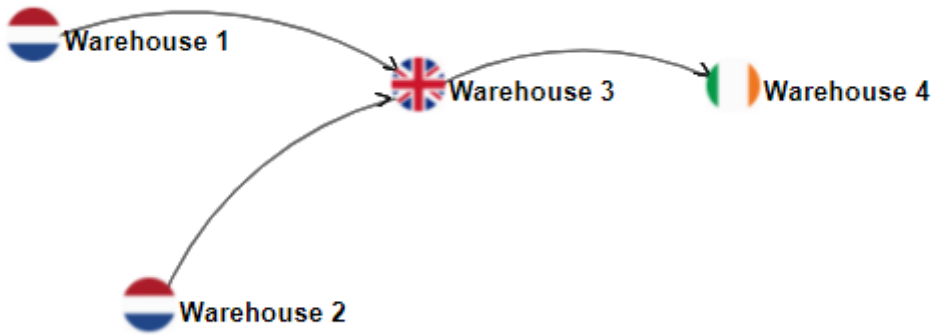
EMRA = "Excise Movement Risk Analysis"
– A tool developed by HMRC supporting bulk extracts of data from EU-wide **EMCS** system which tracks the movement of Excise goods (e.g. alcohol, tobacco, oils).

EMRA Visualisations (2)

- Cleaned data and JavaScript/D3 code hosted in Google Drive.
  - Allows easy sharing of visualisations and for us to restrict permissions to named individuals.

Source	sourceCountry	Target	targetCountry	Producer	Volume
Warehouse 1	NL	Warehouse 3	GB	BEER A	15360
Warehouse 1	NL	Warehouse 3	GB	BEER B	15760
Warehouse 2	NL	Warehouse 3	GB	WINE A	23988
Warehouse 2	NL	Warehouse 3	GB	BEER B	32640
Warehouse 3	GB	Warehouse 4	IE	WINE A	12480
Warehouse 3	GB	Warehouse 4	IE	WINE B	19600



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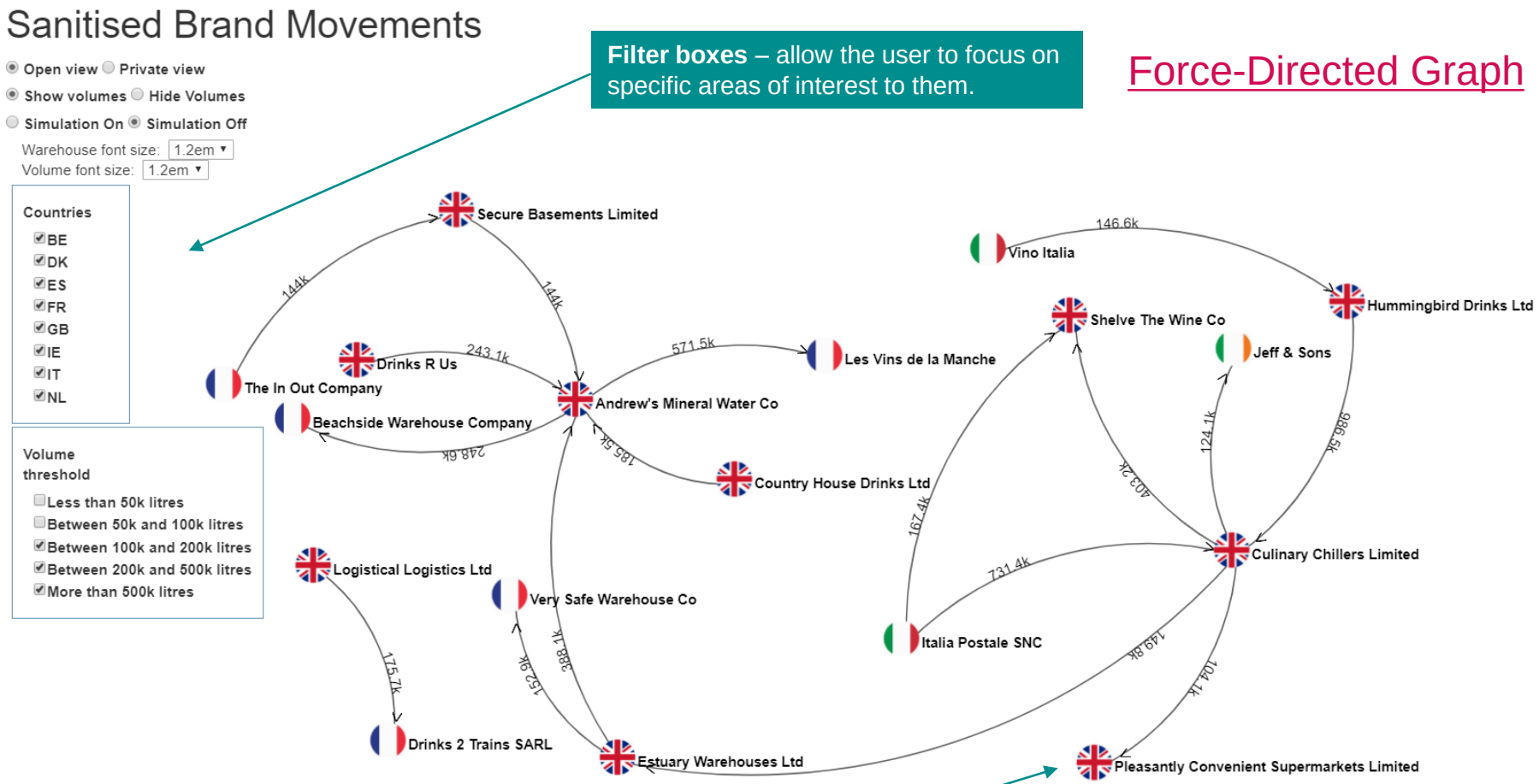
Interactive EMRA Visualisations (3)



Filter boxes – allow the user to focus on specific areas of interest to them.

Force-Directed Graph

Nodes and links – can be moved and positioned by the user to arrange into e.g. supply chains.

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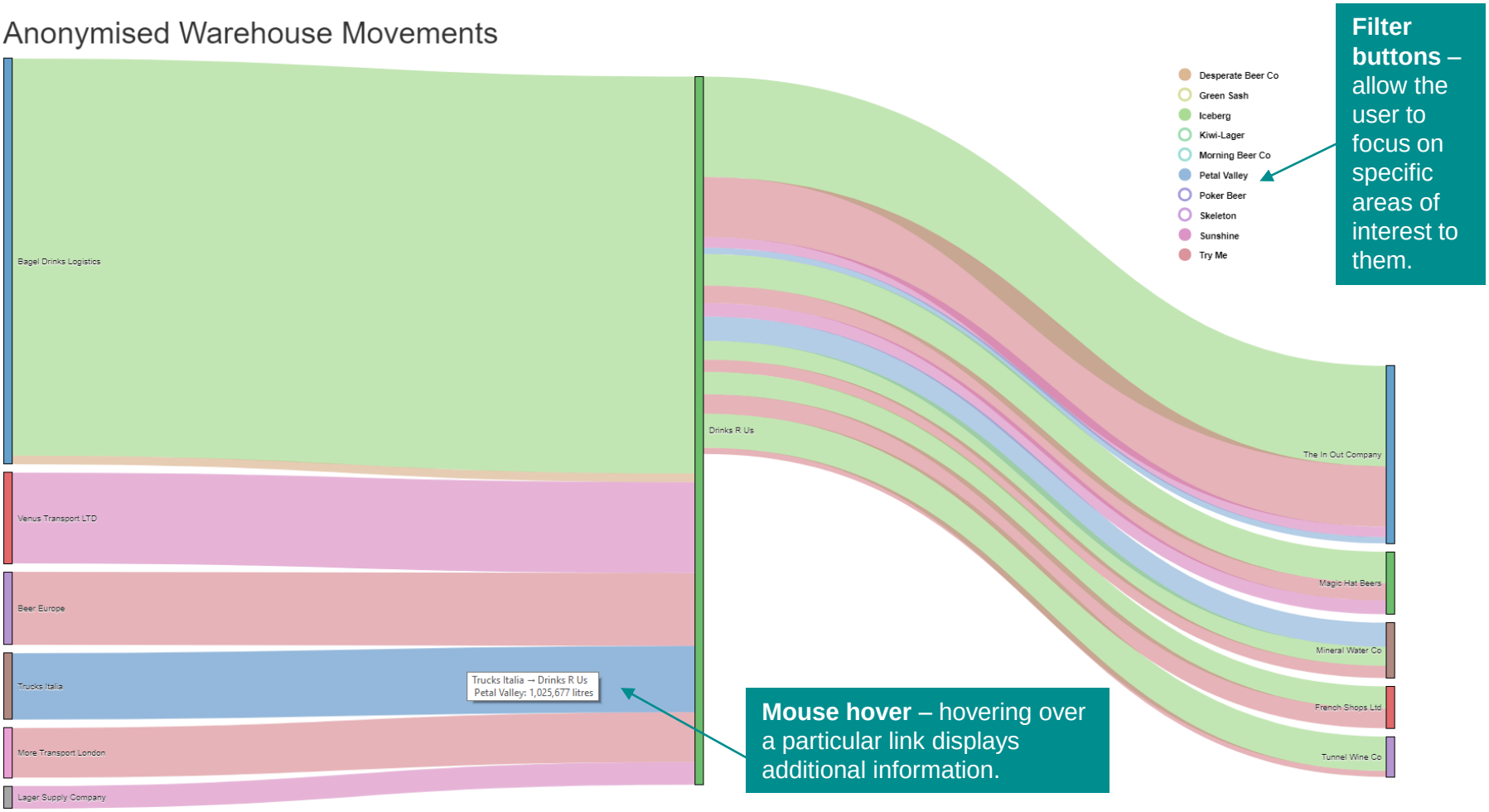
Interactive EMRA Visualisations (4)



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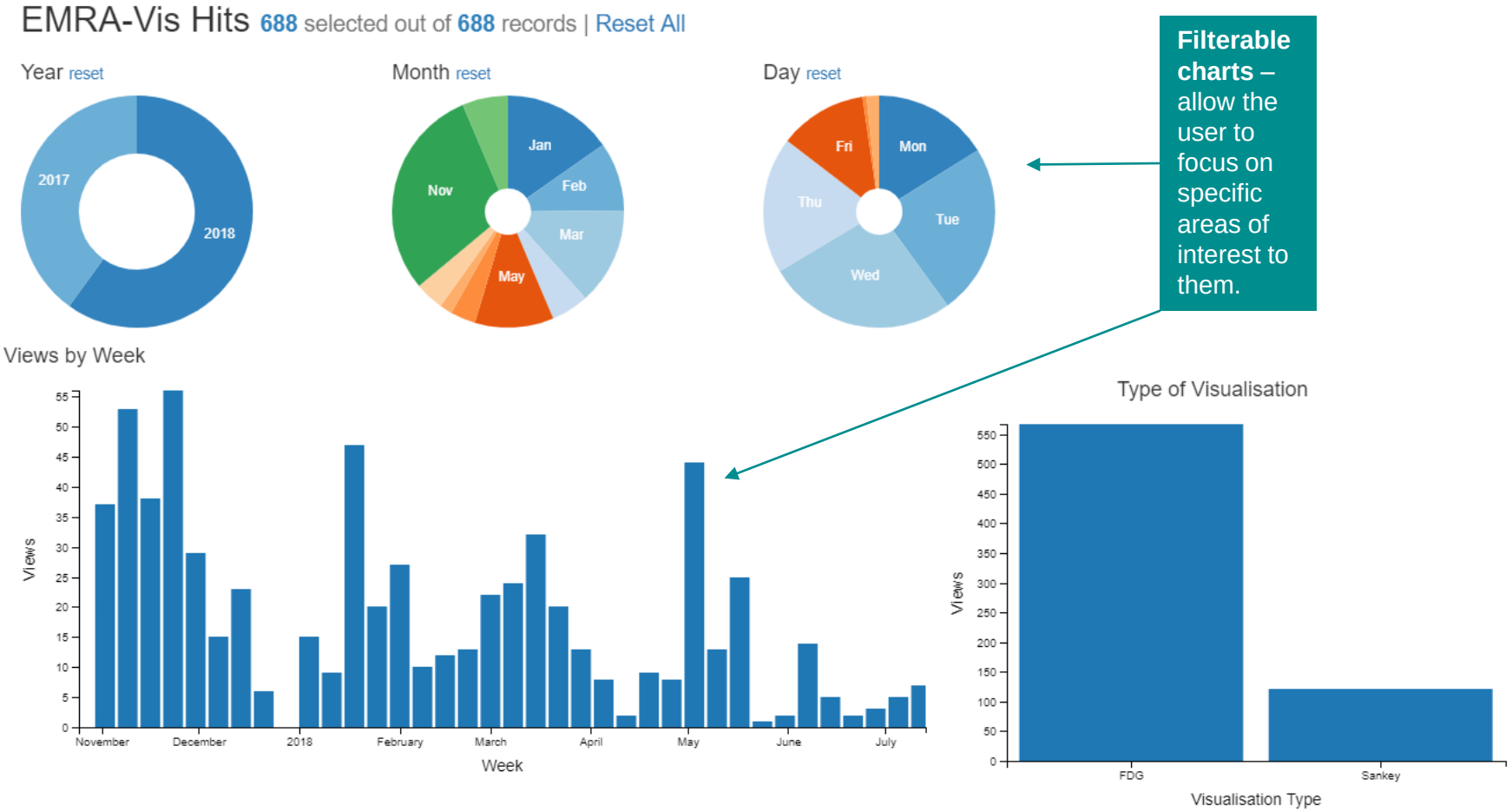
Sankey Diagram

Interactive EMRA Visualisations (5)



Filterable charts – allow the user to focus on specific areas of interest to them.

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[Usage Dashboard]

Dashboard allows us to keep track of which visualisations are being used and when.

Reproducible analysis for publications

Issues:

- Large number of national statistics published
- A very manual process (e.g. copy/paste) and time consuming
- Potential errors

Benefits:

- Collaborate on development and review
- Publish reproducible documents

Statistical software: R

- Comprehensive set of statistical libraries - KnitR library

R Studio

- Auto completion, indentation, highlighting
- Linked documentation
- Debugging tools

Version Control: Gitlab

- Allows collaboration between analysts
- Easily share, amend and reuse code

KnitR and R Markdown

KnitR:

- R library to unify statistical analysis and reporting
- Define R functions to produce analysis and outputs
- Documents (text, tables, graphics) are produced dynamically
- Write a mix of markdown and R code (R Markdown)
- Generate reports in .html, .docx, .pdf

R Markdown:

- Independent of R
- Simplified way of typesetting HTML

Knitting National Statistics

```
same = "similar to"
uk.res.no.yr.pct <- get_pct_chg(b=before, a=after, s=same, v=vals, t=1, r=1)

```

The seasonally adjusted estimate of the number of residential property transactions `r uk.res.sa.mth.pct` between `r get_mthyr(prev.month)` and `r get_mthyr(cur.month)`. This month's seasonally adjusted figure is `r uk.res.sa.yr.pct` the same month last year, `r uk.res.sa.yr.2.pct` transactions in `r get_mthyr(prev.2.year)`. Chart 1A shows the historic time series for residential property transactions.

Caution should be used making comparisons of transactions between `r get_mthyr(cur.month)` and `r get_mthyr(prev.year)` as some taxpayers may have changed their behaviour as they considered the result of the June 2017 General Election, and the EU referendum in June 2016.

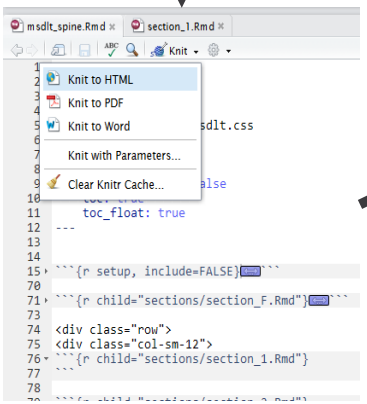
For `r get_mthyr(cur.month)` the number of non-adjusted residential transactions was about `r uk.res.no.mth.pct` `r get_mthyr(prev.month)`. The number of non-adjusted residential transactions was `r uk.res.no.yr.pct` `r get_mthyr(prev.year)`.

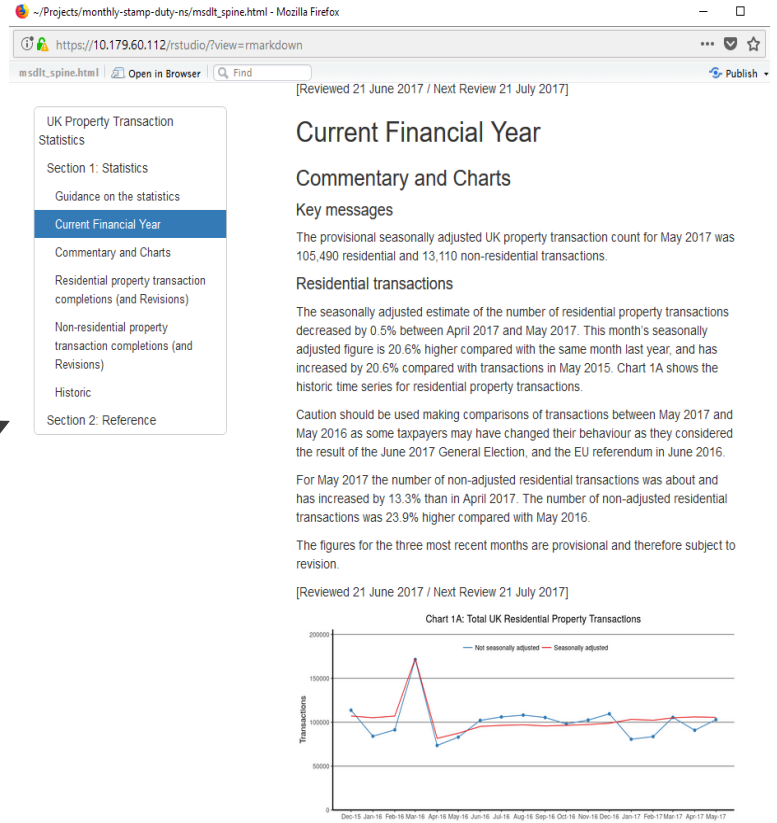
The figures for the three most recent months are provisional and therefore subject to revision.

[Reviewed `r get_full_date(release_date)` / Next Review `r get_full_date(next_release_date)`]

```{r, echo=FALSE}

graph.data %>%
```





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Useful links and further information

These run best in Google Chrome

- Employment Allowance Publication: https://kai-data-exploitation.github.io/ns-employment-allowance/empall_spine.html

- Stamp Duty Publication: https://kai-data-exploitation.github.io/monthly-stamp-duty-ns-output/msdlt_spine.html

- D3 applications in JavaScript are located here: https://d3js.org/

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