

Overview of Preliminary Results

Introduction:

- Background to project.
- Product cost impact on Retail fuel prices.
- Retail vs Wholesale prices.

Wider Setting:

- Price Cycles (contrast with Perth and Canberra).
- Price Cycle duration changes in last 10 years.
- Comparison with other fuel reporting schemes.

Methodology:

- FuelCheck data.
- Area/Region data choices.
- Service Station counts (shows areas & regions).

Limitations/issues with FuelCheck history data:

- Low vs High frequency Price Updates.
- Sanity check of FuelCheck prices (vs AIP).

Differences found across various dimensions:

- Price differences – 4 main FuelCodes.
- Price trends/cycles (U91) – regional differences.
- Area / Region differences (per top Brand).
- Brand differences.

Scenarios and strategies:

- Individual and Family.
- 3 potential strategies.
- Extremes in price variations.

API (Jan 27) and Filled-data (Jul 16) demos:

- Static heatmap of prices around Jan 27 peak.
- Interactive demo of prices per day (Jan 27 peak).
- Static heatmap of prices around 16/7/18 peak.

Conclusion:

- Recommendations for consumers.
- Other Recommendations.

Background

FuelCheck data – availability and suitability

Fuel Price factors and trends (esp. product cost and retail price cycle)

Key questions addressed:

- **Family scenario (imagine a family of 5 with mostly short trips on weekends and several evenings, with a family car requiring about 70L every 3 weeks).**
- **Individual scenario (imagine an individual with a 60 km round-trip to work on weekdays and some minor usage evenings and weekends, with a small car requiring about 40L every week).**
- **Extreme price variations**
- **Differences due to region and/or vendor and/or fuelcode**

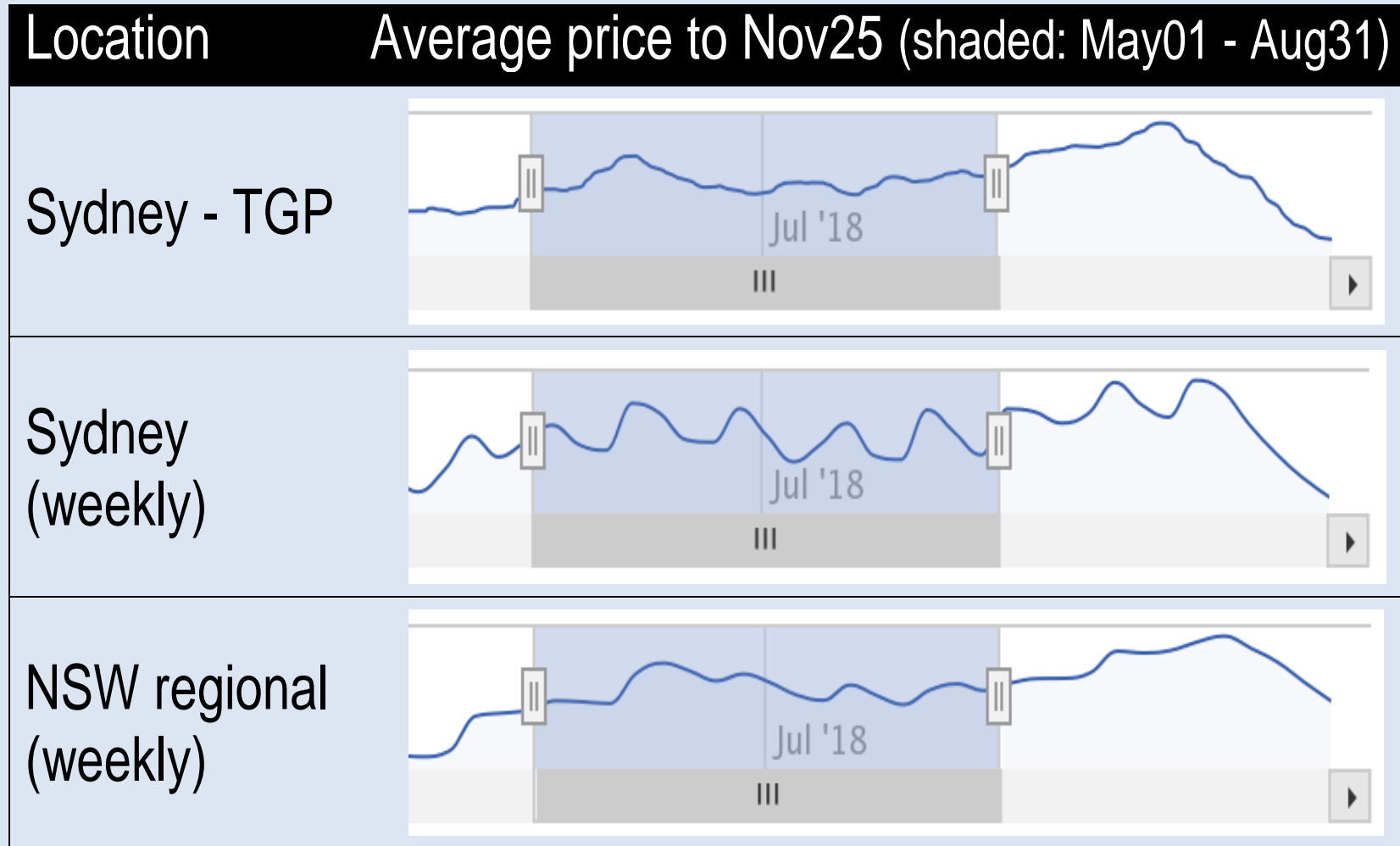
TGP = Product +costs +Excise +GST +margin

The chart displays three time series from March 11 to November 18. The 'Avg. Syd Retail' series (grey) shows the highest values, fluctuating between approximately 125 and 160. The 'Avg. TGP_L' series (black) follows a similar trend but at lower values, ranging from about 120 to 145. The 'Avg. Prod+Tax' series (green) shows the lowest values, generally between 110 and 140. Blue arrows indicate lagged values for the grey and black series, with 'lag1' and 'lag2' labels pointing to specific data points.

PdateSun	Avg. Syd Retail	Avg. TGP_L	Avg. Prod+Tax
11/03	135	122	113
25/03	140	123	118
08/04	135	128	117
22/04	145	130	120
06/05	148	132	123
20/05	140	135	128
03/06	155	138	127
17/06	143	134	124
01/07	153	132	128
15/07	137	134	126
29/07	138	132	125
12/08	152	135	124
26/08	139	137	126
09/09	152	139	130
23/09	161	142	131
07/10	154	145	138
21/10	161	145	135
04/11	158	140	131
18/11	125	122	113

- Product cost is the **main varying factor** in the TGP price; when it goes up, so will the TGP (usually with a 1-2 week lag).
- **Wholesalers do not control the taxed product price, only their small margin.**
- Retailers buy their fuel at the TGP price (a further 1-2 week lag may occur before changes in TGP show in the retail price).
- **Product cost (and hence TGP and retail) steadily rose from early March to early October before finally starting to drop.**
- Retail price fluctuations deviate from the TGP and product trends. This is due to the **price discount cycle**, where average retail margins are near 20 c/L at the cycle peak and near zero at the trough, with **cycle duration varying between 3 and 4 weeks.**

Average Prices – Retail vs Wholesale



Key Points:

Sydney **retail** prices fluctuate much more often than the wholesale (TGP) price (following typical price cycle behaviour).

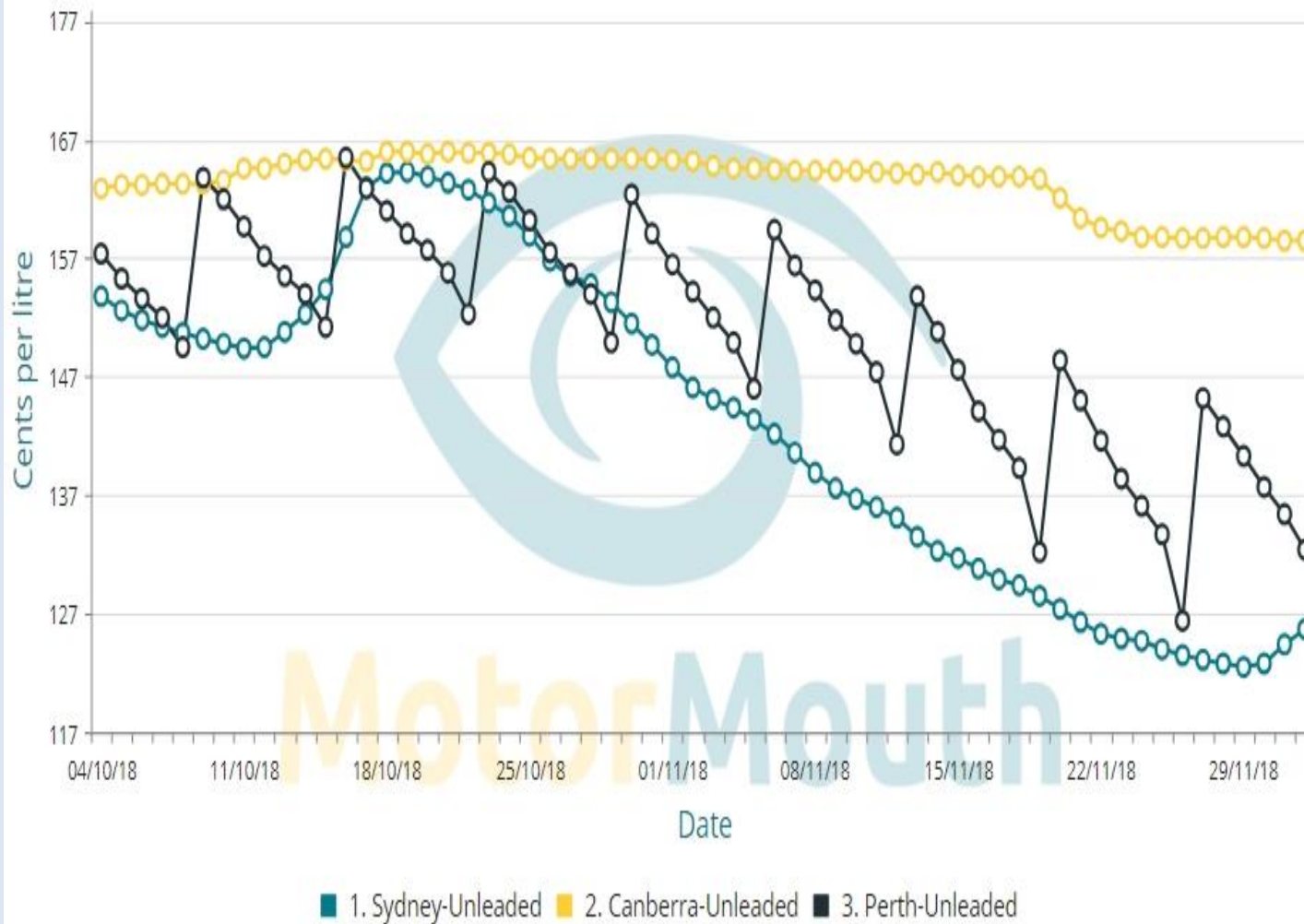
Regional prices mostly match the TGP trend (suggesting a more cost-based pricing strategy).

Trendline charts are courtesy of AIP's Pricing website.

AIP publishes **weekly** average RETAIL prices for many locations, and **daily** average TGP prices for capital cities.

Comparison: Sydney vs Perth vs Canberra

Daily Average Petrol Prices



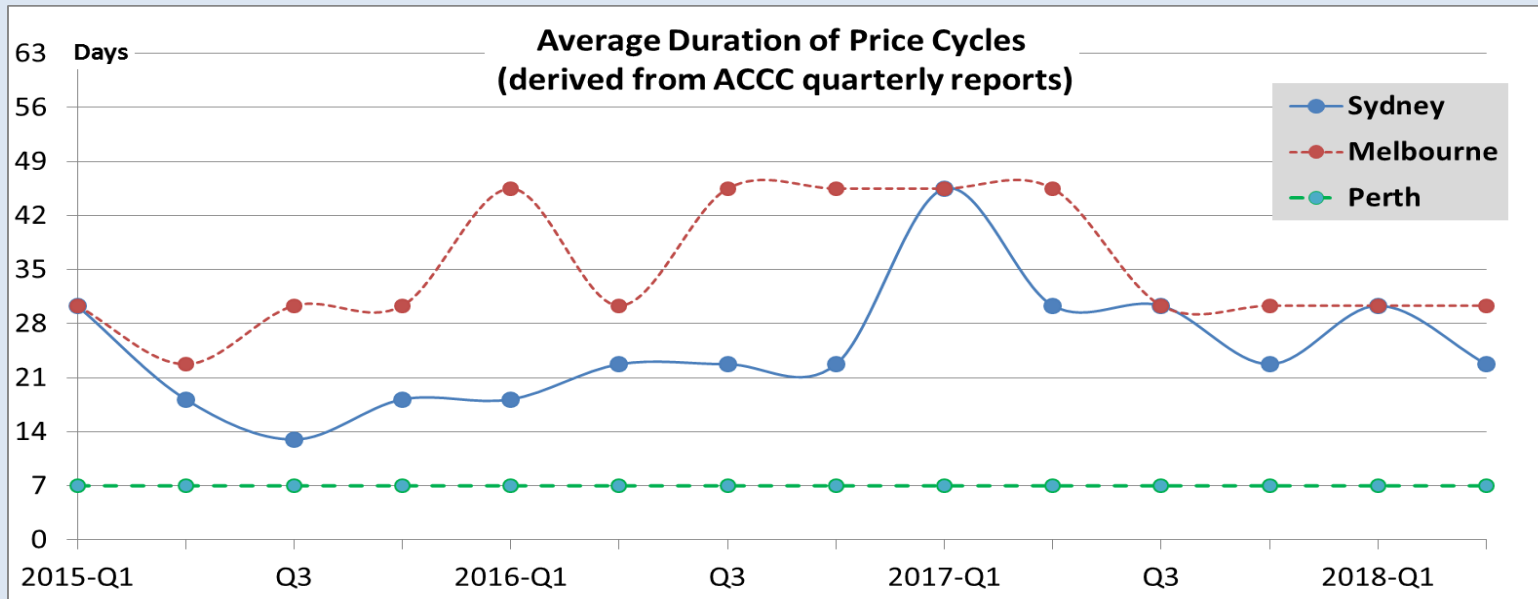
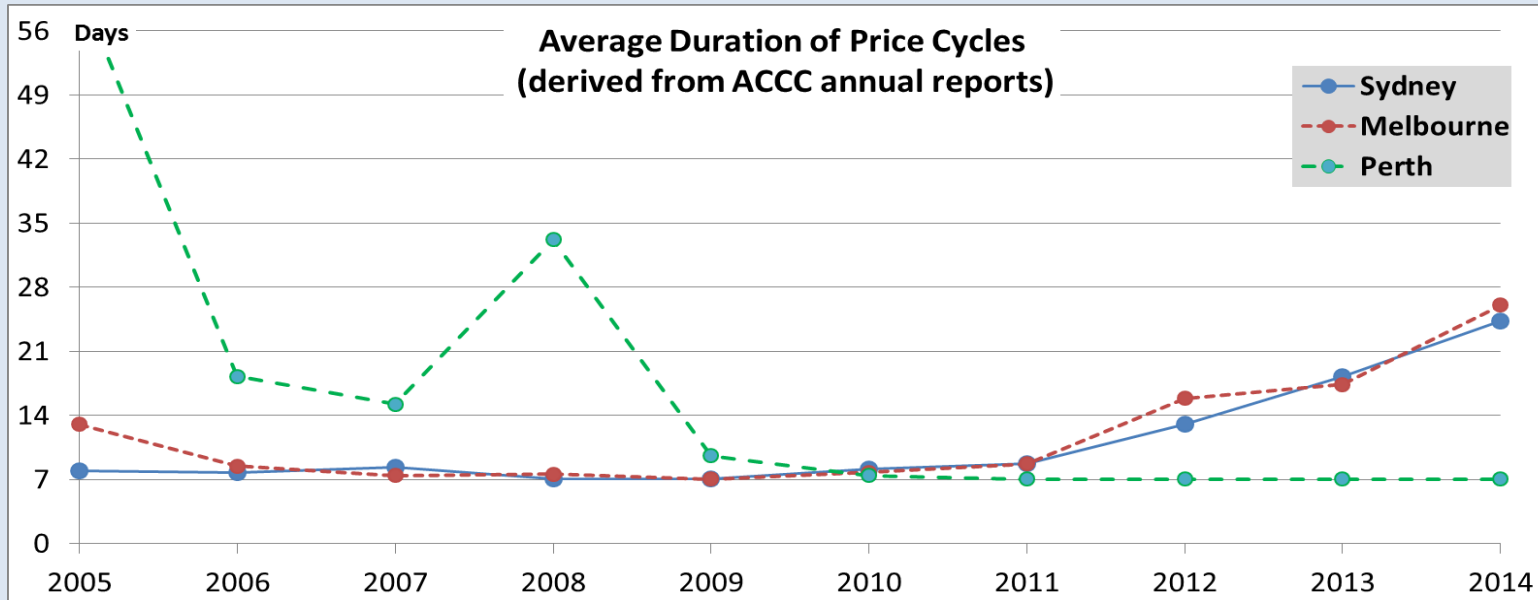
Key Points:

Sydney fuel prices are usually cheaper on average (than Perth and Canberra). When Perth is at the low point in its weekly cycle it may be cheaper than Sydney.

Canberra average prices are generally well above those of Sydney and the other major capital cities. Canberra does not have a discernible price cycle, and in this respect its pricing pattern is more like that of a large regional NSW city.

Note: FuelCheck excludes Canberra from its coverage, and Canberra has no known formal data collection method.

Price Cycle durations – changes over time



Key Points:

Sydney price cycle duration was around a week (7 days) up to 2011, but has grown in recent years to between 3 and 4 weeks.

Perth's duration has gone the other way and is now consistently 7 days.

Melbourne's price cycle duration has been similar to Sydney (sometimes shorter in recent years).

Generally the price cycle behaviour of the 4 largest "eastern" capitals (east of Perth) are seen to be similar, with Perth currently unique with its weekly cycle.

FuelCheck – comparison with other schemes

Across Australia, similar schemes to FuelCheck include:

State	Main Scheme/App	Type/owner	Notes
NSW	FuelCheck (Aug 2016)	nsw.gov.au	
NT	MyFuel NT (Nov 2017)	nt.gov.au	App is <u>very</u> similar to NSW FuelCheck.
QLD	Fuel Prices QLD (Dec 2018)	dnrme.qld.gov.au (2 year trial)	Informed Sources aggregates the price data; MotorMouth & Petrol Spy apps suggested.
SA	<u>was</u> RAA (to Sep 2016)	TBA	
TAS	GasBuddy app (Apr 2017)	RACT / GasBuddy	Prices are Crowd-Sourced
VIC	RACV app		vic.gov.au rejected mandatory fuel price reporting; Recommend RACV app and general app awareness.
WA	FuelWatch (2001)	wa.gov.au	Legislation ensures tomorrow's price is posted every day by 2.30pm, and is fixed for 24 hours.
ACT	<u>was</u> ACT Fuel Watch (to 2017)	TBA	

FuelCheck – Historical and API data available

The following fields are supplied by the API and historical data. Our analysis mostly focused on the historical data, although we later found that the API has certain advantages (eg. API data gathered once per day is well-suited to showing price progression during a cycle, since a single daily price exists for every service station).

API Field	History Field	Notes
stations.name	ServiceStationName	Often “Brand”+“Address”
stations.address	Address	eg. 11 Main St, Suburb NSW 2111
(stations.loc.latitude)	(Suburb)	Suburb usually subset of Address
(stations.loc.longitude)	(Postcode)	Postcode usually subset of Address
stations.brand	Brand	NB: Station might change brands
stations.code / prices.stationcode		NB: no unique key for history (SSN+Address is very close)
prices.fueltype	FuelCode	
prices.lastupdated	PriceUpdatedDate	
prices.price	Price	

Key Points:

History data (data.nsw.gov.au) is typically 1-2 months out of date (eg. Sep 2018 & Oct 2018 were not available until 27 Nov 2018), and **as of 3/2/19 data for Nov and Dec 2018** is not posted yet.

Regulations only require price updates to be posted (which may be few and far between).

History data has no unique code for station, nor latitude and longitude fields.

API data (on api.nsw.gov.au) has no history – apps and other API users must manage their own.

Time-based and Geographical groupings

Beyond the fields provided by FuelCheck, extra fields were added to facilitate analysis.

Added field	Notes
SeasonCode	eg. 18A for Autumn 2018
YearMonth	eg. 2018-05
Area2	Sydney or Regional
Region	9 regions
Area	3 regions per area

Note that ACCC and AIP analyse capital cities and hundreds of regional cities/towns, but do not always cover smaller towns.

The compulsory reporting requirement of FuelCheck ensures coverage of these smaller towns, and allows their prices to now be accurately visible to pricing websites and apps.

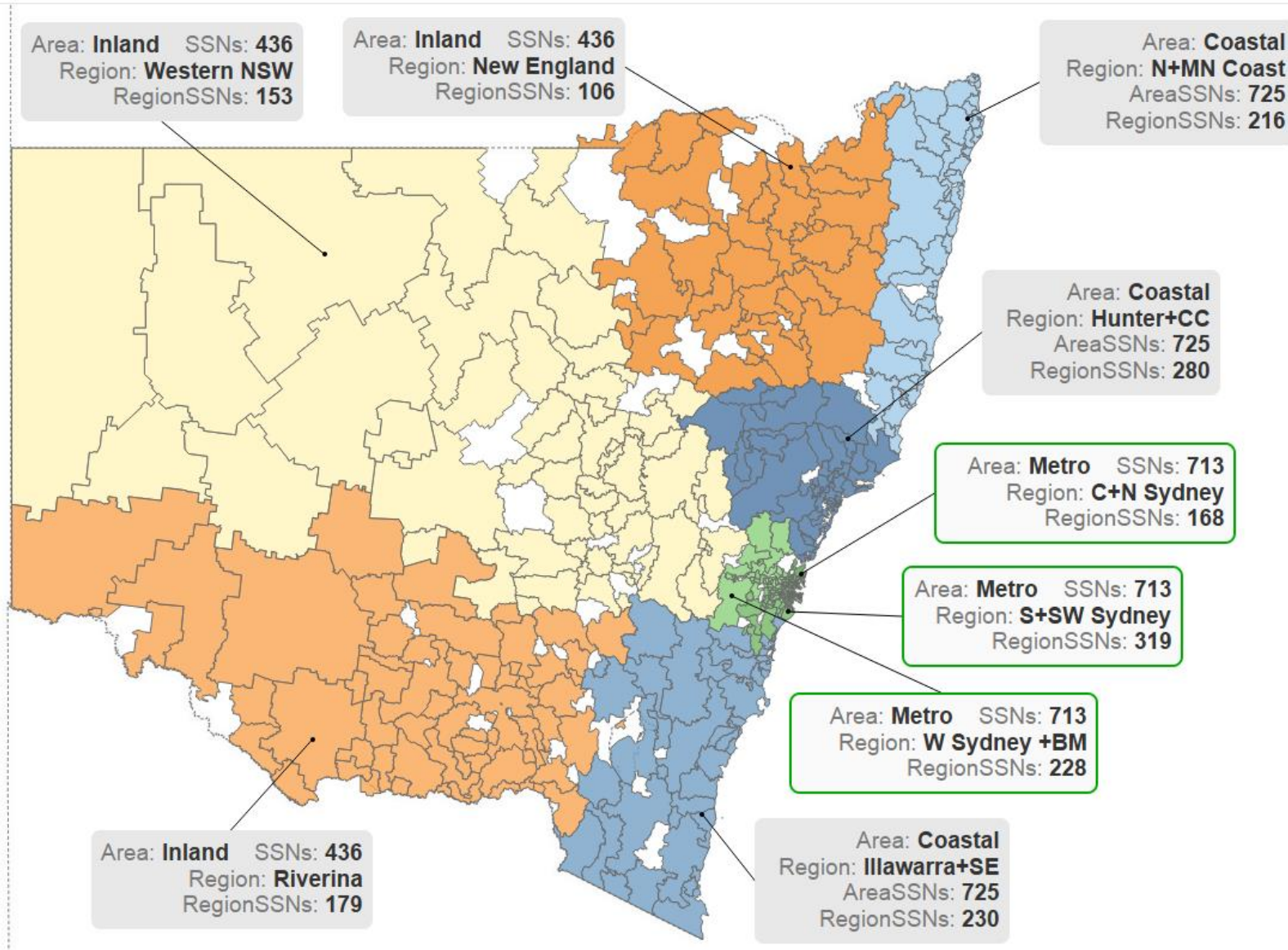
We used the 9 region breakdown by Postcode derived from Training NSW (Hunter & Central Coast combined).

These 9 regions are further grouped into 3 “areas”, namely Coastal, Inland, and Metro.



Service Station counts by Area & Region

U91 availability (SSN counts per Region and Area)



Key Points:

The area and region breakdown is illustrated here.

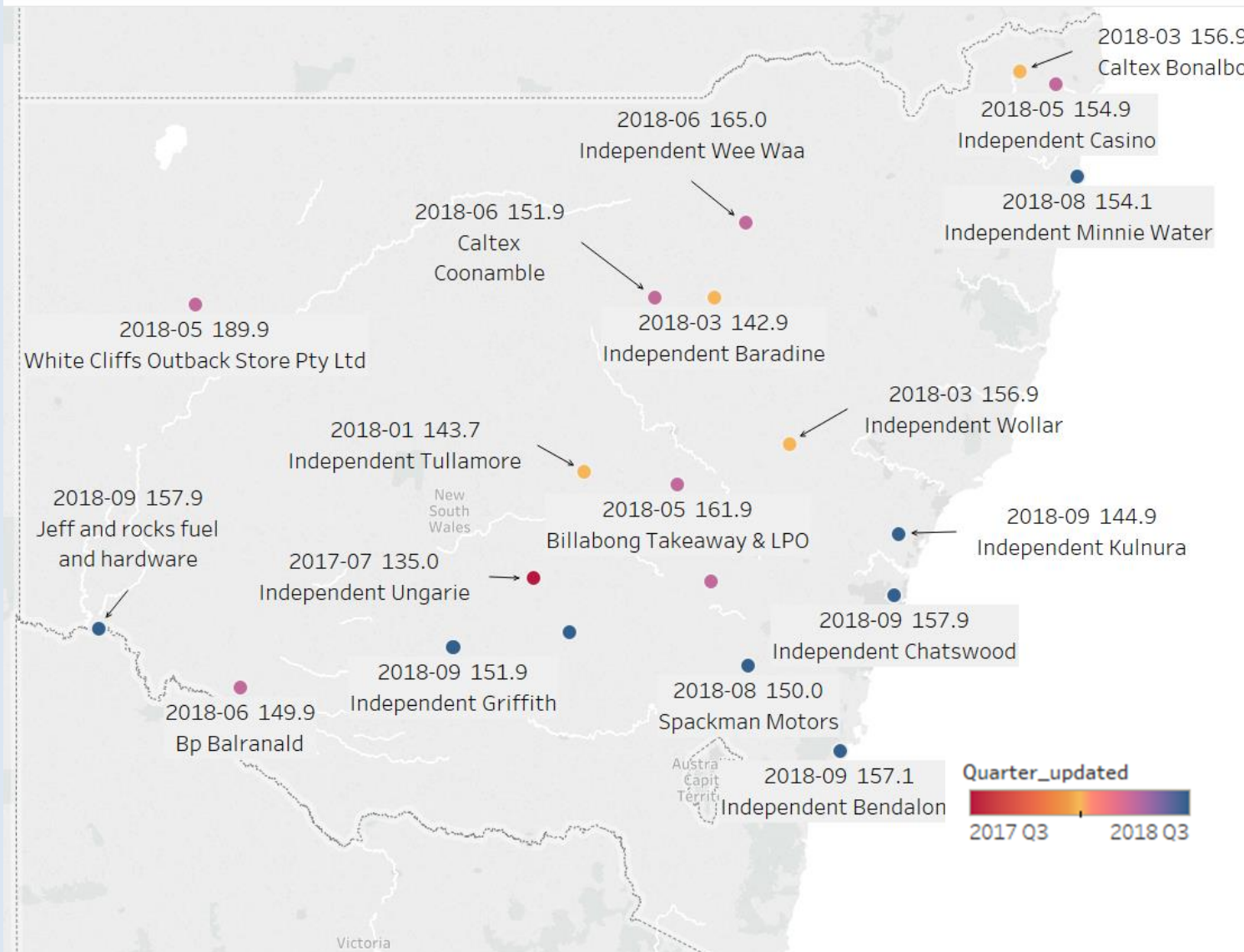
U91 is the most widely available fuel so is used here for illustration.

FuelCheck historical data contains Postcode but not latitude and longitude, so Tableau can only locate service stations using the geolocation of the postcode.

(API-based apps are able to locate service stations more precisely).

Price Updates - LOW frequency example

Service Stations with no ULP price updates since Sep 2018



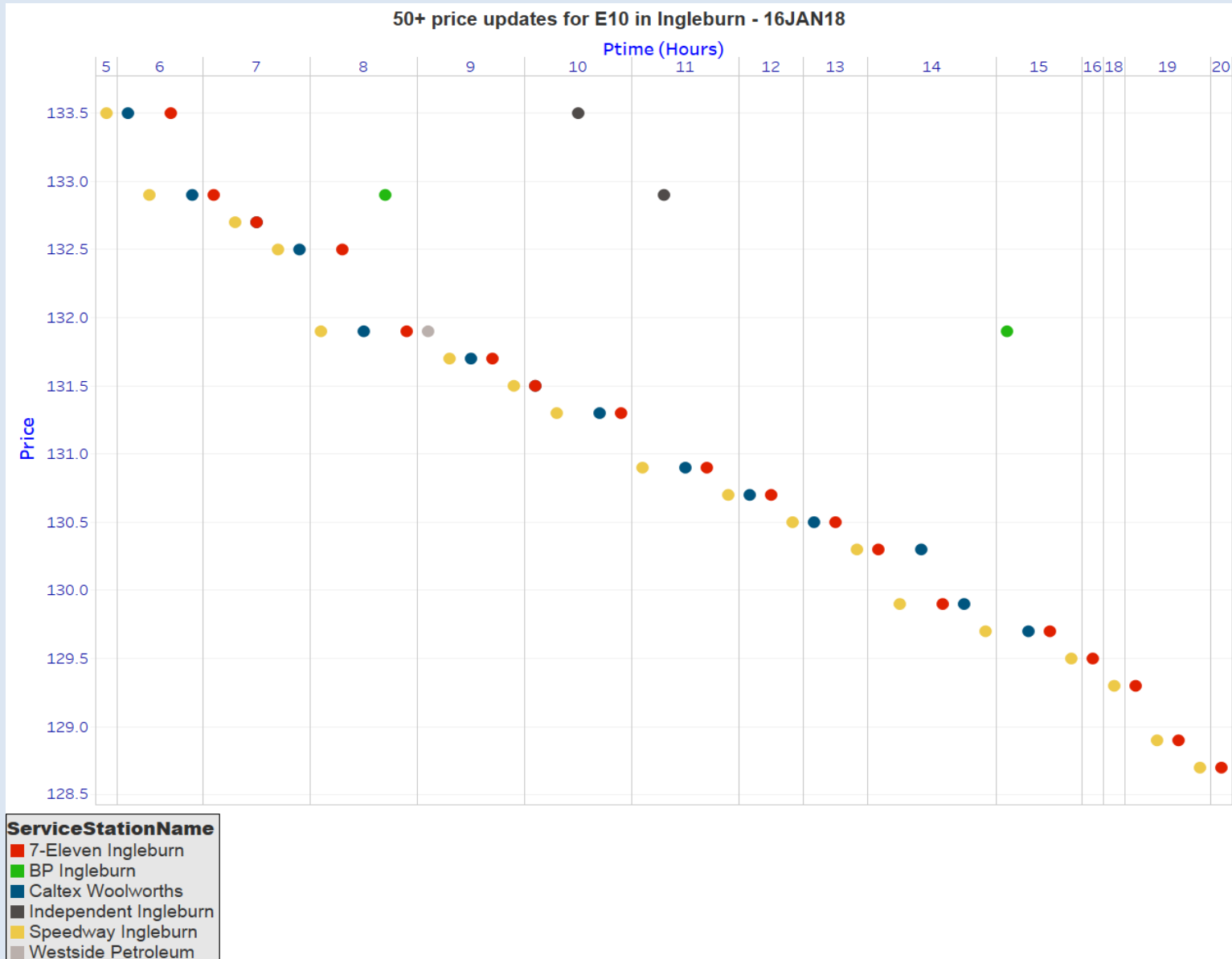
Key Points:

Many service stations in regional areas only rarely post price updates (the 20 points shown had not posted any Q4 price updates as of Dec 6).

This pattern of such rare price updates is sometimes known as **sticky pricing**.

Since their last price update, prices for these service stations have NOT been included in any daily (or monthly) averages calculated using the FuelCheck history data.

Price Updates - HIGH frequency example



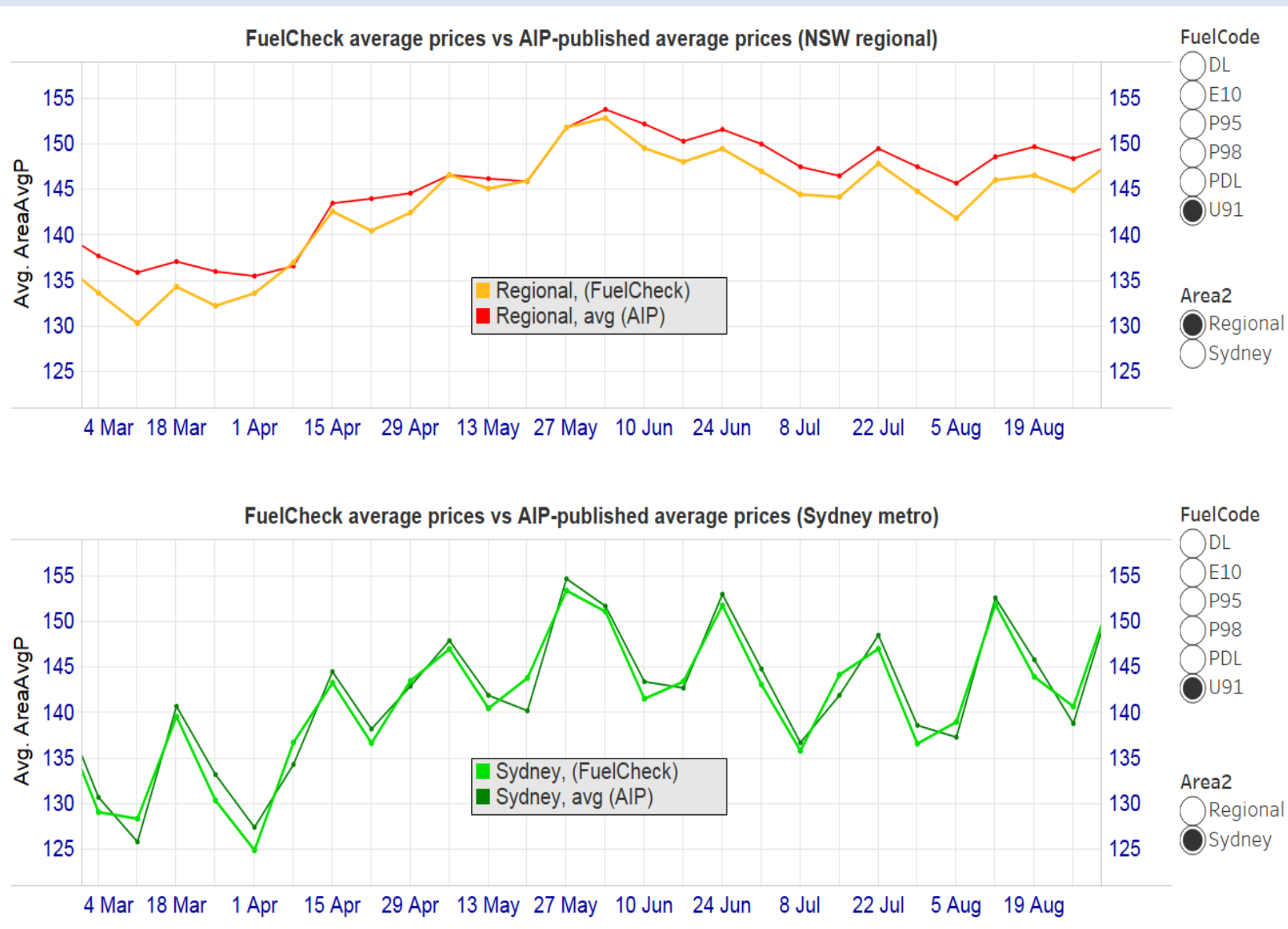
Key Points:

A key factor in the retail fuel price cycle in major capital cities is the effect of intense competition.

Here we see 6 nearby service stations all selling the same product, and all quickly responding to competitor price cuts (often within the hour).

The most vigorous competition is between Speedway, 7-Eleven, and Caltex-Woolworths, with 48 price changes between them.

FuelCheck prices check against AIP prices



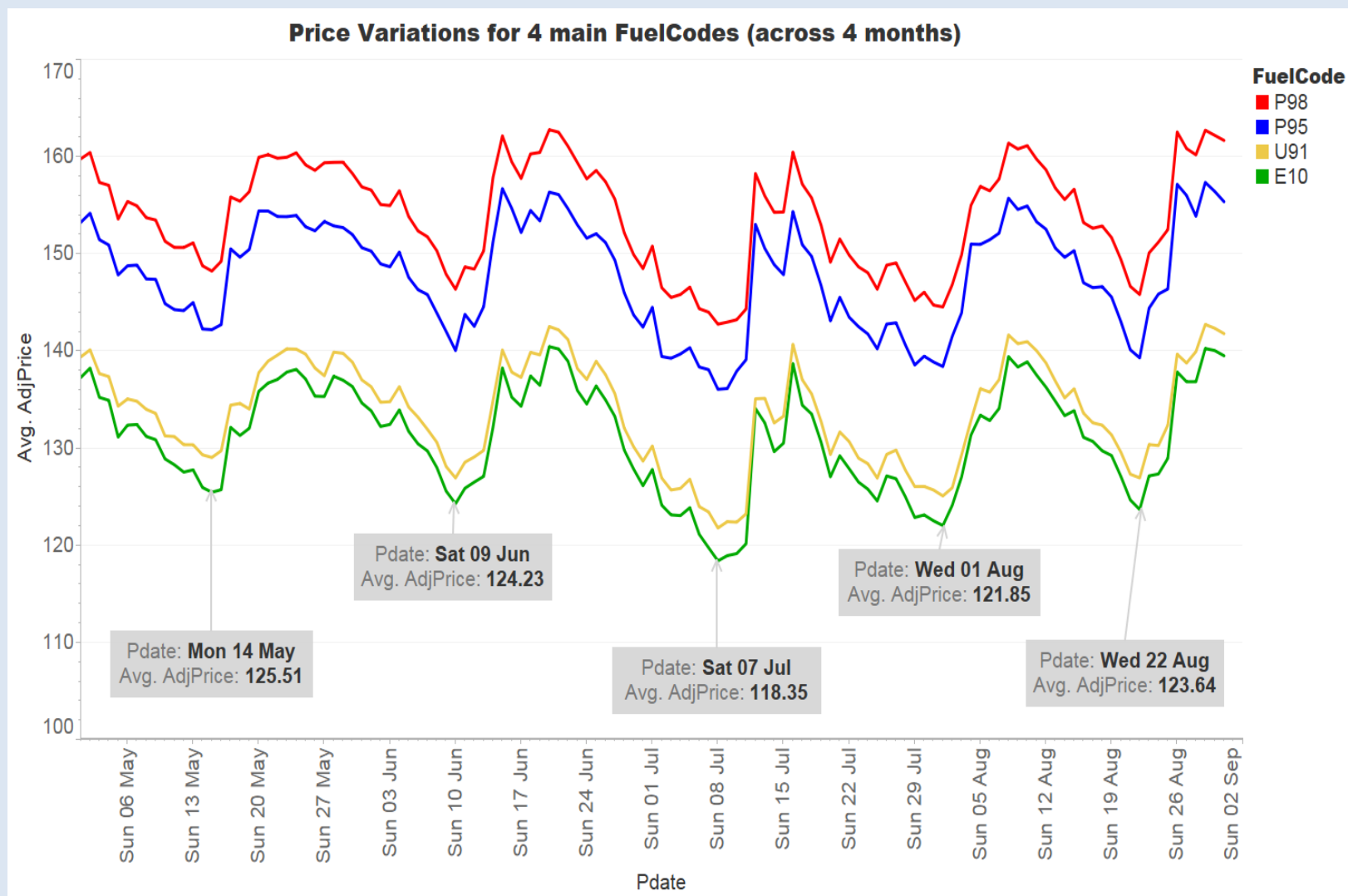
Key Points:

Averages from **FuelCheck** are compared to the weekly averages for Sydney, Regional, and NSW published by **AIP** (for the 6 months to Aug31).

- the discrepancy is noticeably higher for regional prices than for Sydney prices.

This may be due to regional prices changing much less often due to reduced competition (and no requirement to post records when nothing has changed).

Price Cycles – 4 main petrol FuelCodes



Key Points:

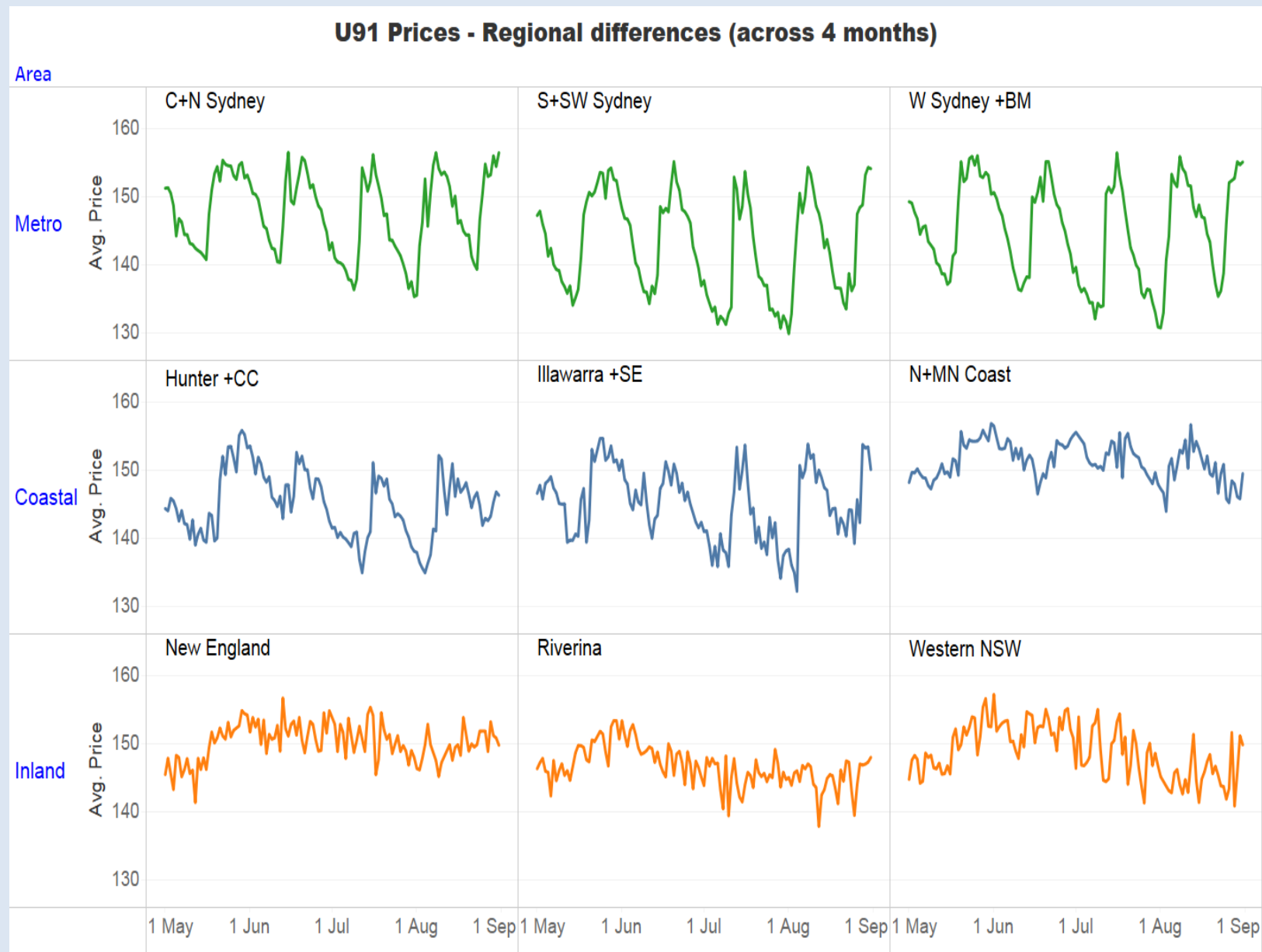
The 4 main Fuel Codes are seen to follow similar cycles, with average prices (statewide) spaced fairly consistently across the date range:

$$E10 < U91 << P95 < P98$$

The annotated troughs show the **cycle durations** for this 4 month period to be:

26 days, 28 days, 25 days, 21 days

U91 Price Trends – Regional differences



Key Points:

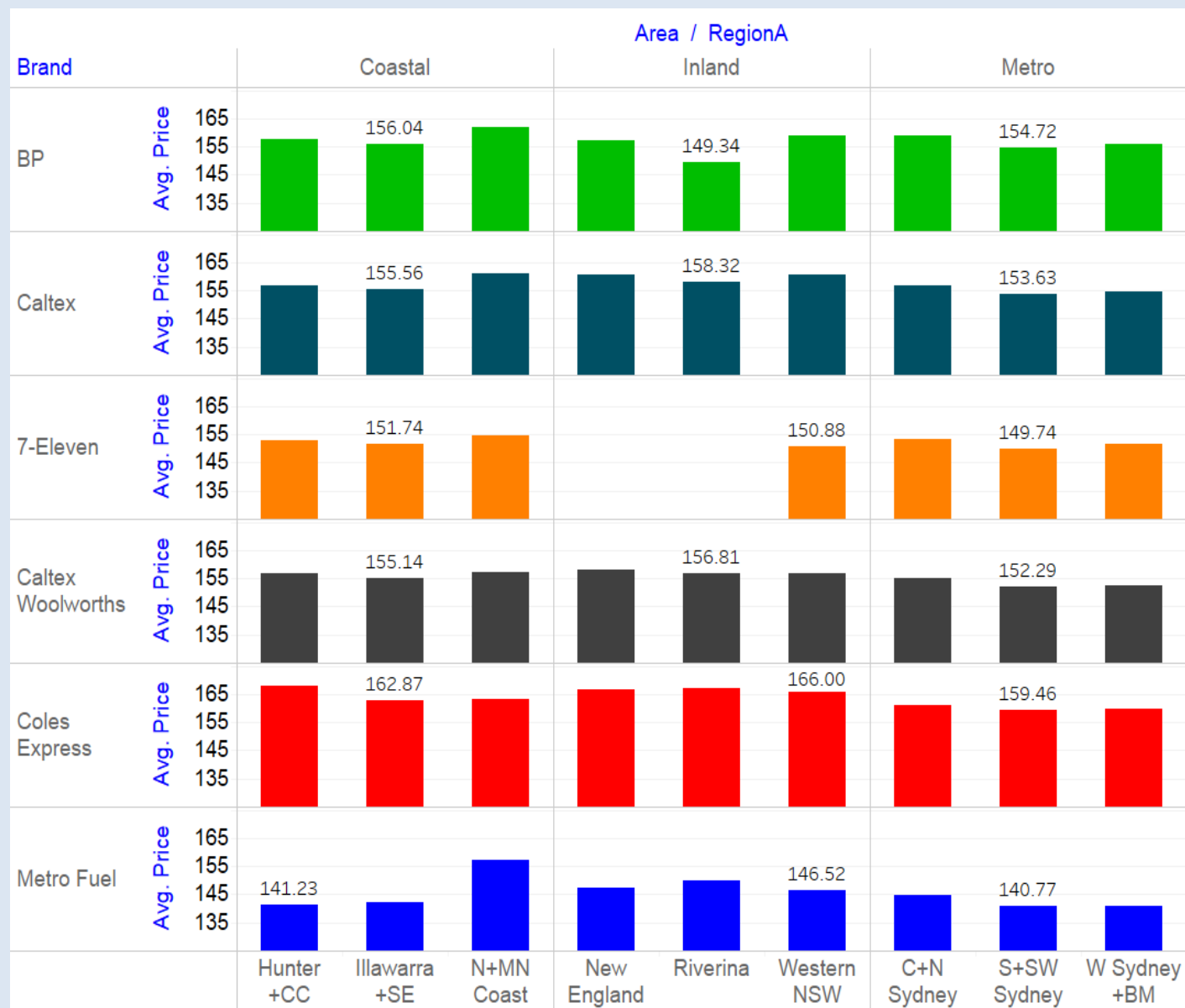
A price cycle is clearly evident for all Metro regions.

Almost 5 full cycles are visible over the 4 month (17 week) period, so the average cycle duration here was ≈ 3.4 weeks

The first 2 Coastal regions also show (weaker) evidence of a price cycle (these are the regions which are adjacent to greater Sydney).

The third coastal region, and all 3 Inland regions, do not appear to follow the price cycle evident in the other regions.

Price differences due to Area & Region



Key Points:

For each Area and Region, average prices for 4 main fuel codes are shown below for popular brands (period May 1 to Aug 31):

Within the **Coastal** area:

- **Illawarra+SE** has the lowest average prices, and **N+MN Coast** has the highest.

Within the **Inland** area:

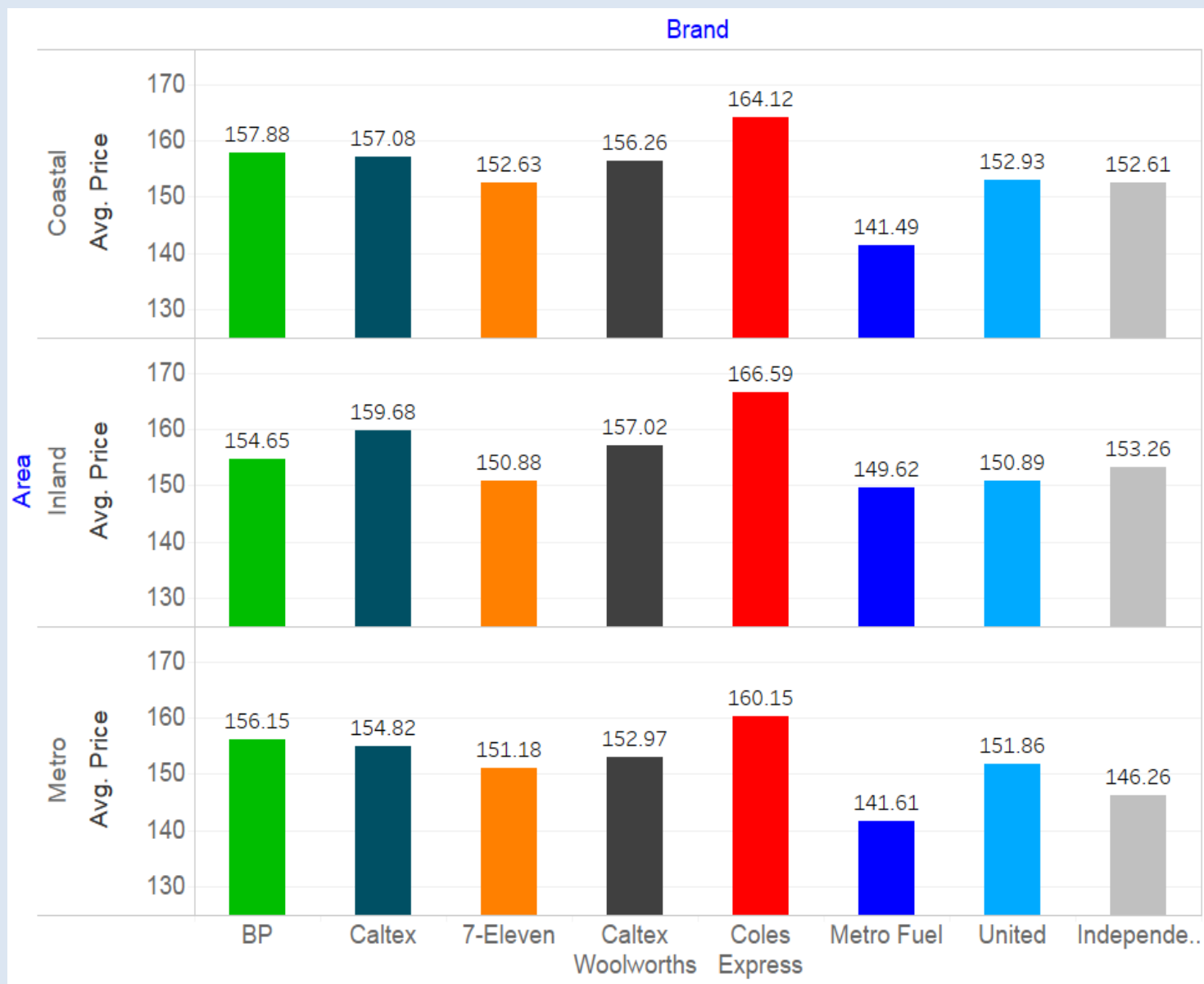
- **New England** usually has the highest.

Within **Metro**:

- **S+SW** has the lowest average prices, and **C+N Sydney** invariably has the highest.

NB: chart colours are chosen to try and correspond with brand logo colours, with the same ones also used on the next slide (which focuses on Brand).

Price differences due to Brand (by Area)



Key Points:

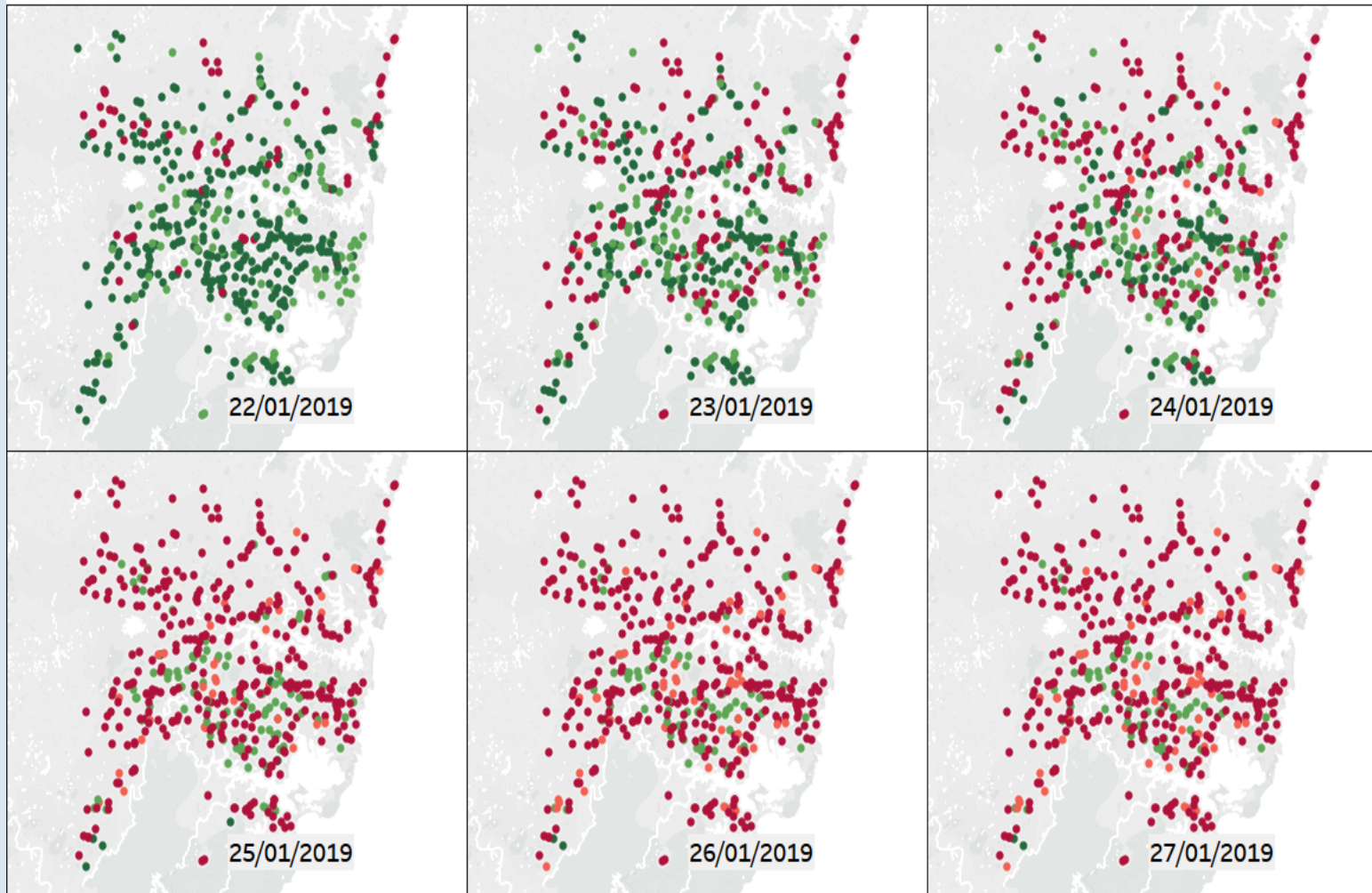
Average prices for the 4 main (petrol) FuelCodes are shown below, for the 8 most popular brands (for period May 1 to Aug 31):

For these top 8 brands:

- Coles Express has the highest average price for all areas.
- The oil-based retailers (BP & Caltex) are generally the next highest on average (after Coles Express).
- Metro Fuel always has the lowest.
- 7-Eleven followed by Woolworths tend to be the cheapest of the “top 5” brands, though better prices are often found at independents such as Metro.

The peak avoidance strategy

Progression of U91 Sydney Price Hikes - 27th Jan 2019 peak



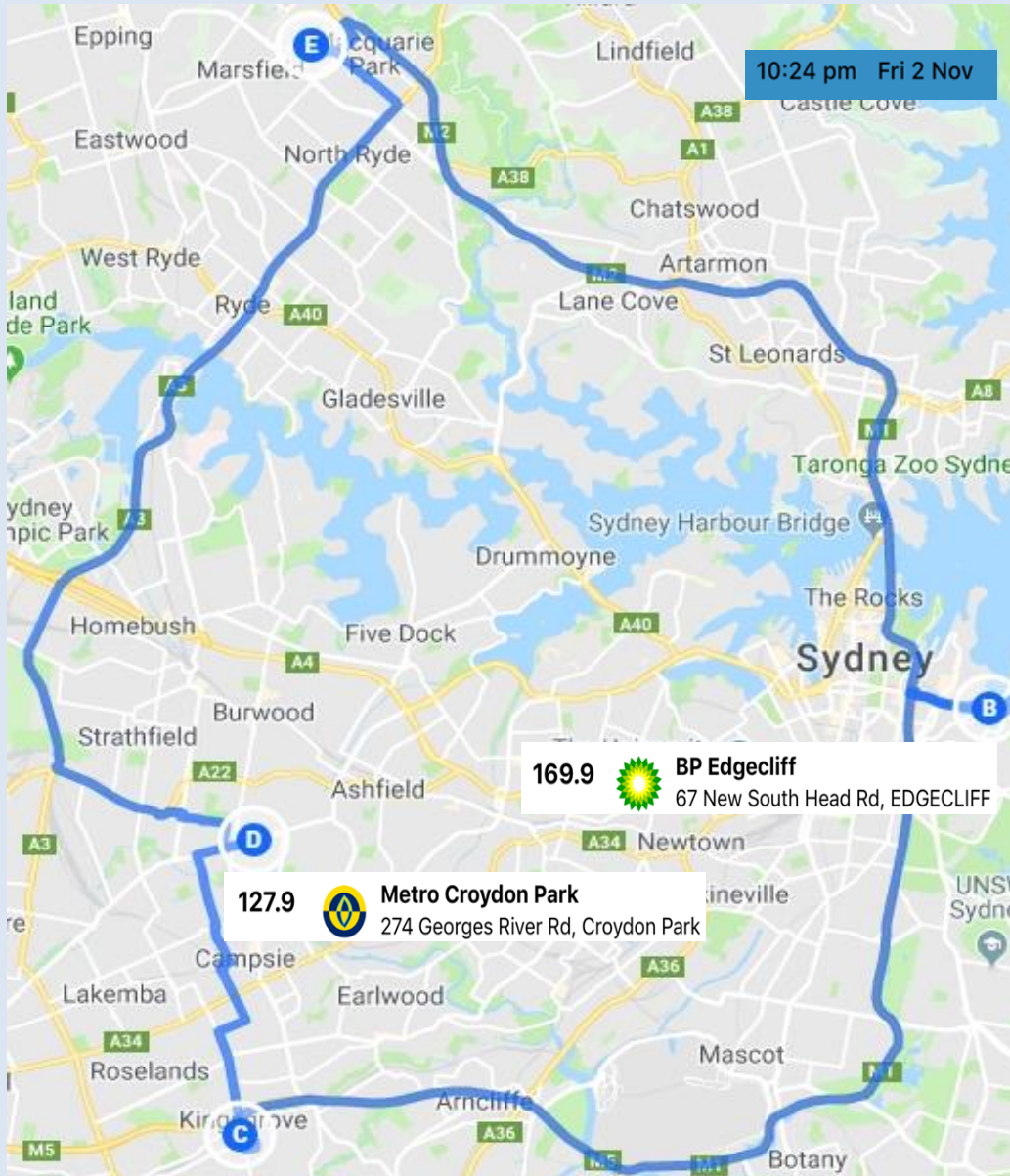
Key Points:

Prices are usually only at their highest for a few days during the peak of the price cycle.

Also the “peak” occurs when the average price is the highest, and at that point there are still some retailers (eg. Metro) who are still selling at lower prices - seen as green dots on the chart.

If you must buy petrol during the peak, then savings of around 20 c/L can be achieved if buying from a lower-priced independent brand rather than one of the currently higher-priced top 5 brands.

The shop-around strategy



Starting at Macquarie University, the default (fastest) route chosen by Google Maps is via Sydney ([eastern](#) map route). On Nov 2, had I detoured at map location B for petrol, I would have paid **169.9 c/L** at BP Edgecliff for E10.

If on that day I used the FuelCheck app's MyTrip function, with a 1km maximum detour, then I would have taken the [western](#) map route, and would have paid **127.9 c/L** for E10 at Metro Croydon Park (location D), for a **42 c/L** fuel cost saving (\$16.80 for a 40L tank).

Key Points:

- Shopping around for a better price is generally encouraged for all scenarios.
- The FuelCheck app provides an option (MyTrip) which simplifies this process (other apps like MotorMouth have comparable functionality).

The 7-Eleven strategy

By December 2 (2018), fuel prices had been falling slowly since a high at 19/10 (previous low was 12/10).

7-Eleven has an app which allows the user to find and “lock in” a price, which they can redeem for 7 days even if the pump price goes up.

This was trialled as follows:

- on 2/12, a U91 price of **117.9** was locked in.
- on 4/12, the price went up to **151.4**.
- on 6/12, the price went down to **149.9**.
- on 7/12, 40L of U91 was bought (at **117.9**).

The result was a saving of 32 c/L compared to the current pump price that day (see receipt at right).

Across Sydney on 7/12, most retailers had by now sharply lifted their prices.

Key Points:

This option could be used as a way to achieve savings in most family and individual scenarios.

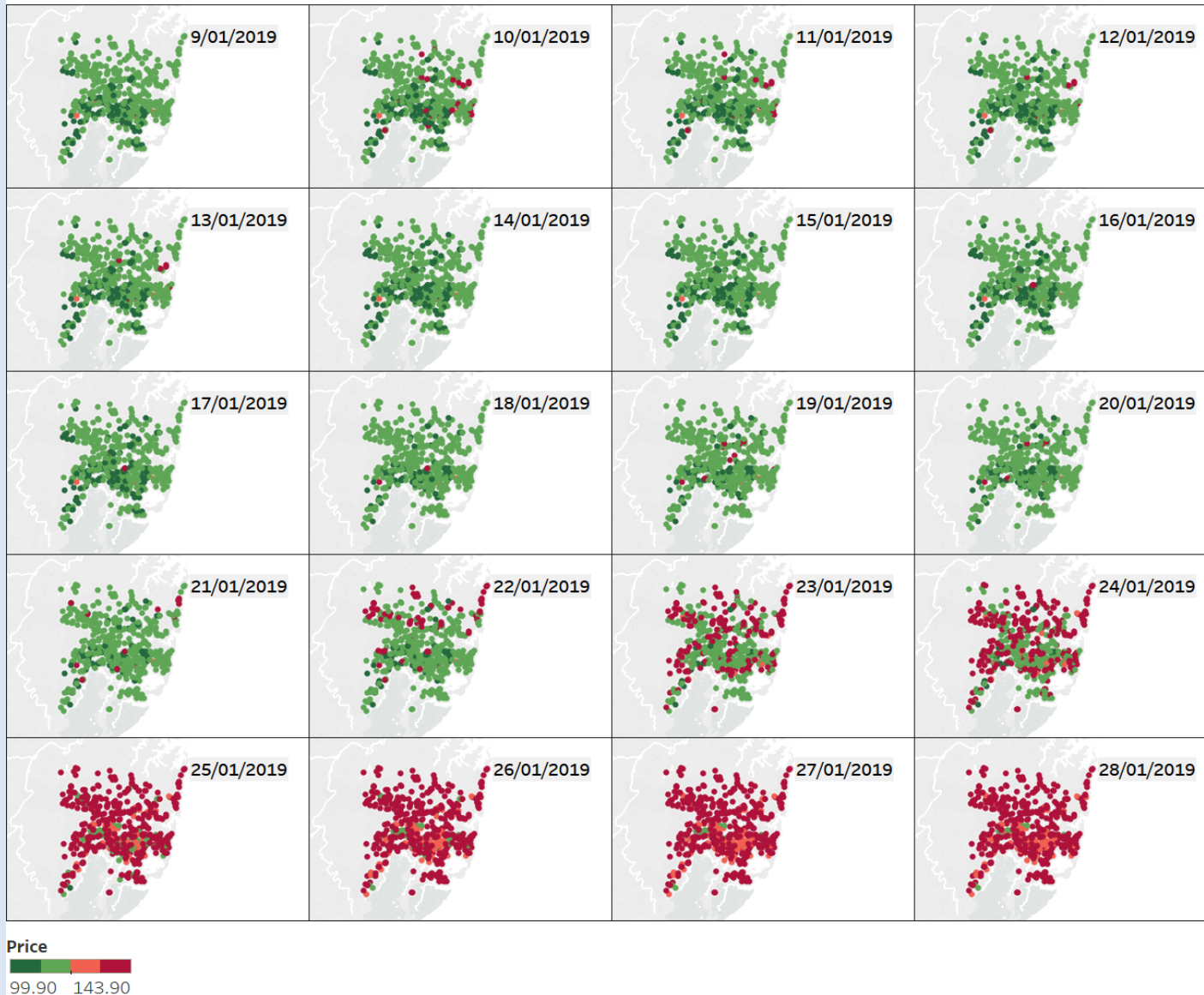
It does require using the 7-Eleven app and its specific restrictions (the locked in amount needs to be nominally pre-paid, although when you actually pay you can do so normally).

7/12/2018 19:38:14 ST:2176B		
TAX INVOICE		
Description	Qty	Amount
ULP	No. 5	
39.99 L @ \$1.499/ L		\$59.95
FPL DISC	1	-\$12.80
Total:		\$47.15

API demo: Fuller Price cycle progression for Jan 2019

21

Progression of U91 Sydney Price Hikes - 27th Jan 2019 peak



Key Points:

API was used to produce chart (using data saved via “GetAllFuelPrices” calls around midnight each day).

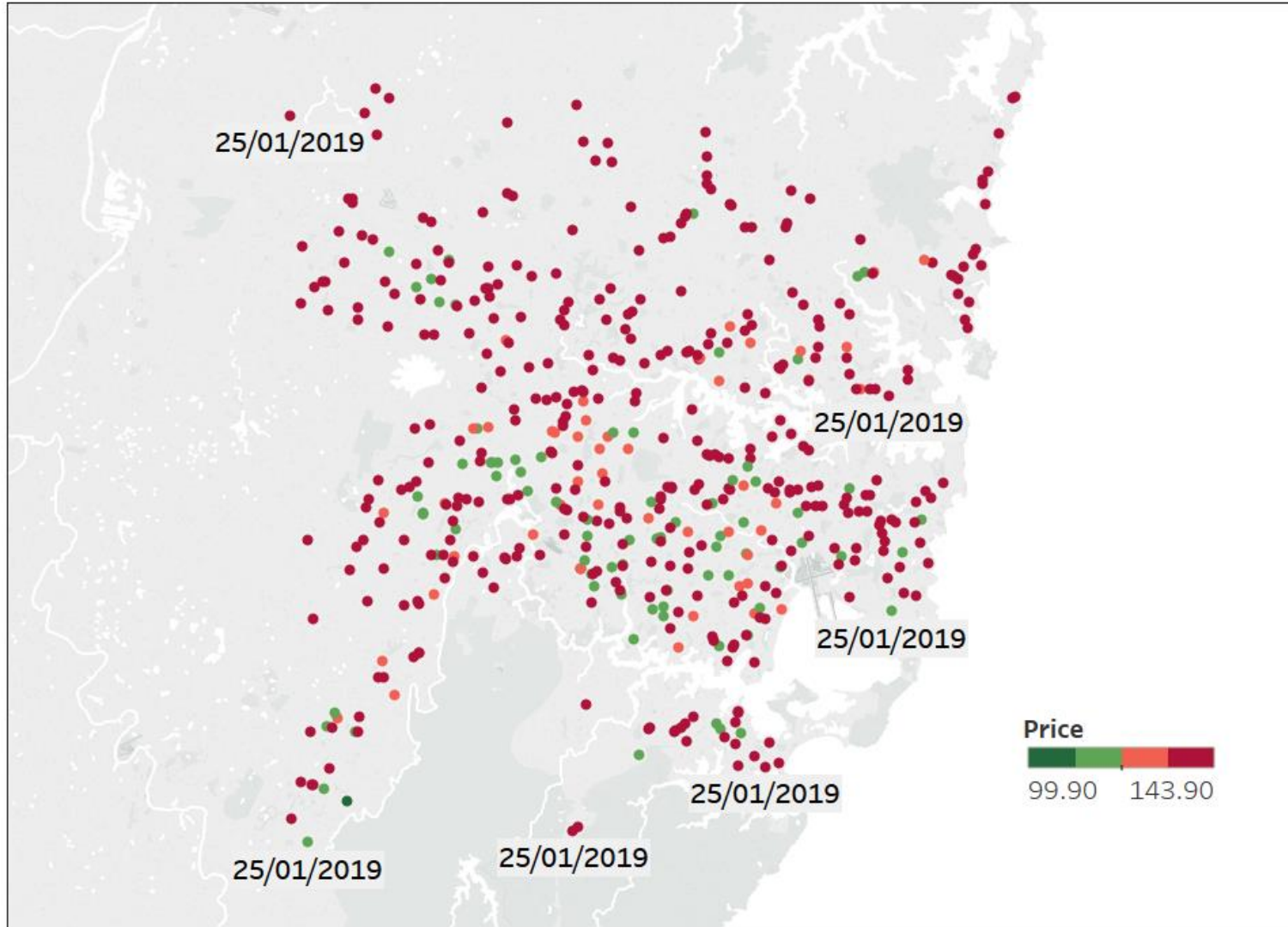
As before, chart shows heatmap colours representing level of Jan 2019 prices (U91) for top-5 brand service stations in the core area of Sydney.

Initially around 20 service stations “hiked” prices (10/1). Competitors did not follow suit, so by 14/1 most prices were back at the 9/1 level (~ 110 c/L). Another attempt was made by a handful of stations on 19/1 which was also partially backed out. On 21/1 a different handful of stations hiked their prices - this time competitors DID follow suit and by 27/1 most prices were at the new level (~ 141 c/L).

API demo: Jan 2019 cycle progression (interactive)

22

Progression of U91 Sydney Price Hikes - 27th Jan 2019 peak (PAGES version)



Latitude
-34.1 to -33.65

Longitude
150.8 to 151.35

Brand (group)

- ☒ 7-Eleven, BP, Caltex and 2 more
- ☒ Budget, Metro Fuel, Speedway and 2 more
- ☐ Costco, Enhance, Independent and 10 more

Region A
Multiple values

Fueltype
U91

Get Date
25/01/2019
☒ Show history

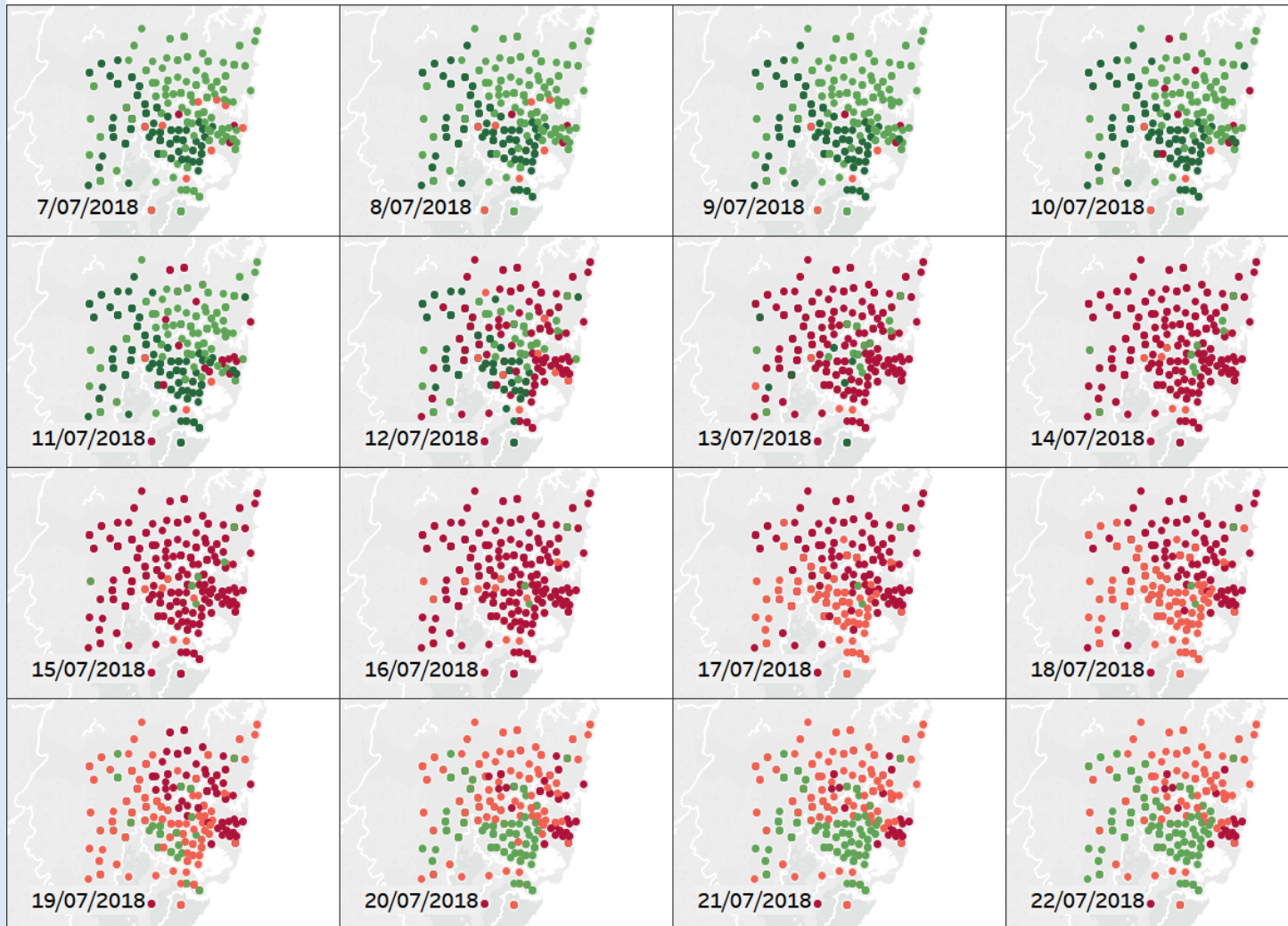
Interactive demonstration works best if Tableau is in Presentation Mode and the “Get Date” pages are cycled through either manually or at medium speed.

Also useful to show the effects with or without the 2nd group of brands.

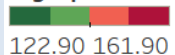
Filled Data demo: Price cycle progression for Jul 2018

23

July 2018 cycle progression (low=10/7, peak 16/7) - fuel type U91



Avg. Fprice



Key Points:

Raw FuelCheck data is not suitable here as most service stations only post update records (so on average, records exist for less than half of the calendar days).

Instead, “filled” data was prepared from the raw data, whereby “empty” days are populated by filling forward from the most recent preceding price change entry.

As before, the chart shows heatmap colours, representing July 2018 prices for days near the cycle which peaked 16/7. Here the data is for fuel type U91 and 7 brands (including the top 5) for service stations in the core area of Sydney.

Conclusion

- We found that the duration of the price discount cycle for Sydney fluctuates from cycle to cycle, and at present is between 3 and 4 weeks on average (compared to between 2006 and 2011 when the duration was typically 7 days).
- Our results show the strongest price cycle behaviour is in Sydney (as expected by recent studies). Coastal areas have discernible but much weaker price cycles, while Inland areas tend to not have price cycles but instead follow more cost-based or sticky patterns.
- Consistent price differences exist across brands - independent retailers such as Metro and United usually having the lowest prices - particularly in Sydney (metro) area. Coles Express is generally the most expensive brand, followed by BP and Caltex.
- Geographical price differences are also seen. For most brands, Sydney prices are cheaper than regional prices. Notable differences between regions (within area) also occur, eg. C+N Sydney invariably has the highest prices in Metro area, while in the Coastal area, N+MN Coast is generally the highest and Illawarra+SE is generally the lowest.

Recommendations for consumer

- While the historical NSW FuelCheck data are a useful resource to analyze past trends (whether time-based, geographical, or brand), they are not ideally suited for informing day to day consumer buying recommendations, since they are typically around two months out of date.
- Instead, mobile and web-based apps – particularly FuelCheck and MotorMouth – are better suited for realistic consumer buying recommendations, as they use the real-time API function (also maintained by FuelCheck).
- Recent Sydney price cycles have been unusually long (last two about 48 days each). In this climate, the peak-avoidance strategy is less useful – since prices may remain high for several weeks before eventually dropping. The shop-around strategy is generally recommended in most scenarios using the above-mentioned apps (unless say you have a work car with a Fuel Card).

Other recommendations

- With the current NSW regulations, **price change** records do not always reflect actual daily prices, since service stations may post many updates in a single day, or might only post a handful of updates in an entire month (or year).
- The WA approach legislates for a single price update each day, and that must be posted by 2.30pm the previous day. This approach overcomes the main issues identified in relation to the accuracy of analysis results using historical data, and certainly satisfies those in favour of price transparency (especially consumers and ACCC).
- However, some studies and stakeholders suggest this price transparency has potential downsides – the increasing speed at which prices are communicated to retailers may reduce their incentive for competition, which may in turn lead to higher prices.

References

- FuelCheck website + app
- AIP (Australian Institute of Petroleum)
- Training Service NSW
- MotorMouth
- ACCC
- ACAPMA
- FuelWatch WA

Appendix: Major players in Australian fuel pricing

Various opinions and stakeholders exist:

(RS: Rod Sims, MM: Mark McKenzie, AC: Alan Cadd, GT: Geoff Trotter)

Name (rep initials)	Role	Notes
ACCC (RS)	Promote competition and fair trade	Supports price transparency for consumers; consider price cycles to generally be a retail money-making scheme.
AIP	Represent oil companies	Supports ACCC view on transparency; does not support <u>compulsory</u> price reporting; supports third-party apps.
ACAPMA (MM)	Represent retailers	Support transparency, but <u>not</u> compulsory price reporting
Motoring assoc NRMA /RA* /AA*	Represent road users (members)	Typically support fuel price transparency
Informed Sources	<u>Private</u> supplier of retail price data	Own MotorMouth; <u>against</u> regulated fuel price reporting
FuelTrac (GT)	<u>Private</u> supplier retail+TGP data	Call for price cap; believe price cycles are “fake”
MotorMouth (AC)	Independent mobile fuel price App	Cover >70% of SSNs (notably <u>not</u> Coles Express)
Supermarket retailers	Coles Express & Caltex-Woolworths in top 5 retail market share brands	Woolworths <u>sold</u> to EG Group after ACC blocked sale to BP. Coles market share dropping due to price issues.
Oil company retailers	BP and Caltex still in top 5 brands	
Major Independents	Franchisees, resellers etc	7-Eleven (top 5), Metro, United, Liberty, Puma, Speedway
Other Independents	Small business operators	APCO <u>unsuccessfully</u> sued *twice* by ACCC