

Market Inquiry on Retail Petrol Prices in Singapore

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MARKET INQUIRY ON RETAIL PETROL PRICES IN SINGAPORE

SYNOPSIS

In 2011, the Competition Commission of Singapore (“CCS”) published the findings from its inquiry into the competitive landscape and regulatory structures of the petrol market in Singapore. Since then, listed petrol prices have continued to fluctuate, and there was public feedback that listed prices did not fall in line with the decline in crude oil prices.

On 9 February 2015, CCS commenced a further inquiry to understand the decision-making processes of petrol retailers and purchasing habits of motorists. CCS has made the following findings:

- i) Listed petrol prices do not reflect wholesale price movements completely and immediately. Between January 2010 and December 2016, for every SGD 10 cent change in MOPS prices, the listed petrol prices changed by an average of SGD 7 cents in the same direction. On average, adjustments in listed petrol prices took place over 8 days for MOPS price increases and 6 days for MOPS price decreases. The pass-through was on average similar whether the MOPS prices increased or decreased.
- ii) Discount and rebate schemes are complicated and make price comparison difficult. While listed petrol prices are similar across petrol retailers, effective prices, i.e. retail prices net of petrol discounts and rebates, vary. While discounts and rebates made up 5% to over 20% of the listed petrol prices, the complexity of these scheme structures may make it difficult for consumers to compare effective prices and make informed decisions on their petrol purchases.
- iii) There has been a gradual increase in non-fuel costs and profit margins in recent years. The wholesale petrol cost, i.e. MOPS price, as a component of retail petrol prices decreased from 2010 to 2015. Non-fuel cost components comprising operating costs, levy and taxes, land costs, and discounts and rebates increased. Operating income margins also increased. The ability of petrol retailers to increase their operating margins is likely to be a result of limited retail price competition.
- iv) There is high brand loyalty among consumers. The majority of consumers (58%) did not switch petrol brands between 2012 and 2016. According to the consumer survey, only 1 in 5 consumers (22%) compared prices across petrol brands. The top reasons for not switching were: the convenience of station locations, satisfaction with current credit/debit card promotions and loyalty programmes, accessibility to a wide network of stations, and protection of the vehicle’s engine.

- v) There is a need to improve the transparency of the effective retail price to allow consumers to make more informed choices and increase competition. CCS found that a lack of price transparency to consumers inhibits effective competition in the market. If information on effective prices, i.e. retail prices net of petrol discounts and rebates, was made more simple and available, consumers would be able to compare effective prices and be better equipped to make more informed petrol purchase decisions. This would in turn facilitate a more price-competitive retail petrol market in Singapore, as petrol retailers would then be encouraged to offer better prices and promotions to attract consumers.
- vi) There is scope to raise consumer awareness on octane grades. CCS found that the majority of motorists in Singapore (63%) were purchasing a higher grade of petrol than needed for their vehicles. There could be a perception among many motorists that a higher grade of petrol is better. However, studies have shown that using a higher petrol grade than recommended by the vehicle manufacturer does not optimise engine performance.

CCS is of the view that the development of a price comparison web portal and/or mobile application to make available more information regarding petrol prices will further empower consumer to make more informed purchase decisions and encourage more effective and transparent competition amongst the petrol retailers, especially with the potential entry of a fifth petrol retailer in Singapore. CCS is exploring development opportunities in this area with relevant stakeholders.

BACKGROUND

2. In 2011, CCS published the findings of its inquiry into the competitive landscape and regulatory structures of the petrol market in Singapore titled “An Inquiry into the Retail Petrol Market Study in Singapore”. Through that inquiry, CCS found that the retail petrol market regulatory regime in Singapore was generally pro-competitive. CCS also found that although the market structure gave rise to a material risk of collusive or coordinated practices between market players, no evidence was found that the petrol retailers were engaged in anti-competitive collusive behaviour.¹

3. In February 2015, CCS commenced a further market inquiry. This second inquiry took place when the price of crude oil experienced a sustained decline from US\$115 per barrel on 19 June 2014 to reach a low of US\$46 on 12 January 2015.² During this period, CCS received feedback that retail petrol prices had not fallen in tandem with crude oil price declines.

4. The broad focus of the second inquiry was two-fold:

- i) To understand the retail pricing process of petrol retailers so as to understand how, if at all, crude oil prices impact retail petrol prices in Singapore; and
- ii) To understand the purchasing habits of customers of retail petrol in Singapore so as to gain an insight on how consumers decide between the different retail brands.

5. For the purposes of this inquiry, CCS obtained information from the petrol retailers³ and consulted industry experts⁴ to understand the supply considerations and pricing behaviour of petrol retailers. CCS also commissioned Forbes Research Pte. Ltd. to conduct a consumer survey in Singapore to understand consumer behaviour, including switching between brands, in relation to retail petrol purchases.⁵ This inquiry is limited in scope to retail petrol and not diesel, although petrol retailers also sell diesel products. CCS published its interim findings from this inquiry on 23 February 2016.⁶

¹ The 2011 report can be found here:

<https://www.ccs.gov.sg/~media/custom/ccs/files/media%20and%20publications/publications/market%20studies/inquiry%20into%20retail%20petrol%20market%20in%20singapore%20may%202023.ashx>.

² Price of crude oil used in this inquiry is based on UK Brent which is a benchmark price for purchases of crude oil worldwide.

³ CCS obtained commercially sensitive and confidential information from petrol retailers under section 61A of the Competition Act.

⁴ CCS thanks the industry experts who have provided their views on the industry. They include representatives of overseas competition authorities, representatives of local banks that provide credit card discounts for petrol purchases, developers of mobile applications that compares petrol prices, and an independent oil industry consultant, Mr. Ong Eng Tong.

⁵ The consumer survey was commissioned by CCS as part of the market inquiry. The survey report is attached as [Annex A](#).

⁶ The media release can be found on CCS's website: <https://www.ccs.gov.sg/media-and-publications/media-releases/interim-findings-from-ccs-retail-petrol-study>.

OVERVIEW OF THE SINGAPORE RETAIL PETROL MARKET

6. Structurally, the market for the sale of retail petrol in Singapore has not changed significantly since the 2011 inquiry.⁷ The four petrol retailers, Chevron Corporation (“Chevron”), ExxonMobil Asia Pacific Pte. Ltd. (“ExxonMobil”), Shell Eastern Petroleum Pte. Ltd. (“Shell”) and Singapore Petroleum Company (“SPC”) remain vertically integrated, in that they import and refine crude oil into distillate products, including petrol, through their refinery plants in Singapore⁸ and a proportion of the refined petrol is sold through their network of stations island-wide. As at end 2016, there were no independent petrol retailers operating in Singapore who are not affiliated to the refineries.⁹

7. The petrol retailers also continue to sell different grades of petrol. All the petrol retailers except Shell sell Octane 92, Octane 95 and Octane 98 petrol. Shell does not sell Octane 92 petrol. It is also the only petrol retailer that sells a premium petrol grade labelled as V-Power Nitro+. The consumer survey shows that three-quarters of respondents (73.9%) have not switched between petrol grades in the last five years.¹⁰ Amongst the petrol grades, Octane 95 accounted for the highest petrol sales in Singapore at around 60 per cent of the retail petrol market in 2015.¹¹

RETAIL PETROL PRICES WERE OBSERVED TO MOVE IN TANDEM WITH THE MOPS PRICE

8. Petrol retailers use MOPS prices¹², not crude oil prices, in their cost accounting and pricing decisions for retail petrol.¹³ The crude oil price refers to the price of unrefined oil while the MOPS price refers to the price at which petrol retailers purchase the refined wholesale petrol from the refineries. The MOPS price is an average market price assessed and published by S&P Global Platts (“Platts”), an independent provider of information and benchmark prices for commodities and energy markets. The MOPS price tends to be higher than the crude oil price as the MOPS price includes the cost of refining the crude oil into wholesale petrol. As all four petrol retailers in Singapore refine their own petrol for retail sale (i.e. they generally purchase little or no wholesale petrol from another refiner), they account for their cost of

⁷ The 2011 inquiry highlighted that the market is highly concentrated, which along with other market characteristics (i.e. homogeneous product, lack of substitutes, high barriers to entry and weak buyer power), gives rise to a material risk of collusive or coordinated practices between market players.

⁸ Chevron and SPC co-own Singapore Refinery Company (SRC) as a joint-venture refinery plant.

⁹ Sinopec (Hong Kong) Limited won a tender for its first retail petrol site in Singapore in February 2017. Reference: http://www.sinopecgroup.com/group/en/Sinopecnews/20170323/news_20170323_325512087921.shtml

¹⁰ Section 4.2 of the Forbes Consumer Survey report.

¹¹ Based on revenue information provided by petrol retailers.

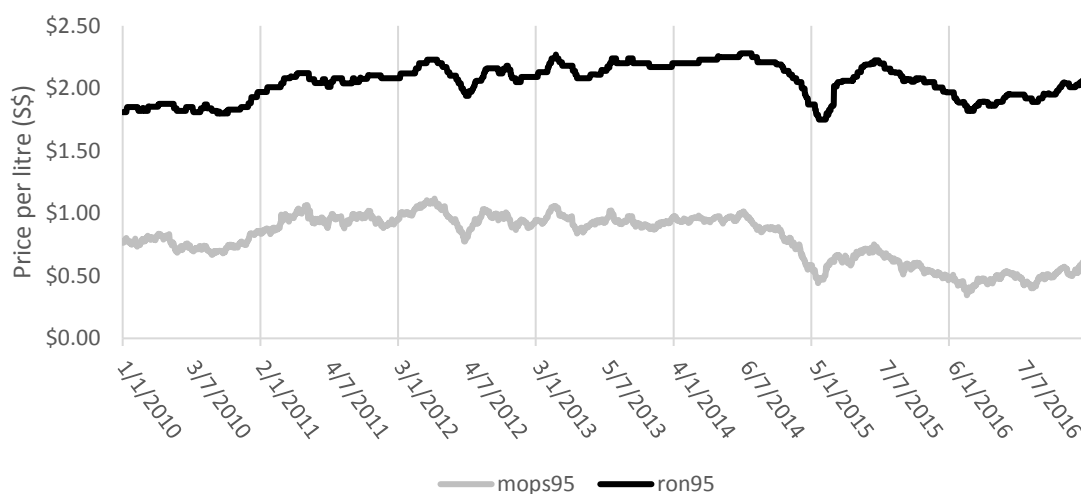
¹² Means of Platts Singapore (“MOPS”) price refers to the price at which petrol retailers purchase the refined wholesale petrol from the refineries. Petrol retailers use MOPS prices, not crude oil prices, in their cost accounting and pricing decisions for retail petrol.

¹³ Based on the information obtained by CCS from the petrol retailers.

wholesale petrol using the same MOPS prices.¹⁴ Therefore, it is appropriate to compare retail prices with MOPS prices, not crude oil prices.

9. Exhibit 1 shows the daily retail prices and MOPS prices from 1 January 2010 to 31 December 2016. Daily retail prices for Octane 95 are presented as the average listed price¹⁵ for Octane 95 set by the petrol retailers at the end of each day. The MOPS prices are converted from US dollar to Singapore dollar to account for changes in exchange rate, and converted from per barrel to per litre for comparison.

Exhibit 1: Daily retail and MOPS prices for Octane 95



Source: Daily retail prices are from petrol retailers; MOPS prices are from Platts.

10. The retail price was observed to move in tandem with the MOPS price over the seven-year period.

11. There also appears to be a relatively high level of pass-through of the fall in MOPS prices to consumers¹⁶ for the more recent period of June 2014 to January 2016 (87%). Similarly high levels of pass-through are observed for the shorter periods of June 2014 to January 2015 (85%), January 2015 to June 2015 (101%), and June 2015 to January 2016 (103%). The comparison for each period is outlined in the following paragraphs.

12. Exhibit 2 sets out the MOPS price, listed price and effective price for Octane 95. The effective price refers to the price that consumers pay for Octane 95 petrol excluding the 15

¹⁴ Using MOPS price as the price of wholesale petrol allows a vertically-integrated refinery cum retailer to account for the opportunity cost between using its refined petrol for its own retail business and selling the refined petrol internationally at MOPS price.

¹⁵ Listed price refers to the retail price that is listed on the petrol pump, before discounts and rebates. It is also known as the pump price.

¹⁶ Pass-through refers to the percentage of an increase (or decrease) of cost that is passed on to consumers through changes in listed and effective price.

SGD cents levy hike introduced in February 2015¹⁷ and including an average of 15% attributed to discounts and rebates available to consumers.¹⁸

Exhibit 2: Comparison of monthly average price changes (Jun 2014 – Jan 2016) (in SGD)

Month	MOPS 95 price	Octane 95 price (listed)	Octane 95 price (effective)
Jun 2014	0.98	2.26	1.97
Jan 2016	0.46	1.91	1.51
Change (S\$)	-0.52	-0.35	-0.46
Pass-through to listed price	67%		
Pass-through to effective price	87%		

Source: Calculated using daily retail petrol prices from petrol retailers.

13. As Exhibit 2 shows, for the period June 2014 to January 2016, the MOPS price fell by an average of 52 cents, and the listed price of Octane 95 fell by 35 cents. The pass-through was approximately 67%. After discounts and rebates, and accounting for the levy increase in February 2015, the effective price that consumers paid for Octane 95 was found to have fallen by 46 cents. Therefore, the pass-through of the change in the MOPS price to the effective price is 87%.

14. Exhibit 3 sets out the same monthly price comparisons for Octane 95 over shorter periods. The periods June 2014 to January 2015, January 2015 to June 2015, and June 2015 to January 2016 were chosen as they were periods of sustained increases and declines in MOPS prices.

Exhibit 3: Comparison of monthly average price changes over shorter periods

Month	MOPS 95 price	Octane 95 price (listed)	Octane 95 price (effective)
Jun 2014	0.98	2.26	1.97
Jan 2015	0.49	1.78	1.55
Jun 2015	0.71	2.21	1.77
Jan 2016	0.46	1.91	1.51
Price change (S\$)			
Jun 2014 – Jan 2015 (decrease)	-0.49	-0.48	-0.42
Jan 2015 – Jun 2015 (increase)	+0.22	+0.43	+0.22
Jun 2015 – Jan 2016 (decrease)	-0.25	-0.30	-0.26

¹⁷ The levy hike was announced by the government as part of the Singapore Budget 2015: http://www.singaporebudget.gov.sg/budget_2015/families1.aspx.

¹⁸ The effective prices presented in this report are based on an updated estimate of the discount rate in 2015, and hence differ slightly from the interim findings.

Pass-through of the MOPS price to effective price	
Jun 2014 – Jan 2015 (decrease)	85%
Jan 2015 – Jun 2015 (increase)	101%
Jun 2015 – Jan 2016 (decrease)	103%

Source: Calculated using daily retail petrol prices from petrol retailers

15. Similarly, the pass-through is relatively high between 85% and 103%, though the exact rate of pass-through is sensitive to the specific period chosen.

LISTED PETROL PRICES DO NOT REFLECT WHOLESAL PRICE MOVEMENTS COMPLETELY AND IMMEDIATELY

16. CCS also conducted an econometric analysis to estimate the effect of an isolated change in MOPS price on retail petrol price over a longer period of time.

17. On average, over the period January 2010 to December 2016, for every 10 cents movement in the MOPS price, the listed petrol price moved by around 7 cents in the same direction, and this adjustment took place over 8 days for a MOPS price increase and 6 days for a MOPS price decrease. The pass-through was on average similar whether prices increased or decreased.¹⁹

18. Exhibit 4 shows the simulated effect of a 10 cents increase of the MOPS price on retail petrol prices over the period of 8 days. Exhibit 5 shows the same for a 10 cents decrease of the MOPS price over the period of 6 days. The dotted lines encapsulate an acceptable range of estimated error.

¹⁹ CCS performed an econometric regression to estimate how increases and decreases in MOPS prices affect average Octane 95 prices using data from 1 January 2010 to 31 December 2016. Using Bayesian Information Criterion, 8 days' lag was selected as the best trade-off between goodness of fit and complexity of the model for a MOPS price increase, and 6 days' lag was selected for a MOPS price decrease. The same analysis was done separately for Octane 92 and Octane 98 prices. The results are consistent in terms of the pass-through of around 7 cents to retail price for every 10 cents change in the MOPS price. Details of the analysis are set out in Annex B.

Exhibit 4: Simulated effect of a 10 cents *increase* in the MOPS price

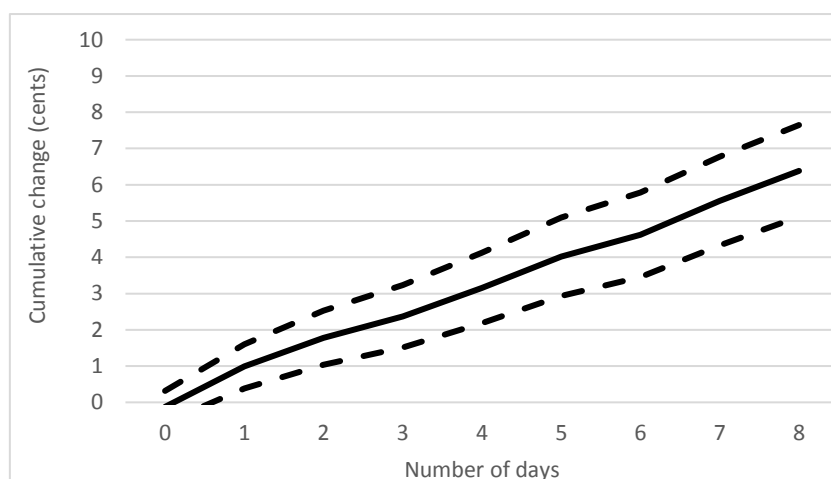
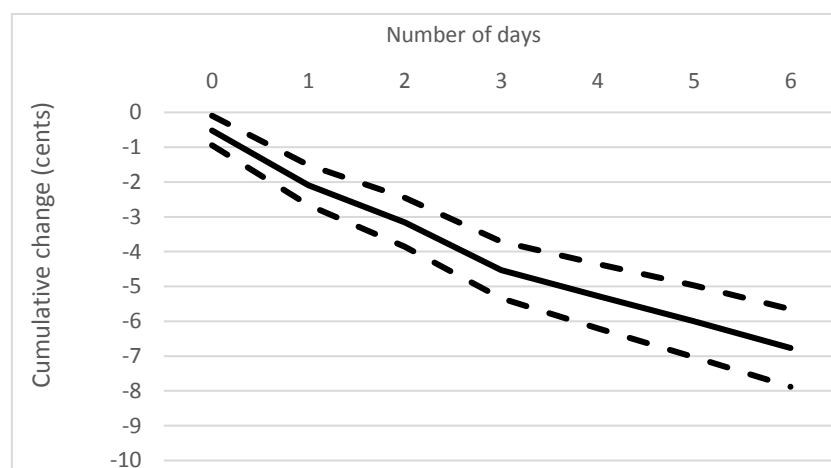


Exhibit 5: Simulated effect of a 10 cents *decrease* in the MOPS price



Source: CCS's calculations based on retail petrol prices and MOPS prices.

19. CCS found that the magnitude of change in the retail petrol price is not significantly different depending on whether the MOPS price increased or decreased, and the change did not occur over a shorter time when the MOPS price increased (8 days) compared to when the MOPS price decreased (6 days). Taken together, this suggests that on average, retail petrol prices do not adjust downwards more slowly or by smaller amounts compared with upward price adjustments, in response to a corresponding change in the MOPS price. In other words, retail petrol prices do not show a 'rocket and feather' pattern.

GENERAL OBSERVATIONS ON RETAIL PETROL PRICE MOVEMENTS

20. CCS also studied the prices charged by petrol retailers for each petrol grade on an hourly basis. Based on price changes since 23 February 2015, CCS observed that prices do not

always move in tandem among the petrol retailers. Furthermore, there is no observable pricing pattern, such as a clear price leader, either for price increases or price decreases, though certain petrol retailers undertook more frequent price changes than others.

21. To illustrate, Exhibit 7 summarises the price changes that took place from April to September 2015, which have been organised into 23 episodes. Each episode began on a date when one petrol retailer adjusted its price away from the other retailers and ended when the prices charged by all four retailers converged to similar levels. Price reversal means that the petrol retailer that had adjusted its price subsequently adjusted it back to the original level after the indicated timespan.

Exhibit 7: Episodes of Octane 95 petrol price changes (Apr 2015 to Sep 2015)

No	Start date	Direction of price change	Magnitude of price change			Time taken for price change (hrs)	Number of retailers involved	Price Differential between retailers
			increase	decrease	reversal			
1	14 Apr 2015	Reversal	-	-	3 cents	29 hrs	1	0 cent
2	16 Apr 2015	Increase	3 cents	-	-	25 hrs	4	0 cent
3	24 Apr 2015	Increase	4 cents	-	-	94 hrs	4	0 cent
4	28 Apr 2015	Increase	4 cents	-	-	30.5 hrs	4	0 cent
5	7 May 2015	Increase	2 cents	-	-	111 hrs	4	0 cent
6	2 Jun 2015	Increase	3 cents	-	-	21 hrs	2	3 cents
7	5 Jun 2015	Decrease	-	3 cent	-	na	1	3 cents
8	5 Jun 2015	Decrease	-	1 cent	-	na	1	2 cents
9	11 Jun 2015	Increase	3 cents	-	-	29.5 hrs	4	2 cents
10	23 Jun 2015	Decrease	-	3-4 cents	-	42.75 hrs	4	3 cents
11	7 Jul 2015	Decrease	-	3 cents	-	29 hrs	4	3 cents
12	24 Jul 2015	Decrease	-	2-3 cents	-	7 hrs	4	3 cents
13	6 Aug 2015	Decrease	-	2 cents	-	na	1	1 cent
14	14 Aug 2015	Reversal	-	-	1 cent	78 hrs	1	1 cent
15	18 Aug 2015	Decrease	-	3 cents	-	52.5 hrs	4	1 cent
16	25 Aug 2015	Decrease	-	3-4 cents	-	24 hrs	4	2 cents
17	1 Sep 2015	Increase	1-3 cents	-	-	27 hrs	3	3 cents
18	3 Sep 2015	Decrease	-	3 cents	-	na	1	3 cents
19	4 Sep 2015	Reversal	-	-	2 cents	96 hrs	1	3 cents
20	9 Sep 2015	Reversal	-	-	3 cents	143 hrs	1	3 cents
21	16 Sep 2015	Decrease	-	2-3 cents	-	24.5 hrs	2	1 cent
22	25 Sep 2015	Increase	3-4 cents	-	-	93.5 hrs	3	5 cents
23	30 Sep 2015	Decrease	-	1-4 cents	-	3 hrs	2	4 cents

Note: Price differential between retailers refer to the difference between the highest and lowest price across the petrol retailers at the end of the price changes episode

Source: Petrol prices changes provided by petrol retailers

22. Of the 23 price episodes during this period, there were 8 episodes of price increases, 11 episodes of price decreases and 4 episodes of price reversals. CCS observed that for the 5 episodes when the price increase involved all four petrol retailers²⁰, it took between 25 to 111 hours for the price change. In comparison, for the 5 episodes of price decrease that involved all four petrol retailers²¹, it took between 7 to 52.5 hours. CCS notes that the other episodes of price changes do not include all four petrol retailers, and also that for most of the episodes, the prices between the four petrol retailers are not the same, i.e. there was a price differential of between one to five cents.

23. Exhibit 8 provides further insights into the price interactions between the petrol retailers by highlighting price changes for the two weeks between 3 September 2015 and 17 September 2015.

Exhibit 8: Octane 95 petrol price changes (3 Sep 2015 - 17 Sep 2015)

No	Date	Time	Player	Old Price	New Price	Price increase	Price Decrease	Description
1	3 Sep 2015	1600	Player I	2.08	2.05	-	-0.03	Player I dropped its price from the highest to the lowest among the 4 players
2	4 Sep 2015	1800	Player II	2.08	2.10	+0.02	-	Player II adjusted price in the other direction a day later
3	8 Sep 2015	1800	Player II	2.10	2.08	-	-0.02	Player II fully reversed its price after 4 days
4	9 Sep 2015	1200	Player I	2.05	2.08	+0.03	-	Player I increased its price from the lowest to the highest among the 4 players
5	15 Sep 2015	1100	Player I	2.08	2.05	-	-0.03	Player I fully reversed its price again to the lowest among the 4 players after 6 days
6	16 Sep 2015	0930	Player III	2.08	2.05	-	-0.03	Player III also dropped its price to the lowest among the 4 players
7	17 Sep 2015	1000	Player II	2.08	2.06	-	-0.02	Player II also dropped its price though to a lesser degree than the others

Note: Player IV did not adjust its price during the entire period.

Source: Petrol price changes provided by petrol retailers.

²⁰ Refer to rows 2, 3, 4, 5 and 9 of Exhibit 7.

²¹ Refer to rows 10, 11, 12, 15 and 16 of Exhibit 7.

24. Exhibit 8 above illustrates in greater detail that the price changes do not always move in tandem between petrol retailers. For example, after Player I adjusted its price downwards (row 1), Player II adjusted its price upwards instead (row 2). After none of the other players followed, Player II did a full reversal only 4 days later (row 3). Thereafter, Player I also fully reversed its price decrease 6 days after the other players maintained the higher price (row 4). After that, Player I decreased its price and the other players followed suit within 2 days (rows 5-7), except Player IV that maintained its lower price throughout the period.

25. The information available to CCS does not indicate that commercially sensitive price information is shared among petrol retailers.²² To understand how price changes are made, CCS studied the process of price setting and the considerations taken into account by the petrol retailers when making decisions to adjust their retail petrol prices. CCS found that petrol retailers follow broadly similar internal processes comprising data collection, price change recommendations and approvals. However, the petrol retailers' considerations differ in relation to deciding whether and when to adjust prices. CCS understands that price adjustments are not simply commercial decisions in response to cost changes and targeted margins, but also strategic decisions in response to competitors' retail petrol offerings. In this regard, the petrol retailers regularly monitor and react to each other's published retail petrol prices and associated promotions, though such behaviours in themselves would not amount to collusion unless there is an agreement or concerted practice between some or all of the petrol retailers.²³

26. The information available to CCS does not indicate collusion or exchange of information between the petrol retailers in Singapore. CCS has observed that price changes between the petrol retailers do not always move in tandem. Where similar price changes or price convergence is observed, this can be explained by the fact that petrol retailers regularly monitor and react to each other's published retail petrol prices and associated promotions in an effort to retain customers or to win new customers.

27. Further, despite similar listed prices, petrol retailers offer discounts through their loyalty programmes, for payments using credit and debit cards and through other promotions, such that after discounts and rebates, the actual price paid by each motorist, i.e. the effective price, may therefore differ.

²² CCS obtained information provided by the petrol retailers in their responses to notices issued under section 61A of the Act. These notices compel the petrol retailers to reveal information pertaining to the exchange of information between them and their competitors, including exchanges that may take place at industry meetings.

²³ Collusion that is prohibited under section 34 of the Act requires an agreement, or concerted practice, in which some or all of the petrol retailers knowingly substitute the risks of competition with co-operation, which would impact retail petrol prices in Singapore.

DISCOUNT AND REBATE SCHEMES ARE COMPLICATED AND MAKE PRICE COMPARISON DIFFICULT

28. Though petrol is a homogeneous product and listed petrol prices are similar across retailers, CCS has observed effective petrol price differentiation in the market through various discount and rebate schemes.

29. Exhibit 9 shows the various retail petrol scheme loyalty programmes and discounts and rebates available to consumers through use of credit card payment methods displaying the savings advertised by petrol retailers in 2016.

Exhibit 9: Discount and Rebates Schemes offered by petrol retailers (with advertised savings)

	Caltex	ExxonMobil	Shell	SPC
Loyalty programme ²⁴	Plus! (3 points for every litre pumped worth 2 cent)	Smiles (1 point for every litre pumped worth 3.3 cent)	Shell Escape (1 point for every litre pumped worth 3.3 cent)	SPC & U (10% discount)
Credit card payment ²⁵	OCBC 365 Credit Card (Up to 23.9%) HSBC Cards (up to 16% and 5% rebates) ANZ, Standard Chartered Card (14%) Other OCBC Credit or Debit Card (14%)	Citibank Credit/Debit Card (Up to 20.88%) OCBC Plus! Visa Cards (18.5%) DBS-Esso MasterCard (17%)	Citibank Cash Back Credit Card (Up to 20.88%) UOB One Credit Card (Up to 20.8%) HSBC Premier MasterCard Credit Card (Up to 19.16%) HSBC Visa Platinum (Up to 18.3%) Other HSBC Credit/Debit Cards (14%) Other Citibank Credit Cards (13.6%)	POSB Everyday Card (Up to 20.1%) UOB Visa/MasterCard (Up to 20%) American Express Card (Up to 15%) Other DBS/POSB Card (except DBS-Esso) (15%)

²⁴ Points accumulated can generally be used to redeem different items. The value of a point presented in the table is based on the redemption of a \$10 fuel voucher or offset of an equivalent amount of fuel purchase from the petrol retailer.

²⁵ The discount rates advertised include the 5% 'walk-in' site discount.

			Other UOB Credit Cards (Up to 13.6%)	
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Source: compiled from petrol retailers' websites on 29 July 2016.

30. Taken together, the schemes offer savings ranging from a minimum of 5% from 'walk-in' site discount to more than 20% from the use of loyalty programme, membership of partner organisations and discounts associated with payment methods, for example, using credit cards.²⁶

31. The consumer survey found that 93.2% of consumers used petrol discounts and rebates on a regular basis.²⁷

32. CCS found that a typical consumer enjoys 15% in petrol discounts. Based on 2015 data, CCS estimates that consumers accessed on average petrol discounts of 15%, which comprised a 5% site discount, an additional 4% from loyalty programmes and an additional 6% from utilising credit cards and associated discounts available for that payment method.²⁸ This was corroborated by the consumer survey finding that consumers enjoy on average 14.9% off total petrol bill and that majority of consumers enjoyed discounts of between 11% and 20%.²⁹

33. Exhibit 10 and Exhibit 11 show that effective prices across petrol retailers (which are the final prices that consumers pay after discounts and rebates) vary more than listed prices. CCS adopted two different methodologies to compare listed and effective prices. The first methodology compares the displayed prices of Octane 95 petrol against the discounted prices after various promotions. The second methodology compares the displayed prices of all grades of petrol against the actual revenue per litre of the petrol players. Each shaded area encapsulates the range of prices between the highest and the lowest price per litre across petrol retailers for each month or quarter: The wider the area, the more listed prices, effective prices or quarterly revenue per litre varied across petrol retailers. The first methodology is sensitive to the eligibility of individual consumers to various targeted discount schemes, while the second methodology is sensitive to the product mix of individual petrol players. Although the time periods covered under the two methodologies are different due to the availability of data, the consistency of the results reinforces the conclusion that effective prices are different from listed prices in terms of price level and price range (between the highest and lowest price).

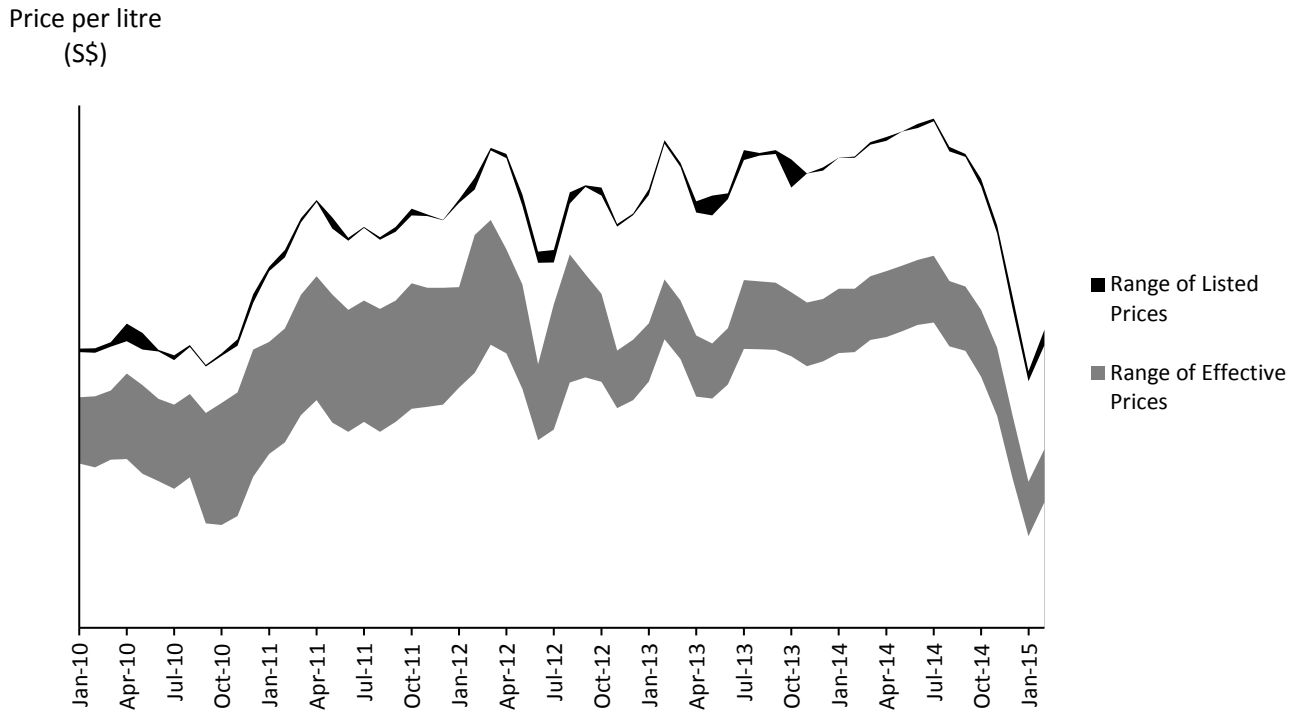
²⁶ For example, a customer who drives up to a petrol station obtains the 'walk in' site discount off the retail price. If the customer also shows the retailer's loyalty card, he gets additional discount or rebates. If he also pays using an eligible credit card, he may enjoy a further discount and/or rebate subject to specific terms and conditions. The customer may also receive vouchers for return visits or for store purchases.

²⁷ Section 7.2 of the Forbes Consumer Survey report.

²⁸ Although there is a credit card component, the total discounts and rebates estimated is an average of all transactions, including those paid by credit card and non-credit card holders.

²⁹ Section 7.2 of the Forbes Consumer Survey report.

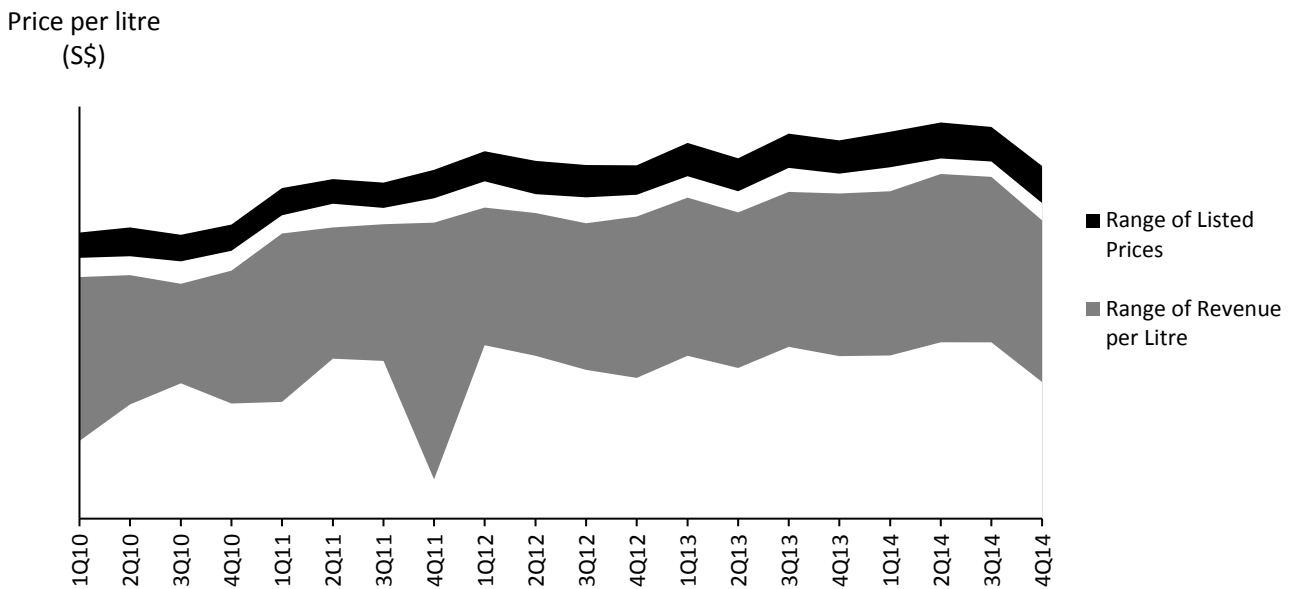
Exhibit 10: Effective prices of Octane 95 vary more than listed prices



Note: The vertical axis does not necessarily start at zero.

Source: CCS compilation from submissions of petrol companies.

Exhibit 11: Quarterly revenues per litre vary more than listed prices



Note: The vertical axis does not necessarily start at zero.

Source: CCS compilation from submissions of petrol companies.

34. This is consistent with CCS's finding from the consumer survey responses that the lowest average discount utilised amongst the four petrol retailers is 13.4%, and the highest

average is 16.4%.

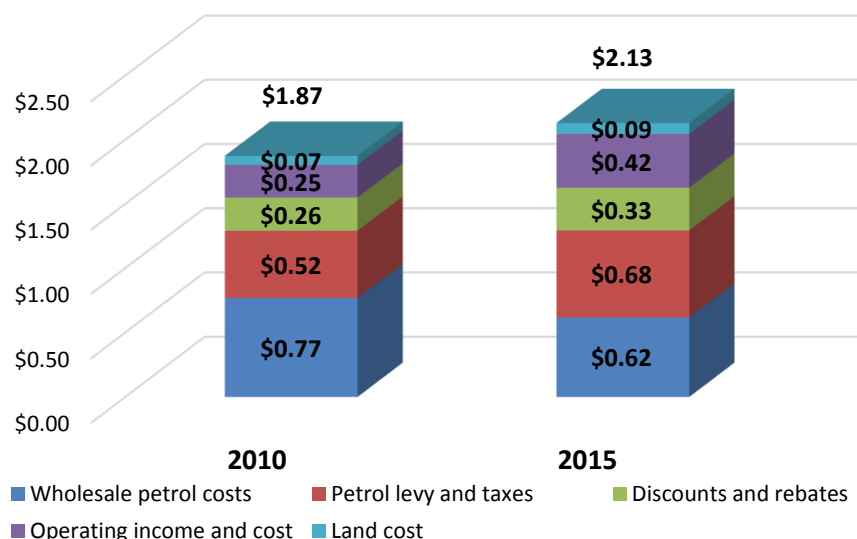
35. The injection of price competition into the retail petrol market by way of discount schemes can be viewed as positive from the point of view of consumers. However, CCS recognises that the complexity of the discount scheme structures, in particular the different conditions that have to be met before consumers are able to benefit from each discount or rebate scheme, may make it difficult for consumers to account for the discounts and compare the effective prices that they would pay. As a result, consumers may find it hard to make an informed decision on their petrol purchase, and that may in turn reduce the effectiveness of competition.

THERE HAS BEEN A GRADUAL INCREASE IN NON-FUEL COSTS AND PROFIT MARGINS IN RECENT YEARS

36. For the period 2010 to 2015, CCS reviewed and studied the key individual components of retail petrol prices to determine how the components of retail petrol prices have changed over the years.

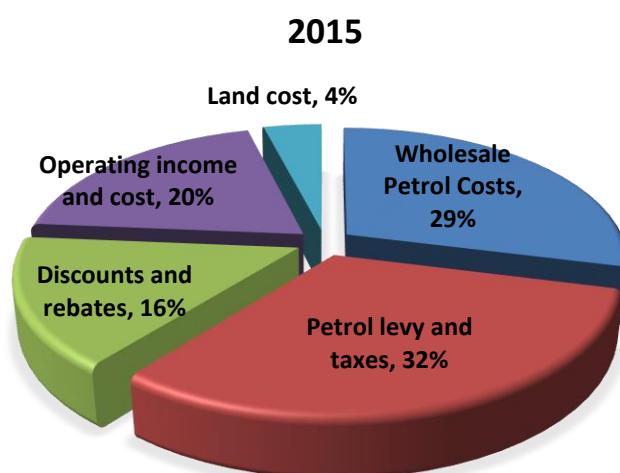
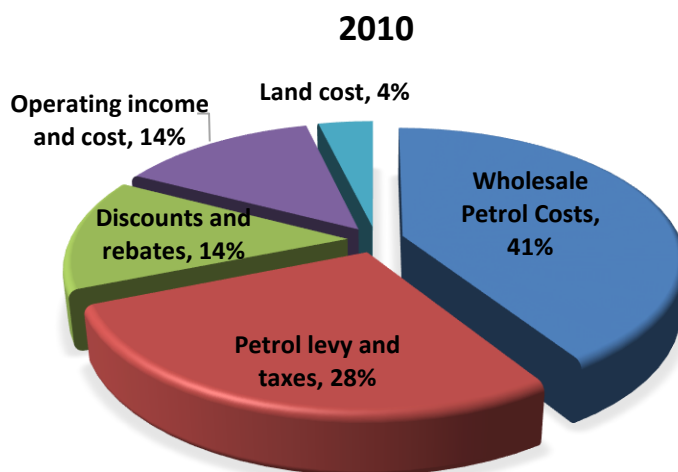
37. Exhibit 12 shows the components of listed petrol price in absolute dollar terms for 2010 and 2015.

Exhibit 12: Components of retail petrol price in dollar terms for 2010 and 2015



38. Exhibit 13 shows the components of listed petrol price by percentages for 2010 and 2015.

Exhibit 13: Components of retail petrol price in percentage terms for 2010 and 2015



*Note: Figures may not add up to 100% due to rounding.
Source: CCS's estimates based on information provided by petrol retailers.*

39. The components of listed retail petrol prices are:
- i) Petrol duty and taxes, which comprise the duties levied on petrol by the government and the prevailing goods and services tax ("GST") paid on retail petrol. Since 23 February 2015, the duty for Octane 98 and above is S\$0.64 per litre, while the duty for Octane 92 and Octane 95 is S\$0.56 per litre.
 - ii) Wholesale petrol costs, which is accounted for using the MOPS price.
 - iii) Operating costs of the retail petrol business. This generally includes manpower, utilities, maintenance, marketing and administrative costs.

- iv) Operating income, i.e. gross profit.
- v) Discounts and rebates.
- vi) Land costs, which are the amortised costs of leasing or purchasing the sites for the petrol stations.

40. Between 2010 and 2015, CCS observed that the retail petrol price has increased from \$1.87 to \$2.13. The wholesale petrol cost component has decreased from \$0.77 to \$0.62 (from 41% to 29%), though part of the decrease was off-set by the levy and taxes component which has increased from \$0.52 to \$0.68 (from 28% to 32%), and the discounts and rebates components which have increased from \$0.26 to \$0.33 (from 14% to 16%). The land cost component increased from \$0.07 to \$0.09 (but remained relatively unchanged in percentage terms at 4%). Within the operating income and cost component which has increased from \$0.25 to \$0.42 (from 14% to 20%), both operating income and operating cost have respectively increased. Overall, the combined non-fuel components comprising operating costs, levy and taxes, land costs, and discounts and rebates have increased. The operating income margins also increased. The ability of petrol retailers to increase their operating margins is likely to be a result of limited retail price competition.

THERE IS HIGH BRAND LOYALTY AMONG CONSUMERS

41. In a competitive market, consumers may be expected to switch between petrol retailers to secure the best deals. This is especially so in the retail petrol market as petrol is a homogenous product and large part of the competition takes place between the petrol retailers based on pricing.

42. The consumer survey revealed that pricing is one of the key considerations for consumers when purchasing petrol. The consumer survey found that:

- i) The top five reasons for purchasing petrol from a particular brand most often are: the convenience of station locations, attractiveness of credit/debit card promotions, attractiveness of brand loyalty programmes, good fuel efficiency/mileage and low listed petrol prices.³⁰
- ii) The top reasons for not switching to another petrol brand are: the convenience of station locations, satisfaction with current credit/debit card promotions, satisfaction with current loyalty programmes, the petrol brand has a wide network of stations and is hence easily accessible, and protection of the vehicle's engine.³¹

³⁰ Section 3.1 of the Forbes Consumer Survey report.

³¹ Section 4.1 of the Forbes Consumer Survey report.

- iii) The top reasons for switching to another petrol brand are: greater convenience of station locations, more attractive credit/debit card promotions, lower listed petrol prices, wider network of stations and better fuel efficiency/mileage.³²

43. Based on the above, factors directly related to pricing, i.e. attractiveness of credit/debit card promotions, attractiveness of brand loyalty programmes and low listed petrol prices are consistently ranked highly by respondents in their choice of petrol brand.

44. However, despite the importance of pricing to consumers and the fluctuations of petrol prices over time, the consumer survey revealed that 3 in 5 respondents did not switch petrol brands in the last five years, and most of those who switched tried only one other petrol brand.³³

45. The paradox that consumers attach importance to petrol pricing, yet most did not switch petrol brands despite the fluctuations of petrol prices over time, could be due to the lack of ready access to and awareness of retail petrol prices by consumers, and hence the lack of necessary information to make the best petrol purchase decision.

46. This finding should be understood in light of the current environment where retail petrol stations in Singapore do not advertise their retail petrol prices on prominent sign boards at the entrance to the petrol stations. Rather, at retail petrol stations in Singapore, petrol prices are accessible only at the petrol pump or at the entrance to, or inside, at the retail kiosk.

47. CCS understands that three out of the four petrol retailers publish their listed prices online, and information on petrol discounts can be accessed on each petrol retailer's website. However, CCS has observed that many discount and rebate schemes may not be easily comparable due to differing terms and conditions and qualifying criteria. For example, the rebate may be presented as a percentage of the listed price or post-discount price. There may also be a requirement for a minimum monthly expenditure either on petrol or in general in order for the card holder to enjoy a higher rebate. There may also be benefits which are difficult to compare or quantify monetarily, e.g. free gifts or redemption points.

48. The consumer survey shows that only 1 in 5 of respondents (22%) compared petrol prices. In other words, almost 4 in 5 respondents do not monitor the prices of petrol across brands.³⁴

49. CCS also inquired further into the manner in which consumers monitor petrol prices. Among survey respondents who compared petrol prices, 75.6% monitor prices displayed at

³² Section 4.1 of the Forbes Consumer Survey report.

³³ Section 4.1 of the Forbes Consumer Survey report.

³⁴ Section 7.1 of the Forbes Consumer Survey report.

the petrol station; 10.9% through petrol companies' websites; 10.9% through word-of-mouth; 9.8% through comparison websites and 5.6% through mobile/tablet applications. 9.4% indicated that they monitor through other methods, e.g. TV, newspaper and radio. The aforementioned percentages add up to more than 100% as most respondents indicated more than one method of monitoring.³⁵

50. Using data from the consumer survey, CCS found that amongst respondents who monitor prices across petrol brands, those who monitor prices through comparison websites or mobile/tablet applications collectively indicated a significantly higher discount (16.5%) compared to those who monitor through conventional means (e.g. on-site display) or petrol retailers' websites (14.5%) by 2%. Therefore, if all motorists in Singapore monitor petrol prices through comparison websites or mobile/tablet applications, it would lead to an estimated aggregate savings of S\$40 million per year. (Refer to Annex C for the calculations) This suggests there is significant value in presenting price and discount information in a comparable manner as in comparison websites and mobile/tablet applications.³⁶

THERE IS A NEED TO IMPROVE THE TRANSPARENCY OF THE EFFECTIVE RETAIL PRICE TO ALLOW CONSUMERS TO MAKE MORE INFORMED CHOICES AND INCREASE COMPETITION

51. Therefore, enhanced transparency of retail petrol prices via online/mobile platforms can encourage a more competitive market in Singapore. CCS is of the view that if petrol price information, i.e. retail prices and petrol discounts, were made more readily available and with greater transparency enabling consumers to compare prices, consumers would be better equipped to make more informed petrol purchase decisions. This would in turn facilitate a more price-competitive retail petrol market in Singapore, as petrol retailers would then be encouraged to offer better prices and promotions to attract consumers.

52. Improving price transparency will encourage competition and benefit consumers. Further, CCS does not expect the increased price transparency for consumers to raise the risk of coordination between the petrol retailers as they already monitor and take into consideration retail petrol price movements by their competitors when making their own pricing decisions.

53. There is scope to increase the transparency of effective petrol prices in Singapore. Though there are existing price comparison websites (e.g. PetrolWatch) and mobile applications (e.g. Fuel-Me-Up, Singapore Petrol Prices, Galactio-SG), none of them provide complete and real-time updates on petrol price changes and applicable discounts in a manner

³⁵ Section 7.1 of the Forbes Consumer Survey report.

³⁶ For example, consumers who monitor via prices displayed at petrol stations would have to drive into different petrol stations to compare prices. Consumers who monitor via petrol retailers' websites would have to visit each retailer's website to compare the prices as well as navigate to the webpage containing the relevant discounts and rebates information. They also need to do their own calculations and comparisons of the effective prices after discounts and rebates. Consumers who rely on word-of-mouth may not be privy to the latest prices and discounts available.

that is easily comparable between all petrol retailers. For example, most of these price comparison websites are not able to provide real-time update on ExxonMobil's listed prices as they are not published on ExxonMobil's website.

54. Therefore, CCS is of the view that the development of a price comparison web portal and/or mobile application to make available more information regarding petrol prices will further empower consumers to make more informed purchase decisions and encourage more effective and transparent competition amongst the petrol retailers in Singapore. CCS is exploring development opportunities in this area with relevant stakeholders.

THERE IS SCOPE TO RAISE CONSUMER AWARENESS ON OCTANE GRADES

55. Octane rating is a standard measure of the quality of fuel required by a vehicle's engine. Research Octane Number ("RON")³⁷ is the most common type of octane rating.³⁸ RON measures a fuel's ability to resist incomplete combustion of the petrol fuel in the engine cylinder which causes a sudden knock or blow to the piston, also known as "knocking".³⁹ The octane requirement of an engine varies with compression ratio, geometrical and mechanical considerations and operating conditions.⁴⁰ Additives can be added to petrol to increase the RON.⁴¹ While CCS is aware of five studies that unanimously concluded that using higher than recommended petrol grade can increase the Brake Specific Fuel Consumption⁴² and reduce Brake Thermal Efficiency⁴³, brake torque⁴⁴ and power^{45,46,47,48,49}, there is still a prevailing view

³⁷ In most countries like Singapore and Europe, the displayed octane rating shown on the petrol pump is the RON. However, in some other countries like the United States, the displayed number is the Anti-Knock Index ("AKI"), also called the Posted Octane Number ("PON"), which is the average of the RON and Motor Octane Number ("MON").

³⁸ Alahmer, A., & Aladayleh, W. (2016). Effect two grades of octane numbers on the performance, exhaust and acoustic emissions of spark ignition engine. *Fuel*, 180, 80-89.

³⁹ Groyzman, A. (2014). *Corrosion in Systems for Storage and Transportation of Petroleum Products and Biofuels*, DOI 10.1007/978-94-007-7884-9_2, Springer.

⁴⁰ Exxon Mobil, Reference: www.exxon.com/en/octane-rating

⁴¹ Adding additives to gasoline can increase the octane number. Additives increase the activation energy of combustion of the gasoline mixture. Activation energy is the minimum applied energy required to start a chemical reaction – which in this case, it is to initiate combustion. Thus, the injection of anti-knock additives allows for the increase in activation energy of combustion, in which the combustion happens without detonation.

⁴² Brake Specific Fuel Consumption ("BSFC") is a measure of how efficiently a given amount of fuel is being converted into a specific amount of horsepower. A more inefficient conversion leads to higher BSFC.

⁴³ Brake Thermal Efficiency measures how well an engine converts thermal energy released from the injected fuel to mechanical energy in the engine.

⁴⁴ Brake torque is the power of the braking system to stop the motion of a moving vehicle.

⁴⁵ Sayin, C., Kilicaslan, I., Canakci, M., & Ozsezen, N. (2005). An experimental study of the effect of octane number higher than engine requirement on the engine performance and emissions. *Applied Thermal Engineering*, 25(8-9), 1315-1324.

⁴⁶ Alahmer, A., & Aladayleh, W. (2016). Effect two grades of octane numbers on the performance, exhaust and acoustic emissions of spark ignition engine. *Fuel*, 180, 80-89.

⁴⁷ Khalia, A., Antar, M., & Farag, M. (2015). Experimental and Theoretical Comparative Study of Performance and Emissions for a Fuel Injection SI Engine with Two Octane Blends. *Arabian Journal for Science and Engineering*, 40(6), 1743-1756.

⁴⁸ Sayin, C. (2012). The impact of varying spark timing at different octane numbers on the performance and emission characteristics in a gasoline engine. *Fuel*, 97, 856-861.

⁴⁹ Mohamad, T., & How, H. (2014). Part-load performance and emissions of a spark ignition engine fueled with RON95 and RON97 gasoline: Technical viewpoint on Malaysia's fuel price debate. *Energy Conversion And Management*, 88, 928-935.

that using a higher octane grade leads to better engine performance. Instead, using the correct gasoline grade recommended by the engine specification listed in the vehicle's owners' manual generally allows the best engine performance.

56. In Singapore, according to the consumer survey, 62% of respondents purchased Octane 95 the most, 28% Octane 98, and 6% Octane 92. The remaining 4% purchased Shell V-Power Nitro+ the most.⁵⁰ Overall, 74% of respondents did not switch grades in the last five years.⁵¹ In choosing a petrol grade, 51% of respondents considered "Good fuel efficiency/mileage", 49% considered "Low listed petrol prices" and 23% considered "High power/ good pickup". Only 11% considered "Specified/recommended grade by vehicle manufacturer".⁵²

57. CCS found from the consumer survey that around 3 in 5 respondents (63%) pump a higher grade of petrol than that recommended by the model of the vehicle. Around 1 in 7 respondents (15%) pump two octane grades higher than the recommended petrol grade, i.e. pumping Octane 98 while the manufacturer of the vehicle recommends Octane 92 petrol.⁵³

58. While CCS recognises that there may be reasons why some drivers choose to pump a higher octane grade than recommended (e.g. to take advantage of the additives that are added in the premium petrol grade), there is also a prevailing view among motorists that using higher petrol grades leads to better engine performance. In this regard, CCS is of the view that greater awareness among consumers regarding octane grades and other technical aspects of petrol usage may help consumers make more informed purchase decisions. CCS will continue to advocate more consumer awareness through appropriate channels.

⁵⁰ Section 3.2 of the Forbes Consumer Survey report.

⁵¹ Section 4.2 of the Forbes Consumer Survey report.

⁵² Section 3.2 of the Forbes Consumer Survey report.

⁵³ A more detailed explanation of the over-pump analysis is found in [Annex D](#).

A NEW RETAILER ENTERS THE MARKET

59. CCS also notes that a new player, Sinopec (Hong Kong) Limited⁵⁴, has been awarded the tender of two petrol station sites in Singapore at Yishun Avenue and Bukit Timah Road.⁵⁵ In CCS's view, Sinopec would need to secure a viable number of petrol sites in order to have sufficient scale to gain market foothold and compete effectively with the other petrol retailers.

60. With more players at the supply side of the market, CCS is of the view that enhancing consumer awareness and making available more information regarding petrol grades and prices at the demand side will enhance the ability of consumers to make informed petrol purchase decisions and further increase competition in the retail petrol market.

⁵⁴ Sinopec (Hong Kong) Limited currently operates as a petrol retailer in Hong Kong, where it successfully entered in 2004 after the government introduced changes to the tendering system. In 2000, the Hong Kong government stipulated that all petrol station sites be re-tendered once their 21-year lease term expired. Previously, an existing player could pay a land premium to renew the lease. In 2003, the government introduced a 'batch tendering' system which allows tenderers to submit a single 'super bid' for a batch of petrol station sites, in addition to bids for individual sites. A 'super bid' tenderer wins the right to operate the batch of petrol station sites if it outbids all other 'super bid' tenderers and its 'super bid' exceeds the sum of the highest bids for individual sites. Reference: <http://www.scmp.com/article/582543/overhaul-petrol-pump-policy-faces-challenge>.

⁵⁵ Sinopec Corp's website, Reference: http://www.sinopecgroup.com/group/en/Sinopecnews/20170323/news_20170323_325512087921.shtml

Annex B: Technical annex on analysis of the effect of MOPS price on listed petrol price

Using statistical analysis, CCS tested whether listed petrol prices in Singapore respond in greater magnitude or speed to an increase in the MOPS price, compared to a decrease, also known as the ‘rocket and feather’ effect.

The selected period of analysis is from 1 January 2010 to 31 December 2016 to cover a significant length of time and episodes of both sustained increases and decreases in MOPS prices. CCS used a series of average listed prices for Octane 95, constructed from daily prices obtained from each petrol retailer, and did the same for Octane 92 and Octane 98. The MOPS prices are based on daily prices of Gasoline 95 unleaded purchased from McGraw Hill Financial. All prices are in or converted to SGD per litre using exchange rates from the Monetary Authority of Singapore.

Using the data above, CCS specified the following equation to estimate the effect of an increase in the MOPS price, and separately a decrease in crude oil price, on average listed petrol price for Octane 95. CCS analysed the same for Octane 92 and Octane 98 prices separately.

$$\Delta R_t = \alpha + \sum_{i=0}^p \beta_{t-i}^+ \Delta M_{t-i}^+ + \sum_{i=0}^q \beta_{t-i}^- \Delta M_{t-i}^- + u_t$$

Where:

- ΔR_t = change in average listed petrol price between time t and t-1
- ΔM_{t-i}^+ = increase in MOPS price between time t-i and t-i-1, zero otherwise
- ΔM_{t-i}^- = decrease in MOPS price between time t-i and t-i-1, zero otherwise
- α = constant
- u_t = error term

Based on Bayesian Information Criterion (“BIC”) which is a measure of the quality of a statistical model based on data, the model selected for Octane 92, Octane 95 and Octane 98 that optimises the estimation is the one that provides 8 days’ lag for MOPS price increase and 6 days’ lag for decrease, i.e. p = 8, q = 6.

The estimated coefficients are displayed in the table below:

Figure: Estimated coefficients based on the regression models

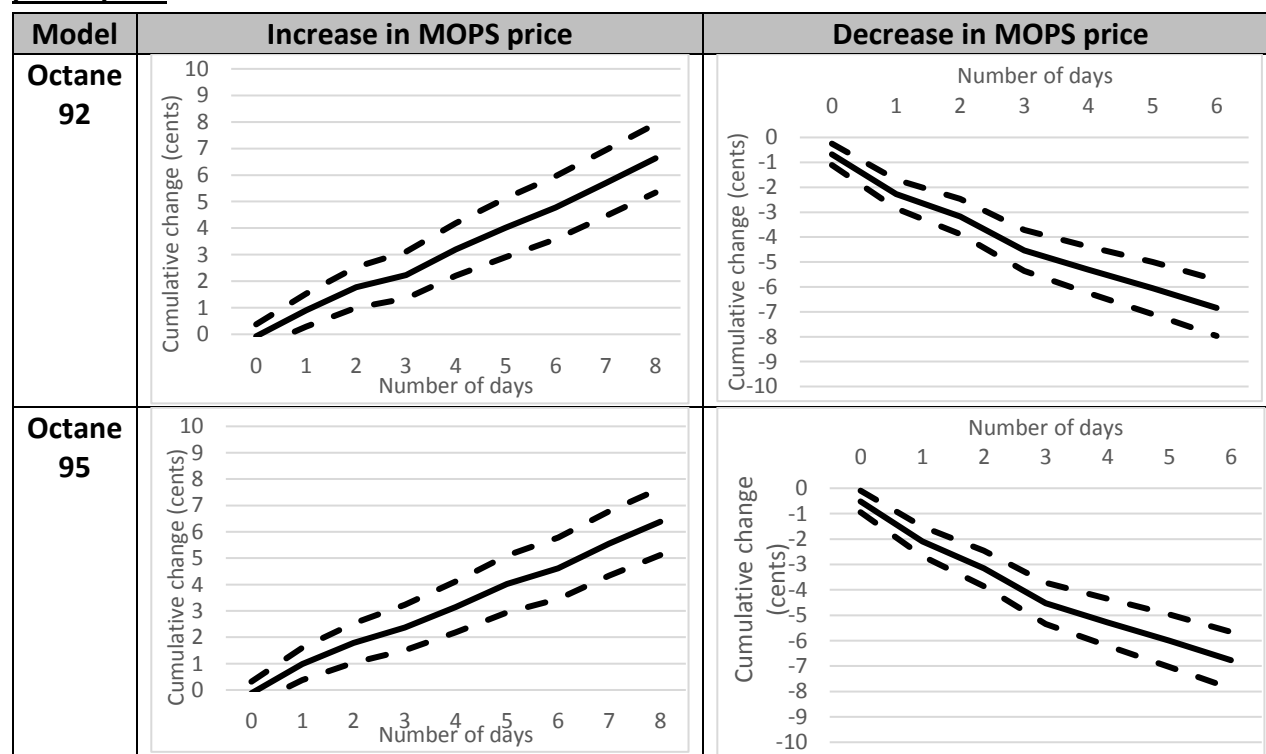
Coefficient	Octane 92 Model	Octane 95 Model	Octane 98 Model
α	0.0002	0.0003	0.0003
Coefficients for increase in MOPS price			
β_{t-0}^+	-0.0078	-0.0128	-0.0138
β_{t-1}^+	0.0982***	0.1113***	0.1100***

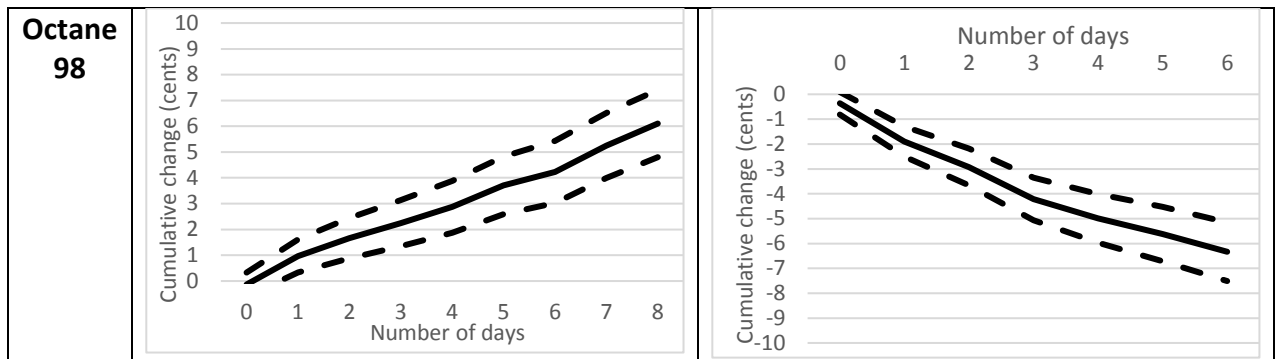
β_{t-2}^+	0.0859***	0.0788***	0.0688**
β_{t-3}^+	0.0464*	0.0589**	0.0580*
β_{t-4}^+	0.0962***	0.0776***	0.0633**
β_{t-5}^+	0.0812***	0.0863***	0.0825***
β_{t-6}^+	0.0756**	0.0598**	0.0521*
β_{t-7}^+	0.0921***	0.0933***	0.1012***
β_{t-8}^+	0.0935***	0.0827***	0.0854***
Coefficients for decrease in MOPS price			
β_{t-0}^-	0.0675**	0.0517*	0.0358
β_{t-1}^-	0.1597***	0.1569***	0.1534***
β_{t-2}^-	0.0893***	0.1061***	0.1026***
β_{t-3}^-	0.1363***	0.1368***	0.1281***
β_{t-4}^-	0.0771***	0.0748***	0.0772**
β_{t-5}^-	0.0736**	0.0723**	0.0633**
β_{t-6}^-	0.0793***	0.0764***	0.0705**
Regression Statistics			
No of observations	2,549	2,549	2,549
R-squared	0.1239	0.1248	0.1060
Adj R-squared	0.1184	0.1193	0.1004

* p<0.05, ** p<0.01, *** p<0.001

Based on the above estimates, CCS calculated the cumulative effect of an increase, and separately of a decrease, in the MOPS price on listed petrol price.

Figure: Cumulative effect of one-time 10 SGD cents increase/decrease in MOPS price on petrol price





Note: Dotted lines encapsulate an acceptable range of estimate error⁵⁶

For completeness, CCS had considered the Akaike Information Criterion (AIC) for lag selection. However, as more lags were added to the model, AIC fluctuated without a clear peak up to as many as 20 lags to the model. Therefore, CCS concluded that BIC is a more reliable lag selection indicator as BIC is more averse to modelling complexity than AIC, and has consistently recommended a particular combination of lags, i.e. 8 days for increase in MOPS price and 6 days for decrease.

Based on the regression results and regardless of the models used, CCS tested and did not find a significant difference in the cumulative effect of an increase and decrease in MOPS price.

The corresponding F-values for the various models are as follows. In none of the model can the null hypothesis (i.e. no asymmetry in price effects) be rejected at 10% level.

F-statistics	lag selection (p=8, q=6)
Octane 92	0.8279
Octane 95	0.6863
Octane 98	0.8201

Therefore, CCS concludes that based on the data, the “rocket and feather” effect⁵⁷ does not exist at a statistically significant level.

⁵⁶ 95% confidence interval

⁵⁷ Refer to paragraphs 16-19 of this report.

Annex C: Analysis of survey responses on monitoring and discounts

Using responses from the consumer survey, CCS calculated the petrol discount rate indicated by groups of respondents who monitor petrol prices across brands. The relevant survey questions are:

- Question 22: “Do you monitor the prices of petrol across the petrol brands?” For respondents who indicated “Yes”, they were directed to Question 24 which states: “How do you usually monitor the prices of petrol across petrol brands?”
- Question 26: “Do you make use of petrol discounts and rebates on a regular basis?” For respondents who indicated “Yes”, they were asked in Q28 to indicate “Approximately how much discounts are you getting on your petrol purchases?” in percentage terms.

CCS found that:

- 237 respondents who indicated that they monitor the prices of petrol across petrol brands (14.8%) did not enjoy a significantly different discount on their petrol purchases as compared with the 806 respondents who do not monitor (14.9%).
- Amongst the 237 respondents who monitor petrol prices, CCS estimated that respondents enjoyed an average discount of 16.2% if they only monitor through comparison websites. Respondents enjoyed an average discount of 15.1% if they only monitor through mobile/tablet applications. CCS found that the discounts enjoyed by monitoring via comparison websites (16.2%) and mobile/tablet applications (15.1%) are significantly higher compared to the discounts enjoyed by respondents who monitored via other means.⁵⁸ Though the two groups of respondents who monitor via price comparison websites or mobile/tablet applications are small, the differences in discounts they enjoy are statistically significant from the other groups of respondents who monitor via other means.
- Respondents who indicated that they monitor through comparison websites or through mobile/tablet applications collectively indicated a significantly higher discount (16.5%) compared to those who monitor through conventional means (e.g. on-site display) or petrol retailers’ websites (14.5%) by 2%. The difference in discount is statistically significant.⁵⁹

⁵⁸ As respondents may indicate multiple methods of monitoring petrol prices, CCS conducted a regression analysis on the discounts indicated by respondents using dummy variables to isolate the effect on discounts for each monitoring method.

⁵⁹ CCS conducted a separate regression analysis to estimate the difference in discount enjoyed by the respondents who monitor via comparison websites or mobile/tablet applications (‘in’ group) as compared to the respondents who does not monitor via comparison websites and mobile/tablet applications (‘out’ group). In other words, as long as a respondent monitor via monitoring websites or mobile/tablet applications, he is in the ‘in’ group. Otherwise, he is in the ‘out’ group. Therefore, the discount percentages may not be directly comparable with those the prior regression as the models are specified differently.

Therefore, if all motorists in Singapore monitor petrol prices through comparison websites or mobile/tablet applications, it would lead to an estimated aggregate savings of S\$40 million per year. This is based on the aggregate petrol spending of about S\$2 billion in 2015 across all petrol grades.

This suggests there is significant value in presenting price and discount information in a comparable manner as in comparison websites and mobile/tablet applications.

Figure: Average discount reported by respondent groups

Respondents	Number of respondents	Estimated Discount (Q28)
Q22: Do you monitor the prices of petrol across the petrol brands?		
Respondents who indicated they do <u>not</u> monitor prices across brands	806	14.9%
Respondents who indicated they do monitor prices across brands	237	14.8%
Q24: How do you usually monitor the prices of petrol across petrol brands?		
a) Respondents who indicated that they monitor prices displayed at petrol stations	179	14.5%
b) Respondents who indicated that they monitor through petrol companies' websites	26	14.0%
c) Respondents who indicated that they monitor through comparison websites	24	16.2%*
d) Respondents who indicated that they monitor through mobile / tablet applications	15	15.1%*
e) Respondents who indicated that they monitor through word-of-mouth	27	13.7%
f) Respondents who indicated that they monitor through others ways	23	14.3%
Based on regrouping of respondents based on response to Q24		
Respondents who indicated that they monitor through comparison websites (c) or mobile / tablet applications (d)	37	16.5%*
Respondents who did <u>not</u> indicate that they monitor through comparison websites (c) and/or mobile / tablet applications (d)	200	14.5%

Notes: The analysis excludes 82 respondents who indicated that they did not use discount regularly and hence did not need to indicate the approximate discount they are getting on their petrol purchases. The analysis also excludes 75 respondents who chose not to disclose how much petrol discounts they get on their petrol purchases. Q24 is a multiple-response question, hence the responses add up to more than 237.

** Statistically higher than the other relevant groups*

Annex D: Petrol grade over-pump analysis

CCS analysed the tendency for respondents to pump different grades of petrol and whether the petrol grade that they pump is consistent with or exceeds the petrol grade recommended by the vehicle manufacturer.

In the consumer survey, respondents were asked in Q14 which petrol grade they purchased the most. The respondents were also asked under the questions on demographics to provide details of their vehicles including “Vehicle CC” and “Make/Model”. After removing ambiguous responses (e.g. vehicle models which are not specified, misspelled or incorrect) from the sample, CCS gathered 870 responses covering a total of 193 unique vehicle models.

Based on vehicle manuals available online, CCS collected data on the recommended petrol grade for each vehicle model. Vehicle manuals typically prescribe a “recommended” and “required/minimum” grade. Based on statements found in the owners’ manual distributed by a number of manufacturers (e.g. Audi⁶⁰, Hyundai⁶¹, Kia⁶², Land Rover⁶³ and Nissan⁶⁴), CCS noted that while the vehicle could operate with “required/minimum” octane rating, it may lead to slight reductions in engine performance. On the other hand, using the “recommended” grade optimises engine performance. Therefore, for the purpose of the analysis, CCS used the “recommended” grade as a basis for reference. CCS also considered Shell V-Power Nitro+ to be of the same grade as Octane 98.

CCS compared for each respondent, the corresponding petrol grade available in Singapore with respect to the specified recommended petrol grade for the vehicle model, with the actual grade that the respondent indicated to have purchased most. Respondents who purchased higher than the vehicle recommended grade were considered to have “over-pumped”.

CCS found that around 3 in 5 respondents (63%) pump a higher octane grade of petrol than that recommended by the manufacturer of the vehicle. Around 1 in 7 (15%) respondents pump two octane grades higher than the recommended petrol grade, i.e. pumping Octane 98 while the manufacturer of the vehicle model recommends Octane 92 petrol.

⁶⁰ Audi A3 Owners’ Manual, pp. 228, Reference: <https://ownersmanuals2.com/audi/a3-s3-2016-owner-s-manual-71175/page-230>

⁶¹ Hyundai Getz Owners’ Manual, 1-2, Reference: <https://carmanuals2.com/hyundai-getz-2008-owner-s-manual-101102>

⁶² Kia Optima Owners’ Manual, 1-03, Reference: <https://carmanuals2.com/get/kia-optima-2017-owner-s-manual-98895>

⁶³ Land Rover Discovery Owners’ Manual, Fuel and Refuelling, Reference: https://www.ownerinfo.landrover.com/document/3D/2017/T19950/22468_en_GBR/proc/G1988081

⁶⁴ Nissan Murano Owners’ Manual, Fuel Recommendation, Reference: <https://www.nisuv.com/nicont-530.html>