Analysis of Ownership Models and Price Fluctuations in Retail Gasoline Industry

Charles A.Izuakor[1], Mohamad A. Saouli[2] and Bhaskar R. Sinha[3, *]

[1]Los Angeles Unified School District, Bell
California, USA

[2]DeVry University, Pomona
California, USA

[3]National University San Diego, California, USA

[*]*Corresponding author's email: bsinha [AT] nu.edu*

ABSTRACT---- ***There are two broad categories of ownership models in retail gasoline industry: the branded and the unbranded models. In the branded model an employee of the refinery operates the station and receives wages while the refiner such as Exxon, Mobile, or Shell is the proprietor of the station. Another is the leased lease option. In both cases,the station is bound in contract with the refiner for the supply of gasoline. In the unbranded model, the dealers, also referred to as independent dealers or simply independent retailers, are independent stations and are not tied into a contract with any refiner. Such independent gasoline stations as Gas City, USA Gas, Conoco, and even Costco may purchase gasoline anywhere and resell. With different models and ownership arrangements in retail gasoline industry, the big question is what factors prospective gas station investors and proprietors consider when deciding on an ownership model.Gasoline prices at the pump fluctuates seasonally, daily, and often by the hour. Many empirical studies show that such price fluctuations may inversely impact family budgets, gasoline station owners' bottom line, and high gasoline-dependent companies' operating margins. Studies have examined the effects of some factors such as crude oil prices and sudden disruptions at refineries and delivery channels. This study adopts an analysis of time series to evaluate the dealer cost factors for branded and unbranded gasoline stations and their impact, if any, on price fluctuations and the choice of ownership models. An analysis of results from the study shows there is no significant difference between the branded and unbranded 5-year average dealer cost of gasoline in Southern California given all the cost factors. This study found that dealer and consumer cost changes (fluctuations) vary according to gasoline station's ownership models in branded or unbranded dealerships. Overall, branded gasoline stations were found to be more cost effective operating models in Southern California retail gasoline market.***

Keywords–ANOVA, **c**ompany operated station, dealer operated station, dealer tank wagon, gasoline island, jobber, lessee dealer, oil price information services, rack price, reformulated gasoline, secondary data, vertical integration

---

1. INTRODUCTION

Rising gasoline pump prices regularly command keen attention of consumers and small businesses due to their frequent spikes and fluctuations [1]. Such fluctuations provoke debate within the continental USA and even beyond, because of the importance of gasoline to the daily commute of American households and the American at large. With each upward trend in gasoline prices, customers are quick to accuse gasoline companies and gas stations operators of price gouging, inordinate mark-ups, and extraordinary profit margins. Unfortunately, such price dynamics at the pump and customers' reactions to price changes have defied easy explanation.Gasoline prices affect the United States' economy in so many ways, from transportation to energy supply [2]. These effects are felt by a cross-section of the national economy[3]. Some of the industries most affected by price jump are the trucking and freight companies that depend on gasoline for freight movement. According to Motor and Equipment Manufacturing Association (MEMA), American motorists log close to 3 trillion miles per year and consume about 130 billion gallons of gasoline or 9 million barrels of gasoline per day. The American Trucking Association (ATA) reports that trucking alone ferried 67% of the total freight tonnage in the United States [4]. As such, price

fluctuations immensely influence the cost and ease of freight movement, a mainstay of USA economy. In an inbound logistic trucking perspective survey, it was found that fuel cost represents 49% of the challenges the trucking industry faces [5].Fluctuations in retail price for gasoline have remained on the radar of businesses and individual consumers. At the heart of these fluctuations is crude oil prices and related inventory replenishment cost at every distribution point. Gasoline is an integrated market that features ownership and contractual relationships among refiners, dealers, and retailers. Retail gasoline prices,between 1995 and 2005,have experienced drastic fluctuations in price with an aggregate increase of 250% in retail price per gallon [6]. Such price behavior mirrors the trend in crude oil prices. Between January 1999 and March 2000, the price of oil jumped from $10 per barrel to $30 a barrel, and in 2008, the price of crude oil peaked at $145 a barrel only to dial back to $40 per barrel by early 2009 [7]. This supports the conclusion that the cost of crude oil is the single most significant factor that affects the price of gasoline at the pump and price fluctuations [8].Price fluctuation is most pronounced in California, where consumers pay one of the highest average prices relative to other states in the nation. Californian consumers pay 30 to 40 cents a gallon more than the national average price [9]. California gasoline market is marked by significant price spikes that are followed by remarkable dips in price. Specifically, between 2000 and 2005, the California gasoline market has averaged over 25% price swings on numerous occasions [10]. A similarreport states that California gasoline witnessed an average of 30% price jump per day in early July of 2001 and a 50%average price dive by the fall of that same year [11].The State of California Department of Justice Report of 2014[12] found that in California, the gasoline retail market is characterized by high recurrent price hikes. The report further noted that California, without any direct supply of gasoline from states that are east of the Rockies, is known as "Gasoline Island" and uses a special, reformulated blend of gasoline. Reformulated gasoline (RFG) is a conventional gas that is blended to burn more cleanly and specified for certain cities with smog-forming pollutants and mandated by the congressional Clean Air Act amendments in 1990 [13].

Most sectors of Southern Californian's economy, especially transportation and related companies, depend on gasoline for smooth flow, yet predicting and stabilizing gas prices has become very problematic for two reasons; supply or production is almost equal to demand and increase in prices do not induce additional production of gasoline. That means demand for gasoline in California is inelastic to price and sort of defies the laws of supply and demand because, "10 percent increase in price typically reduces short-term demand by as little as only 2 to 3 percent due to a high reliance on gasoline [14].With such a high reliance on gasoline, frequent price fluctuations present challenges for all sectors of the economy, particularly small businesses and individual consumers who rely on gasoline for their daily operations. Such price fluctuations is a concern for market watchers and policy makers since price outcome bears an inverse relationship to the stability of market and the welfare of consumers [15].Fluctuations in the price of gasoline have posed a series of challenges to gasoline dealers and operators [16].Literature concludes that retail gasoline prices are subject to sharp, short-term swings that often send conflicting market signals to both the dealers and customers and often calls for government intervention [17].

To understand the retail gasoline market one needs to understand the nature of gasoline industry. Gasoline industry transcends five distinct stages: exploration, production, refining, distribution, and consumption [18]. Retail gasoline falls under the distribution stage where transportation of gasoline passes from the refineries to the gasoline station through trucks and trains [18]. It is at this stage that wholesalers and dealers play prominent roles. There are two broad categories of distribution channels in retail gasoline industry: the branded and the unbranded dealers. Unbranded dealers and retailers are also referred to as independent dealers or simply independent retailers by some researchers. The branded retail gasoline dealers fall under three ownership models based on the contract type: (a) company owned (CO) with full vertical integration; (b) lessee-dealer (LD) ownership model where the refiner possesses sole ownership of land and other immobile capital with the independent owner acting as a self-employer; and (c) open-dealer (OD) where the refiner has no investment capital [19-21].In a company-operated (CO) ownership model, an employee of the refinery operates the station and receives wages while the refiner such as Exxon, Mobile, or Shell is the proprietor of the station [21]. In lessee-dealer (LD) ownership model, the LD signs a contract for the right to lease a station from the refiner [21-22]. Once signed, the LD is obligated to purchase the refiner's gasoline at whatever price the refiner mandates. In open-dealer (OD) model, the dealer owns the station but is bound in contract with the refiner for the supply of gasoline [23].Ownership model that does not fit into any of the three branded ownership arrangements is characterized as unbranded. When a station is classified as unbranded, it is an independent station and is not tied into a contract with any refiner [19][21]. Such independent gasoline stations as Gas City, USA Gas, Conoco, and even Costco may purchase gasoline anywhere and resell [21]. With different models and ownership arrangements in retail gasoline industry, the big question is what factors do prospective gas station investors and proprietors put into consideration when deciding on an ownership model.Better understanding of such factors will help owners set prices that will at least generate a positive return on investment in the form of profit. Understanding how these factors play out will help owners make better investment decision in an industry that is already highly competitive. Gasoline station makes less money during rising prices than during the period of falling prices [23]. As such, better knowledge of the interplay of dealer cost as a factor that influences price volatility will help potential gasoline station owners choose a model and set prices that will help sustain their businesses during changing prices.

This research has examined dealer cost of gasoline as a major factor that influences a prospective gasoline station owner's choice of an ownership model and the effect on gasoline pump price fluctuations. This study further examined three of the above branded ownership models and the unbranded (independent) gasoline operators in the gasoline market to determine their influence on gasoline price and price fluctuations. At the individual level, fluctuating or higher gas prices means paying more at the gas pump, it cuts down the resources left to spend on other goods and services, and affects the broader economy. Just as individuals and families search for ways to mitigate the impacts of rising prices, businesses both large and small, also search for ways to face daily challenges of coping with the fluctuating prices and maintaining a meaningful control over their operational costs [24]. Some businesses, including colleges, have elected to go with four-day weeks to limit their employees' or students' financial burden for commuting. For example, in 2008, Southwestern Community College announced a four-day school week to help students and staff save on gas money [24]. Industries that are significantly sensitive to gasoline prices like trucking, auto industry, freight companies, and airline industry continue to watch price behavior of gasoline and seek for ways to reduce cost [24].The problem is that gasoline price behavior is volatile because of crude oil cost variations and a number of other cost variables, such as transportation and storage costs. Just in the last decade, gasoline price has risen by about 7.51% per gallon compared to 1.91% compound growth rate of Consumer Price Index of other non-energy items [25]. Consumers of gasoline are unhappy about this situation, mainly because it is unclear how dealer costs reflect on the pump cost of gasoline. From an investment perspective, price fluctuations create uncertainty for investors who rely on long time predictability to make decisions [18]. Studies have shown the need to clarify the magnitude of dealer actual costs and other artificial costs that may be ownership model induced, influencing pump prices [18]. Thus, the purpose of this research is to examine quantitatively the influence of dealer costs of gasoline on price fluctuations at the pump and the choice of ownership models by entrepreneurs in the retail gasoline market in Southern California. Examining cost fluctuations by ownership structure helps, to a certain extent,explain the increases in gasoline prices in the past decade, and might aid prospective gasoline business entrepreneurs to choose the most cost effective models. Result from this study might help to provide answers to trends in rising gas prices; a useful information to governments, energy policy makers, entrepreneurs, and consumers.

2. RESEARCH DESCRIPTION

It is unclear which of the interconnected factors have caused the significant gasoline price increases in the past decade, which has become the most watched retail market price because of its volatility. Though gasoline price hikes are characterized as seasonal, it is affected by crude oil cost variations and suffers from occasional refinery glitches. Other factors leading to arbitrary price increases and fluctuations are unclear, since we know that legislation does little to affect prices and in some cases, actually raises prices [23][26]. Any global or local disturbance, industry related or not, may cause instant spike in gasoline pump price. The literature is full of examples where every time gasoline prices spike it creates discontent that reverberates through the consumers of gasoline in the retail industry [26]. Such spikesgenerate ripple effects that pit consumers against the retail stations, owners against the big oil companies, and oil companies in turn against elected officials and their legislations [26]. Data from the Consumer Expenditure Survey, U.S. Department of Labor, show that an average American household spent 4.4% of its income on gasoline and motor oil purchases in 2008, which represents a 67% increase over 2002 statistics [27]. Yet, consumers are unaware of the dealer cost of gasoline in the context of ownership models and how such costs influence gasoline prices at the pump. The only thing the customers know is that they pay too much at the pump. From an investment perspective, price fluctuations create uncertainty for investors who rely on long time predictability to make decisions [18]. For the purpose of this paper, an investor represents a person interested in owning and operating a gasoline station.

This paper presents the results of the research that seeks to determine if there is a correlation between the yearly and 5-year-average dealer and consumer costs of gasoline, and the number of gasoline stations in each ownership-type (branded and unbranded) between 2009 and 2013. Also, it determines which operating group (branded or unbranded model) is the most cost effective in Southern California market considering dealer and consumer costs of gasoline.Using choice of ownership model as the independent variable and price pump prices as the dependent variables, this research determines the association between dealer cost of gasoline and choice of ownership model on one hand and then the impact of such ownership models in Los Angeles County of Southern California.Understanding of the ownership structure and the cost consequences of different ownership models will aid prospective entrepreneurs involved in the gasoline business to choose the least restrictive and most cost-effective models.

3. RESEARCH METHODOLOGY

A quantitative methodology was used for this study. Time series analysis, which usually involves the analysis of large numerical data, a precursor to a quantitative methodology in which statistical and mathematical methods dominate [28]. This time series analytical design was applied in this study to collect, compare and analyze data in five phases. In Phase I, archival

data on branded and unbranded gasoline costs and prices were collected in sequence and at specific data points, 2009, 2010, 2011, 2012, and 2013 5-year period. In Phase II, costs and prices were measured by comparing their averages at successive points in time during the 5 years, for branded and unbranded operating models, to determine the significance of differences in costs and gasoline pump prices between the two brands. In Phase III, the correlation between cost fluctuations or changes, in branded and unbranded yearly and 5-year average dealer costs of gasoline, and the changes in consumer cost of gasoline at the pump for the same periods were determined, assuming that other factors that influence prices beside direct costs are constant. In Phase IV, the correlation between the yearly and 5-year-average dealer and consumer costs of gasoline, and the number of gasoline stations in each ownership-model between 2009 and 2013 was determined. In Phase V, the most cost effective operating models; brandedor unbranded,were determined from an established 5-year cost trend or pattern.Data on costs and prices were collected from dealerships in Los Angeles, California. Past gasoline costs and prices for a 5-year period, 2009-2013, were extracted from archival databases for dealerships meeting the sampling criteria for participation in this study. Some of the databases used are: Oil Prices Information Service database [29-30], and the U. S. Energy Information Administration (EIA) database [31-32] which provides a comprehensive State energy statistics and creates historical time series of energy production, consumption, costs, prices, by States and sources. The populationwas about 460 gas stations located in Los Angeles, California [33]. A non-probability sampling technique in which gasoline dealerships were chosen as participants arbitrarily based on a set of criteria, location, structure, and type of dealership (e.g., branded and unbranded) was applied as a sampling technique for data collection. Hence only costs and prices from participants meeting the choice criteria were sampled and used for analysis in this study. This technique is called "purposive sampling" [28]. Thus, participant dealerships and their operations were identifiable as capable of being classified under the existing operational structures as branded and unbranded, with terminal codes, terminal owner and locations.

Time Series, Analysis of Variance (ANOVA), and correlation analysis software were used. Many software programs analyze time series, such as SPSS, and Excel, mostly if linear regression analysis is necessary [34]. The magnitude of the trends in branded and unbranded dealerships was essential in this study, so Excel was used in generating the time series analysis incorporating a linear regression analysis. The time series was used to establish trends or patterns, the ANOVA to assess variances between branded and unbranded, and the correlation analysis to correlate variances in costs to pump prices.Data were extracted from the databases, sorted according to the variables and research question, and scored on Excel worksheet. Then, the appropriate statistical analysis applied to answer the research questions. Alpha was set at 0.05 level of significance (α =0.05).

4. RESULTS AND FINDINGS

This study examined the influence of two factors, the dealer cost of gasoline on price fluctuations at the pump and the choice of ownership models by entrepreneurs in the retail gasoline market in Southern California. The year 2009 was chosen as a base year, and a price fluctuation index for each year between 2009 and 2013 was determined as the differences in gasoline prices between a base year 2009 and subsequent years up to 2013 for two ownership models, branded and unbranded, in the retail gasoline market. In addition, the number of stations in each ownership model in the retail gasoline market for each year starting from the base year was determined. Price changes and number of stations were the dependent variables, and ownership model, and its related cost, such as dealer tank wagon, and dealer rack price controls were the independent variables. A quantitative analysis of the archival data on the variables was conducted, to determine the results.Data on 183 stations in Los Angeles on costs and prices, for 2009 through 2013 was collected, and yearly averages determined, and tabulated as branded and unbranded as shown in Table 1 and Table 2.

Table 1 - *Yearly Branded Gasoline Average Costs and Retail Prices*

Yearly Average Cost/ Price	Distribution Cost	Crude Cost	Refining Cost	Underground Tank fee	Sales Tax	Excise Tax	Federal Tax	Retail Price
2009	0.13	1.47	0.49	0.01	0.22	0.18	0.18	2.68
2010	0.16	1.88	0.41	0.02	0.17	0.27	0.18	3.09
2011	0.18	2.60	0.38	0.02	0.10	0.36	0.18	3.82
2012	0.28	2.64	0.46	0.02	0.09	0.35	0.18	4.03
2013	0.24	2.57	0.39	0.02	0.09	0.40	0.18	3.89

Table 2 - *Yearly Unbranded Gasoline Average Costs and Retail Prices*

Yearly Average Cost/Retail Prices	Distribution Cost	Crude Cost	Refining Cost	Underground Tank fee	Sales Tax	Excise Tax	Federal Tax	Retail Price
2009	0.15	1.47	0.47	0.01	0.22	0.18	0.18	2.68
2010	0.18	1.88	0.39	0.02	0.17	0.27	0.18	3.09
2011	0.21	2.60	0.34	0.02	0.10	0.36	0.18	3.82
2012	0.32	2.64	0.42	0.02	0.09	0.36	0.18	4.03
2013	0.30	2.57	0.33	0.02	0.09	0.40	0.18	3.89

Alpha was set at 0.05 level of significance (α =0.05).Each phases of the study they were applied, as well as the questions they address. Results were calculated from descriptive and inferential statistical analysis.Table 3 shows the consumer cost fluctuations in branded and unbranded. Table 4 contains data showing the five year mean cost/price and number of gasoline stations in branded and unbranded It is clear from this data that the mean price of petroleum (4.25) is the highest in the 76 brand, which has the highest number of gas stations, 1179, while the brand, 'We Got It,' with the lowest number of stations (63) has the lowest price (4.03). The observed pattern suggested a variation or fluctuations in which gas prices are higher in brands with more number of stations, than in brands with less number of station, and that dealer and consumer cost changes (fluctuations) vary according to gasoline station's ownership type in branded or unbranded dealerships. To confirm this pattern a correlation analysis was carried out. This correlation analysis returned a 0.772460157 coefficient of correlation, which suggests that a correlation exists between a 5-year mean cost/price and number of gasoline stations in both branded and unbranded gasoline markets.Correlation coefficient ranges from zero to one, one being very strong correlation and zero being no correlation. This study confirmed that there is a correlation between dealer costs and fluctuations and gasoline prices on the one hand, as well as between costs and prices and the number of stations.

Table 3 - *Data Table, Consumer Cost Fluctuation in Branded and Unbranded*

	76	7-Eleven	Arco	Chevron	Costco	Food for Less	G & M Food	Mobil	Shell	United	USA Petrol	Valero	We Got It	Unbranded
	0.00	0.00	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.0010	-0.01	0	0.002	0.010	0.100	-0.03	0.01	0.00	-0.01	0.01	-0.01	-0.02	-0.04
	0.0010	-0.01	0.016	0.002	0.010	0.100	0.01	-0.01	0.00	-0.01	0.03	-0.02	-0.03	-0.03
	0.0070	0.023	0.014	-0.017	0.010	0.100	0.01	0.02	0.00	0.02	0.01	-0.02	-0.04	-0.02
	0.0010	-0.01	0.024	-0.007	0.010	0.120	0.01	-0.01	0.01	0.00	0.05	-0.04	-0.04	-0.02
	-0.0020	0.003	0.001	-0.009	0.010	0.120	0.01	0.01	0.00	0.00	0.02	0.00	-0.03	-0.04
	-0.0030	-0.035	0.019	-0.014	0.020	0.120	-0.01	-0.02	0.01	0.01	0.01	-0.01	-0.04	-0.03
	-0.0080	-0.035	0.014	-0.018	0.020	0.120	-0.01	-0.02	0.02	0.00	0.02	-0.03	0	-0.05
	-0.0200	-0.01	0.014	-0.029	0.020	0.120	-0.01	-0.03	0.02	0.00	0.02	-0.04	0	-0.06
	-0.0250	-0.04	-0.01	-0.041	0.020	0.120	-0.01	-0.05	0.04	0.00	0.01	-0.02	0	-0.06
	0.2290	-0.015	0.012	-0.047	-0.020	0.130	-0.03	-0.05	0.05	0.00	0.00	-0.03	0	-0.06
	-0.0380	-0.015	0.029	-0.057	-0.020	0.120	-0.03	-0.07	0.06	0.00	0.00	-0.06	0	-0.07
	-0.0460	0.01	0.022	-0.058	-0.020	0.140	-0.03	-0.06	0.04	0.00	0.00	-0.06	0	-0.07
	-0.0490	0	0.038	-0.066	-0.020	0.120	-0.03	-0.08	0.06	0.00	-0.02	-0.03	0	- 0.09
Mean Fluctuation	0.01	-0.01	0.00	-0.02	0.00	0.10	-0.01	-0.02	0.02	0.00	0.01	-0.03	-0.01	-0.04
Number of Stations	1179	52	511	896	14	14	27	532	637	61	147	268	63	279

The branded market was found to be most cost effective in Southern California. As seen from Table 4 and Figure 1, the 5-year mean price of branded gasoline (4.106538) was found to be greater than the 5-year mean price of unbranded gasoline (4.08442857). This suggests that the unbranded stationscould be more cost effective, than the branded stations considering dealer and consumer price of gasoline. A regression analysis was carried out to further confirm this result, and to determine the brand that is most significantly cost effective.

Table 4 - *Five Year Mean Cost/Price and Number of Gasoline Stations in Branded and Unbranded*

	76-Gas	7-Eleven	Arco	Chevron	Costco	Food for Less	G & M Food	Mobil	Shell	United	USA Petrol	Valero	We Got It	Unbranded
5-Year Mean Cost/ Price	4.25	4.16	4.04	4.26	3.92	3.98	3.98	4.28	4.23	4.04	4.06	4.16	4.03	4.08
Number of Stations	1179	52	511	896	14	14	27	532	637	61	147.00	268	63	279

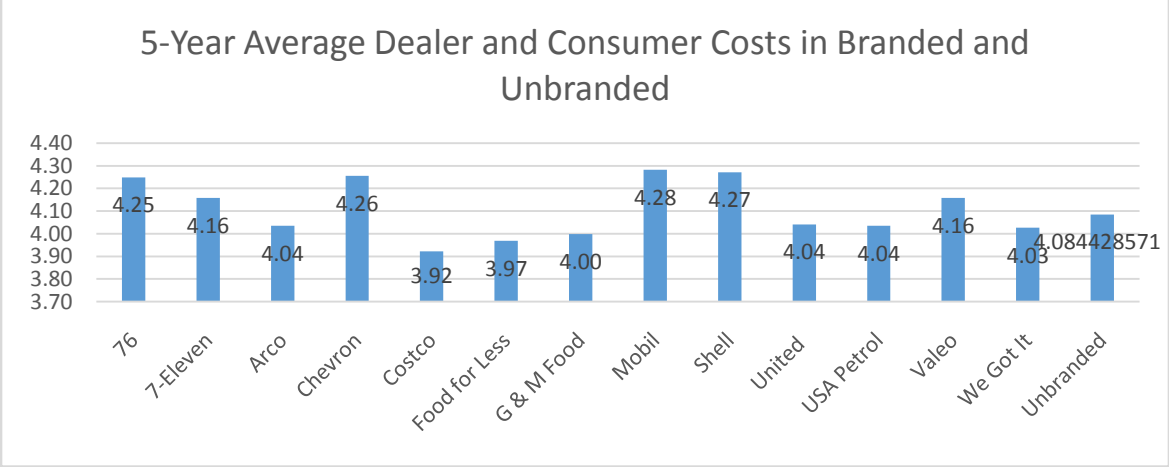

Figure 1- *5-Year Average Dealer and Consumer Costs in Branded and Unbranded*

Results from the regression analysis on yearly average costs in branded and unbranded gasoline markets depict the branded market to be most significantly cost effective. This result supports the hypothesis that the operating groups (branded and unbranded stations) are not equally cost effective in Southern California, considering dealer and consumer costs of gasoline. It was determined that the regression coefficients of unbranded stations have a higher cost contribution (1.86453) than the branded stations (0.431364). Two cost contribution factors, cost of crude (0.983193384) and Under Tank Fee (1.823630212) on theunbranded stations are by far higher and less cost effective than in the branded models 0.953213391 for cost of crude and 0 for Under Tank Fee, respectively. Following Table 5, Figure 2, and Table 6 contains data analysis fields and regression analysis results.

Table 5 - *Regression Coefficients of Cost Contributions in Braded and Unbranded GasolineMarkets*

	Branded	Unbranded	Difference (B-U)
Intercept	0.7494415	0.76036531	-0.01092382
Distribution cost	1.2595501	1.22791902	0.031631052
Crude Cost	0.9532134	0.98319338	-0.029979994
Refining Cost	0.6155597	0.58317517	0.03238451
Underground Tank fee	0	1.82363021	-1.823630212
Sales Tax	0	0	0
Excise Tax	0.3673481	0	0.367348071
Federal Tax	0	0	0
Cost Contribution	0.4313636	1.86453	

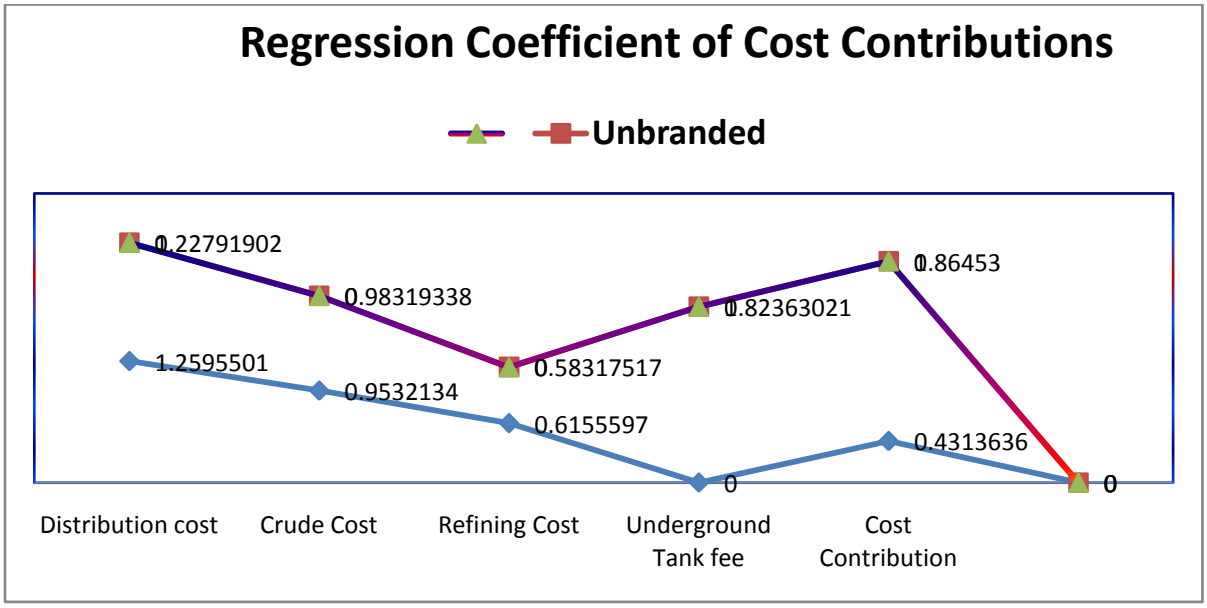

Figure 2 – *Regression Coefficient of Cost Contributions*

Table 6 - *Yearly Average Costs in Branded and Unbranded Gasoline Markets*

Yearly Average Cost	Distribution cost	Crude Cost	Refining Cost	Ud/Tank fee	Sales Tax	Excise Tax	Federal Tax	Retail Price
Branded								
Year 2009	0.1325	1.4654	0.4863	0.0100	0.2167	0.1800	0.1800	2.6787
Year 2010	0.1610	1.8781	0.4100	0.0200	0.1712	0.2650	0.1800	3.0921
Year 2011	0.1767	2.6000	0.3808	0.0200	0.0981	0.3550	0.1800	3.8152
Year 2012	0.2792	2.6426	0.4623	0.0200	0.0883	0.3539	0.1800	4.0347
Year 2013	0.2381	2.5701	0.3903	0.0200	0.0862	0.3992	0.1805	3.8861
Unbranded								
Year 2009	0.1519	1.4654	0.4677	0.0100	0.2167	0.1800	0.1800	2.6787
Year 2010	0.1794	1.8781	0.3917	0.0200	0.1712	0.2650	0.1800	3.0921
Year 2011	0.2131	2.6000	0.3437	0.0200	0.0981	0.3550	0.1800	3.8152
Year 2012	0.3204	2.6426	0.4223	0.0200	0.0881	0.3600	0.1800	4.0347
Year 2013	0.3033	2.5701	0.3257	0.0200	0.0862	0.3992	0.1805	3.8861

5. CONCLUSIONS AND RECOMMENDATIONS

The results in this study were determined from both descriptive and inferential statistical data analysis.Based on descriptive and inferential statistical analysis,this paper concludes that the branded and unbranded dealer cost of gasoline in Southern California are not the same, even though statistical calculations indicate that their differences are not significant. This is because variations were found between the branded and unbranded stations in cost factors and their contributions to consumer price, such as refining costs, tank fees and excise tax. These variations, although statistically small, translate into several millions of dollar for gallons of gasoline consumers pay for on a daily basis.The pump price of gasoline in Southern California reasonably approximated average dealer cost of branded and unbranded gasoline.The pump price of gasoline in Southern California is not correlated to branded or unbranded dealer cost fluctuations or changes.Dealer and consumer costs, price hikes, and fluctuations vary according to gasoline station's ownership type in branded or unbranded dealerships. These dealer and consumer costs of gasoline highly correlate with the number of gasoline stations owned by a dealer. Finally, this research concludes that the unbranded ownership stations are more cost effective than branded (lessee option, dealer option, company owned) in Southern California because total dealer and consumer costs (prices) of gasoline are lower in the unbranded than in the branded. This conclusion was made because in two of factors, mean costs and refining costs that contribute to gasoline price; the unbranded stations were found to be lower than the branded stations. Only in one factor, Under Tank Fee, was better for the branded stations. Based on these findings, it was concluded that there is the need for modification in ownership structure in the Southern California gasoline market.

Whether gas prices are falling or rising, consumers in California pay one of the highest average prices compared to other States in the nation [9]. More so, the gasoline market is riddled with frequent price spikes that are usually followed by remarkable dips in prices, averaging over 25% price swings every 5 years, and 30% price jump/swing per day [10-12]. These fluctuations present huge challenges for all sectors of the economy, small businesses, and individual consumers who rely on gasoline for their daily operations. Such price fluctuations is a concern for market watchers and policy makers since price outcome bears an inverse relationship to the stability of market and the welfare of consumers [15]. It is believed that recommendations based on the findings from this study will serve as prescriptive solutions to the challenges of gasoline price swings and hikes discussed above, and the pedestal for regulating and structuring the gasoline market for price stability in California, comparative to other states. This study recommends the following:

1. Encourage the proliferation of the unbranded model and low brand diversity. This can be done by adjusting the ownership structure to favor the choice of the unbranded stations by entrepreneurs through government edicts and incentives, and by adjusting the principal-agent contracts. This will inject competition but not such that will cripple the market with unhealthy competition in high prices and fluctuations. This recommendation was made because the frequency of price hikes and fluctuations was found to be higher in the branded ownership model than in the unbranded

model found to be more cost effective. On that ground, competition in the unbranded market is healthier than competition in the branded market, which is riddled with high brand diversity.

2. Promote competition in the gasoline market. Encourage more entrepreneurs to get into the business of crude production, refining and retailing, especially in the unbranded market. Competition in the unbranded market is more likely to bring down prices in California to rates comparable to other States. Promoting a healthy competition in favor of the unbranded market through control of high brand diversity is very likely to bring prices down in California to rates comparable to other States. Competition generally is a price-driving factor mainly relevant when gasoline prices are rising, less relevant when prices fall because, it is mainly when prices are rising that consumers search for lower cost gasoline with intensity [35]. That is not the case in California, where gas prices are always 20% -30% higher than the national average and prices in other States. Thus, competition is always relevant in California, whether prices are rising or falling.
3. Control of high brand diversity. This recommendation parallels findings in [23] that higher prices were common in markets with high brand diversity in the branded market and conclusions that high brand diversity correlates with higher prices. Chevron charges 3 cents more than the unbranded station for regular gasoline, and 15 cents above the price that an unbranded station would charge for premium all in the name of reformulation [27]. Reformulation in brand diversity has been justified as additional cost in additives. It has provided a leeway for many known brands to profiteer at the forefront of uncontrolled price manipulations and hikes to their advantage.
4. Strengthening of the standard principal-agent framework. This recommendation was made because strengthening the standard principal-agent framework will permit more unbranded ownership model, which according to the results from this study and others, such as [36] is more cost effective than the branded ownership model. Addressing the need for a change in the ownership structure from a less vertically integrated company-owned structure to a more lessee-owned and open-dealership ownerships to allow greater unobservable freedom; the freedom to integrate other businesses such as convenience store and repair shops that provide extra margin for cushioning price fluctuations. Again, the reason for this recommendation is that the unbranded model, which represents more of the open dealership structure, was found to be doing better than the branded model in costs and pricing.
5. Limit the number of gasoline stations a brand can have. It was found that the higher the number of pump stations owned by an ownership type, the higher the fluctuations and increases in gas prices, as confirmed by the correlation analysis. Since the branded stations own more pump stations, they display higher and more fluctuations in gasoline prices than the unbranded ownerships, and for that reason, this effort should start from the branded ownerships. As stated earlier, efforts at curbing fluctuations and hikes in gasoline prices in Los Angeles should begin with ownership models or brands with large number of gas stations in the branded models: Mobil, Shell, Chevron and 76-gas.
6. Standardization of underground tank fee and excise tax. There is the need for a sustainable reduction in underground tank fees and excise tax, which are two cost-contributing factors, where the branded and unbranded stations differ significantly. Efforts to bring them to par can be achieved through standardization that set uniform fees and taxes for the market per liter of crude or gasoline. It would also be nice to explore doing the same for other cost contributing factors in the industries where noticeable differences that are not significant exist.

6. FURTHER RESEARCH OPPORTUNITIES

Further research areas recommended are (a) what should be the reasonable limit on the number of gasoline stations a brand can own, (b) what should be the reasonable level of brand diversity permitted to avoid hiding under diversity to hike prices and profiteer, and (c) ways and means available for standardization of fees and taxes. Institutions, arms of government and other governmental agencies, and even States with deep pockets may sponsor further studies on branded models segregated into lessee, company owned, and company operated with the goal of identifying cost price discrimination by geographical zones and boundaries within the industry. Research should focus on exploring and investigating the price effects of having a definite transition period between winter and summer blends for gasoline. State executives and legislatures may issue executive orders or enact legislation calling on refineries to switch blends as they deem necessary.

7. BIBLIOGRAPHY

[1] Federal Trade Commission (2005)Gasoline Price Changes: The Dynamic of Supply, Demand, and Competition: A Federal Trade Commission Report. Retrieved from https://www.ftc.gov/reports/gasoline-price-changes-dynamic-supply-demand-competition-federal-trade-commission-report

[2] Johnson, M. A., & Lamdin, D. J. (2012). Changes in gasoline prices and consumer sentiment. *The Journal of Applied Business and Economics, 13*(4), 43-51. Retrieved from ProQuest.

[3] McCaffrey, D., Liptrot, T., & Jenkins, B. (2011). Retail gasoline pricing: A Bayesian Hierarchical Approach to Modeling the effect of Brand on Elasticity. *Journal of Revenue and Pricing Management, 10*(6), 514-527. doi: http://dx.doi.org/10.1057/rpm.2011.30
[4] American Trucking Association (ATA, 2011) Why America needs you. Retrieved from http://www.trucking.org/Get_Trucking.aspx
[5] O'Reilly, P. (2013). Trucking perspective 2013. Retrieved from http://www.inboundlogistics.com/cms/article/trucking-perspectives-2013/
[6] Berry, D. C., Byers, D. M., & Oates, D. J. (2007). Open price agreements: Good faith pricing in the franchise relationship. *Franchise Law Journal, 27*(1), 45-56. Retrieved from ProQuest.
[7] Borenstein, S., & Shepard, A. (2002). Sticky prices, inventories, and market power in wholesale gasoline markets. *The Rand Journal of Economics, 33*(1), 116-139. Retrieved from ProQuest.
[8] Cooper, T. E., & Jones, J. T. (2007). Asymmetric competition on commuter routes: The case of gasoline pricing. *Southern Economic Journal, 74*(2), 483. Retrieved from ProQuest.
[9] Borenstein, S., Bushnell, J., & Lewis, M. (2004). Market power in California's gasoline market. UC Berkeley: Center for the Study of Energy Markets. Retrieved from https://escholarship.org/uc/item/7vq1m8mq
[10] Gicheva, D., Hastings, J., & Villas-Boas, S. (2010). Investigating income effects in scanner data: Do gasoline prices affect grocery purchases? *The American Economic Review, 100*(2), 480-484. doi: http://dx.doi.org/10.1257/aer.100.2.480
[11] Thompson, J. R. (2008). *Misunderstood markets: The case of California gasoline* (Order No. 3317977). Available from ProQuest Dissertations & Theses Full Text. (304699312). Retrieved from http://search.proquest.com/docview/304699312?accountid=34899.
[12] The State of California Department of Justice. (2014). *California gasoline market.* Retrieved from http://oag.ca.gov/antitrust/gasoline
[13] Environmental Protection Agency (2014) Reformulated gasoline. Retrieved from http://www.epa.gov/OMS/fuels/gasolinefuels/rfg/index.htm
[14] Varian, H. R. (2004) Parsing California Gas Prices. *New York Times: Economic Scene.* Retrieved from http://people.ischool.berkeley.edu/~hal/people/hal/NYTimes/2004-07-01.html
[15] Zhu, X., & Liu, X. (2011). Dynamics of retail pricing: A case study of fluid milk. *China Agricultural Economic Review, 3*(2), 171-190. doi: http://dx.doi.org/10.1108/17561371111131308
[16] Acharya, R. N., Kagan, A., & Manfredo, M. R. (2009). Impact of rising fuel cost on perishable product procurement. *Journal of Business Logistics, 30*(1), 223-X. Retrieved from ProQuest.
[17] LeClair, M. S. (2006). Achieving gasoline price stability in the U.S.: A modest proposal. *The Energy Journal, 27*(2), 41-54. Retrieved from ProQuest.
[18] Abelkop, A. D. K. (2009). Why the government should drink your milkshake: The case for restructuring the federal gas tax. *Journal of Corporation Law, 35*(2), 393-424. Retrieved from ProQuest.
[19] Shepard, A. (1993) *Contractual Form, Retail Price, and Asset Characteristics in Gasoline Retailing (1993).* Retrieved from http://citeseerx.ist.psu.edu/showciting;jsessionid=F37AF3A467A39A748F0C248548C64EA8?cid=1520664
[20] Taylor, B. A. (2000). Retail characteristics and ownership structure. *Small Business Economics, 14*(2), 157-164. Retrieved from ProQuest.
[21] Hastings, J. (2004). Vertical relationships and competition in retail gasoline markets: Empirical evidence from contract changes in Southern California. *American Economic Review, 94*(1), 317-328.
[22] Hastings, J., &Gilbert, R. (2005). Vertical integration in gasoline supply: An empirical test of raising rivals' costs. *Journal of Industrial Economics, 53*(4), 437-571.
[23] Brewer, J. (2007). *Competition in the retail gasoline industry* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses.
[24] Folger, J. (2011)How Gas Prices Affect The Economy. Retrieved from Investopedia, at http://www.investopedia.com/financial-edge/0511/how-gas-prices-affect-the-economy.aspx
[25] Johnson, R. N. (2002). Search costs, lags and prices at the pump. *Review of Industrial Organization, 20*(1), 33-50. Retrieved from ProQuest.
[26] Deck, C. A., & Wilson, B. J. (2004). Economics at the pump. *Regulation, Cato Review of Business and Government,* Retrieved from http://www.ncpa.org/sub/dpd/index.php?Article_ID=103
[27] Jaureguiberry, F. (2010). An analysis of strategic price setting in retail gasoline markets (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses.
[28] Cooper, D. R., & Schindler, P. S. (2008). *Business Research Methods.* New York, NY: McGraw-Hill Irwin.
[29] Oil Price Information Service (OPIS). (2014). Retrieved from http://www.opisnet.com/about/opis.aspx
[30] Oil Price Information Service (OPIS). (2014).Crude wholesale and retail prices, 1/2/12 to 12/31/12. Retrieved from http://www.opisnet.com/gasoline-prices.aspx

[31] U.S. Energy Information Administration (EIA). (2010). Annual energy review 2009. Retrieved from www.areadevelopment.com/StudiesResearchPapers/8-20-2010/.
[32] U.S. Energy Information Administration (EIA). (2014). *Independent Statistics and Analysis: U.S. Energy Information Administration*. Retrieved from http://www.eia.gov/state/seds/
[33] Manta. (2013). California gasoline service stations: Browse cities. Retrieved from http://www.manta.com/mb_44_B121D_05/gasoline_service_stations/California
[34] Australian Bureau of Statistics. (2005). *Time series analysis: The basics.* Retrieved from http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Time+Series+Analysis:+The+Basics
[35] Snow, N. (2011). Oil prices still primary driver for gasoline prices, FTC says. *Oil and Gas Journal.* Retrieved from ProQuest.
[36] Beck, T. (2000). *Retail characteristics and ownership structure* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses.