KEY FACTORS INFLUENCING ELECTRIC VEHICLE SALES IN THE UNITED STATES FROM 2014 TO 2018

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Abstract

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Electric vehicles are considered a method to reduce carbon emissions. Various countries implement policies to promote electric vehicles; these policies include financial support, which provides some incentives that the United States can learn from. This thesis aims to investigate the relationship between four key factors average median household income, electricity prices, gasoline prices and the number of electric vehicles charging stations in the United States from 2014 to 2018. Based on sales data, average income, electricity prices, gasoline prices, and the number of public charging stations from 52 states and territories in the United States, the study conducts a panel data analysis to test four factors, year dummy variables, and state dummy variables influencing electric vehicle sales. From the result, this study finds that income, electricity prices, and the number of charging stations have a positive relationship with electric vehicle sales, while gasoline prices have a negative relationship with electric vehicle sales.

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CHAPTER ONE: INTRODUCTION

The earth has suffered from climate change, and many countries consider electric vehicles to be a method of reducing carbon dioxide emissions. To meet the 2030 climate targets in the Pairs Agreement, various governments set targets for electric vehicle sales (Melton et al, 2020). The Nationally Determined Contributions (NDCs) have set a target for the reduction of greenhouse gas emissions of 14 percent to 18 percent below 2005 levels by 2025 (Vine, 2017). In 2017, transportation has emitted 29 percent of U.S. greenhouse gas emissions by gas and sector (U.S. Emissions, 2020). The U.S. government has implemented policies to meet the target, such as, expanding public transportation opportunities, and improving vehicle efficiency to reduce emissions, to meet the target (Vine, 2017).

Electric vehicles are considered an important pathway to reduce emissions. There are some differences between EV, HEV, PEV, and FCEV. Battery electric vehicles (EVs or BEVs) are powered only by electricity. The battery is charged at a charging station. EVs do not have an internal combustion engine. Hybrid electric vehicles (HEVs) use both electricity and petroleum, and are not plugged in to charge. Plug-in electric vehicles (PEVs) include EVs and PHEVs. Plug-in hybrid electric vehicles (PHEVs) are powered by gasoline or diesel, and electricity is stored in the battery. Fuel cell electric vehicles (FCEVs) are powered by a fuel cell, instead of a battery, or in combination with a battery to power its motor.

CHAPTER TWO: LITERATURE REVIEW

2.1. Advantages of electric vehicles

Almost all of US electricity is produced from coal, nuclear energy, natural gas, and renewable energy sources. Electric vehicles will reduce the use of petroleum and greenhouse and regulated emissions that contribute to climate change and smog. Furthermore, EVs have air quality and health benefits. Lin et al. (2020) found that based on the air quality policy, both of CMAQ and BenMAP, EVs improved the air quality of Taiwan and reduced emissions. PM2.5 is reduced through the study in Taiwan. Due to the variety of charging stations in the U.S., the electric vehicle brings about the convenience of home charging (Pesaran et al, 2006).

2.2. Other countries' policies for electric vehicles

Norway has the largest number of EVs in the world, which can be contributed to early policies. The Norwegian government removed purchase taxes for EVs to enter the market in the early 1990s. The government issued privileges for EV users such as access to the bus lanes, free parking in the cities, free toll roads, and financial support for charging stations (Fearnley et al, 2015). In the meantime, the occupancy of EVs rose rapidly in Norway. Figenbaum (2017) found that reducing the purchase price has been the most effective method for EVs to enter the Norwegian market. In 2010, the government was concerned about reducing greenhouse gas emissions (Fearnley et al, 2015).

In 2009, China launched the Electric Vehicle Subsidy Scheme (EVSS). Hao et al. (2014) defined phase I and phase II of EVSS. In phase I EVSS, from 2009 to 2012, the government provided public market subsidies for HEV, PHEV, EV, and FCEV in 25 cities for purchasing buses. In 2010-2012, the government provided private market subsidies for PHEV and EV in six cities for private purchases. PHEV and EV subsides were up to ¥50,000 and ¥60,000 per vehicle, respectively. In phase II EVSS, the subsidies for both public and private markets were up to ¥60,000 per vehicle. The government also provided nonsubsidy incentives. For example, the transportation department offered a license plate lottery exemption in Beijing. The transportation department offered free license plates for customers.

Canada has financial policies that include point-of-sale incentives, rebate programs, tax exemptions and tax credits, which are also implemented in the US and Europe. Also, increasing carbon pricing in the cost of fossil fuels. For priority road, the government provides a high-occupancy vehicle (HOV) lane access for consumers to have a faster traveling time. Public charging stations are provided for consumers' convenience in their daily lives (Melton et al, 2020).

The Austrian government also provides financial incentives for consumers. Fearnley et al. (2015) found that when purchase taxes and annual motor vehicle taxes are reduced, consumers can save about $4,500 in the five years. Insurance companies provide 10 to 20 percent off of EV monthly rates. Some of the Austrian federal states have offered subsidies of up to $3,500 per EV.

2.3 Influencing factors

2.3.1 Government policy

The government plays the main role in the development of the electric vehicle industry. The government knows the importance of electric vehicles; the government can release a more efficient policy to offer subsidies and promote the growth of electric vehicles (Lin and Wu, 2018). Chinese consumers can effectively increase their willingness to purchase EVs by financial incentives (Jian and Wei, 2019).

2.3.2 Social influence

Wang and Liu (2015) found that consumers' purchasing decisions will be influenced by the external environment, like the reference group and social status. Graham-Rowe et al (2012) found that some drivers and their passengers feel good about electric vehicles due to the environmental benefits in their analysis. Jian and Wei (2019) found that consumption of EVs could gain society's recognition and maintain social face in China due to the higher prices of EVs.

2.3.3 Cost

The cost included the purchase budget, gas prices, and electricity cost. The technology of the battery caused the EVs to have a higher price, which makes consumers prefer to purchase conventional vehicles because they have a budget limit (Jian and Wei, 2019). Diamond (2019) found that gasoline prices to be the most visible signal considered because fuel savings directly influence consumers' decision to purchase EVs. Lower-income consumers are more likely to purchase HEVs to discount fuel cost savings (Diamond, 2019). The electricity cost per hundred kilometers for EVs is lower than gasoline in China (Wang and Liu, 2015). Consumers save more money while driving EVs compared to conventional vehicles.

CHAPTER THREE: DATA

According to the statistical data from the Alliance of Automobile Manufacturers (2019), from 2014 to 2018, California had the highest sales of EVs. The average sales are 187,609.6 per year, and in 2018 California had over 230,000 electric vehicles sold. Florida, Texas, and New York also had a great number of sales of electric vehicles; these states had over 20,000 electric vehicles sold per year. Washington, Illinois, and Pennsylvania had around 15,000-20,000 sales per year. Georgia, New Jersey, Massachusetts, Virginia, Ohio, and Arizona had around 8,000 to 20,000 sales per year. South Dakota, North Dakota, Alaska, Wyoming had much fewer sales of electric vehicles, which is around 300-600 per year. Other states had thousands of electric vehicles sold per year. From total sales, sales decreased to 477,918 in 2015 from 558,953 in 2014. From 2015 to 2018, total sales kept increasing.

According to the data from the American Community Survey from 2014 to 2018, Washington, Maryland, New Jersey, Hawaii, Massachusetts, and Connecticut had higher average median income compared with other states, which was over $70,000 each year. However, states like Louisiana, New Mexico, Arkansas, Mississippi, West Virgin had lower average income, which were around $40,000 to $48,000 each year.

According to the data from EIA, the average electricity prices decreased from 2014 to 205, and increased from 2015 to 2016, then decreased from 2017 to 2018. Hawaii had the highest electricity prices in the five years, the average electricity price was up to 27.74 cents per Kilowatthour. Alaska (18.288), New Hampshire (16.016), and Rhode Island (16.644) had higher electricity price than others. Washington (7.63), Louisiana (7.74), and Oklahoma (8.04) had lower electricity price than others.

According to the data from EIA, all states' gasoline prices decreased from 2014 to 2016 and increased from 2016 to 2018. The average gasoline price was 2.6512 per gallon in 2014; some states had higher gasoline prices, such as California (2.755), Connecticut (2.901), Hawaii (3.014), Massachusetts (2.708), Pennsylvania (2.829), Rhode Island (2.725), and Texas (2.763). Some states had lower gasoline prices (around 2.5 per gallon), such as Alabama, Arkansas, Kansas, Louisiana, Minnesota, and Tennessee. The average gasoline price was 1.7637 per gallon in 2015; California, Nevada, Pennsylvania, and Texas had higher gasoline prices (over 2 per gallon). The average gasoline price decreased to 1.4622 per gallon in 2016. California and Connecticut had higher gasoline prices (over 1.7 per gallon). In 2017, the average gasoline price increased to 1.651 per gallon. California had the highest gasoline price at 1.981 per gallon. In other states, like Arizona, Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Washington, it was over 1.7 per gallon. In 2018, the average gasoline price kept increasing to 1.9428. California, again, had the highest average gasoline price at 2.354 per gallon. Compared with other states, Idaho, Nevada, Oregon, Utah, and Washington had higher prices, which were over 2.1 per gallon.

Between 2014 and 2018, the number of public charging stations in the US increased yearly. In 2015, 2016, and 2017, it increased by 20.97%, 35.82%, and 41.87%, respectively. However, in 2018, it only increased by 2.42%.

CHAPTER FOUR: MODEL

4.1 Influencing factors in the U.S.

4.1.1 Average income

Consumers have purchase budget for purchase vehicles, while the electric vehicles have generally higher prices compared to conventional vehicles. From Dimond's research, lower-income people are preferring to purchase HEVs (2019). Therefore, this paper targets median household as the main consumers to purchase the electric vehicles. Collecting average median household income by states helps to analyze the influencing factors.

4.1.2 Gasoline prices and electricity prices

Gasoline prices are a factor influencing consumers' adoption of EVs. In the long term, EVs show their financial benefits compared to conventional vehicles. A minor variation in gasoline prices will lead to significant changes in the adoption of EVs. For example, in the U.S., when gas prices increased to $4.00 nationwide in the spring and summer of 2009, consumers showed a significant change in their driving preferences and habits (Diamond, 2009). Rivers and Schaufele found that a 10 percent increase in gasoline prices leads to a 0.8 percent increase in EV sales (2017). Electricity prices are also a factor influencing consumers' choice. Usually consumers charge their EVs overnight at home. For long-time charging, consumers consider electricity prices as a factor to their willingness to purchase EVs.

4.1.3 Charging infrastructure

The long-distance driving of EVs relies largely on charging infrastructure (Jian and Wei, 2019). Consumers face "range anxiety" while driving EVs without available charging stations, which means consumers feel anxious about whether they can recharge the vehicles on a trip. Long charging times and insufficient charging station infrastructures are considered technical barriers (Li et al, 2017). Jian and Wei (2019) found that the charging point will normally be outside of the home or the office, in publicly accessible locations or highway service stations. Li et al. (2017) found that consumers are more willing to charge at home, although public and domestic charging infrastructures are both insufficient. Therefore, the government should focus more on domestic charging infrastructures. Azadfar et al. (2015) found that the most popular time to charge a vehicle is at night, which doesn't occupy consumers' time to wait for the long charging time. Mukherjee and Ryan (2020) found that, in Ireland, people who can charge at home are more likely to purchase BEV, and people who rent accommodations are less likely to purchase because charging infrastructure is a kind of the investment. Consumers will consider the number of charging stations (charging piles) as a factor to influence their decision to purchase electric vehicles.

4.2 Regression

4.2.1 Dependent and independent variables

The electric vehicle sales data from 52 states and territories is the dependent variable; and average income, electricity prices, gasoline prices and the number of public charging stations nationwide are the independent variables. electricity prices and gasoline prices and the number of public charging stations nationwide are the independent variables. The regression includes years dummy variables and state dummy variables. This study hypothesizes that these four factors both have effectiveness in the sales of EVs. Setting panel data regression as

$$EV\ sales_i = \beta_0 + \beta_1 \times electricity\ price_i + \beta_2 gasoline\ price_i + \beta_3 \times the\ number\ of\ charging\ stations_i + \beta_4 \times d_{2014} + \beta_5 \times d_{2015} + \beta_6 \times d_{2016} + \beta_7 \times d_{2017} + \beta_8 \times d_{2018} + aa \times Alabama\ dummy + ab \times Alaska\ dummy + ac \times Arizona\ dummy + ad \times Arkansas\ dummy + ae \times California\ dummy + af \times Colorado\ dummy + ag \times Connecticut\ dummy + ah \times Delaware\ dummy + ai \times District\ of\ Columbia\ dummy + aj \times Florida\ dummy + ak \times Georgia\ dummy + al \times Hawaii\ dummy + am \times Idaho\ dummy + an \times Illinois\ dummy + ao \times Indiana\ dummy + ap \times Lowa\ dummy + aq \times Kansas\ dummy + ar \times Kentucky\ dummy + as \times Louisiana\ dummy + at \times Maine\ dummy + au \times Maryland\ dummy + av \times Massachusetts\ dummy + aw \times Michigan\ dummy + ax \times Minnesota\ dummy + ay \times Mississippi\ dummy + az \times Missouri\ dummy + ba \times Montana\ dummy + bb \times Nebraska\ dummy + bc \times Neveda\ dummy + bd \times New\ Hampshire\ dummy + be \times New\ Jersey\ dummy + bf \times New\ Mexico\ dummy + bg \times New\ York\ dummy + bh \times North\ Carolina\ dummy + bi \times North\ Dakota\ dummy + bj \times Ohio\ dummy + bk \times Oklahoma\ dummy + bl \times Oregon\ dummy + bm \times Pennsylvania\ dummy + bn \times Rhode\ Island\ dummy + bo \times South\ Corolina\ dummy + bp \times South\ Dakota\ dummy + bq \times Tennessee\ dummy + br \times Texas\ dummy + bs \times Utah\ dummy + bt \times Vermont\ dummy + bu \times Virginia\ dummy + bv \times Washington\ dummy + bw \times West\ Virginia\ dummy + bx \times Wyoming\ dummy + \varepsilon_i.$$

where $d_{2014} = 1$if year 2014, 0 otherwise; $d_{2015} = 1$if year 2015, 0 otherwise; $d_{2016} = 1$if year 2016, 0 otherwise; $d_{2017} = 1$if year 2017, 0 otherwise.

4.2.2 Regression

The regression will be

$EV\ sales_{\ i} = (-7.388e + 04) + (8.788e - 01) \times income_i + (4.482\text{e} + 02\ ) \times$

$electricity\ price_i + (-6.578e + 01) \times gasoline\ price_i + (2.780e - 1) \times$

$the\ number\ of\ charging\ stations_i + (1.472e + 04) \times d_{2014} + (9.892e + 03) \times d_{2015} +$

$(5.441e + 03) \times d_{2016} + (1.384e + 04) \times Alabama\ dummy + (-1.6743 + 04) \times$

$Alaska\ dummy + (1.470e + 04) \times Arizona\ dummy + (1.539e + 04) \times$

$Arkansas\ dummy + (1.765e + 05) \times California\ dummy + (2.210e + 03) \times$

$Colorado\ dummy + (-1.035e + 04) \times Connecticut\ dummy + (-2.231e + 03) \times$

$Delaware\ dummy + (-1.681e + 04) \times District\ of\ Columbia\ dummy + (3.603e + 04) \times$

$Florida\ dummy + (1.782e + 04) \times Georgia\ dummy + (-1.902e + 04) \times$

$Hawaii\ dummy + (8.886e + 03) \times Idaho\ dummy + (1.642e + 04) \times Illinois\ dummy +$

$(1.125e + 04) \times Indiana\ dummy + (5.161e + 03) \times Lowa\ dummy + (5.345e + 03) \times$

$Kansas\ dummy + (1.419e + 04) \times Kentucky\ dummy + (Louisiana\ dummy) +$

$(5.295e + 03) \times Maine\ dummy + (-7.417e + 03) \times Maryland\ dummy +$

$(-5.56e + 03) \times Massachusetts\ dummy + (1.403e + 04) \times Michigan\ dummy +$

$(-1.168e + 02) \times Minnesota\ dummy + (1.599e + 04) \times Mississippi\ dummy +$

$(1.326e + 04) \times Missouri\ dummy + (8.329e + 03) \times Montana\ dummy +$

$(3.560e + 03) \times Nebraska\ dummy + (7.801e + 03) \times Nevada\ dummy +$

$(-1.171e + 04) \times New\ Hampshire\ dummy + (-4.455e + 03) \times New\ jersey\ dummy +$

$(1.328e + 04) \times New\ Mexico\ dummy + (1.892e + 04) \times New\ York\ dummy +$

$(1.921e + 04) \times North\ Carolina\ dummy + (-1.439e + 03) \times North\ Dakota\ dummy +$

$(1.675e + 04) \times Ohio\ dummy + (1.833e + 04) \times Oklahoma\ dummy + (1.225e + 04) \times$

$Oregon\ dummy + (1.522e + 04) \times Pennsylvaniadummy + (-3.434e + 03) \times$
$Rhode\ islande\ dummy + (1.258e + 04) \times South\ Carolina\ dummy + (4.414e + 03) \times$
$South\ Dakota\ dummy + (1.414e + 04) \times Tennessee\ dummy + (2.751e + 04) \times$
$Texas\ dummy + (-1.114e + 03) \times Utha\ dummy + (3.481e + 03) \times Vermont\ dummy +$
$(4.174e + 03) \times Virginia\ dummy + (1.283e + 04) \times Washingtoin\ dummy +$
$(1.553e + 04) \times West\ Virginia + (7.405e + 03) \times Wisconsin\ dummy) + \varepsilon_i.$

From table 1.1, input variables p-value of average income is less than 0.05, which is significantly important. However, p-value of electricity price, gasoline price, and the number of charging stations are all greater than 0.05, which means these variables are not significantly important. Years dummy variables are all greater than 0.05, which are not significantly important. P-value of most states (Alabama, Alaska, Arizona, Arkansas, California, Connecticut, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Washington, West Virginia, Wisconsin) are less than 0.05, which are significantly important. P-value of other states (Colorado, Delaware, Maine, Maryland, Massachusetts, Minnesota, Nebraska, New Jersey, North Dakota, South Dakota, Utah, Vermont, Virginia) are greater than 0.05, which are not significantly important.

	Estimate	Std. Error	t-value	Pr (>|t|)
intercept	-7.388e+04	3.157e+04	-2.340	0.020281
Income	8.778e-01	2.154e-01	4.075	6.66e-05
Electricity price	4.482e+02	3.291e+02	1.362	0.174720

Gasoline price	-6.578e+01	7.551e+02	-0.087	0.930669
Charging station	2.780e-01	5.831e-01	0.477	0.634134
2014dummy	1.472e+04	1.981e+04	0.743	0.458364
2015dummy	9.892e+03	1.673e+04	0.591	0.555123
2016dummy	5.441e+03	1.041e+04	0.523	0.601656
Alabama dummy	1.384e+04	3.726e+03	3.713	0.000267
Alaska dummy	-1.674e+04	5.303e+03	-3.157	0.001843
Arizona dummy	1.470e+04	2.726e+03	5.390	2.00e-07
Arkansas dummy	1.539e+04	4.102e+03	3.751	0.000231
California dummy	1.765e+05	3.895e+03	45.312	< 2e-16
Colorado dummy	2.210e+03	2.802e+03	0.789	0.431271
Connecticut dummy	-1.035e+04	4.544e+03	-2.278	0.023820
Delaware dummy	-2.231e+03	2.570e+03	-0.868	0.386500
District of Columbia dummy	-1.681e+04	5.196e+03	-3.236	0.001421

Florida dummy	3.603e+04	3.057e+03	11.784	< 2e-16
Georgia dummy	1.782e+04	2.705e+03	6.587	3.99e-10
Hawaii dummy	-1.902e+04	7.893e+03	-2.409	0.016912
Idaho dummy	8.886e+03	2.992e+03	2.970	0.003344
Illinois dummy	1.642e+04	2.389e+03	6.873	8.09e-11
Indiana dummy	1.125e+04	2.836e+03	3.967	0.000102
Iowa dummy	5.161e+03	2.425e+03	2.128	0.034584
Kansas dummy	5.345e+03	2.633e+03	2.030	0.043653
Kentucky dummy	1.419e+04	3.660e+03	3.877	0.000144
Louisiana dummy	1.414e+04	3.794e+03	3.727	0.000253
Maine dummy	5.295e+03	3.155e+03	1.678	0.094876
Maryland dummy	-7.417e+03	4.878e+03	-1.520	0.130004
Massachusetts dummy	-5.056e+03	4.949e+03	-1.022	0.308247
Michigan dummy	1.403e+04	2.904e+03	4.831	2.72e-06
Minnesota dummy	-1.168e+02	2.750e+03	-0.042	0.966158

Mississippi dummy	1.599e+04	4.476e+03	3.572	0.000445
Missouri dummy	1.326e+04	2.944e+03	4.503	1.14e-05
Montana dummy	8.329e+03	3.024e+03	2.755	0.006426
Nebraska dummy	3.560e+03	2.427e+03	1.467	0.143943
Nevada dummy	7.801e+03	2.556e+03	3.052	0.002583
New Hampshire dummy	-1.171e+04	4.768e+03	-2.455	0.014954
New Jersey dummy	-4.455e+03	4.689e+03	-0.950	0.343286
New Mexico dummy	1.328e+04	3.763e+03	3.529	0.000519
New York dummy	1.892e+04	3.377e+03	5.604	7.01e-08
North Carolina dummy	1.921e+04	3.108e+03	6.180	3.61e-09
North Dakota dummy	-1.439e+03	2.354e+03	-0.611	0.541651
Ohio dummy	1.675e+04	2.848e+03	5.883	1.70e-08
Oklahoma dummy	1.833e+04	3.220e+03	5.693	4.49e-08

Oregon dummy	1.225e+04	2.400e+03	5.102	7.87e-07
Pennsylvania dummy	1.522e+04	2.490e+03	6.112	5.19e-09
Rhode Island dummy	-3.434e+03	3.735e+03	-0.919	0.359043
South Carolina dummy	1.258e+04	3.323e+03	3.786	0.000204
South Dakota dummy	4.414e+03	2.658e+03	1.661	0.098366
Tennessee dummy	1.414e+04	3.337e+03	4.236	3.49e-05
Texas dummy	2.751e+04	2.409e+03	11.418	< 2e-16
Utah dummy	-1.114e+03	2.609e+03	-0.427	0.669952
Vermont dummy	3.481e+02	3.385e+03	0.103	0.918185
Virginia dummy	4.174e+03	3.043e+03	1.372	0.171674
Washington dummy	1.283e+04	2.849e+03	4.505	1.14e-05
West Virginia dummy	1.553e+04	4.335e+03	3.583	0.000428
Wisconsin dummy	7.405e+03	2.540e+03	2.915	0.003968

Table 1.1 regression result

From table 1.2, multiple R-squared is 0.9848, which means 98.48 percent of the variation in the output variation is explained by the input variables. P-value is less than 2.2e-16, which is less than 0.05, so the model is significantly important.

Residual standard error	3674 on 197 degrees of freedom
Multiple R-squared	0.9848
Adjusted R-squared	0.9805
p-value	< 2.2e-16

Table 1.2 ANOVA table

From the output, income, electricity price, and the number of public charging stations have positive relationship with EV sales, when these variables increase, EV sales increase. Gasoline price has negative relationship with EV sales, when gasoline prices increase, EV sales decrease. However, only income has significantly importance to EV sales. Year dummy variables have positive relationship with EV sales. Some state dummy variables have positive relationship, and some state dummy variables have negative relationship with EV sales, which means different locations, weather, terrain, culture, environment, etc., influence consumers' choices to purchase EVs.

CHAPTER FIVE: CONCLUSION

5.1 Discussion

References used questionnaires to survey consumers' willingness to EVs, however, this paper uses previous data to test whether the variable is the influencing factors. Some influencing factors are hard to covert data, like government policies, which is different from different states. Hence, this paper only focuses on four independent variables. In addition, this paper uses dummy variables to test five years and 52 states and territories.

5.2 Conclusion

This thesis studies the key factors influencing consumers' willingness to purchase electric vehicles in America. Based on the literature review and model, the independent variables are average median household income, electricity prices, gasoline prices and the number of charging stations. Based on the result, income, electricity prices, and the number of charging stations have a positive relationship with electric vehicle sales, but electricity prices and charging infrastructures are not significantly important to the electric vehicle market. Gasoline price has negative relationship with electric vehicle sales, but it is not significantly important. Increasing income and electricity prices, decreasing gasoline prices, and building more public charging stations for consumers, have positive influences on consumers' willingness to purchase electric vehicles. To promote electric vehicle sales, the US government can also learn from other countries' policies. A financial incentive is a remarkable method for encouraging consumers to purchase electric vehicles.

5.3 Limitation

There are, however, some limitations to this study. This study uses only three factors to test the influences on electric vehicle sales. The data on gasoline prices from fifty-two states and territories is missing some state information, which may influence the result slightly. Secondly, the data on the number of charging stations only include nationwide data rather than statewide data. Data on the number of charging stations from fifty-two states and territories will result in differences in the regression. Besides, this study focuses on the American electric vehicle market, and it will have more value to research on the global.

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