# Cars.com

By: Josh Grasso

June 2021

Quick Intro:

- Cars.com is an online property where auto dealerships pay to advertise their inventory – new and used

- Analyzing alternative data provides evidence that the Used Auto Inventory Advertising market is growing due to:

  - The iBuyer, new-entrants (Carvana) are advertising their significant inventory of used cars in a magnitude that rivals the largest dealers

  - Traditional dealers seem to be both increasing their advertising intensity, in response to iBuyer competition, and maintaining unit volumes

- A longer data history can
  - 1) confirm the statistical significance of these trends and
  - 2) be used to forecast revenues

Auto Retail is Not a Secular Growth Story…

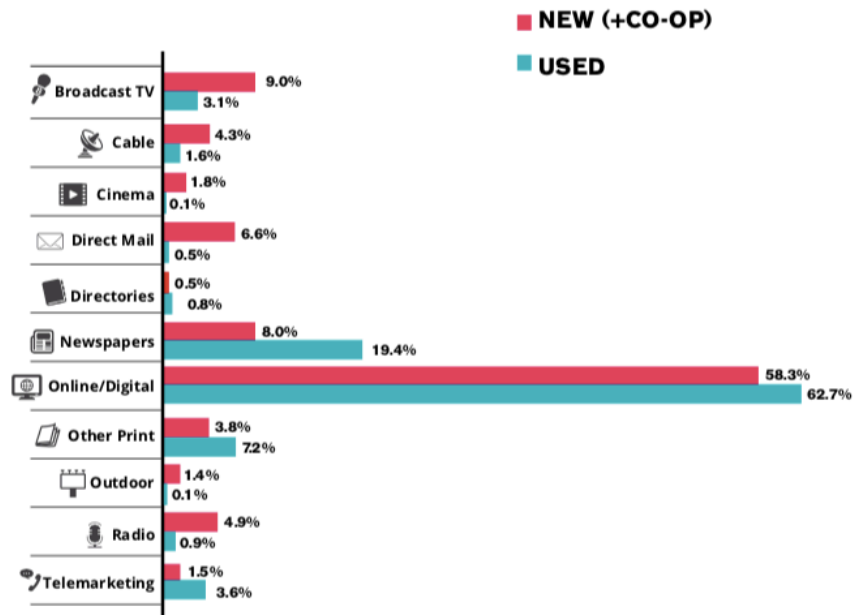Real Personal Consumption Expenditures on New & Used Cars, from BEA
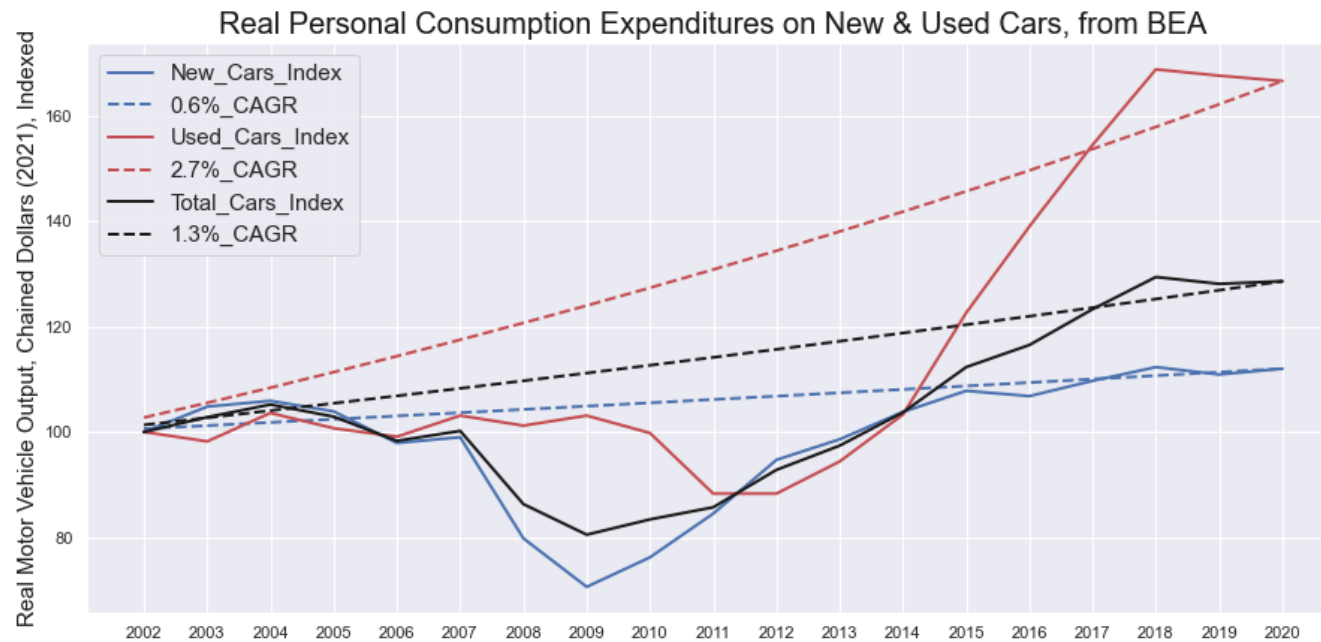
…Nor is Digital Advertising (Anymore) in Auto Retail…
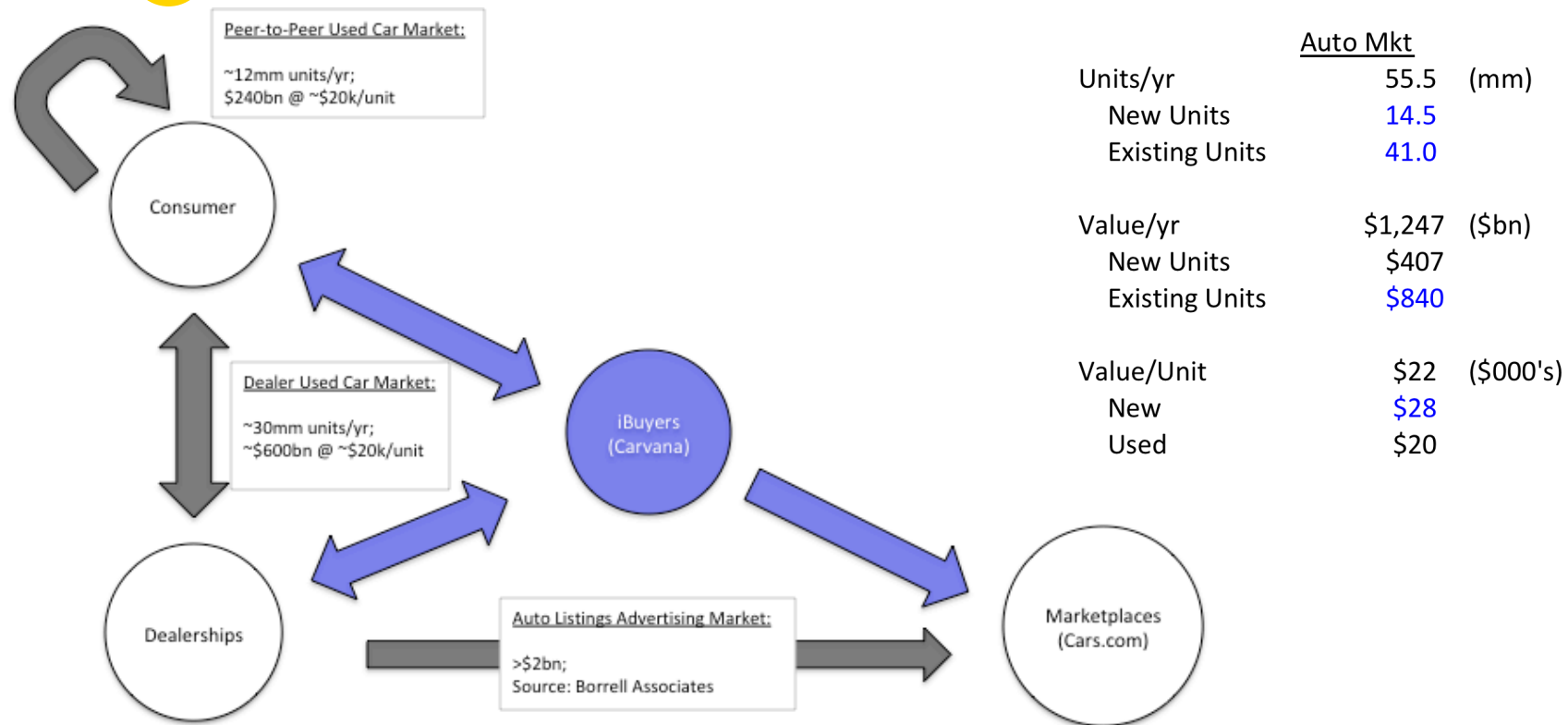
FIGURE 2.6

Source: Borrell, July 2017
© 2017 Borrell

% OF DEALERS USING EACH TYPE OF ADVERTISING MEDIA, NEW VS. USED-CAR DEALERS

Digital Media
Still is the media of choice.

- NEW (+CO-OP)
- USED

Media	NEW (+CO-OP)	USED
Broadcast TV	9.0%	3.1%
Cable	4.3%	1.6%
Cinema	1.8%	0.1%
Direct Mail	6.6%	0.5%
Directories	0.5%	0.8%
Newspapers	8.0%	19.4%
Online/Digital	58.3%	62.7%
Other Print	3.8%	7.2%
Outdoor	1.4%	0.1%
Radio	4.9%	0.9%
Telemarketing	1.5%	3.6%

…But there is a New Entrant in the Used Car Market

Peer-to-Peer Used Car Market:

~12mm units/yr;
$240bn @ ~$20k/unit

Consumer

Dealer Used Car Market:

~30mm units/yr;
~$600bn @ ~$20k/unit

iBuyers
(Carvana)

Dealerships

Auto Listings Advertising Market:

>$2bn;
Source: Borrell Associates

Marketplaces
(Cars.com)

|	Auto Mkt	
Units/yr	55.5	(mm)
New Units	14.5	
Existing Units	41.0	
Value/yr	$1,247	($bn)
New Units	$407	
Existing Units	$840	
Value/Unit	$22	($000's)
New	$28	
Used	$20	

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Thus, Two Important Questions:

◉ Are the new-entrants into auto retailing (the iBuyers) materially increasing the market size of auto inventory advertising?
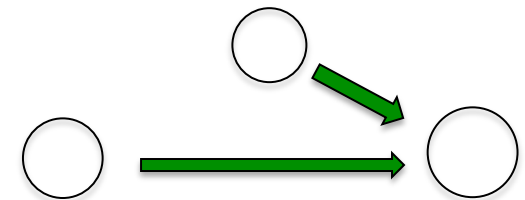
◉ Are dealer inventory volumes and/or advertising intensity changing (declining) due to the new-entrants?

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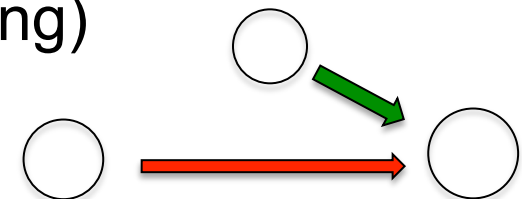
The Players: Auto Retail Business Models

Auto: **Company Name** **Ticker**	**Online Marketplaces**				**Traditional Dealers**					**iBuyers**		
	Cars.com CARS	CarGurus CARG	TrueCar TRUE		CarMax KMX	Penske Auto PAG	Sonic SAH	Lithia LAD		Vroom VRM	Carvana CVNA	Shift Tech SFT
Gross Profit Margin	**81%**	**92%**	**92%**		**13%**	**16%**	**15%**	**15%**		**5%**	**14%**	**6%**
Sales & Marketing*	34%	47%	55%		9%	3%	4%	N/A		N/A	36%	191%
Research & Dev.*	11%	16%	16%		N/A	N/A	N/A	N/A		N/A	N/A	N/A
General & Admin.*	11%	11%	19%	*as % of	43%	55%	68%	N/A	*as % of	N/A	N/A	276%
Total SG&A*	76%	73%	90%	Gross Profit	80%	76%	72%	70%	Gross Profit	343%	142%	689%
Operating Profit Margin*	**3%**	**18%**	**-4%**	* vs. Gross Profit	**12%**	**21%**	**22%**	**25%**	* vs. Revenue	**-250%**	**-7%**	**-626%**
Interest Exp. As % Gross Profit	N/A	N/A	N/A		-24%	5%	7%	3%		5%	17%	63%
Revenue Growth	-10%	-6%	-17%		-7%	-11%	5%	6%		14%	41%	18%
Revenue ($mm)	$548	$551	$279	*Gross Profit	$2,379	$3,126	$1,520	$1,954	*Gross Profit	$72	$5,587	$196
Monthly Unique Visitors (mm)	20	45	8		27	N/A	N/A	N/A		N/A	N/A	0.4
Visits (SimilarWeb)	28	54	14		20	N/A	N/A	N/A		2.7	18.7	1.0
EV/Sales	**2.6x**	**5.6x**	**1.6x**	*Gross Profit	**7.7x**	**2.7x**	**1.7x**	**5.4x**	*Gross Profit	**23.4x**	**7.6x**	**2.1x**
EV/EBITDA	10.6x	29.5x	42.2x		38.3x	11.0x	6.0x	18.1x		N/A	N/A	N/A
EV/OP	75.7x	31.4x	N/A		64.6x	13.0x	7.7x	21.1x		N/A	N/A	N/A
Net Debt/EBITDA	4.0x	-2.3x	-2.7x		-3.1x	1.5x	1.3x	2.6x		N/A	N/A	N/A

The Players: Online Marketplaces

Online Marketplaces - U.S.

Auto:

Company Name	Cars.com	CarGurus	TrueCar
Ticker	CARS	CARG	TRUE
Gross Profit Margin	**81%**	**92%**	**92%**
Sales & Marketing	34%	47%	55%
Research & Dev.	11%	16%	16%
General & Admin.	11%	11%	19%
SG&A as % Revenue	76%	73%	90%
Operating Profit Margin	**3%**	**18%**	**-4%**
Interest Exp. As % Gross Profit	N/A	N/A	N/A
Revenue Growth	-10%	-6%	-17%
All organic?	No	?????	Yes
Revenue ($mm)	$548	$551	$279
Monthly Unique Visitors (mm)	20	45	8
Visits (SimilarWeb)	28	54	14
EV/Sales	**2.6x**	**5.6x**	**1.6x**
EV/EBITDA	10.6x	29.5x	42.2x
EV/OP	75.7x	31.4x	N/A
Net Debt/EBITDA	4.0x	-2.3x	-2.7x

TrueCar has 1/2 the Revenue but only 1/3rd the Valuation of Cars.com

Why is Cars.com GPM 10% less than peers?

Marketing Spend @ ~50% of Revenues

CarGurus has great Operating Margins

No Growth, Albeit with COVID

High Leverage @ Cars.com

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The Players: Traditional Dealers

Traditional Retail Model

Auto:

Company Name		CarMax	Penske Auto	Sonic	Lithia
Ticker		KMX	PAG	SAH	LAD
Gross Profit Margin		**13%**	**16%**	**15%**	**15%**
Sales & Marketing*		9%	3%	4%	N/A
Research & Dev.*		N/A	N/A	N/A	N/A
General & Admin.*	*as % of	43%	55%	68%	N/A
Total SG&A*	Gross Profit	80%	76%	72%	70%
Operating Profit Margin*	* vs. Gross Profit	**12%**	**21%**	**22%**	**25%**
Interest Exp. As % Gross Profit		-24%	5%	7%	3%
Revenue Growth		-7%	-11%	5%	6%
Revenue ($mm)	*Gross Profit	$2,379	$3,126	$1,520	$1,954
Monthly Unique Visitors (mm)		27	N/A	N/A	N/A
Visits (SimilarWeb)		20	N/A	N/A	N/A
EV/Sales	*Gross Profit	**7.7x**	**2.7x**	**1.7x**	**5.4x**
EV/EBITDA		38.3x	11.0x	6.0x	18.1x
EV/OP		64.6x	13.0x	7.7x	21.1x
Net Debt/EBITDA		-3.1x	1.5x	1.3x	2.6x

Marketing Spend is a Smaller Piece of the Cost Structure

Healthy Operating Margins

No Growth, Albeit with COVID

Attractive Yield

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The Players: iBuyers

New iBuyer Model

Auto:

Company Name Ticker		Vroom VRM	Carvana CVNA	Shift Tech SFT
Gross Profit Margin		**5%**	**14%**	**6%**
Sales & Marketing*		N/A	36%	191%
Research & Dev.*		N/A	N/A	
General & Admin.*	*as % of	N/A	N/A	276%
Total SG&A*	Gross Profit	343%	142%	689%
Operating Profit Margin*	***vs. Revenue**	**-250%**	**-7%**	**-626%**
Interest Exp. As % Gross Profit		5%	17%	63%
Revenue Growth		14%	41%	18%
All organic?		Yes	Yes	Yes
Revenue ($mm)	*Gross Profit	$72	$5,587	$196
Monthly Unique Visitors (mm)		N/A	N/A	0.4
Visits (SimilarWeb)		2.7	18.7	1.0
EV/Sales	***Gross Profit**	**23.4x**	**7.6x**	**2.1x**
EV/EBITDA		N/A	N/A	N/A
EV/OP		N/A	N/A	N/A
Net Debt/EBITDA		N/A	N/A	N/A

Carvana has achieved Gross Margins on par with Traditional Dealers

Interest Expense is an Operating Cost to hold Auto Inventory

Growth, despite COVID

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Auto Advertising on Cars.com

Important Question #1:

Are the new-entrants into auto retailing (the iBuyers) increasing the market size of auto advertising?

iBuyer Share of Cars.com Listings: Vegas Market

Vegas: Dealer Share of Listings on Cars.com
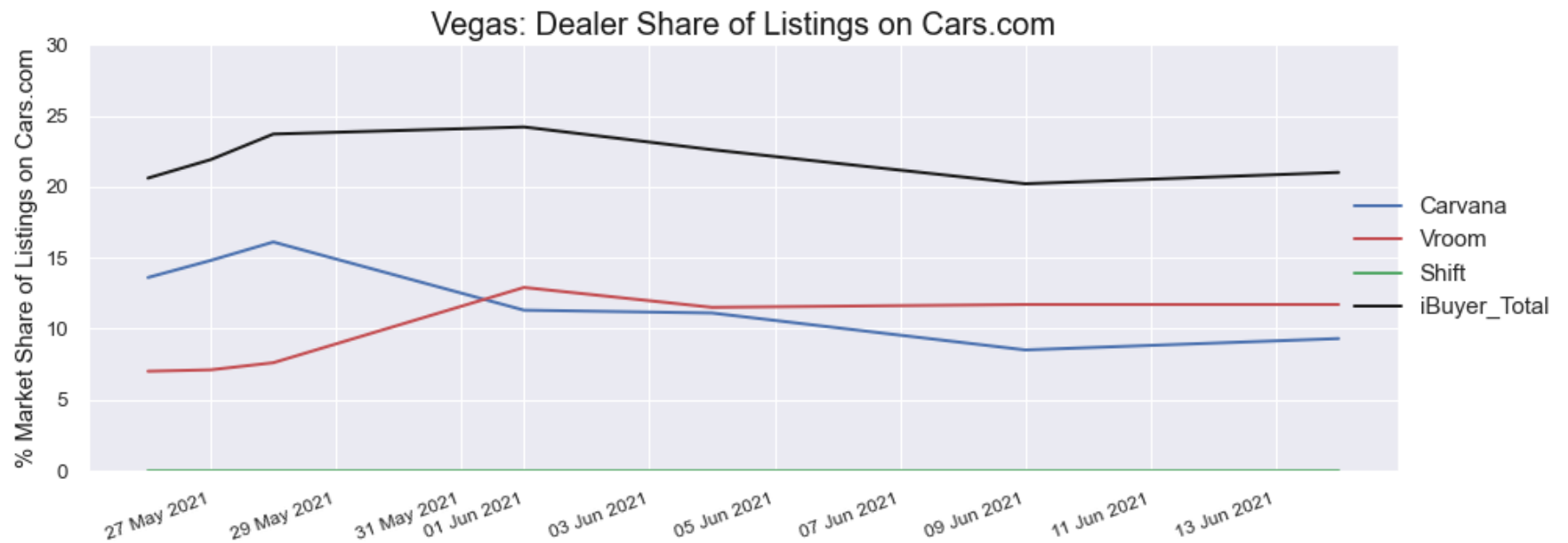
Cars.com Web Scrape:

⦿ Process:
  - ○ Pro: Requests not Selenium
  - ○ Con: VINs located on individual listing page,
    rather than search results page

⦿ Bias:
  - ○ Limited to a sample of 5,000 vehicles
    (50 pages x 100 listings / page)
  - ○ Most markets have +10k, large markets have +20k
  - ○ Limited to % of total instead of absolute # of
    listings, due to sampling

Dealer Share of Cars.com Listings: Vegas Market

Vegas: Dealer Share of Listings on Cars.com

Legend:
- CarMax
- AutoNation
- TRED
- CarLotz
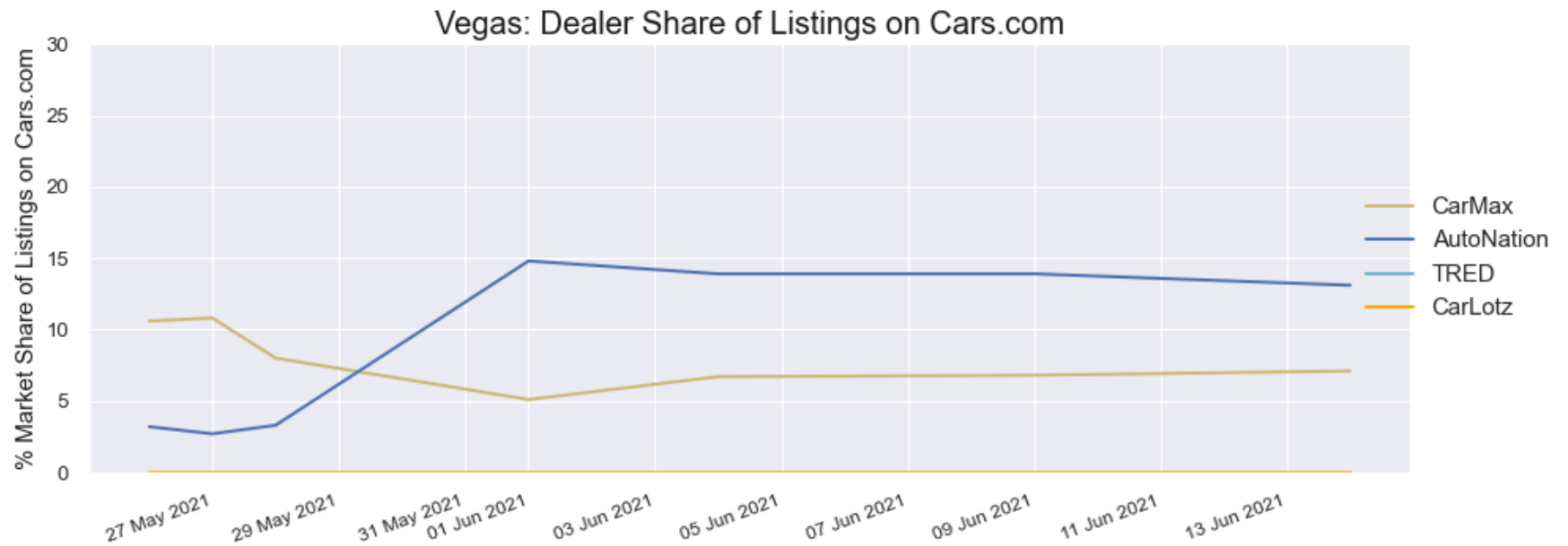
📌 iBuyer Total Share of Cars.com Listings: Target Markets

iBuyer_Total: Dealer Share of Listings on Cars.com

Legend:
- Vegas
- Nashville
- Portland
- Tampa
- Orlando
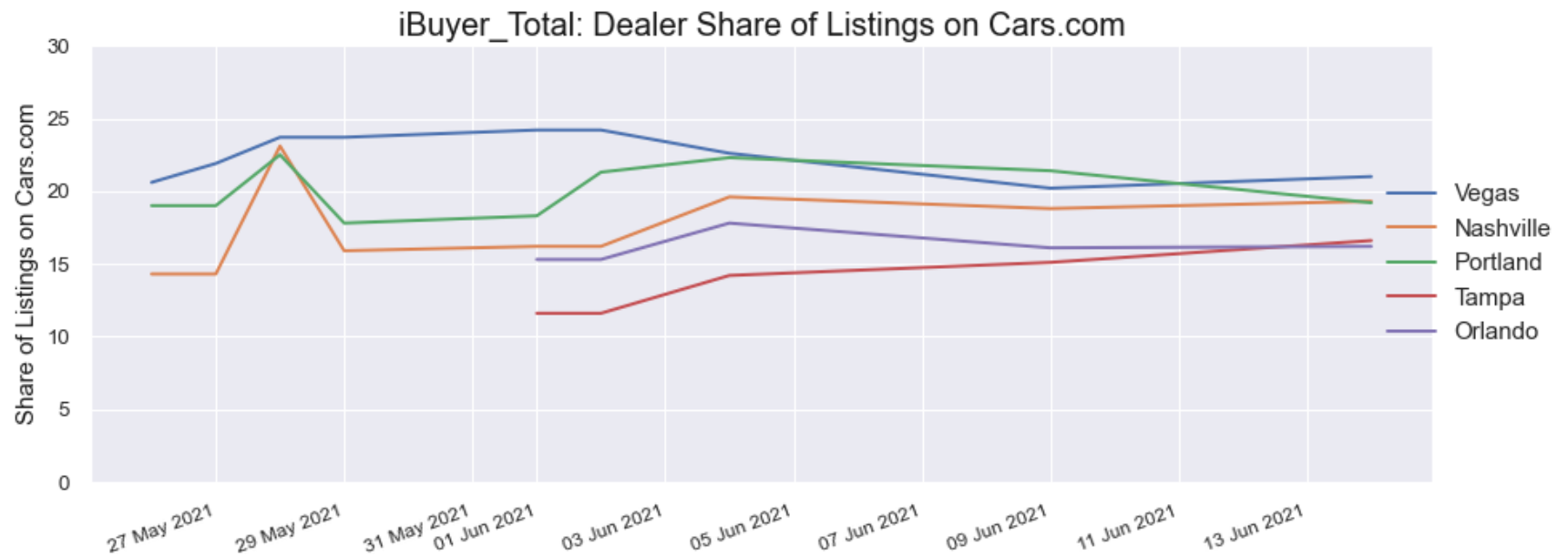
💡 **Key Take-Away:**

Top-Two Market Share: iBuyers vs. Traditional Dealers
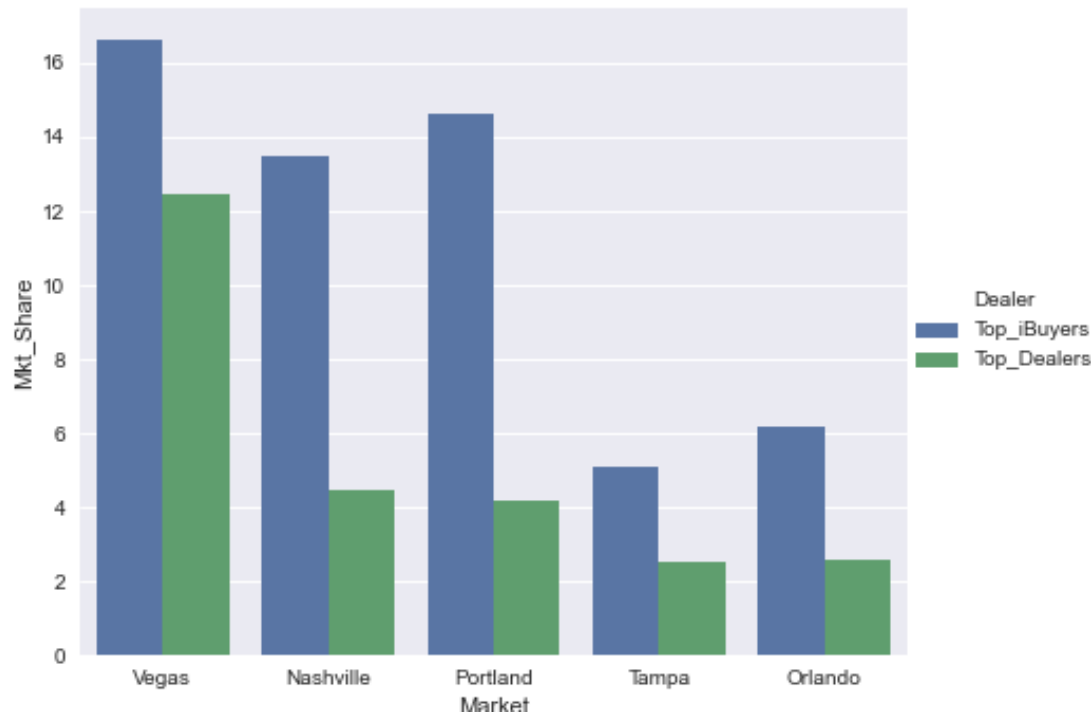
The two largest iBuyers (Carvana & Vroom) are

already advertising more inventory on Cars.com

than the two largest traditional dealerships (CarMax & Auto Nation) in 5 sample markets.

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Carvana & Vroom…

… are already larger advertisers on Cars.com
than CarMax and Auto Nation
in Nashville, Vegas, Portland, Tampa & Orlando.

Zoom in on Carvana

It's hard to forecast what impact the iBuyers will have at the national level in the future. But alternative data allows us to zoom in on the details of specific markets. By comparing those markets that launched several years ago – ex. Nashville in 2014 – with more recent market launches, it's possible to distill what trend, if any, is developing.

The question we are trying to answer is whether Carvana is increasing or decreasing its advertising spend within markets over time?

📌 Carvana Share of Cars.com Listings: Target Markets

iBuyer_Total: Dealer Share of Listings on Cars.com
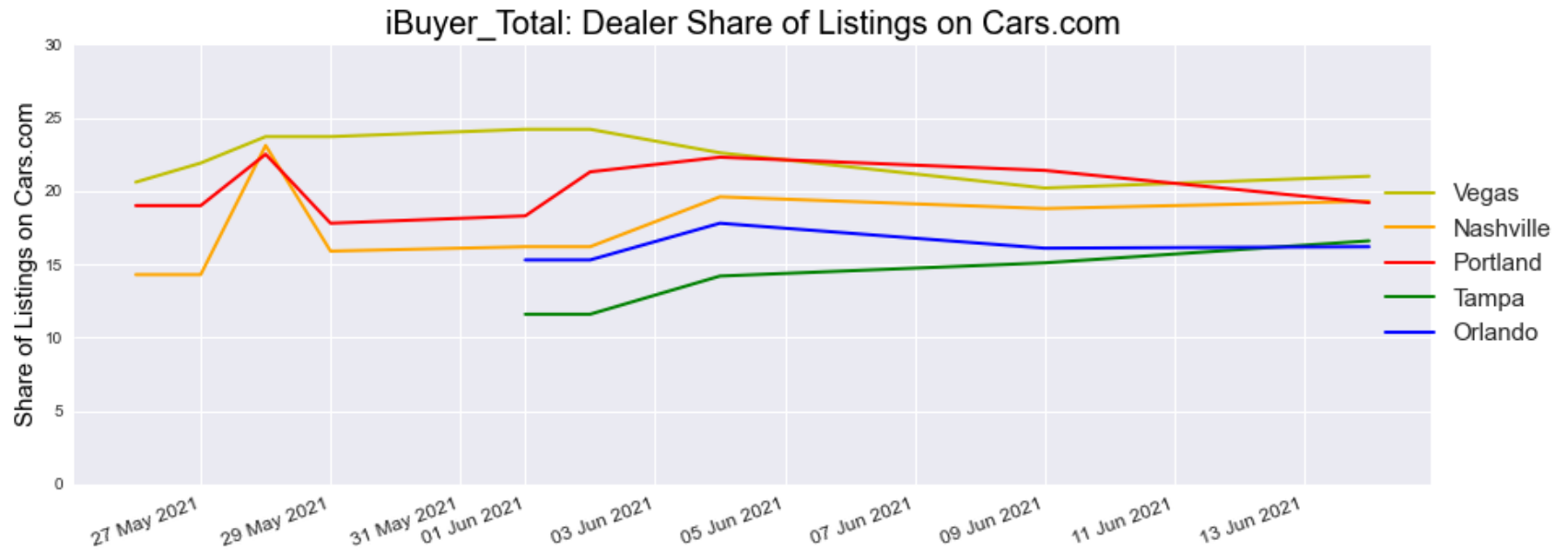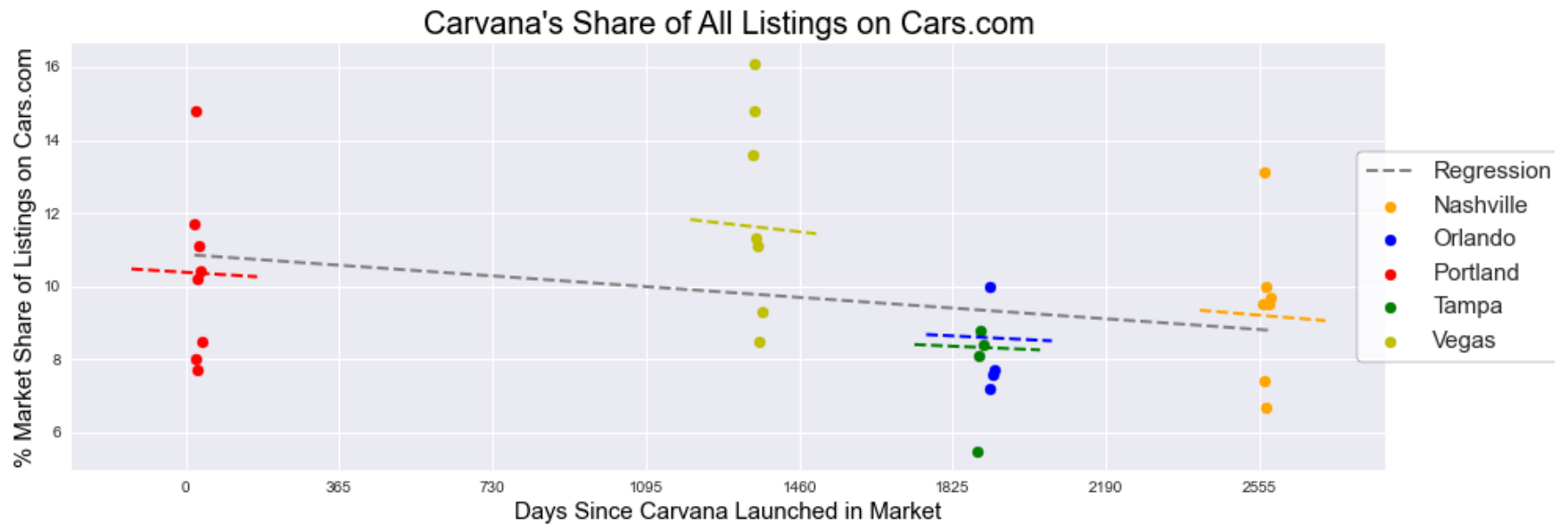
Carvana Market Launch Timeline: Target Markets

Carvana Market Launches
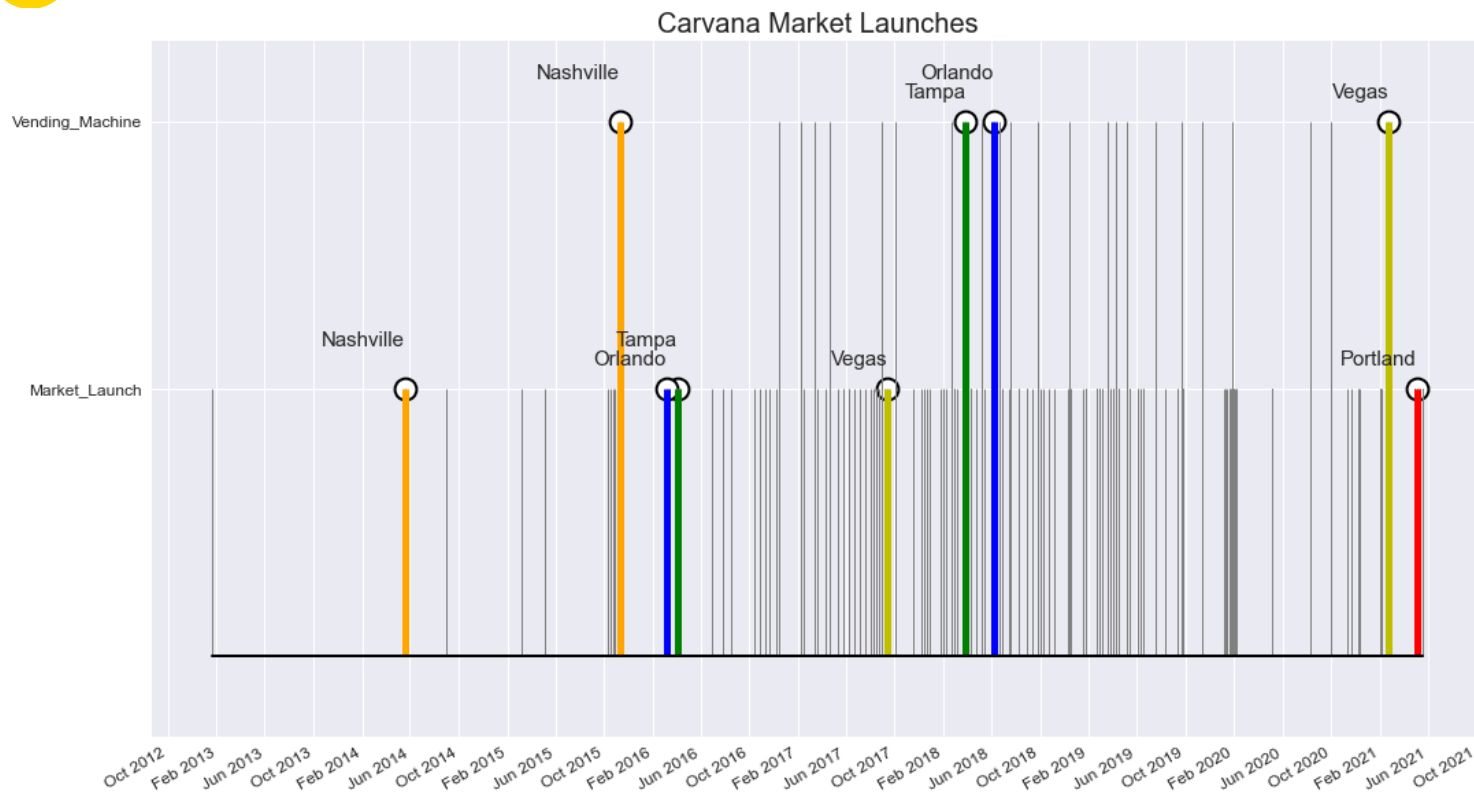
* Carvana Time *
Comparing markets in terms of
days since Carvana launched.

📌 **Carvana Share of Cars.com Listings: Target Markets**

Carvana's Share of All Listings on Cars.com

🔆 Key Take-Away:

```
           Mixed Linear Model Regression Results
========================================================
Model:               MixedLM   Dependent Variable:   Market_Share
No. Observations:    30        Method:               REML
No. Groups:          5         Scale:                4.9375
Min. group size:     4         Log-Likelihood:       -74.1432
Max. group size:     8         Converged:            Yes
Mean group size:     6.0
--------------------------------------------------------
                       Coef.  Std.Err.   z    P>|z| [0.025 0.975]
--------------------------------------------------------
Intercept             10.870    1.276  8.520 0.000  8.369 13.370
Days_Since_Launch     -0.001
Group Var              4.943
Group x Days_Since_Launch Cov -0.001
Days_Since_Launch Var  0.000
========================================================
```

- **Slope Parameter Estimate is basically zero.**

- **But a negative slope would imply that Carvana's peak advertising on Cars.com is at the initial launch of a new market, and declines over time**

- **Multi-level regression**
  - **Level 1: Within City/Market**
  - **Level 2: Across Cities/Markets**
  - **The focus is on isolating and analyzing the between market effects only**

- **Additional sample data is needed to get a p-value for the slope parameter**

Market-Level Detail…

…of Carvana's advertising intensity on Cars.com
could be a strong predictor of nation-wide
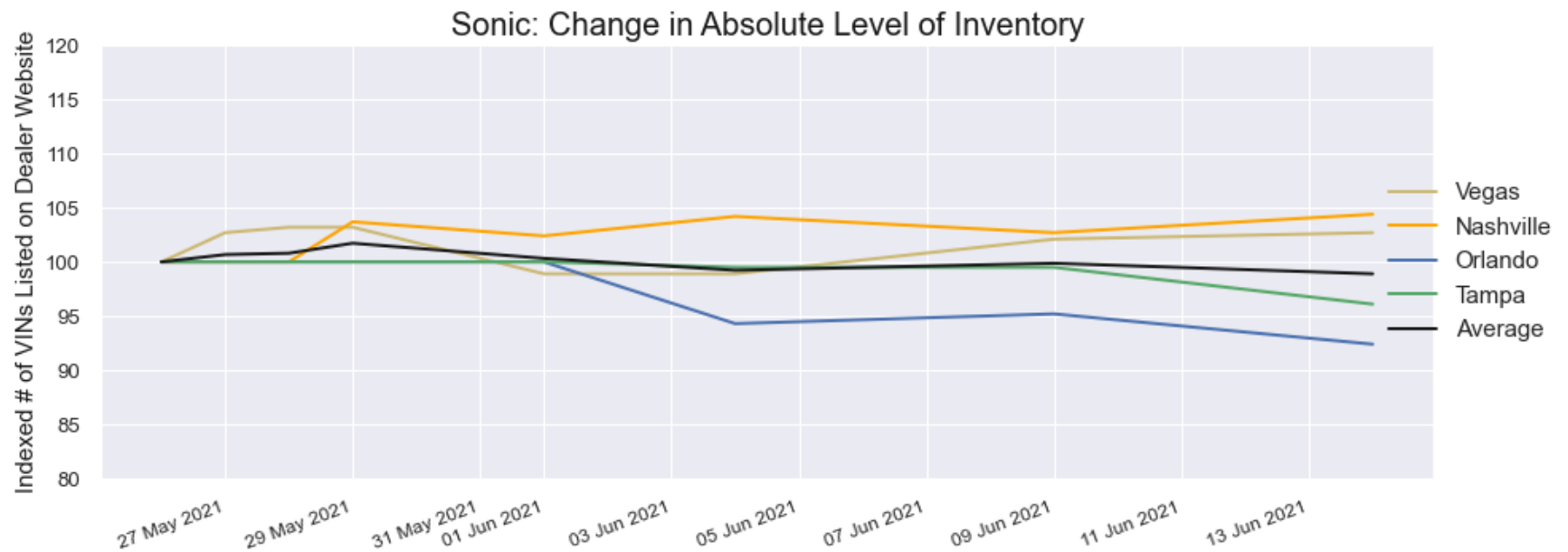iBuyer advertising trends in the future.

Changes at Traditional Dealers

Important Question #2:

Are dealer inventory volumes and/or advertising intensity changing due to the new-entrants?

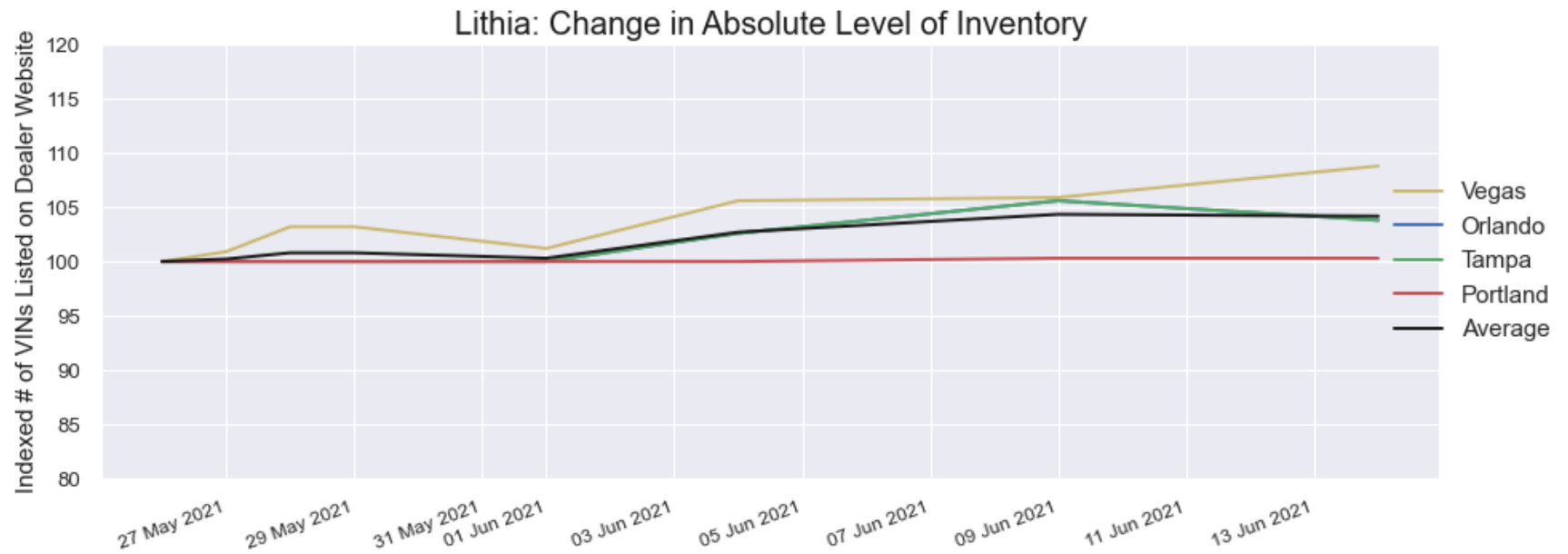Analysis of Sonic (NYSE: SAH) & Lithia (NYSE: LAD)

Monitor Changes in Inventory Levels: Sonic

Sonic: Change in Absolute Level of Inventory

📌 Monitor Changes in Inventory Levels: Lithia

Lithia: Change in Absolute Level of Inventory

Inventory Levels…

…at traditional dealers appear stable.

Sonic Web Scrape:

- ● Process:
  - ○ Con: Selenium not Requests
  - ○ Pro: VINs located on search results page
  - ○ Pro: City by city
- ● Bias:
  - ○ Able to extract all inventory with confidence (within-market data is not a sample)
  - ○ Understand if inventory levels change over time
  - ○ Understand if advertising intensity changes over time
  - ○ Understand if auto advertising market share's change between marketplaces (Cars.com, TrueCar)
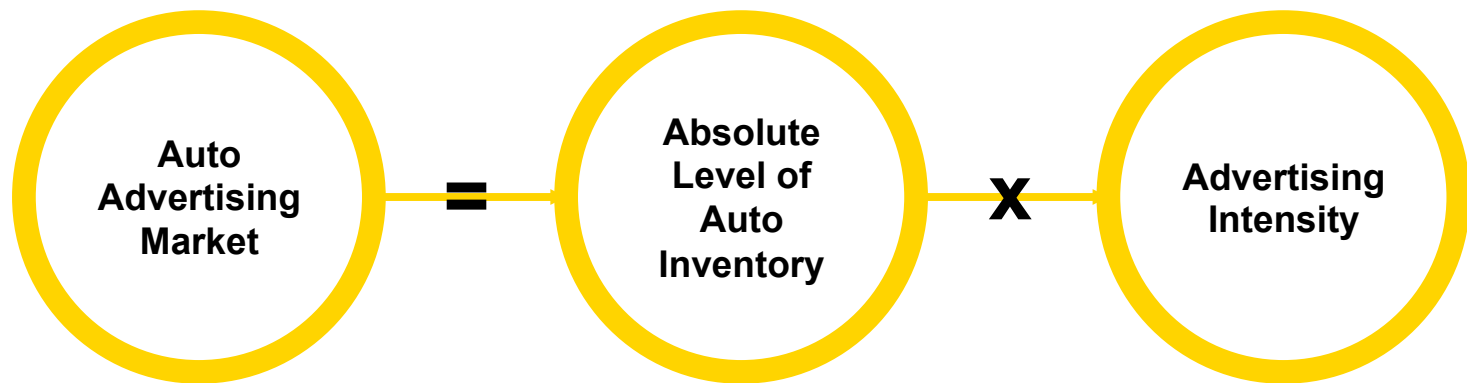
Lithia Web Scrape:

⦿ Process:
- ○ Pro: Same website designer/host as Sonic
- ○ Con: Selenium not Requests
- ○ Pro: VINs located on search results page
- ○ Con: Can only aggregate at the State level
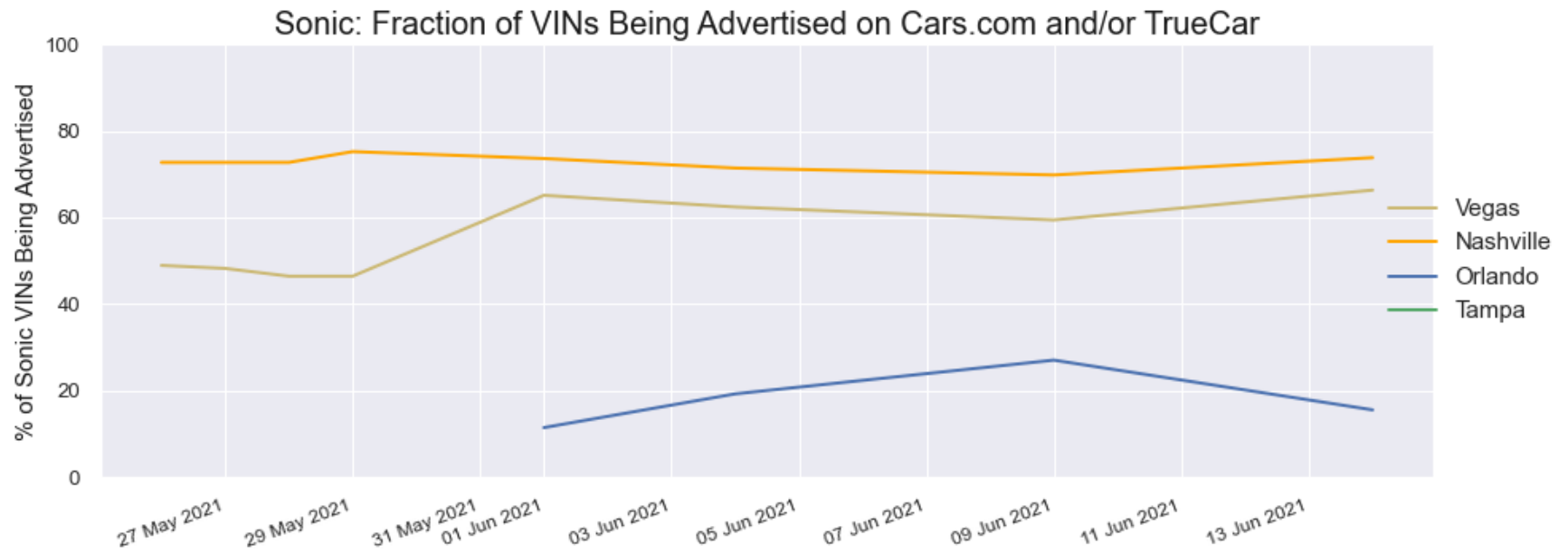 - ▪ Have to analyze Tampa and Orlando, FL in combination
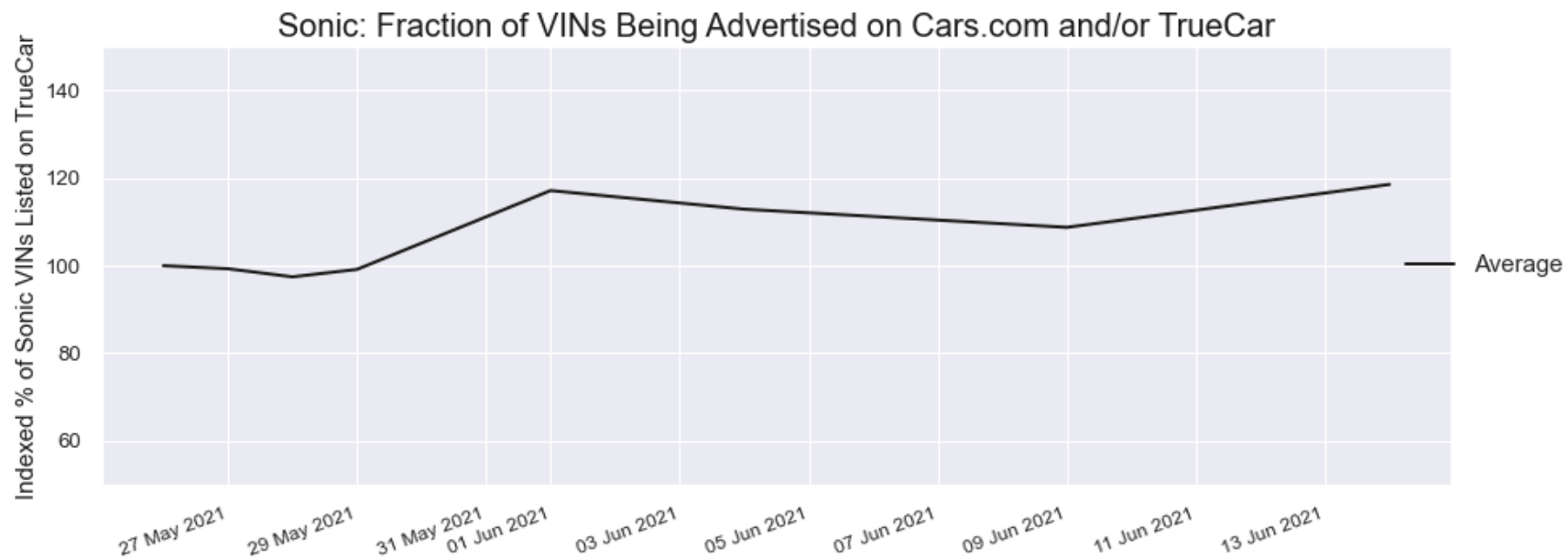
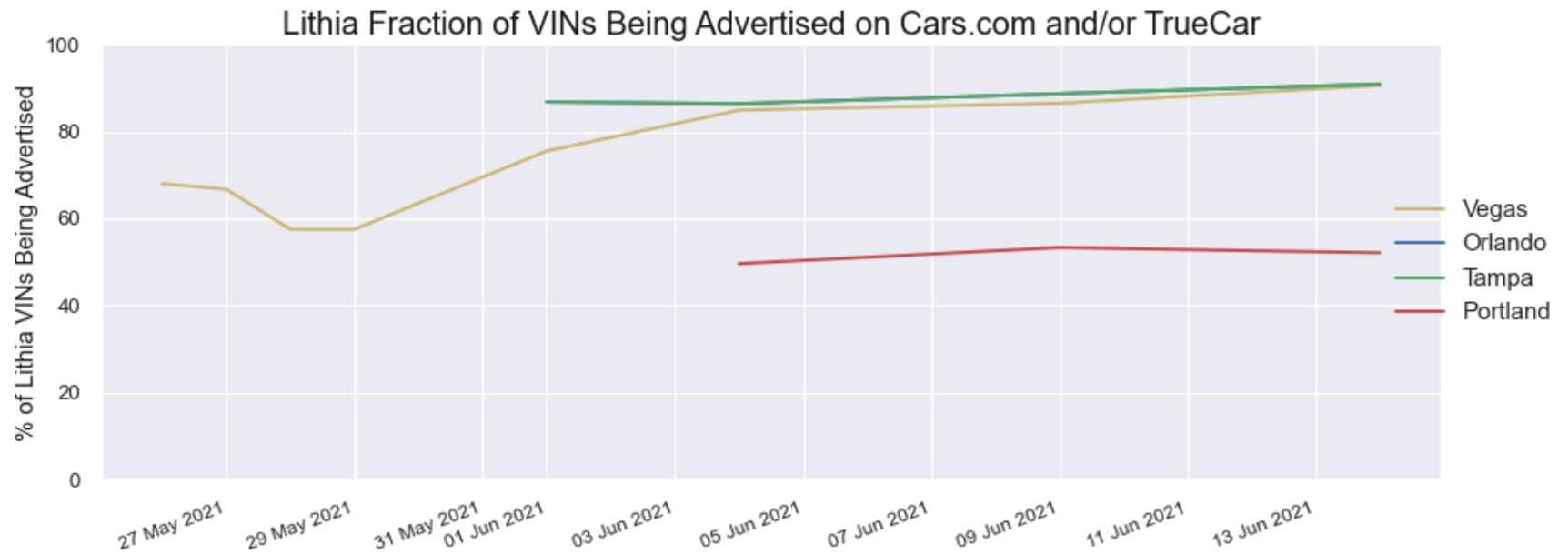**Traditional Dealer Advertising Insights:**

Auto Advertising Market **=** Absolute Level of Auto Inventory **X** Advertising Intensity

📌 Monitor Changes in Advertising Intensity: Sonic

Sonic: Fraction of VINs Being Advertised on Cars.com and/or TrueCar

Monitor Changes in Advertising Intensity: Sonic

Sonic: Fraction of VINs Being Advertised on Cars.com and/or TrueCar

Monitor Changes in Advertising Intensity: Lithia

Lithia Fraction of VINs Being Advertised on Cars.com and/or TrueCar

Monitor Changes in Advertising Intensity: Lithia

Lithia: Fraction of VINs Being Advertised on Cars.com and/or TrueCar
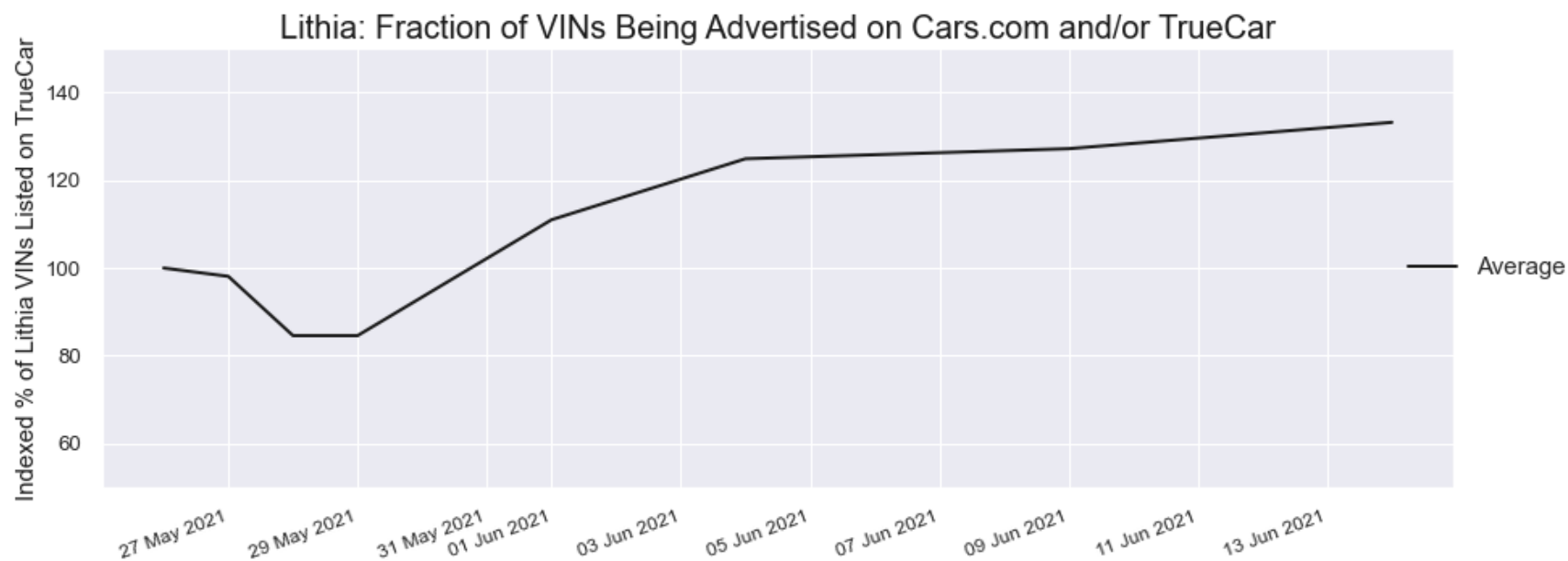
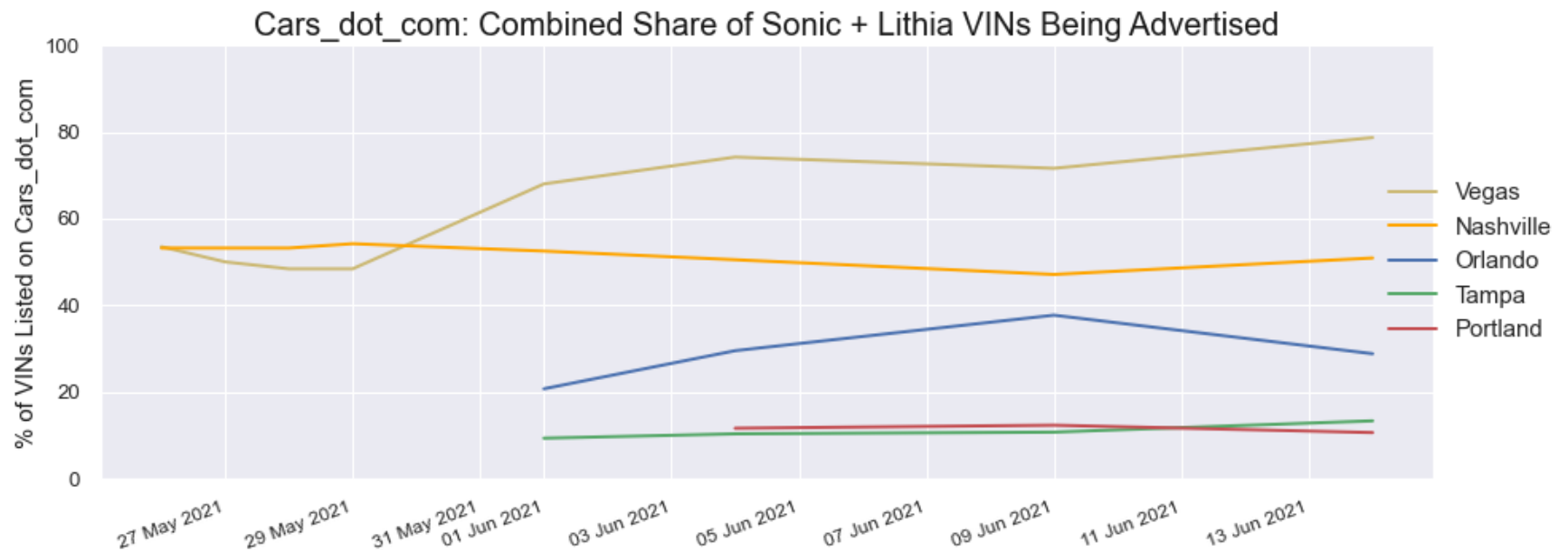# Advertising Intensity...

...is up 20% at Sonic dealerships and
up over 30% at Lithia dealerships.

Advertising Inventory Share: Cars.com

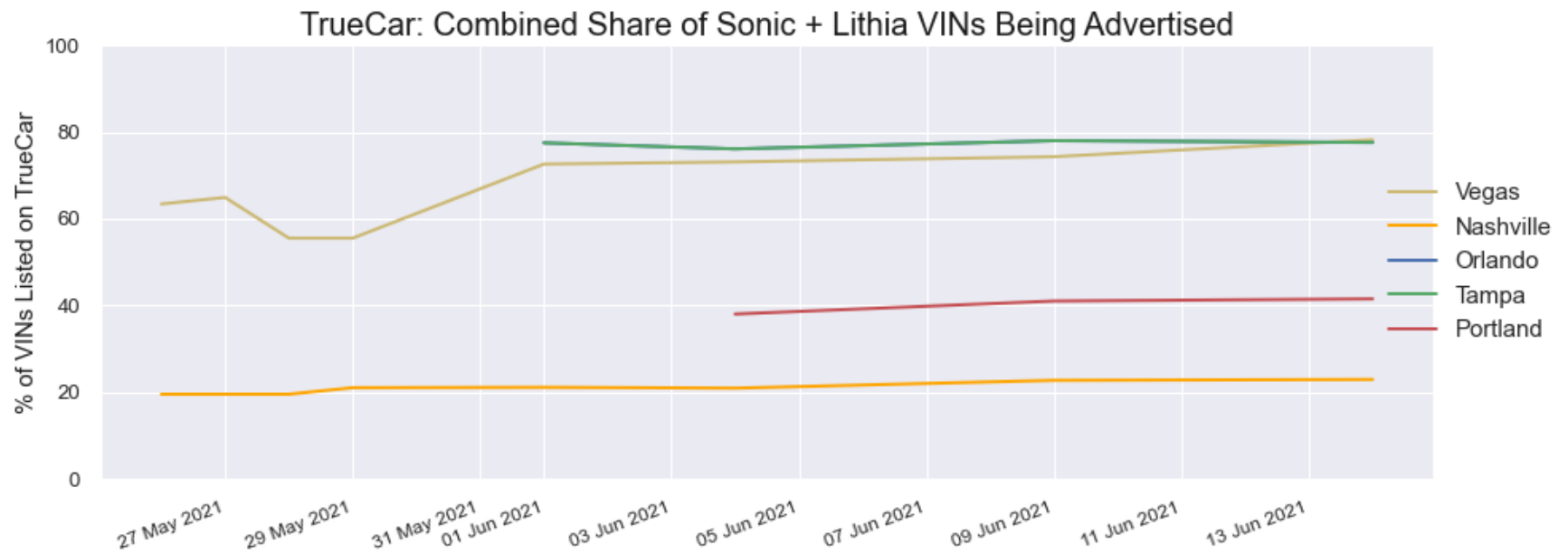Cars_dot_com: Combined Share of Sonic + Lithia VINs Being Advertised

Legend: Vegas, Nashville, Orlando, Tampa, Portland

Advertising Inventory Share: Cars.com

Cars_dot_com: Indexed Share of Sonic + Lithia VINs Being Advertised

Advertising Inventory Share: TrueCar

TrueCar: Combined Share of Sonic + Lithia VINs Being Advertised

Legend:
- Vegas
- Nashville
- Orlando
- Tampa
- Portland

Y-axis: % of VINs Listed on TrueCar

X-axis dates: 27 May 2021, 29 May 2021, 31 May 2021, 01 Jun 2021, 03 Jun 2021, 05 Jun 2021, 07 Jun 2021, 09 Jun 2021, 11 Jun 2021, 13 Jun 2021

Advertising Inventory Share: TrueCar

TrueCar: Indexed Share of Sonic + Lithia VINs Being Advertised
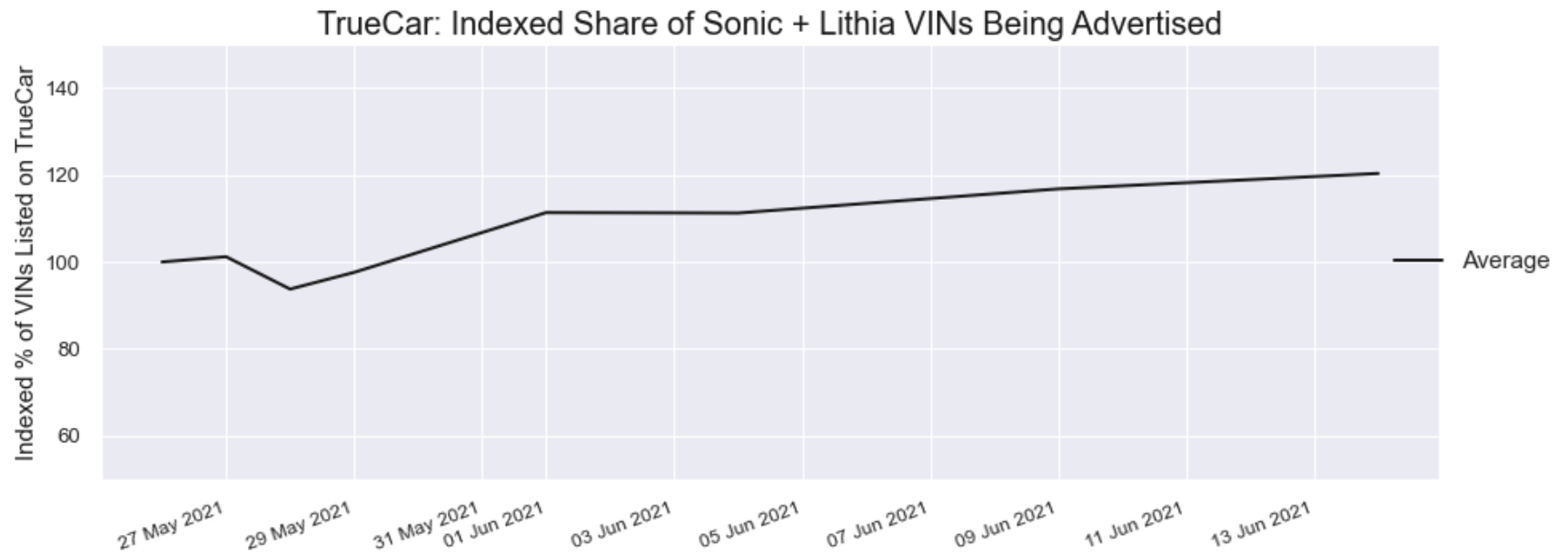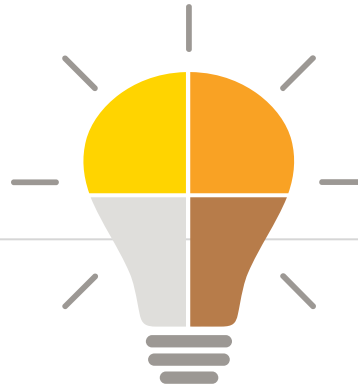
Advertising Intensity…

…by two large, publicly listed dealerships is so far
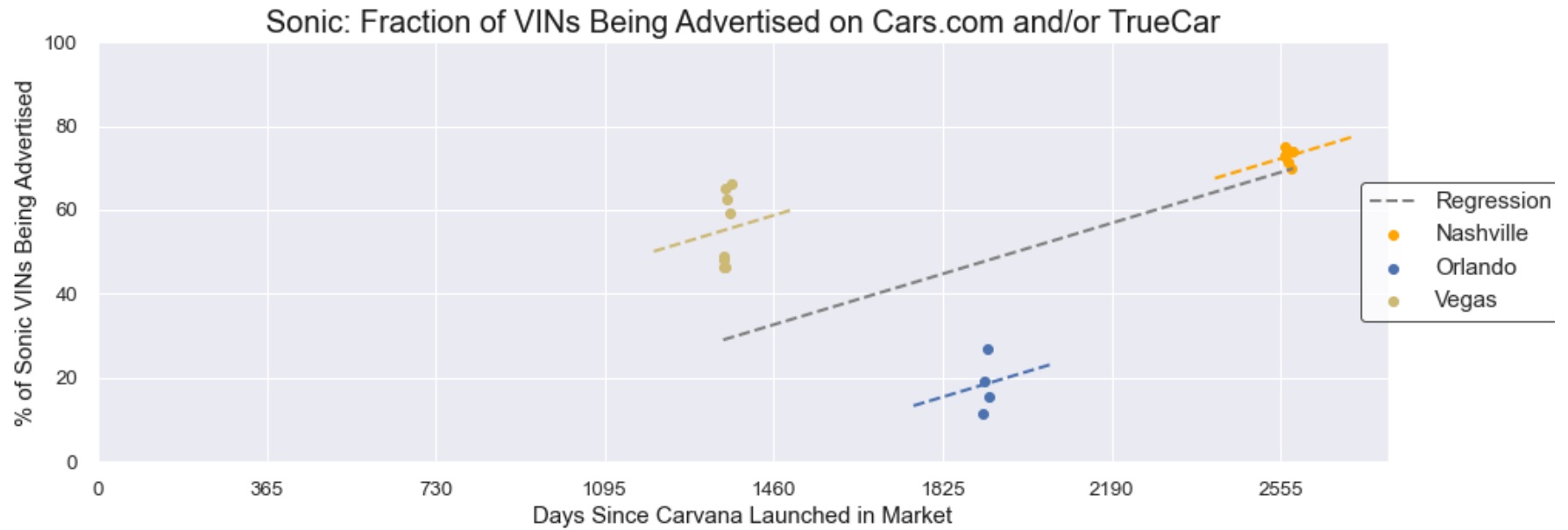rising equally at both TrueCar and Cars.com.

Zoom in on Carvana (again)

Unique insights into longer-term trends, through alternative data:

Is the advertising intensity of traditional dealers changing
as Carvana gains scale in their markets?

🔖 Carvana Impact on Advertising Intensity: Sonic

Sonic: Fraction of VINs Being Advertised on Cars.com and/or TrueCar

Key Take-Away:

```
            Mixed Linear Model Regression Results
========================================================
Model:            MixedLM  Dependent Variable:  Market_Share
No. Observations: 20       Method:              REML
No. Groups:       3        Scale:               39.0277
Min. group size:  4        Log-Likelihood:      -70.4428
Max. group size:  8        Converged:           Yes
Mean group size:  6.7
--------------------------------------------------------
                  Coef.   Std.Err.    z    P>|z| [0.025   0.975]
--------------------------------------------------------
Intercept        -15.833  103.627  -0.153 0.879 -218.937 187.271
Days_Since_Launch  0.033    0.052   0.639 0.523   -0.069   0.135
Group Var        1502.318  396.380
========================================================
```

- **A positive slope implies that Carvana's market entry is increasing Sonic's advertising intensity over time**

- **Multi-level regression**
    - Level 1: Within City/Market
    - Level 2: Across Cities/Markets
    - The focus is on isolating and analyzing the between market effects only

- **Additional sample data needed: 95% confidence interval of slope parameter est. ranges from above to below zero**
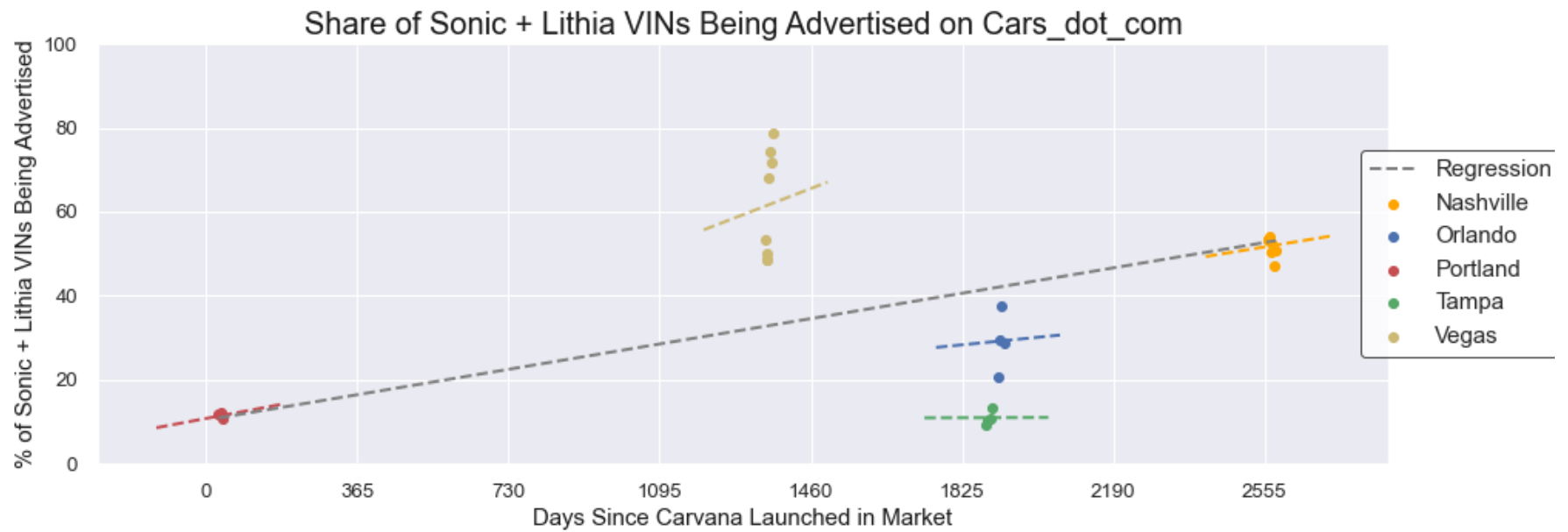
📌 Carvana Impact on Advertising Intensity: Lithia

Lithia: Fraction of VINs Being Advertised on Cars.com and/or TrueCar
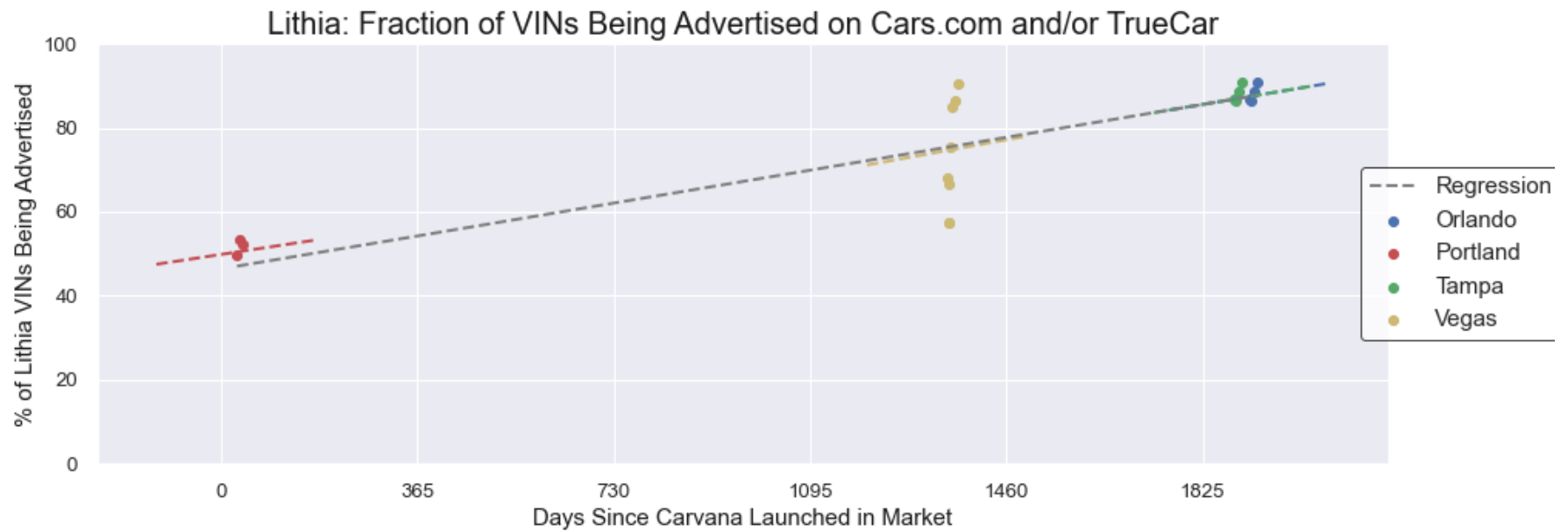
💡 Key Take-Away:

```
              Mixed Linear Model Regression Results
========================================================================
Model:                 MixedLM    Dependent Variable:    Market_Share
No. Observations:      19         Method:                REML
No. Groups:            4          Scale:                 72.7101
Min. group size:       3          Log-Likelihood:        -70.2169
Max. group size:       8          Converged:             Yes
Mean group size:       4.8
------------------------------------------------------------------------
                                  Coef.  Std.Err. z P>|z| [0.025 0.975]
------------------------------------------------------------------------
Intercept                         46.373
Days_Since_Launch                  0.021
Group Var                         72.921
Group x Days_Since_Launch Cov     -0.040
Days_Since_Launch Var              0.000
========================================================================
```

- **A positive slope implies that Carvana's market entry is increasing Lithia's advertising intensity over time**

- **Multi-level regression**
  - **Level 1: Within City/Market**
  - **Level 2: Across Cities/Markets**
  - **The focus is on isolating and analyzing the between market effects only**

- **Additional sample data needed: 95% confidence interval of slope parameter est. ranges from above to below zero**

📌 Carvana Impact on Advertising Intensity: Cars.com

Share of Sonic + Lithia VINs Being Advertised on Cars_dot_com

Key Take-Away:

```
            Mixed Linear Model Regression Results
==================================================================
Model:              MixedLM    Dependent Variable:    Market_Share
No. Observations:   27         Method:                REML
No. Groups:         5          Scale:                 51.8664
Min. group size:    3          Log-Likelihood:        -107.3889
Max. group size:    8          Converged:             No
Mean group size:    5.4
------------------------------------------------------------------
                           Coef.  Std.Err.    z   P>|z|  [0.025   0.975]
------------------------------------------------------------------
Intercept                 10.337  337.567  0.031 0.976 -651.282 671.957
Days_Since_Launch          0.017    0.171  0.097 0.923   -0.318   0.351
Group Var                 51.998 6534.431
Group x Days_Since_Launch Cov -0.027   7.838
Days_Since_Launch Var      0.014    0.007
==================================================================
```
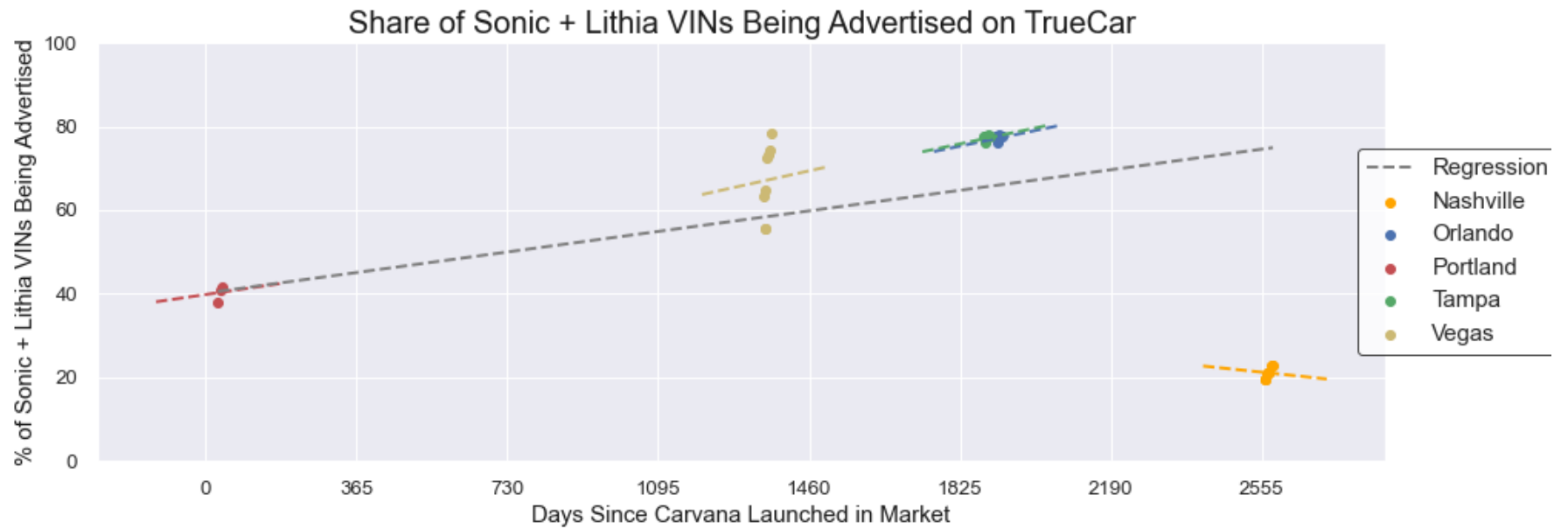
- **A positive slope implies that Carvana's market entry is increasing overall dealer advertising intensity on Cars.com over time**

- **Multi-level regression**
  - **Level 1: Within City/Market**
  - **Level 2: Across Cities/Markets**
  - **The focus is on isolating and analyzing the between market effects only**

- **Additional sample data needed: 95% confidence interval of slope parameter est. ranges from above to below zero**

Carvana Impact on Advertising Intensity: TrueCar

Share of Sonic + Lithia VINs Being Advertised on TrueCar

💡 Key Take-Away:

```
            Mixed Linear Model Regression Results
=====================================================================
Model:               MixedLM    Dependent Variable:   Market_Share
No. Observations:    27         Method:               REML
No. Groups:          5          Scale:                24.6265
Min. group size:     3          Log-Likelihood:       -92.5239
Max. group size:     8          Converged:            Yes
Mean group size:     5.4
---------------------------------------------------------------------
                           Coef.  Std.Err.  z  P>|z|  [0.025 0.975]
---------------------------------------------------------------------
Intercept                  40.106
Days_Since_Launch           0.013
Group Var                  24.683
Group x Days_Since_Launch Cov -0.077
Days_Since_Launch Var       0.000
=====================================================================
```

- **A positive slope implies that Carvana's market entry is increasing overall dealer advertising intensity on TrueCar over time**

- **Multi-level regression**
  - **Level 1: Within City/Market**
  - **Level 2: Across Cities/Markets**
  - **The focus is on isolating and analyzing the between market effects only**

- **Additional sample data needed to get a p-value for slope parameter, especially with Nashville being both the oldest market and an outlier.**

Market-Level Detail…

…of traditional dealer advertising intensity on Cars.com and TrueCar could be a strong predictor of future nation-wide trends.
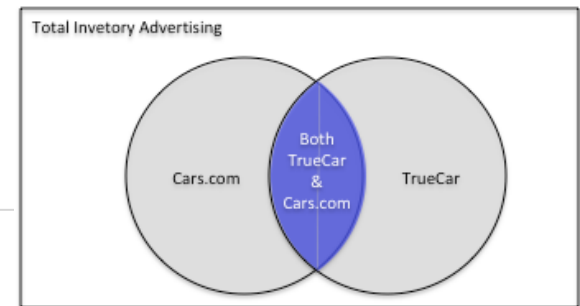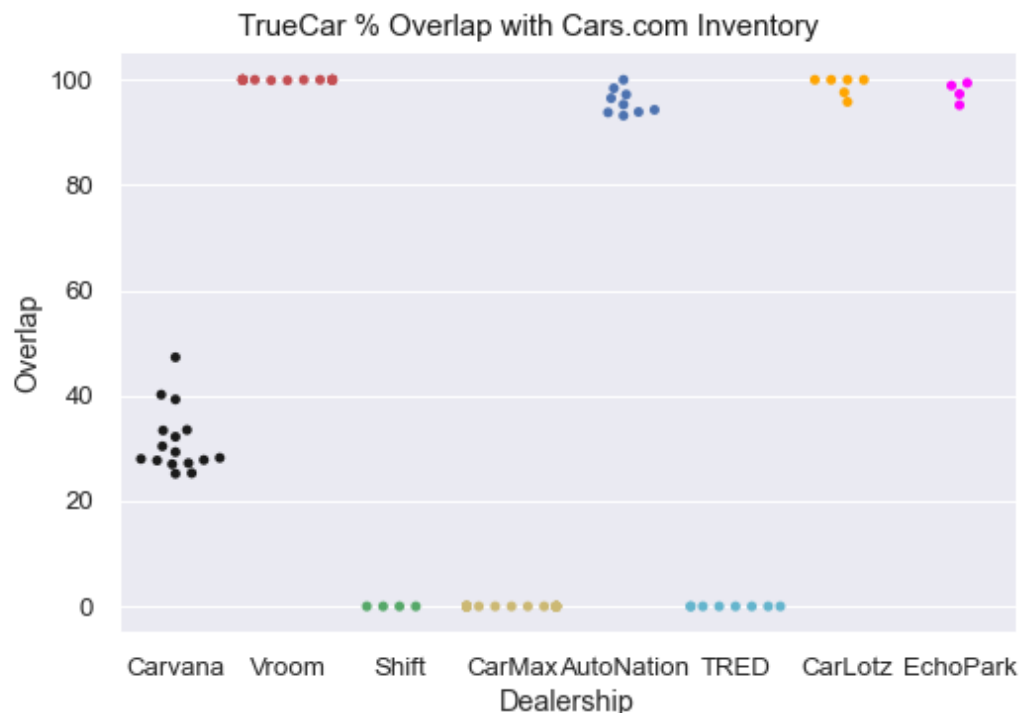
Zoom in on TrueCar

Is TrueCar participating in the same growth in iBuyer inventory advertising as Cars.com?

TrueCar Overlap w/ Cars.com:

Total Invetory Advertising

Cars.com — Both TrueCar & Cars.com — TrueCar

TrueCar % Overlap with Cars.com Inventory

Overlap / Dealership

(x-axis: Carvana, Vroom, Shift, CarMax, AutoNation, TRED, CarLotz, EchoPark)

- **Carvana: Roughly 1/3rd of the Inventory advertised on Cars.com is also advertised on TrueCar**

- **Other iBuyers: Of the inventory Vroom advertises on Cars.com, 100% of it is also advertised on TrueCar. Shift, however, has zero overlap in its advertising.**

- **Traditional Dealers:**
  - **CarMax has zero overlap in advertising**
  - **AutoNation has 100% overlap**

Summary of Analysis:

- The iBuyer new-entrants seem to be increasing the market size of the Auto Retail Advertising market, based on their already meaningful share of inventory being advertised on Cars.com

- This iBuyer boost could be font-end loaded, or could be stable, or increase. More data is needed to make any conclusions about Carvana's advertising intensity on Cars.com over time

- Traditional dealerships seem to also be contributing to growth in the Auto Retail Advertising market

- Traditional dealer inventory trends, so far, remain healthy

- More concretely, traditional dealer advertising intensity seems to be increasing over time due to Carvana's market entry

Investment Ideas:

- **Alternative data is indicating that the Auto Advertising Market is benefiting from entry of the iBuyer business model**
  - Additional data is required to confirm long-term trends and map real-time results to reported financial performance
- **TrueCar is potentially more interesting: exposed to the same themes, but with more operating leverage and valuation upside than Cars.com**
- **However, Auto Retail Marketplaces seems to fail on the core investment pillars of Secular Growth and business model Quality**
  - Cars.com's marketing "investments" have failed to generate longer-term profitability; reported revenue growth has stalled
  - There is significant competition with identical product offerings
  - Looking horizontally across industries, there are other "marketplace" business models besides auto retail. In particular, Stock Exchanges are marketplaces but offer a higher-quality investment alternative

💡 Thinknum:

Car Inventory
🚗

56 companies

Thinknum's "Car Inventory" dataset tracks the inventory of all major online dealerships. Since each vehicle has a unique identification number, users are able to see when a vehicle is added or removed from a dealerships inventory. Tracking the number of vehicles leaving inventory is predictive of a dealership's sales figures.

Open in connections ›

Trending companies

Understand which companies are showing critical movements related to Car Inventory.

Carmax (NYSE:KMX)
CarMax is the United States' largest used-car retailer and a Fort... read more

Carvana (NYSE:CVNA)
Carvana is a technology business start-up founded by Ernie Garcia... read more

- **Web scrape and dataset has already been built by data-vendor Thinknum**

- **Data history that goes back years could allow back-testing, comparison vs. reported financial data**

- **"Thinknum's "Car Inventory" dataset tracks the inventory of all major online dealerships. Since each vehicle has a unique identification number [VIN], users are able to see when a vehicle is added or removed from a dealerships inventory."**

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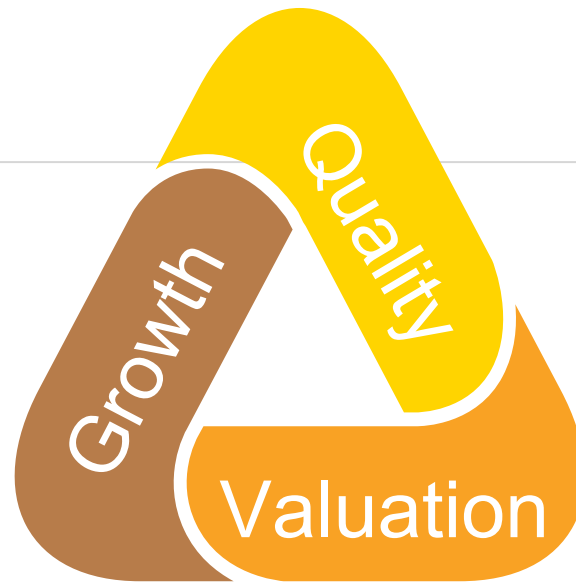
Investment Framework

Josh Grasso

You can get in touch with me at:
joshgrasso@gmail.com

You can see the code for this analysis at:

https://github.com/josh-grasso/
US_Auto_Retail_Advertising/blob/main/
Auto_Retail_Analysis_Charts.ipynb