

Cars.com

By: Josh Grasso



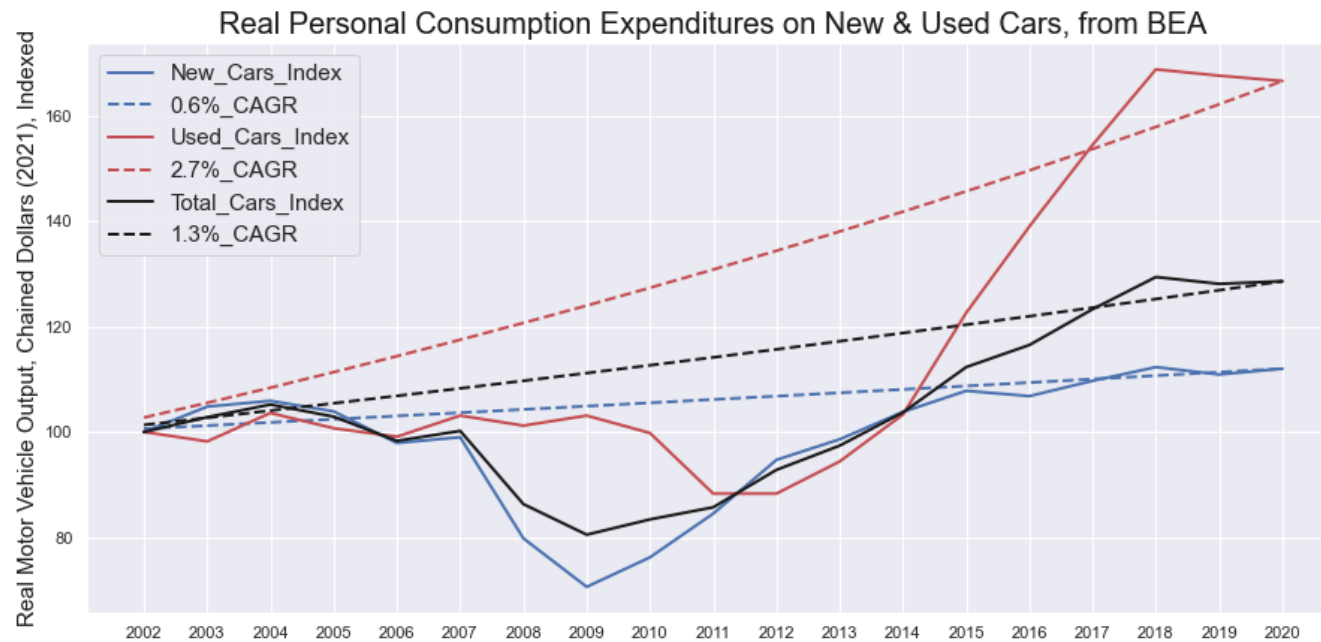


Quick Intro:

- 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...



1.3 % CAGR

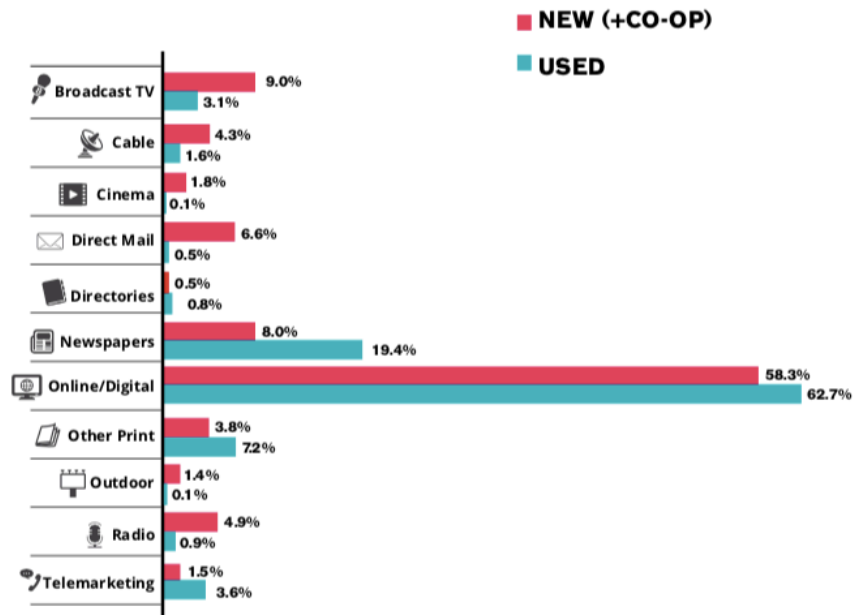


...Nor is Digital Advertising (Anymore) in Auto Retail...

FIGURE 2.6

Source: Borrell, July 2017
© 2017 Borrell

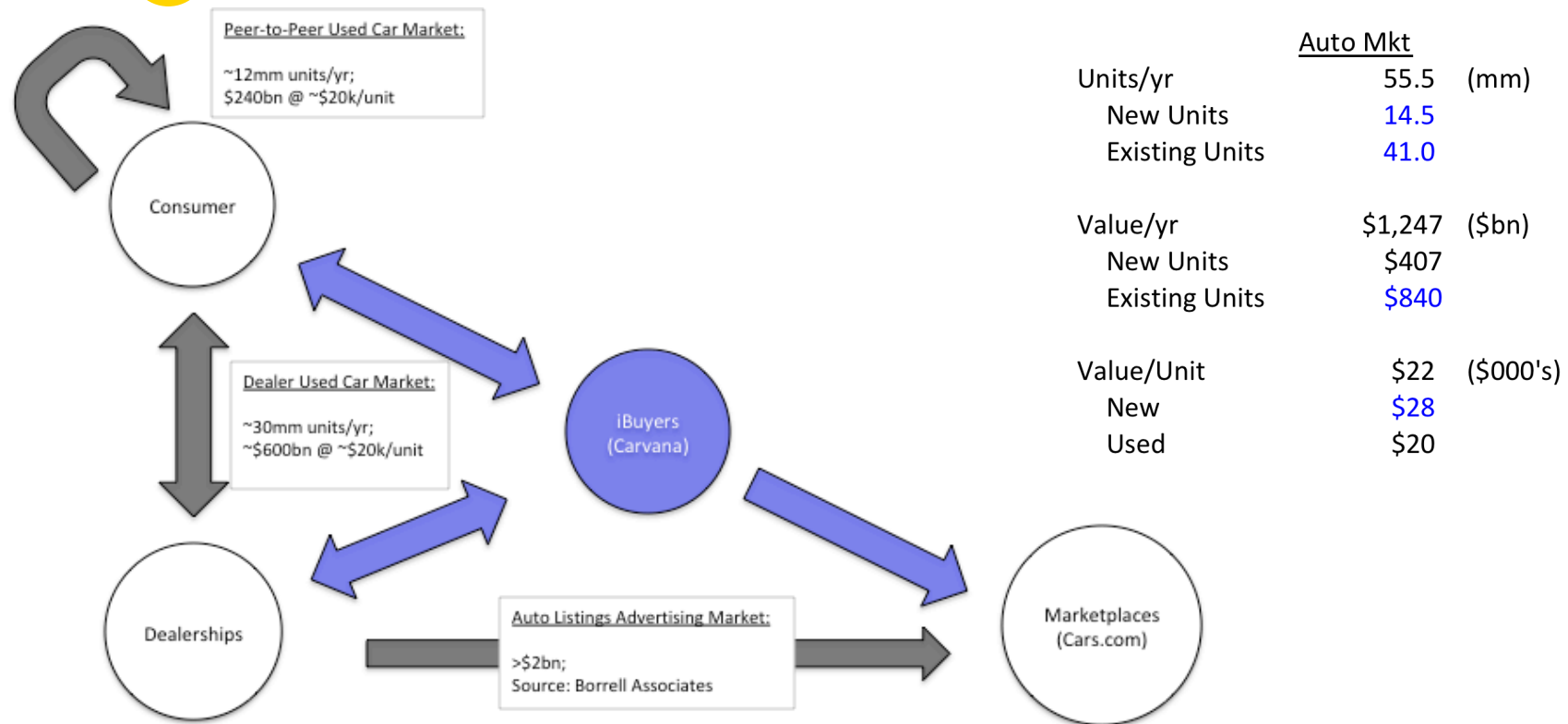
% OF DEALERS USING EACH TYPE OF ADVERTISING
MEDIA, NEW VS. USED-CAR DEALERS




**Digital
Media**
Still is the media
of choice.



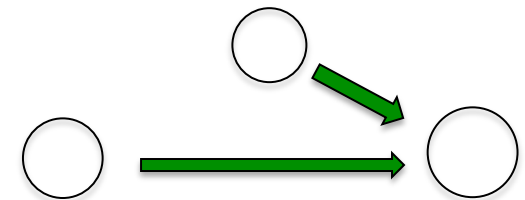
...But there is a New Entrant in the Used Car Market



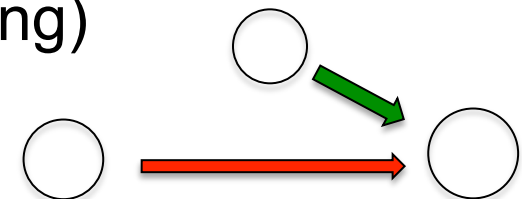


Thus, Two Important Questions:

- 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?





The Players: Auto Retail Business Models

Auto:

Company Name
Ticker

Online Marketplaces

Cars.com
CARS

CarGurus
CARG

TrueCar
TRUE

Traditional Dealers

CarMax
KMX

Penske Auto
PAG

Sonic
SAH

Lithia
LAD

iBuyers

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

Auto:

Company Name
Ticker

Online Marketplaces - U.S.

	Cars.com CARS	CarGurus CARG	TrueCar TRUE
Gross Profit Margin	81%	92%	92%
Sales & Marketing	34%	47%	55%
Research & Dev.	11%	16%	16%
General & Admin.	11%	11%	19%
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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



The Players: Traditional Dealers

Traditional Retail Model

Auto:

Company Name

Ticker

		CarMax KMX	Penske Auto PAG	Sonic SAH	Lithia 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%
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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



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%
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All organic?		Yes	Yes	Yes
Revenue (\$mm)	*Gross Profit	\$72	\$5,587	\$196
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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



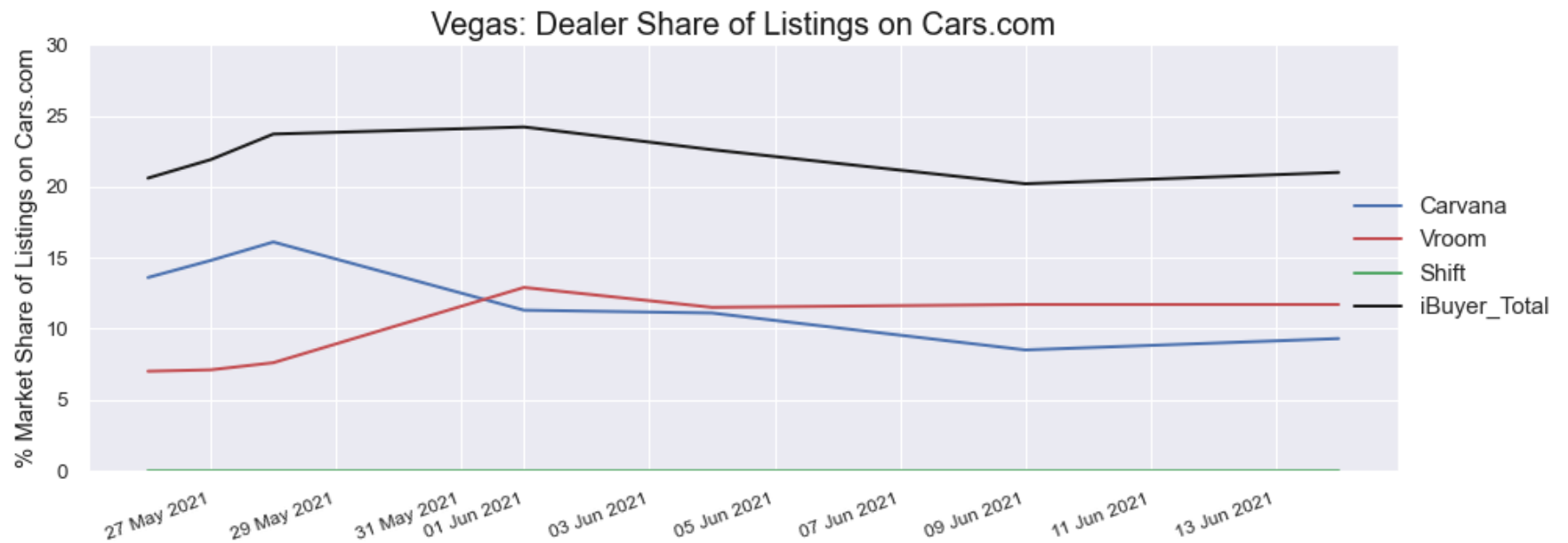
Auto Advertising on Cars.com

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





Cars.com Web Scrape:

● Process:

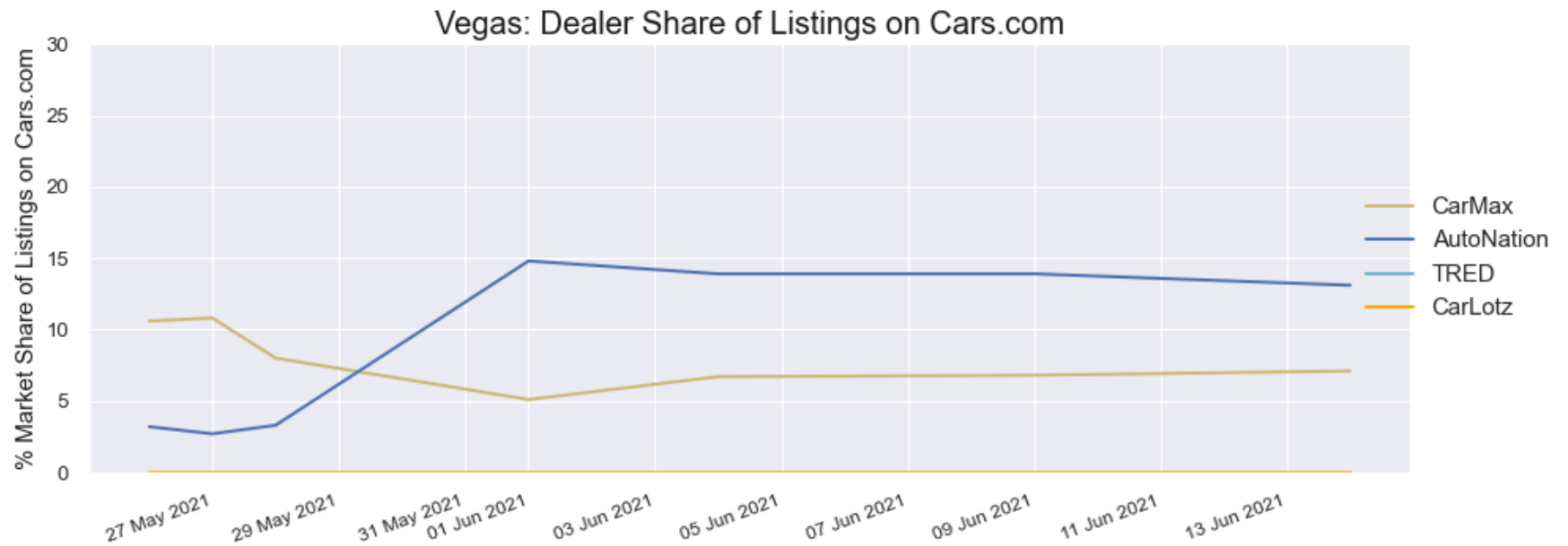
- Pro: Requests not Selenium
- Con: VINs located on individual listing page, rather than search results page

● 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

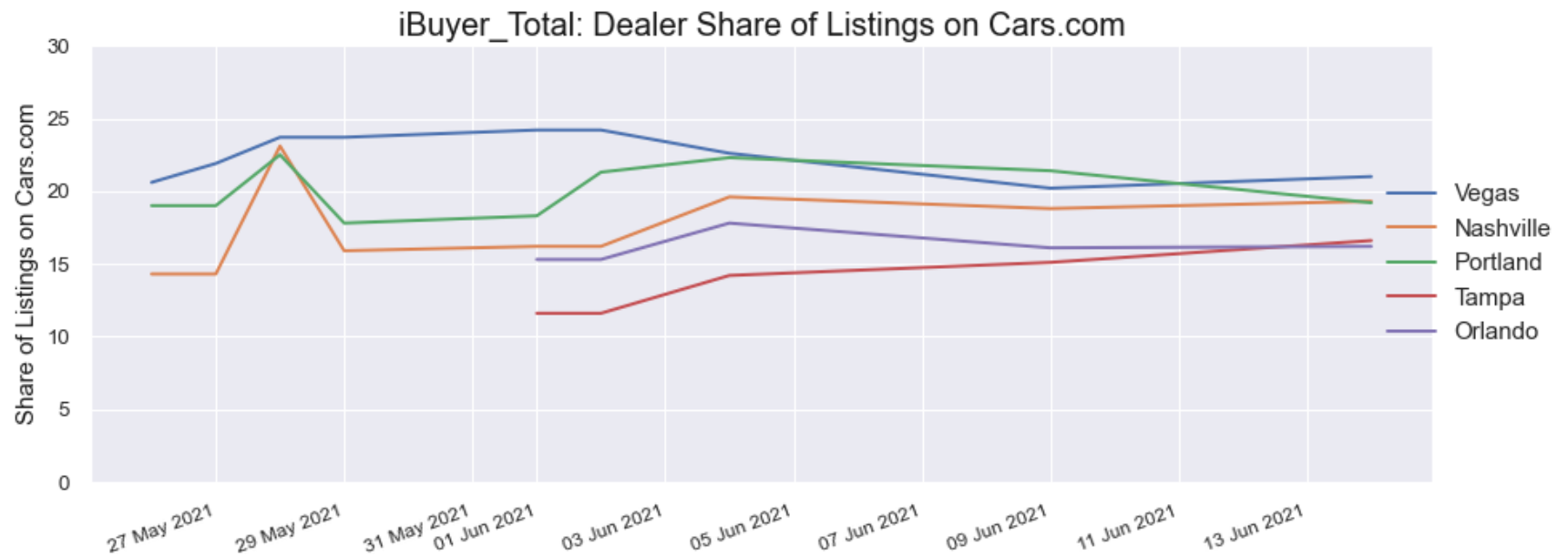


Dealer Share of Cars.com Listings: Vegas Market





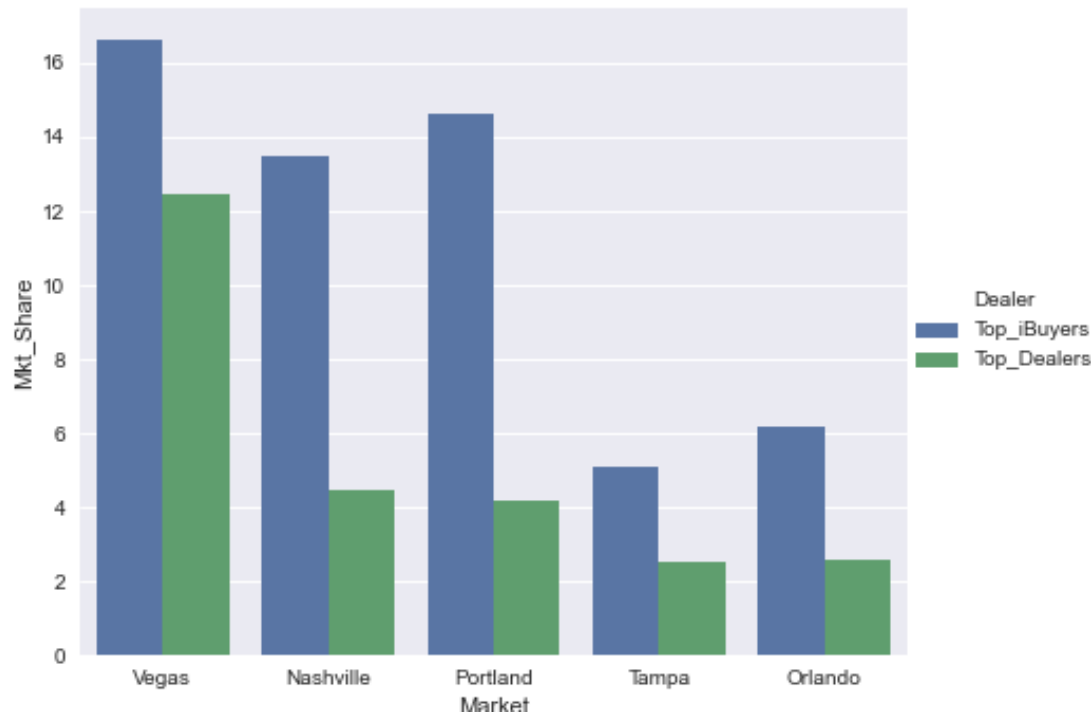
iBuyer Total Share of Cars.com Listings: Target Markets





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.**



Carvana & Vroom...

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



Zoom in on Carvana

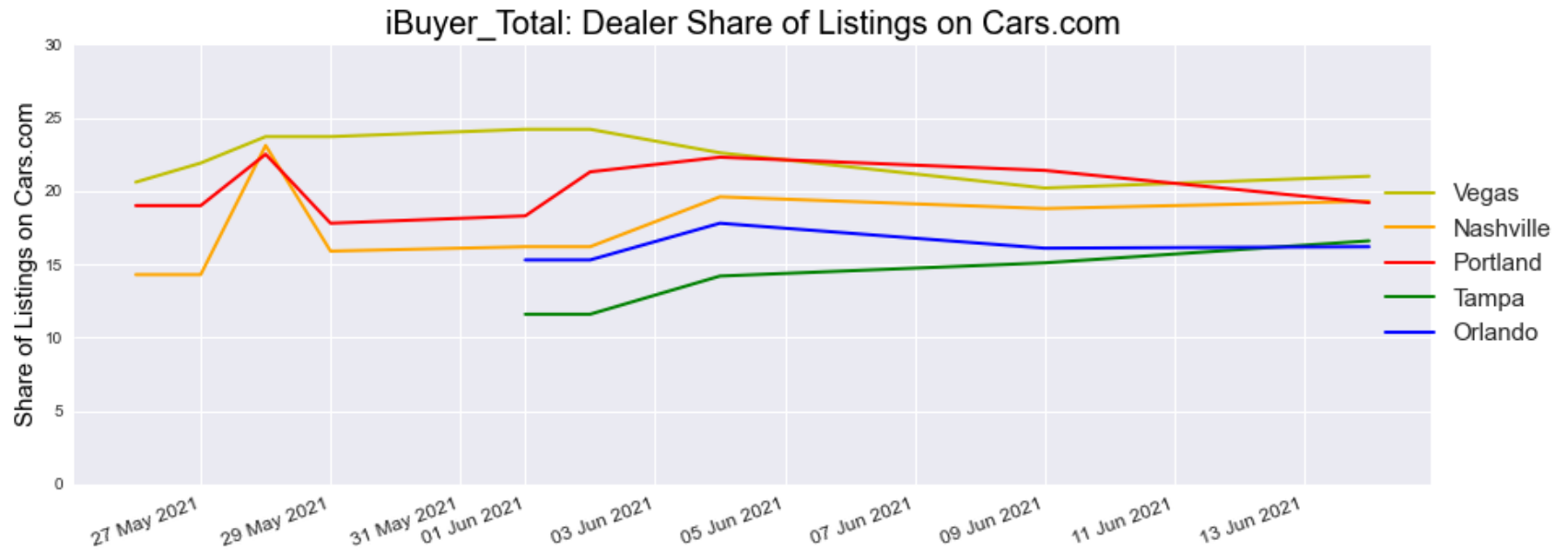
It's hard to forecast what impact the iBuyers will have at the national level in the future. But alternative data allows us to zoom in on the details of specific markets. By comparing those markets that launched several years ago – ex. Nashville in 2014 – with more recent market launches, it's possible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

* Linear Time *
The data is organized by
linear time along the x-axis.

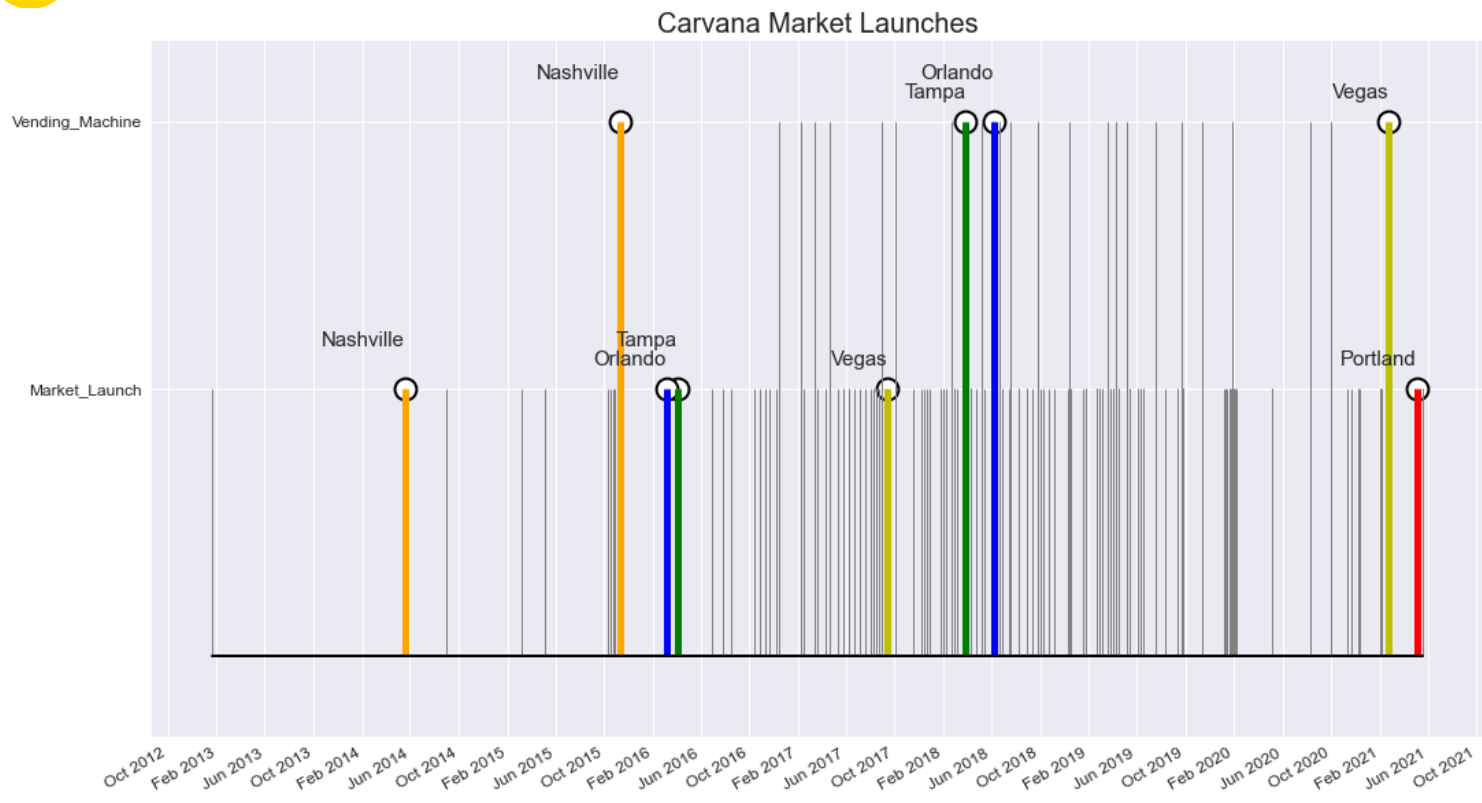


Carvana Share of Cars.com Listings: Target Markets





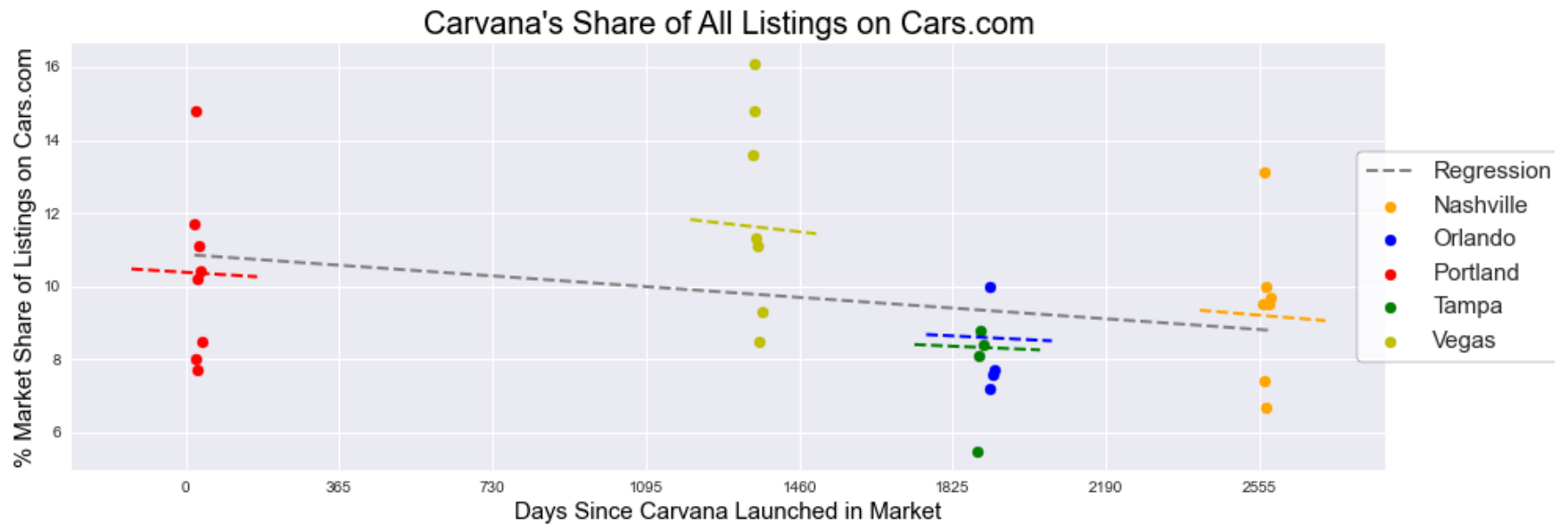
Carvana Market Launch Timeline: Target Markets



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



Carvana Share of Cars.com Listings: Target Markets





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

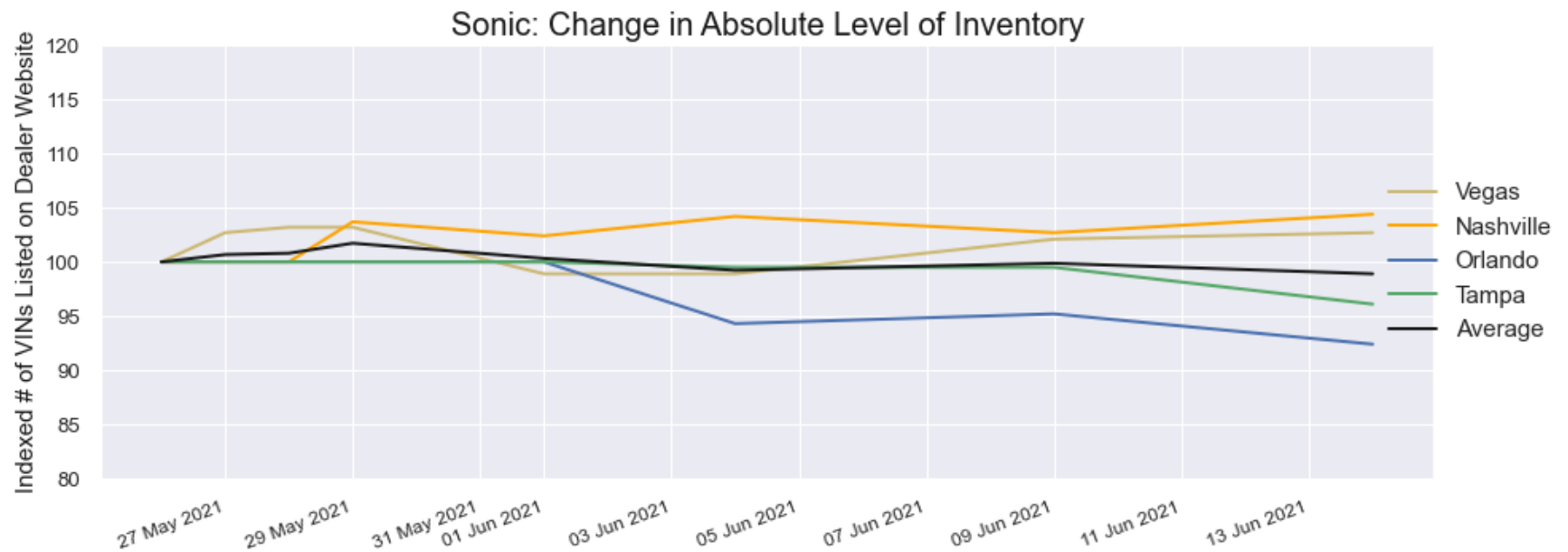
Important Question #2:

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

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

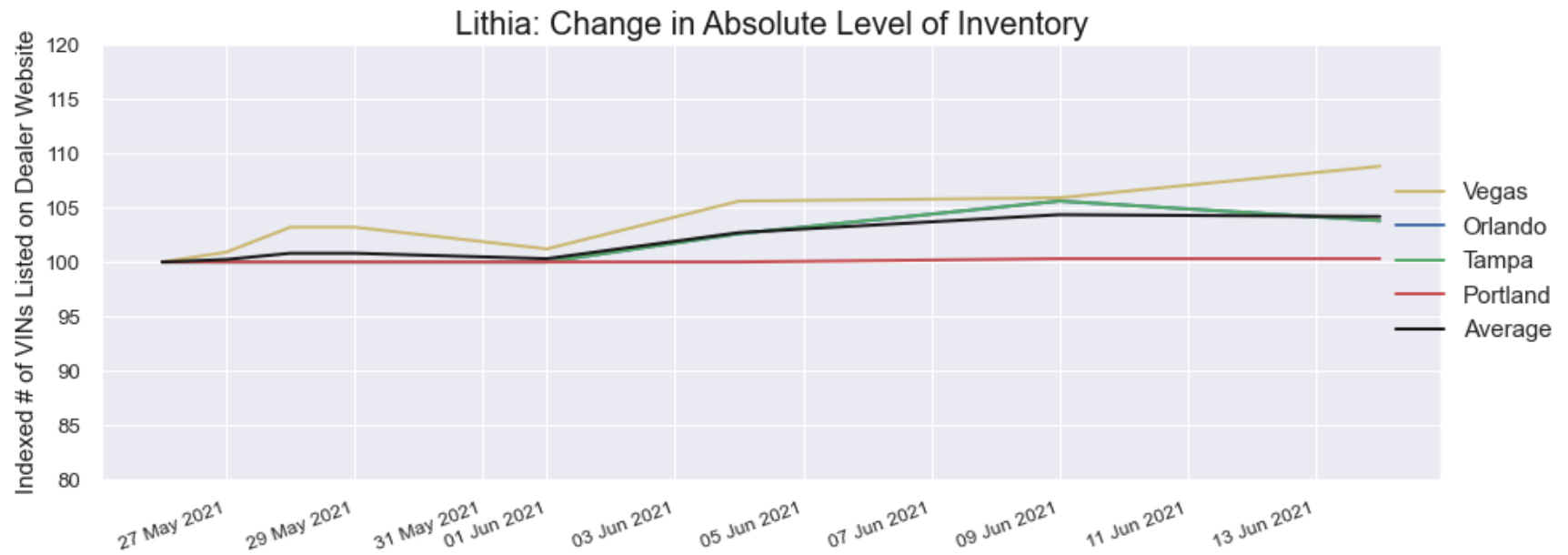


Monitor Changes in Inventory Levels: Sonic





Monitor Changes in Inventory Levels: Lithia





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)



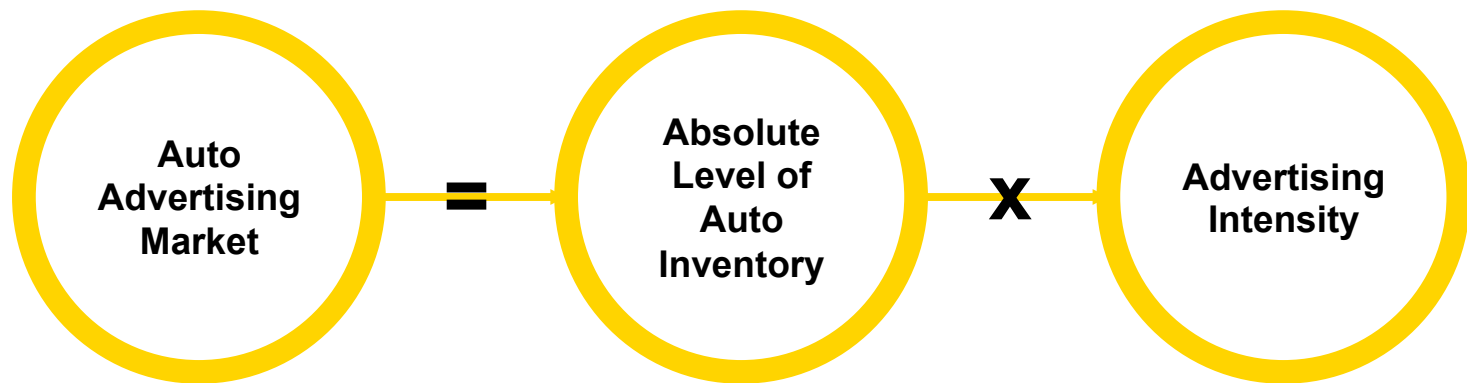
Lithia Web Scrape:

● 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

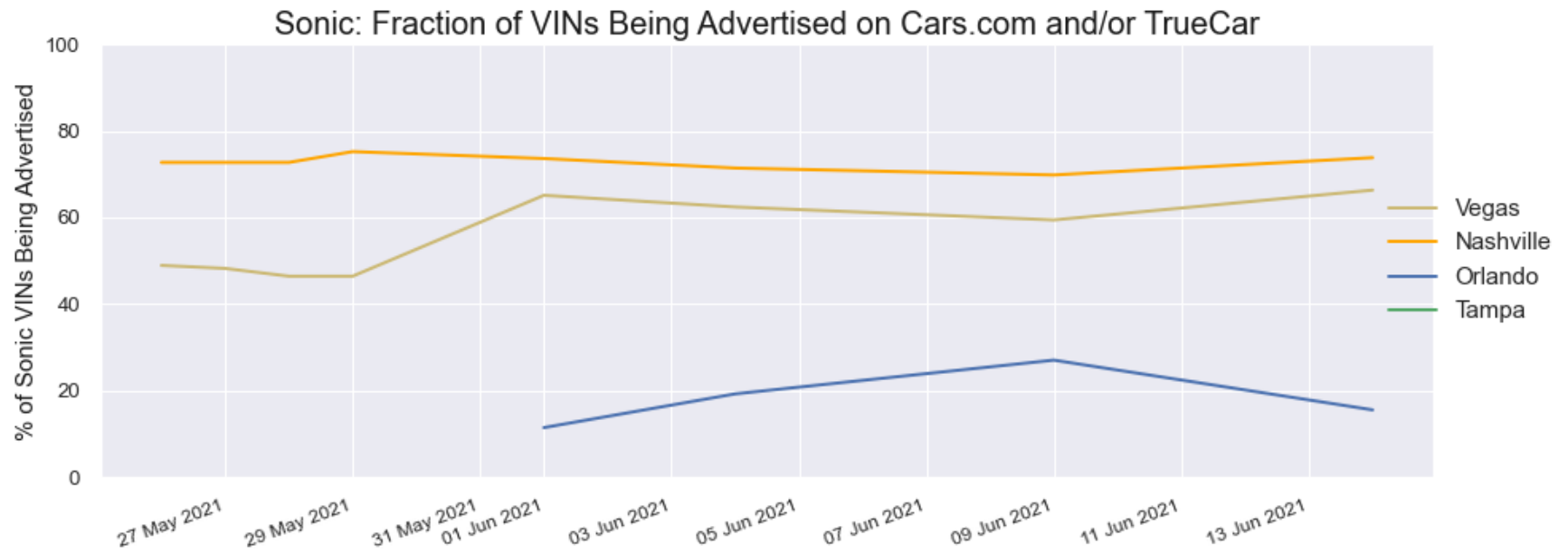


Traditional Dealer Advertising Insights:



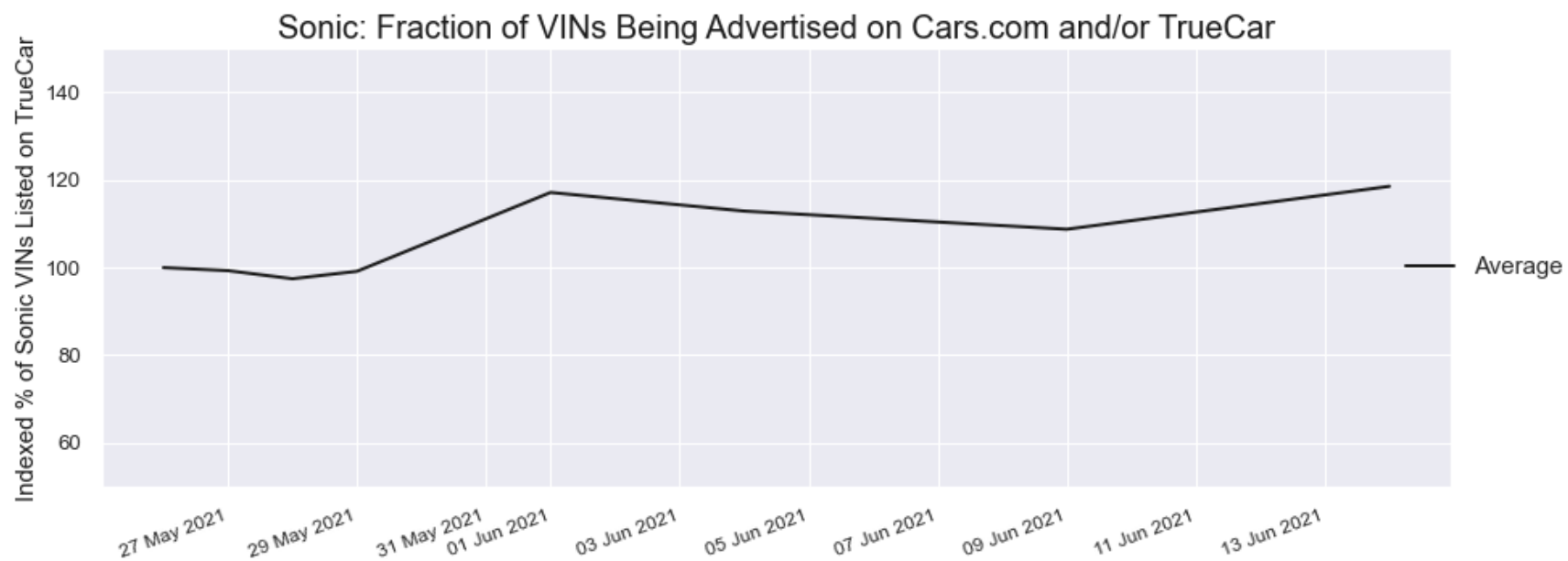


Monitor Changes in Advertising Intensity: Sonic



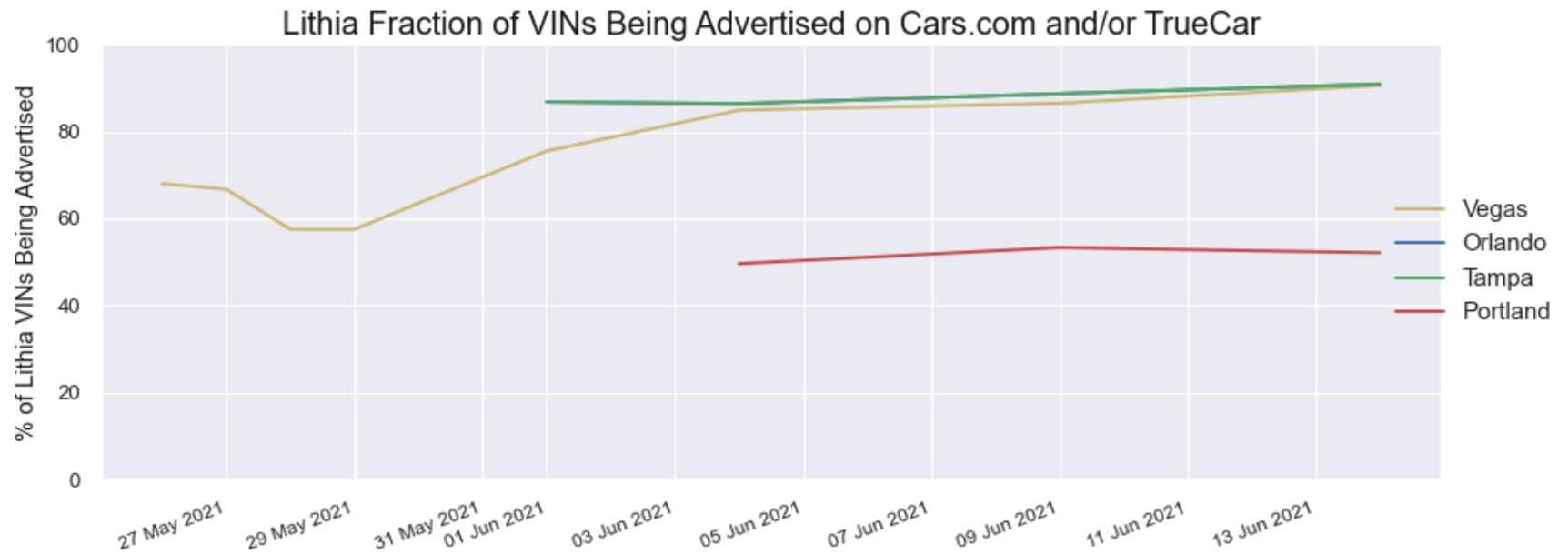


Monitor Changes in Advertising Intensity: Sonic



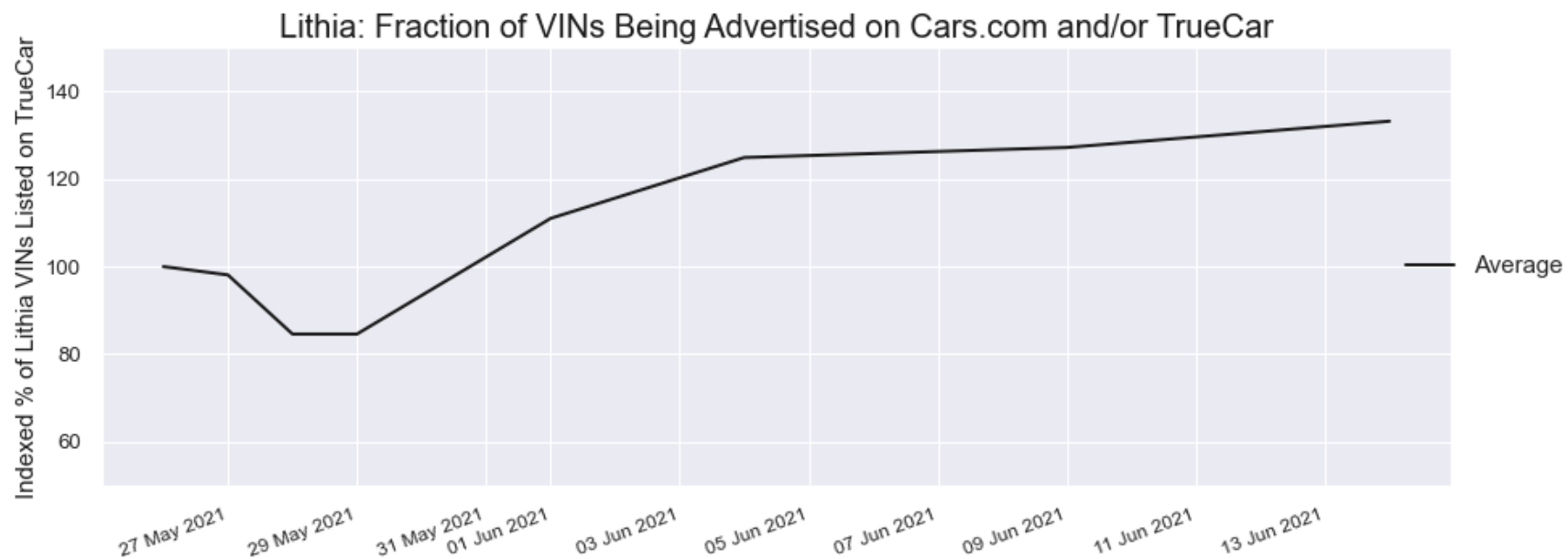


Monitor Changes in Advertising Intensity: Lithia





Monitor Changes in Advertising Intensity: Lithia



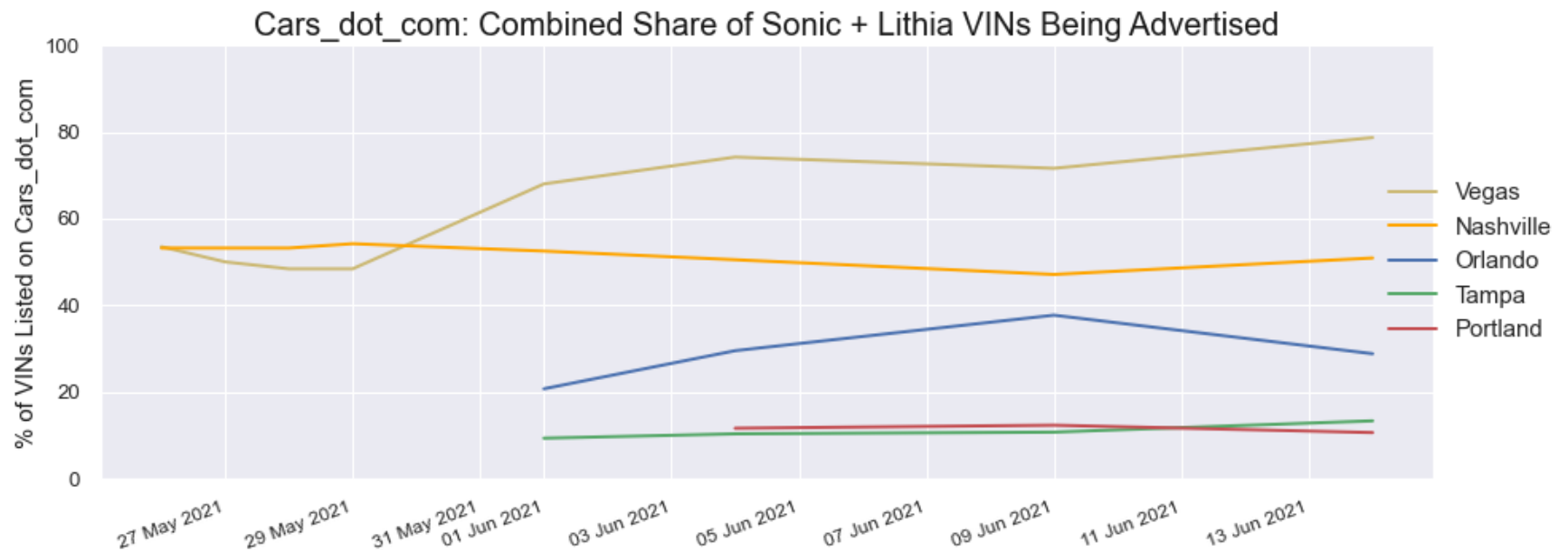


Advertising Intensity...

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

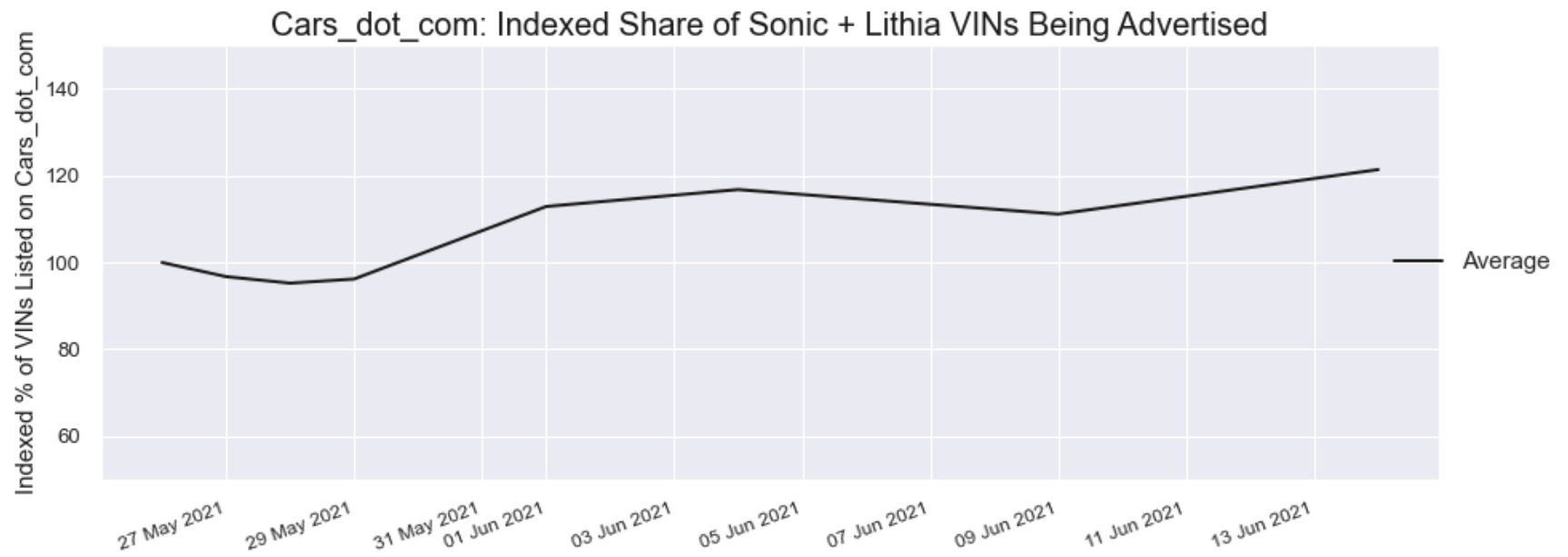


Advertising Inventory Share: Cars.com



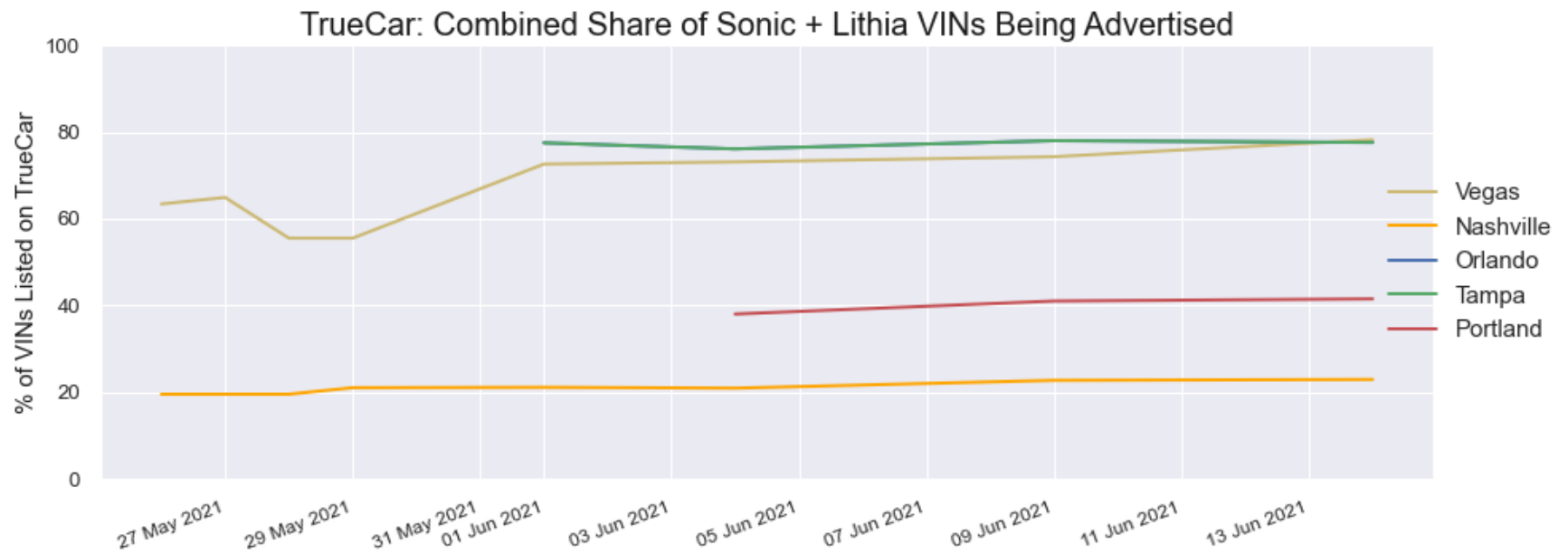


Advertising Inventory Share: Cars.com



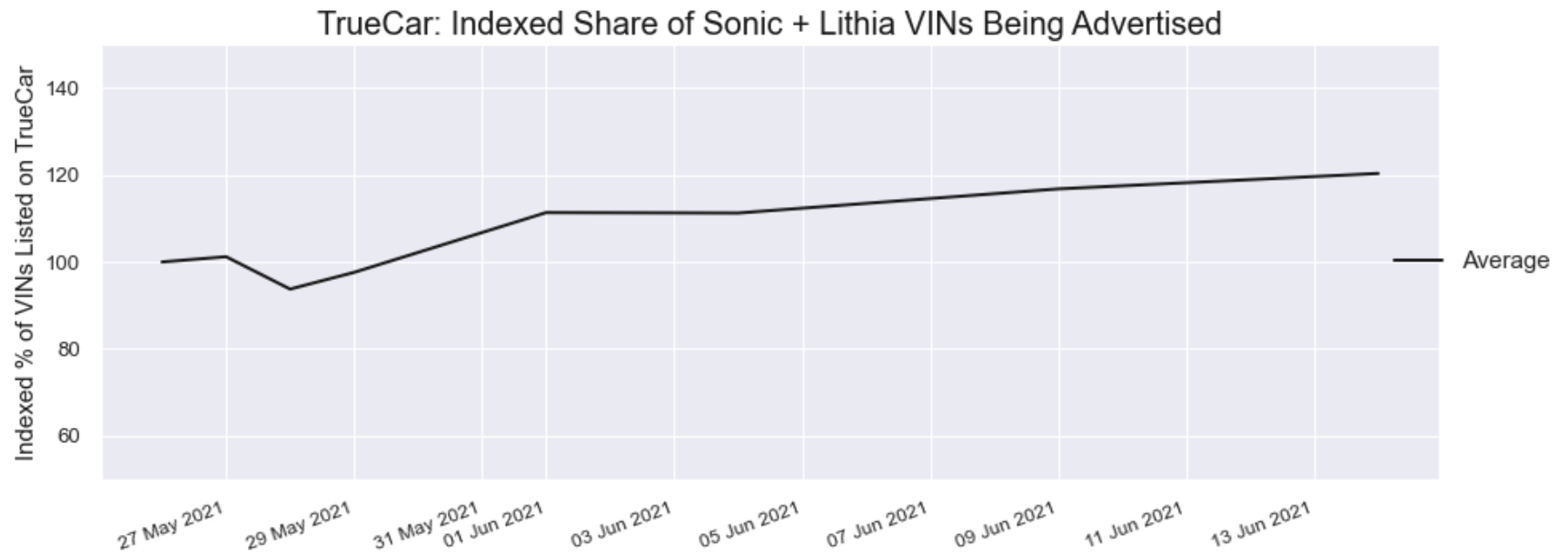


Advertising Inventory Share: TrueCar





Advertising Inventory Share: TrueCar





Advertising Intensity...

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



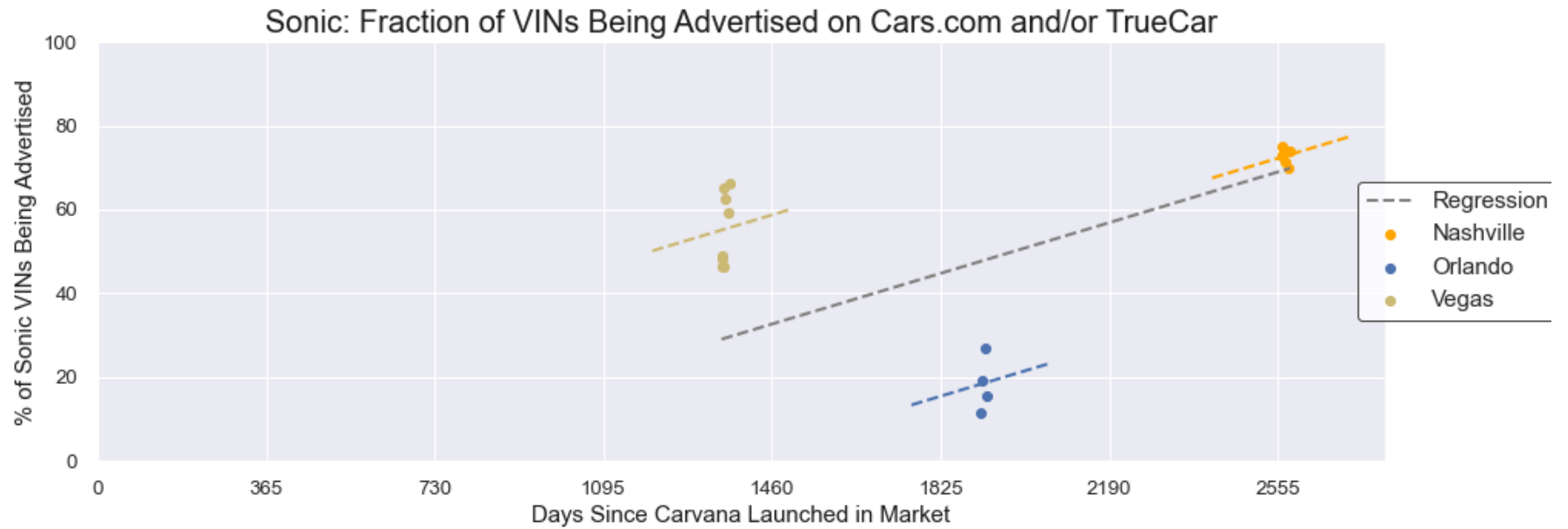
Zoom in on Carvana (again)

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





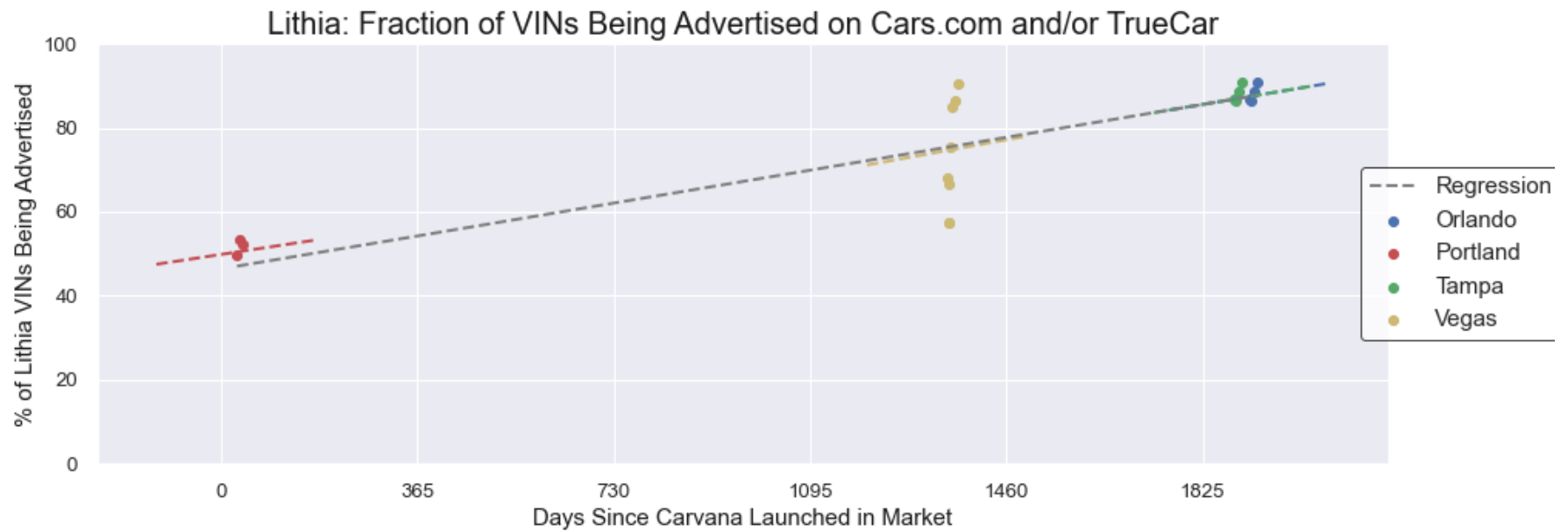
Key Take-Away:

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





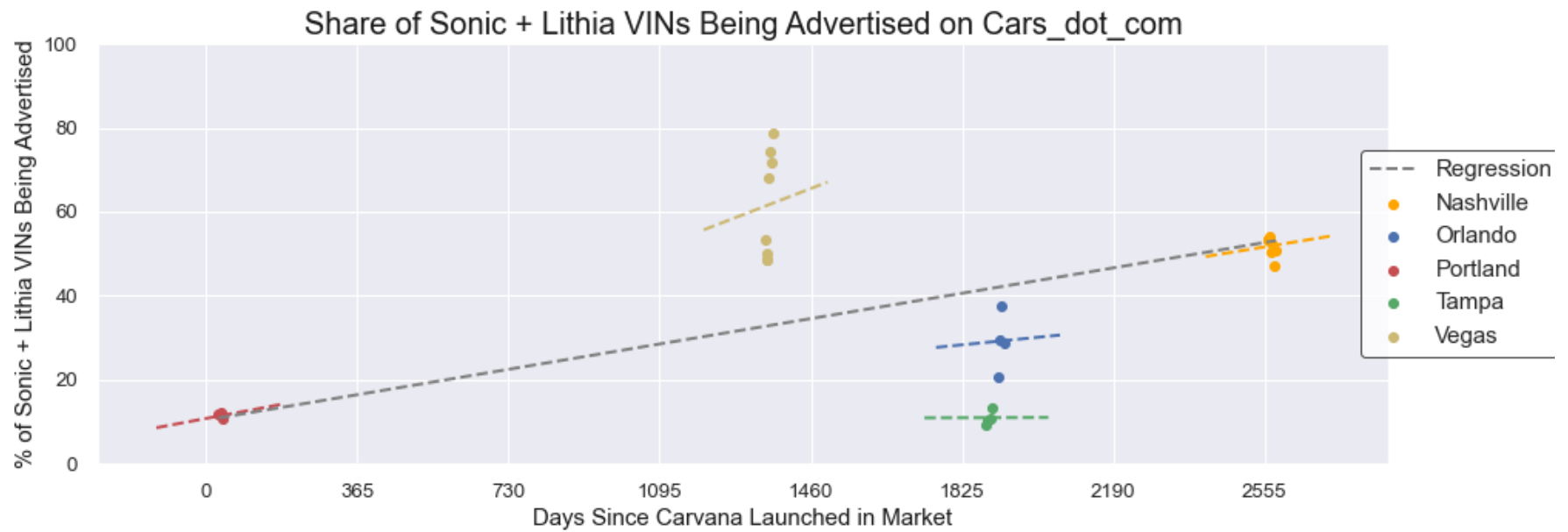
Key Take-Away:

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





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					

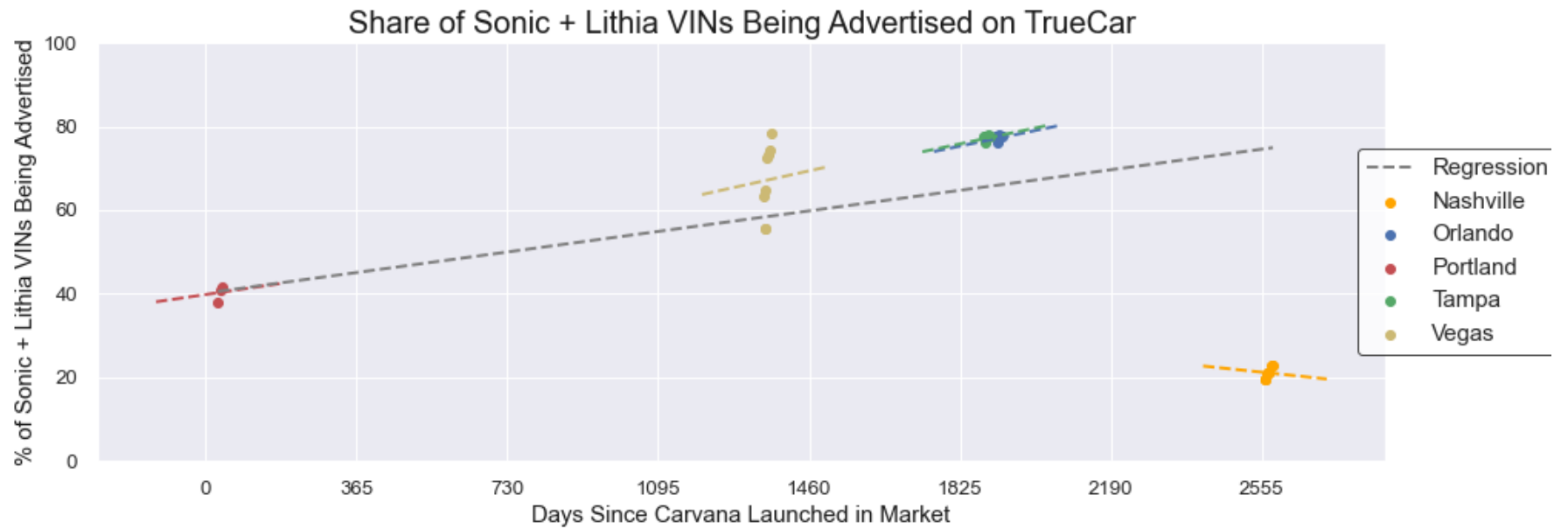
	Coef.	Std.Err.	z	P> z	[0.025	0.975]

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





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.

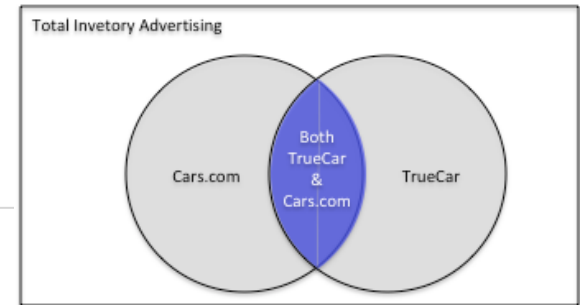
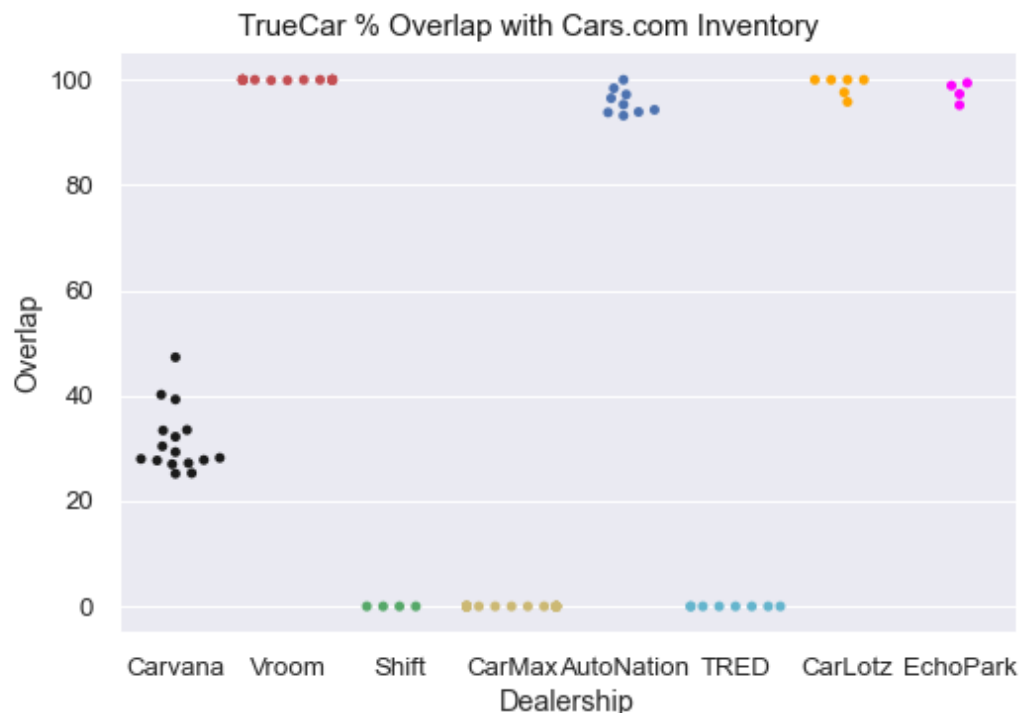


Zoom in on TrueCar

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



TrueCar Overlap w/ Cars.com:



- **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 front-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:

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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 dealership's inventory. Tracking the number of vehicles leaving inventory is predictive of a dealership's sales figures.

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Trending companies

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



CarMax (NYSE:KMX)

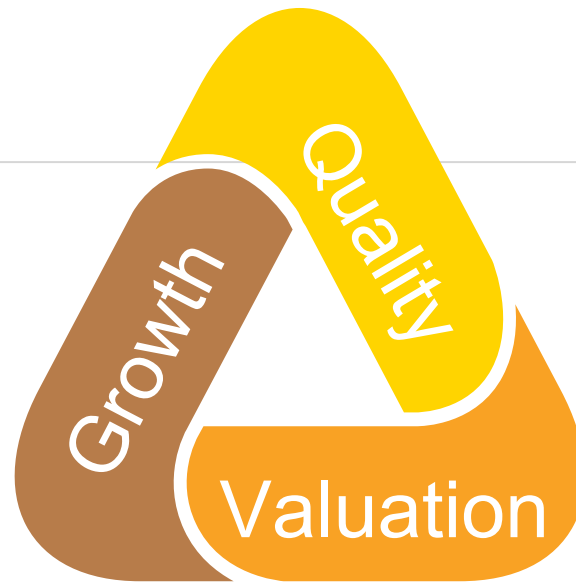
CarMax is the United States' largest used-car retailer and a Fort... [read more](#)



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 dealership's inventory.”**



Investment Framework



Josh Grasso

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