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# Google Trends: A Metric of Consumer Behavior

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**Google Trends is a free data source that provides access to historical search volume data for many Google search terms and has been used by economists to make forecasts of housing prices, automotive sales, and other macroeconomic variables. Small organizations can also leverage Google Trends to improve decision making in a variety of ways, such as by tracking searches for their own products, their competitors' products, and other relevant factors.**

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As of May 2017, nearly 80 percent of the world's internet searches were performed using Google.[1] The emergence of Google as the dominant search engine globally has concentrated a vast amount of data on consumer behavior in one place. While much of this information is either unavailable to the public or available only for a fee, the website *trends.google.com* offers anyone the ability to collect and analyze search volume data in a format that can be broken down by different geographic areas including countries, states, Nielsen Designated Market Areas (DMAs), and select cities.

This search data provides a way for business leaders to measure consumer interest in their products, competitors' products, and many other relevant fac-

tors. Organizations without the resources to perform full-fledged randomized experiments can also use the data to test new business strategies—such as advertising campaigns and pricing models—in a systematic way.

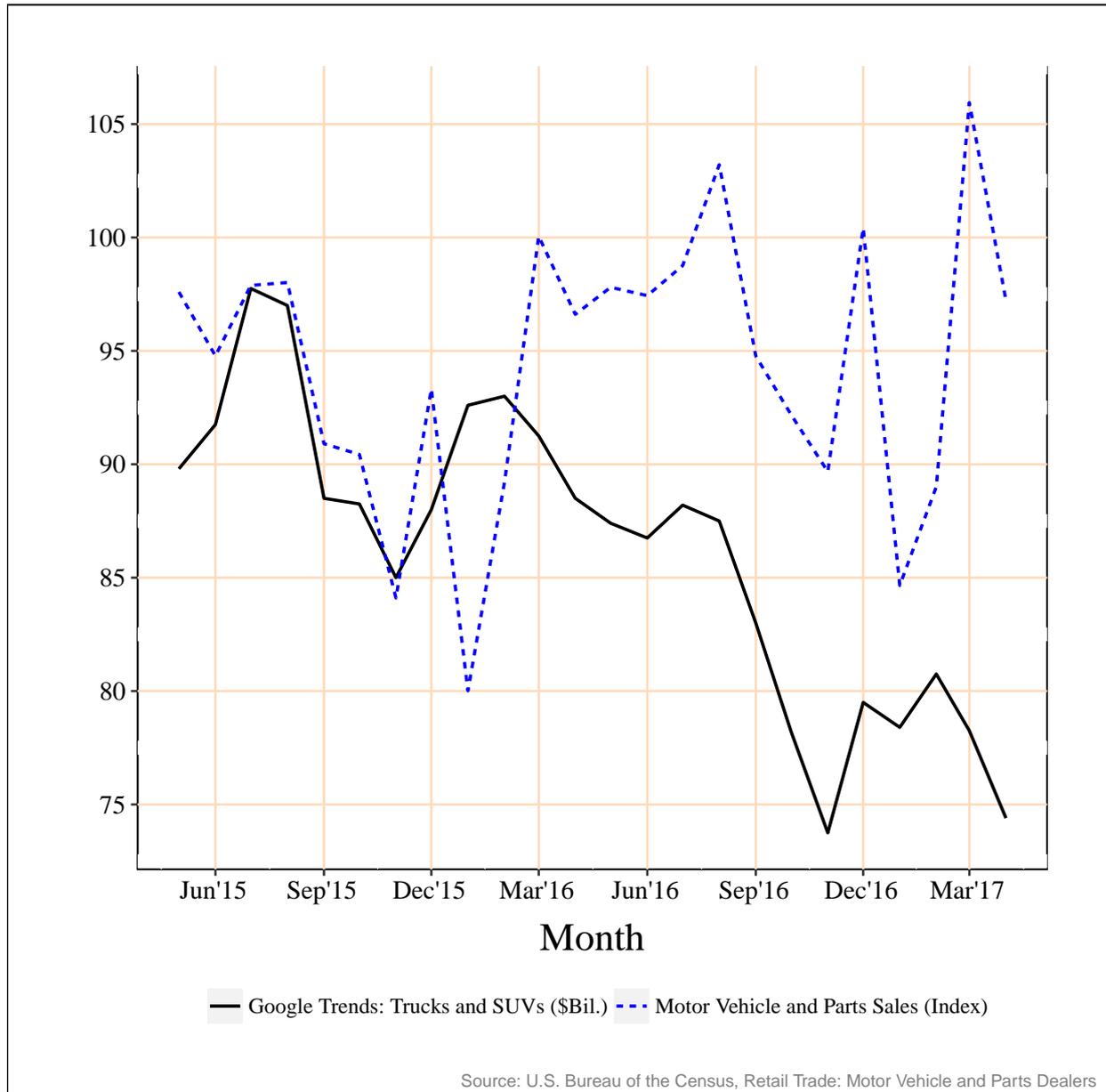
## The Data

While anyone with an online presence can access data regarding their own internet traffic, Google Trends is currently the only comprehensive database on web searches available free of charge. While Google does not release the actual number of web searches to the public (at least not without investing heavily in their Google AdWords advertising platform), the Google Trends search volume “index” does provide an accurate look at how web searches compare between time periods and between geographic locations.

Provided that the volume of web searches is large enough for a given area and time period, accessing the data is as simple as making a selection and downloading the resulting .csv file.

The search index numbers in the file represent a normalized measure of search volumes in proportion to total search volumes for each geographic area. Google's normalization formula takes the highest point of the selected data series and sets that level to be “100,” then scales down the rest of the data points in proportion

Figure 1: Google Trends and Automotive Sales



*The volume of Google web searches for ‘Trucks and SUVs’ tends to closely precede sales in the automotive industry.*

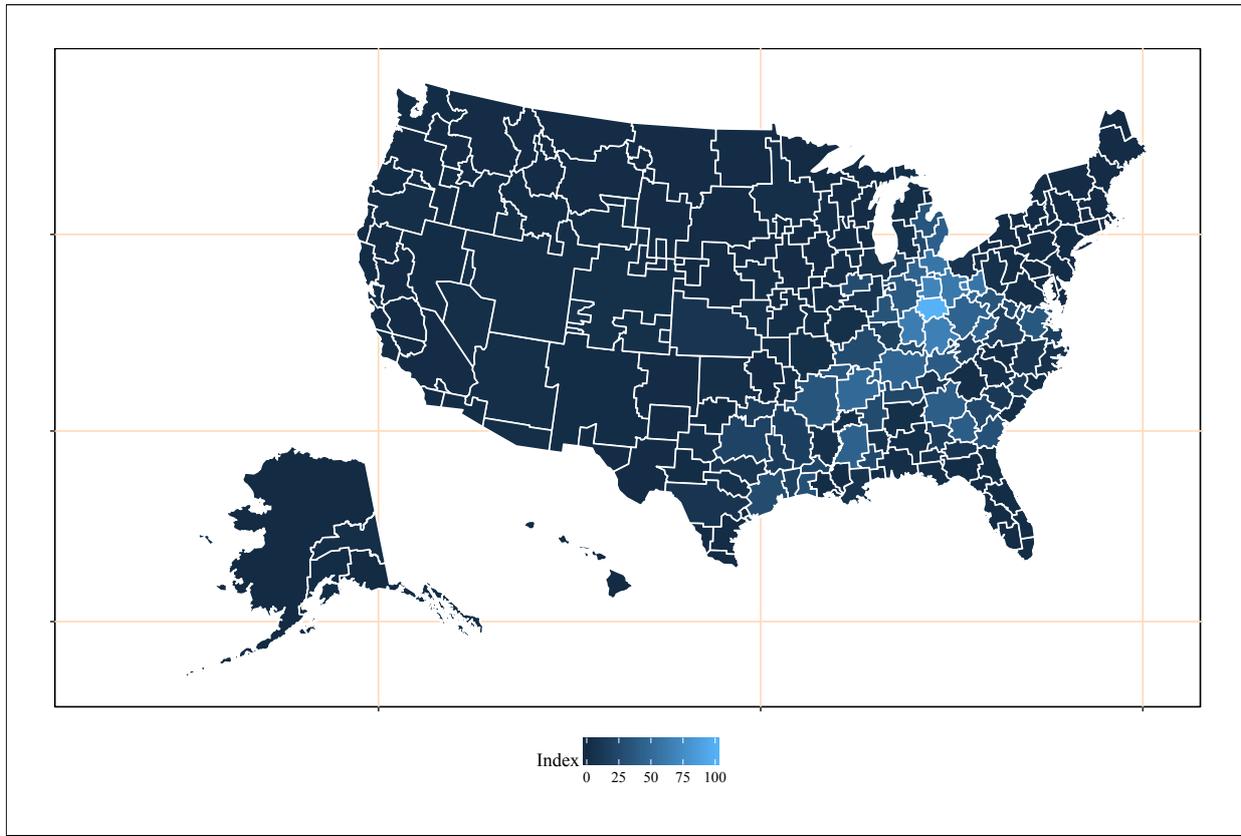
to that highest level. So, for example, if the number of searches for “Chipotle Mexican Grill” during April 2017 was 3 million searches in New York City and 1.5 million searches in Boston, then a selection of “Chipotle Mexican Grill” for April 2017 in New York City and Boston would show a search index of 100 for New York City and 50 for Boston. Similarly, if the number of searches was 4 million in New York during May 2017, then comparing May and April for New York would show a 100 and 75 respectively. Thus, while the actual index number itself does not convey information for any given data point, the pattern in the data over time and between locations is accurate and comparable.

## Quantitative Forecasts

Economists have already been at work using Google Trends to make quantitative forecasts. Several recent research publications demonstrate that including data on web searches from Google Trends can improve the accuracy of forecasts over conventional models.

For instance, Google economist Hal Varian presented results from a variety of industries and topics including motor vehicle sales (see Figure 1 for recent data on the automotive industry), unemployment claims, and travel. Similar work by economists at the University of Pennsylvania and MIT showed that forecasts of housing prices estimated using Google Trends outperformed forecasts made by the National Association of

Figure 2: Google Trends data for 'Kroger' searches by DMA, 2004-2017



*Searches for 'Kroger' are concentrated around the company's national headquarters in Cincinnati, Ohio.*

Realtors.[2],[3]

This research suggests that Google Trends data have predictive power. Even without sophisticated statistical forecasting techniques (a simple graph is one of the most useful tools in making an educated guess about the future), Google Trends data represent information that can be put to work for many different businesses.

### Three Ways to Better Measure Consumer Interest

Google Trends can be used for more than making forecasts of the future, however; the data can provide a way to measure the current level of interest among consumers in a particular market.

First, Google Trends offers a more compelling way to measure consumer interest than other metrics (such as "impressions" or "clicks") that are generally linked to digital advertising. Measuring online activity through digital advertising frequently leads to distorted numbers regarding true consumer interest in a product or company. It is highly likely, for example, that the pool of users who happen to view Chipotle's website are

different from the pool of users who actually typed "Chipotle" into their Google search bar. Information based on the latter is a much more precise way of measuring consumer interest, as web traffic often flows through advertisements for reasons completely unrelated to actual interest in the product or service. By measuring the number of times people search for specific words in Google, Google Trends is effectively removing many biases contained in data related to online advertisements.

Second, Google Trends offers a way to examine consumer interest in competing businesses and organizations, and with a few fairly simple assumptions, predictions of competitors' sales volumes can also be obtained. For instance, suppose a business found that, on average, a marginal increase in the Google Trends search volume index for its product resulted in a \$500 average per day increase in sales the following day, and that this correlation was statistically significant. If a realistic case could be made that the business's competitor had a similar correlation between web searches for its products and sales, then an approximation of the competitor's sales data could be generated using the

relevant Google Trends data. Of course, this prediction would only be as useful as the validity of its underlying assumption, but there are many situations where it is reasonable to assume similar correlations between searches and sales across different businesses in the same market. Using Google Trends in this way gives organizations the ability to strategize for the future while taking into account the operations of their competitors.

Third, businesses and organizations looking to expand into a new geographic location often have insufficient data with which to judge the demand for their product or service in new areas. For example, making any sort of statistical correlation between a business's sales and general demographic characteristics would be impossible with only a few locations. However, to the extent that Google Trends data for relevant web searches represent a reliable proxy for sales, the entire United States could be examined with a statistical model that analyzes the relationships between web searches and a host of various demographic factors such as age, income, housing values, and education of the populations in various metro and state areas. Figure 2 provides an illustration of how Google Trends data can be dis-aggregated by geographic area (DMAs here). When combined with the availability of data going back in time, this allows for powerful comparisons between regions over time.

## Experimental Tests

Business leaders are often interested in determining whether a new strategy, such as an expanded advertising campaign or altered pricing model, increases or decreases sales, on net.

Ideally, questions like these would be answered using a randomized experiment where a random group of locations or stores would be selected to test the new prices or increased advertising expenditures, while the remaining locations would remain unchanged as “controls.” This approach is designed to mimic scientific experiments done in controlled laboratory environments and is generally viewed as the “gold standard” method for statistical testing.

More often, however, businesses and organizations do not have the necessary locations or resources to implement randomized experiments. In this case, Google Trends data can be used to simulate a “control” with which to compare the observed data from a store with the price or advertising change.

For example, suppose that a small business with a single location would like to test the impact of a price discount on overall sales. One approach to measuring the impact of the price change on sales would be to simply compare sales before the price change with sales after the price change for this single location. However, this approach assumes that, had the price not been changed, sales would have continued on at the same level as before. This assumption may be unrealistic for

many reasons such as seasonality, shifts in consumer demand, or other factors that change over time, and due to the fact that there is simply no way to know what would have happened.

If Google Trends web searches were reasonably well correlated with sales (this can be assessed by comparing the variation in the Google Trends data with the variation in the actual sales data in the period of time before the price change), and if the change in pricing was not expected to impact web searches, then Google Trends data on web searches could be used to approximate sales data after the price change, thus providing a sort of “control” store measuring what would have happened absent the price change. The difference between actual sales and the control store's sales would then yield a valid experimental estimate of the impact of the price discount on sales.

## Conclusion

Google holds an enormous market share in the web search industry, and the free data available on Google Trends is a valuable resource for the leaders of businesses and organizations looking to forecast the future, build metrics that measure the interest in their products and services as well as that of their competitors, and measure the sales potential of new geographic locations, pricing structures, advertising campaigns, and other strategies in need of data-driven validation. Examining the graphs and maps of search volume data made possible with Google Trends has the potential to add significant value to leaders making strategic decisions for businesses or organizations.

## References

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