



Winner or Loser? Analysing Your Test Results with Causal Impact on R Studio

Giulia Panozzo

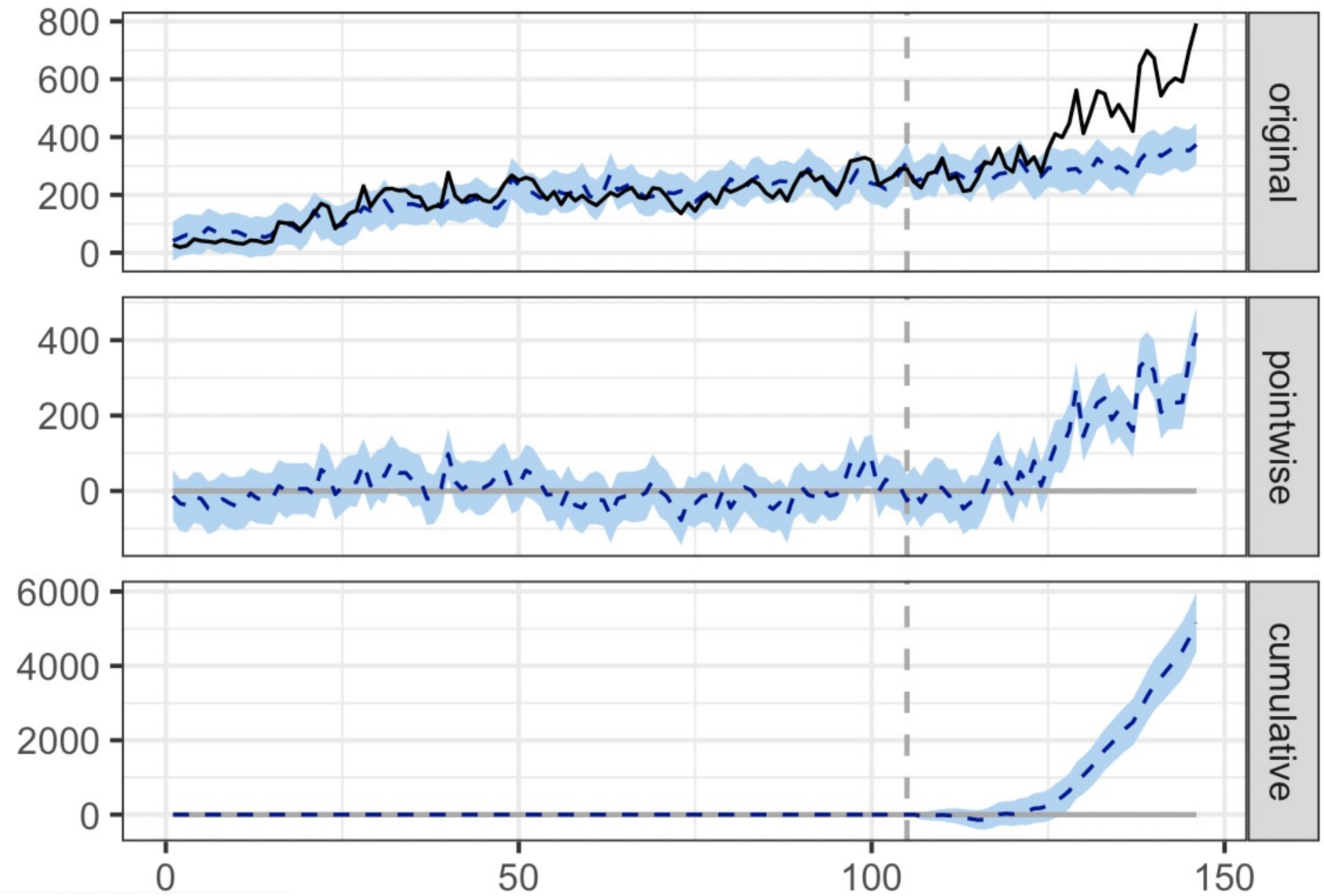


@SequinsNSearch



Slideshare.Net/GiuliaPanozzo1

Pre-
implementation
data + Post-
implementation
data



**Why do we care
about Causal Impact?**

Because Testing is Hard!



Giulia Panozzo @SequinsNsearch · Jun 21
#SEO pals: What do you find to be the most challenging part of running a **#test**?

Choose test group

40%

Analyse/Trust results

40%

Apply findings at scale

20%

10 votes · Final results



Choose test group(s)

13%

Analyse/Trust results

38%

Apply findings at scale

25%

Other (let me know below!)

25%



Ash New (He/Him) • 1st

Senior SEO Manager - Mobile | Virgin Media O2

Resource, Costs & Business Buy In.






Dr. Marie Haynes   @Marie_Haynes · 1h

SEOs deciding whether or not to implement new strategy.



Figen @TheFigen · May 4

It is calculating the physics before it jumps!   



Example



‘Let’s add a price point to the title tag!’

<https://www.example.com> › ... › Dresses



[Little Black Dresses | Example.com](#)



Example



‘Let’s add a price point to the title tag!’

<https://www.example.com> › ... › Dresses

Little Black Dresses **from £15** Example.com

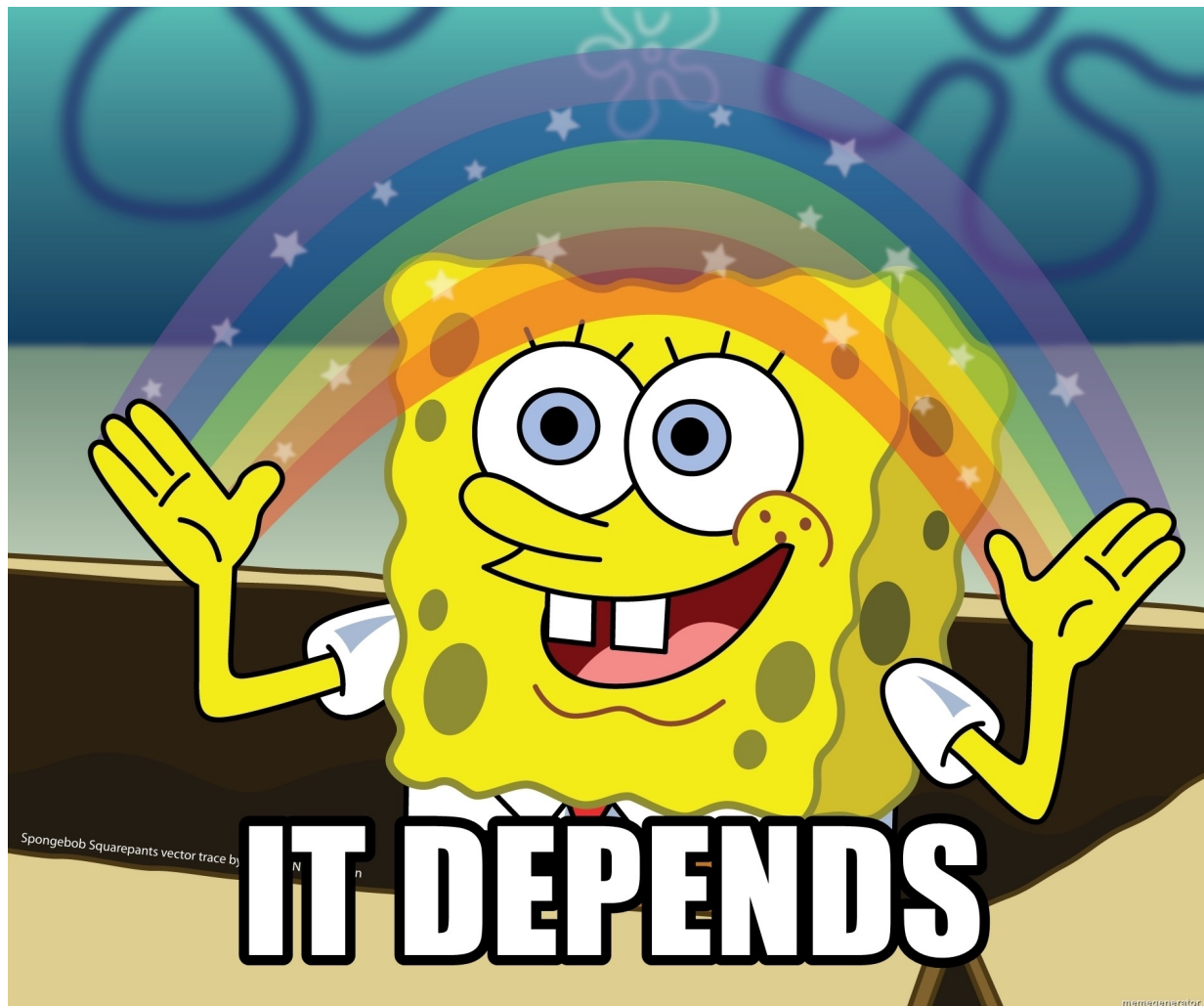




‘But will this help
bring more traffic
in?’



‘Well...’



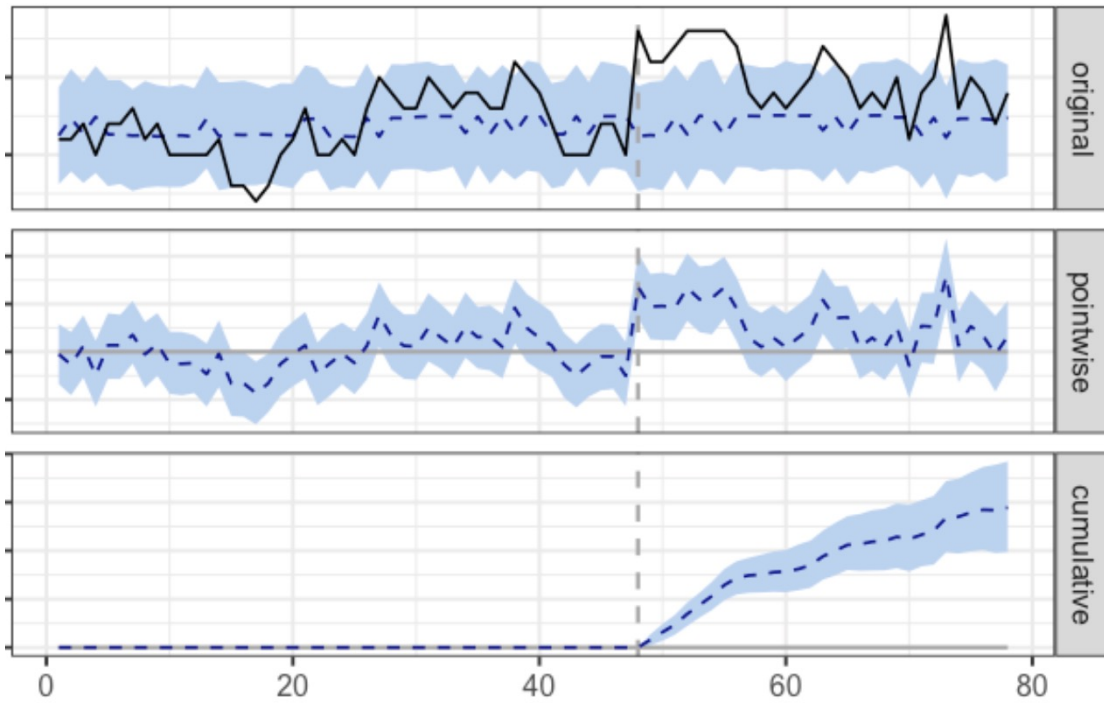
However, with Causal Impact...



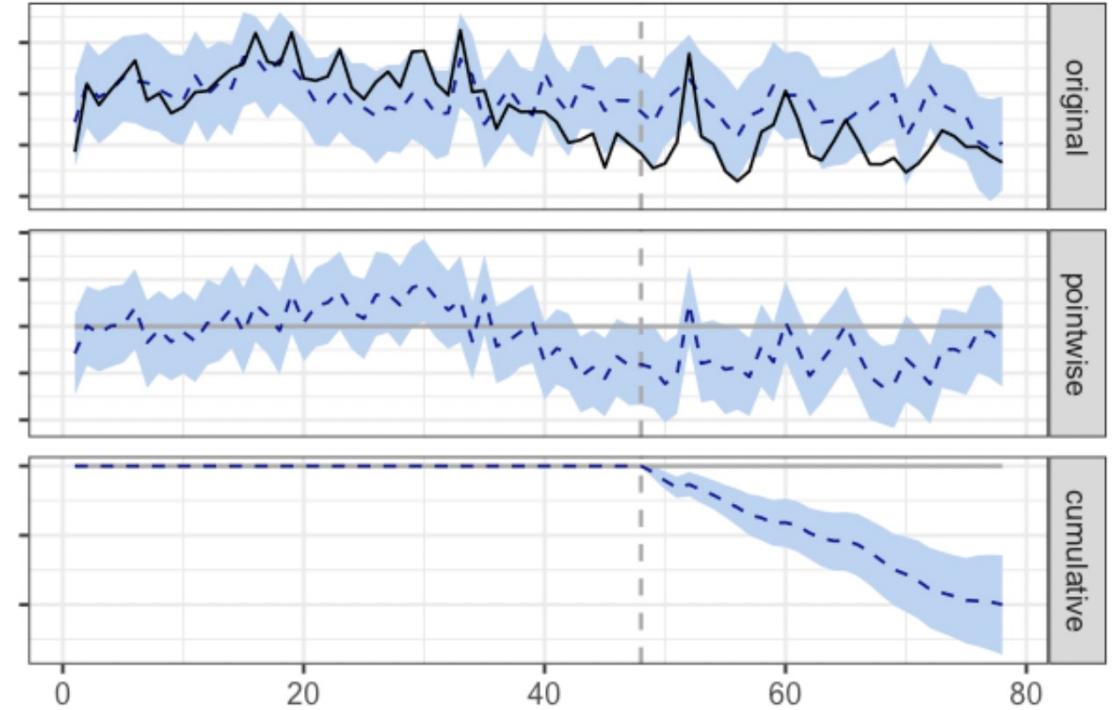
**Causal Impact gives you the
confidence to leverage
statistically significant results and
drive changes at scale**



‘But will this help
bring more traffic
in?’



(Most likely)
YES



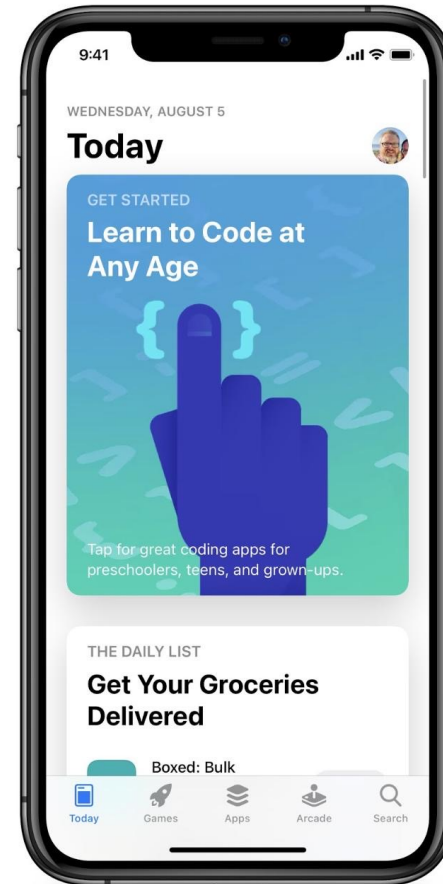
(Most likely)
NO

**You can use Causal Impact on a
number of domains, **not only on
SEO tests!****

Impact of feature changes on app installs

Causal Impact for App Store Analysis

William Martin
University College London, United Kingdom
w.martin@ucl.ac.uk



Impact of influencer campaigns



181k likes 22w

shaym You know what goes great with white? Bioré Charcoal! Get a deep clean with Bioré Deep Pore Charcoal Cleanser. #CleanPoresDontLie #BioreAmbassador

view all 720 comments

dauidlaaam @a_kellyy we're getting this next time we go shopping 🤔🤔🤔

a_kellyy @dauidlaaam bioré?? You want face cleanser? Oh to wash off your makeup? #highlight

a_kellyy @dauidlaaam may 2nd.....

dauidlaaam @a_kellyy chill you had march 5th stahp talking

dauidlaaam @a_kellyy yea gotta wash off all of the makeup you put on me at pandora

a_kellyy @dauidlaaam at where..?

shamz_e The most beautiful girl ever ever everrrrr @liallana

♡ Add a comment...



Impact of offline events and campaigns



Adele

From Wikipedia, the free encyclopedia

And almost any time series data

If you run Causal Impact on R
Studio,
it's free and open-source

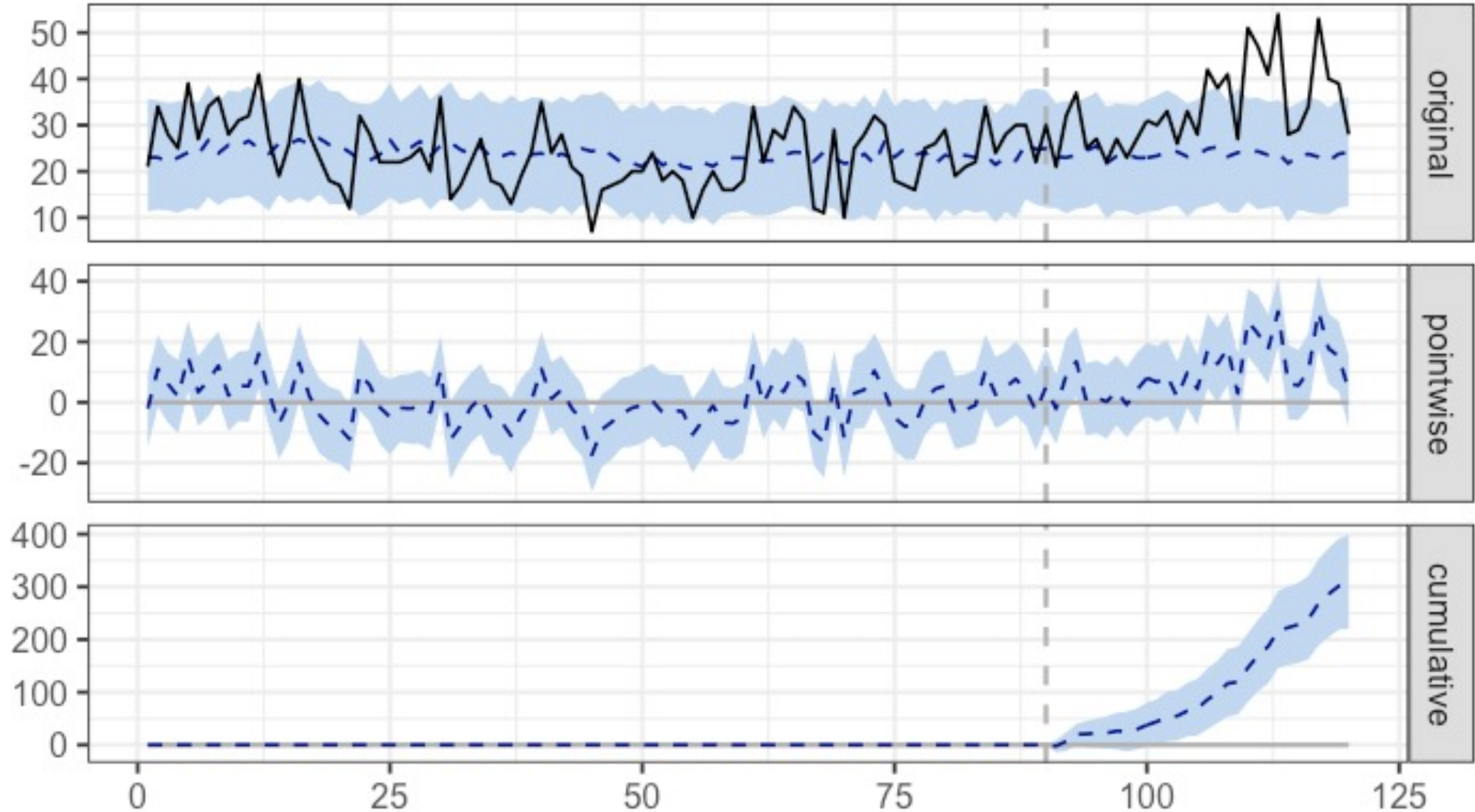
When you find a cool new expensive tool
and have to get your boss approval



What is Causal Impact

And how it can help your strategy

What is Causal Impact?



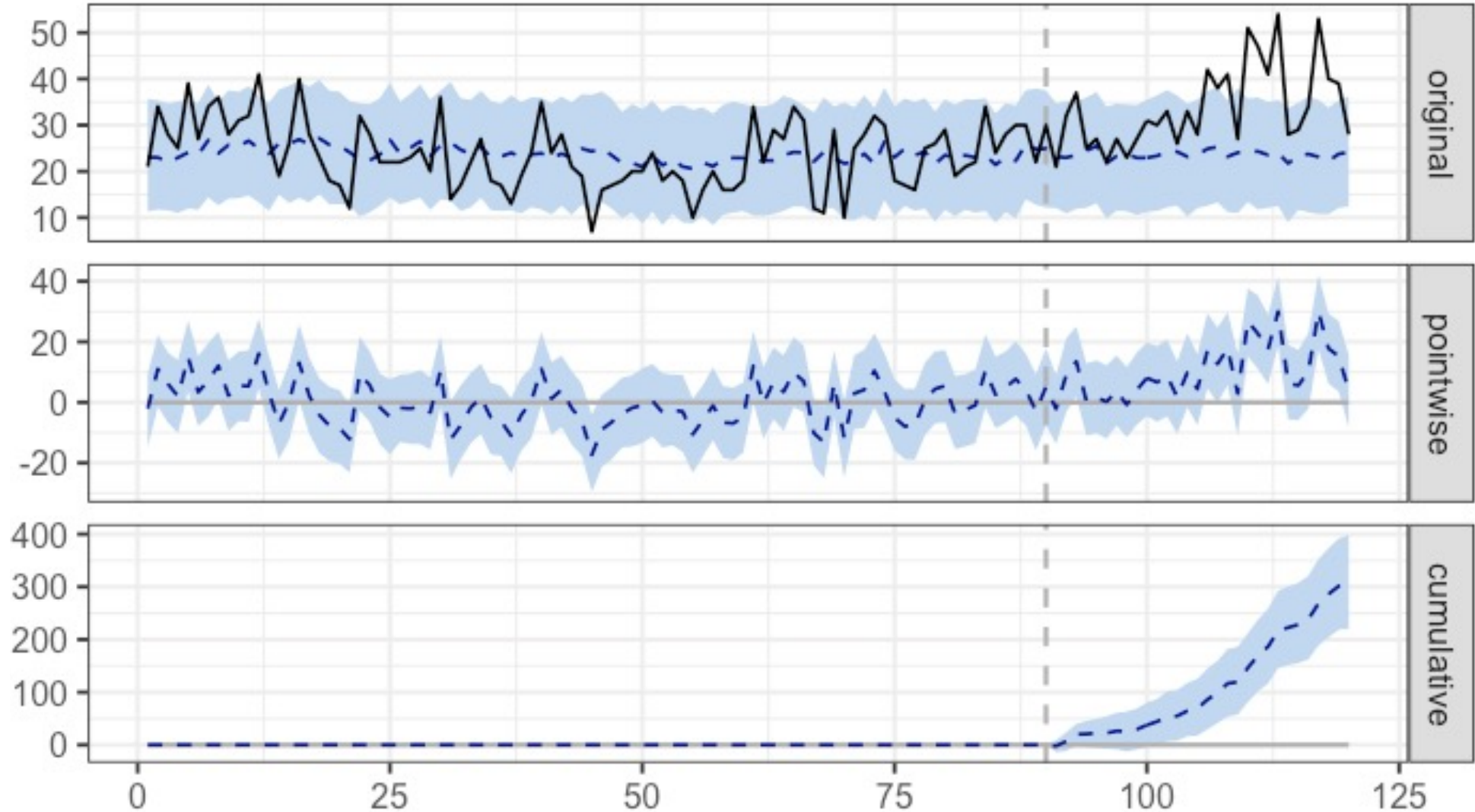
**Powerful package to analyse
data and infer the
cumulative impact of a change
in a time series**

Based on BSTS
**(Bayesian Structural Time
Series)**
statistical model

**Uses past data to predict the
outcome in the absence of the
treatment
(the counterfactual)**

Defines the **impact by
measuring the deviation of the
actual VS predicted outcome**

What is Causal Impact?



How can it help us in marketing?

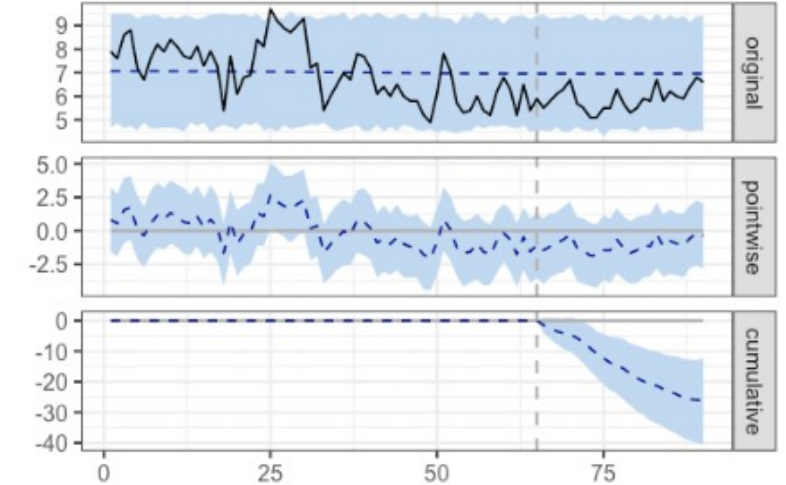
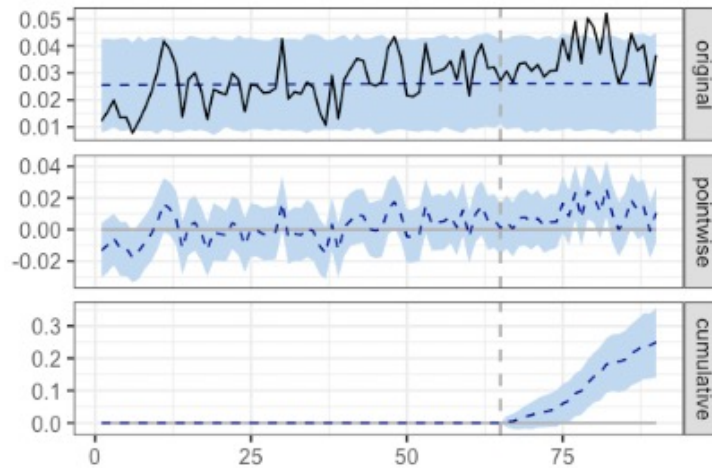
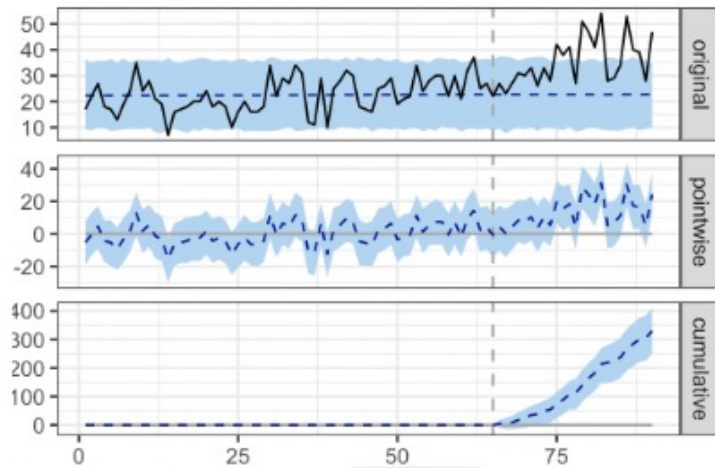


How can it help us in marketing?

Clicks: **+58%**

CTR: **+38%**

Position: **-15%**



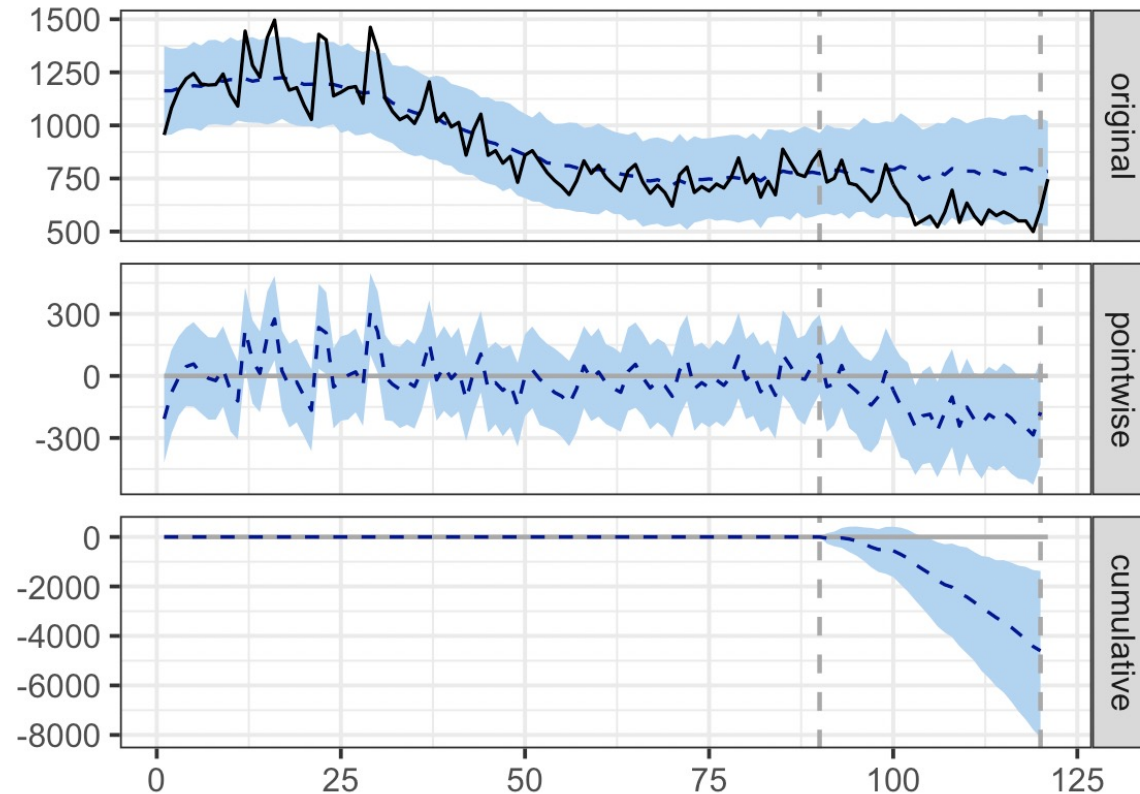
*Example of a clear **winner** from a title tag change*

**It can validate proposed strategy
changes in case of any doubts**

**It's great to clearly show
stakeholders
the impact of our team's work**

**It can help forecast the
direction of changes at scale and
help
make a case for more resources**

How can it help us in marketing?



*Example of a clear **loser** from a title tag change*

By clearly identifying a **winner** or **loser**, we can understand **what works** and **doesn't work** for our audience

How to run your analysis with Causal Impact on R Studio

1. Download R Studio

Download **R** first

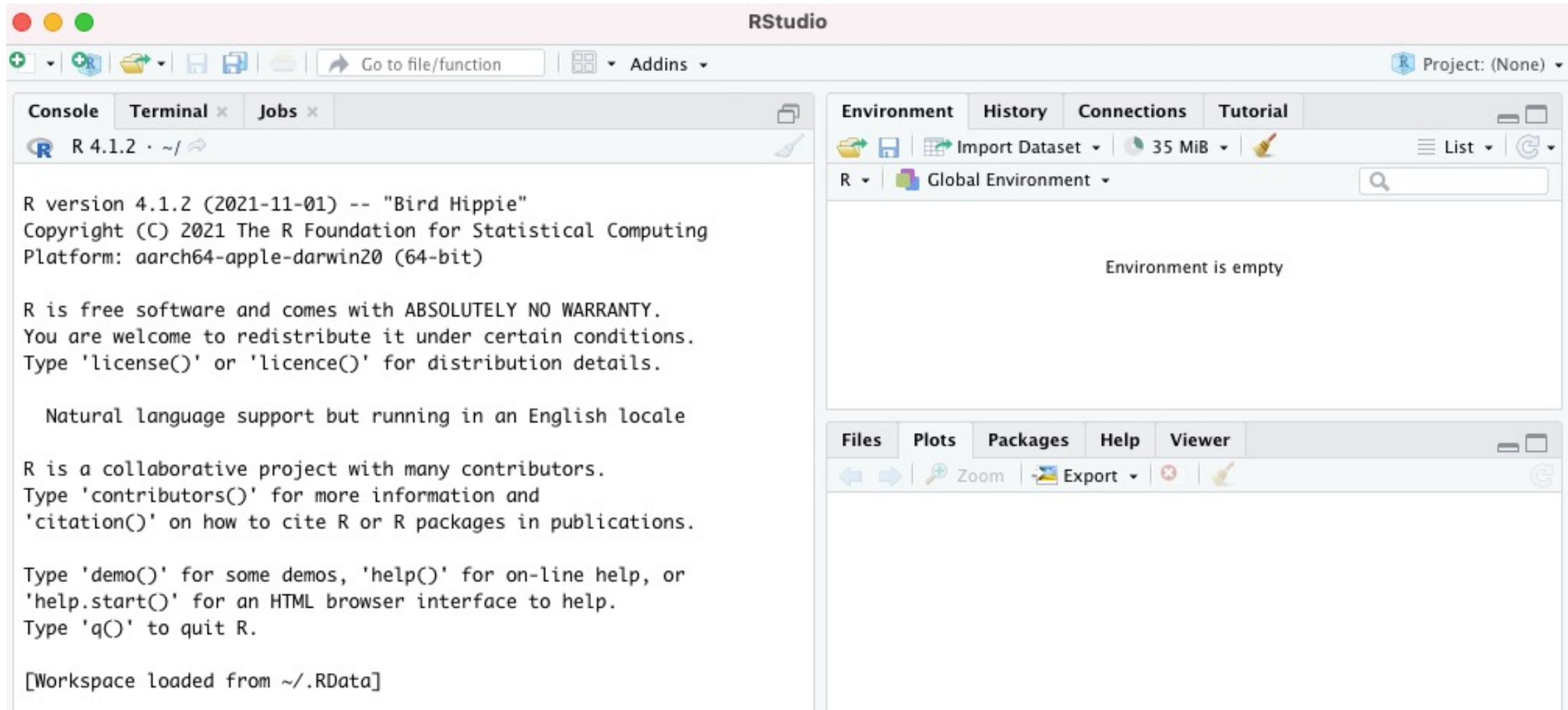
<https://cran.r-project.org/>



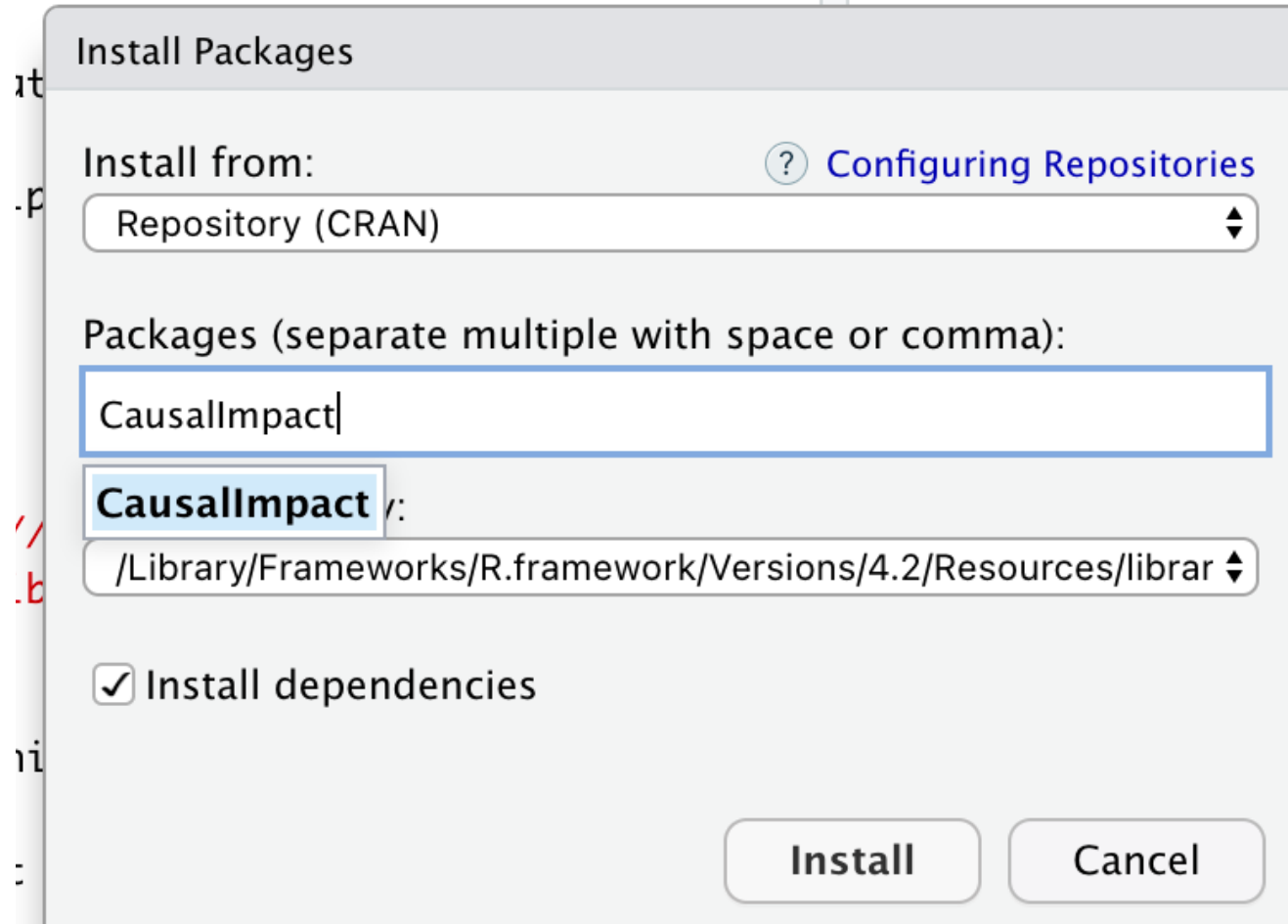
Download **RStudio**

<https://www.rstudio.com/products/rstudio/download/>

1. Download R Studio



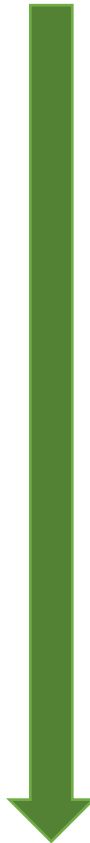
1.1 Install Causal Impact



2. Prepare the data

Date	Clicks	Impressions	CTR	Position
25/06/2022	84	5428	1.55%	5.58
24/06/2022	79	5033	1.57%	5.82
23/06/2022	84	5523	1.52%	5.6
22/06/2022	107	5644	1.90%	5.08
21/06/2022	107	5479	1.95%	4.9
20/06/2022	129	5619	2.30%	4.62
19/06/2022	124	5371	2.31%	4.56
18/06/2022	102	5654	1.80%	4.71
17/06/2022	98	5377	1.82%	5.13

2. Prepare the data



date	clicks_test	clicks_control1	clicks_control2
01/01/2022	21	37	40
02/01/2022	34	43	49
03/01/2022	28	35	51
04/01/2022	25	49	58
05/01/2022	39	54	51
06/01/2022	27	48	48
07/01/2022	34	67	36
08/01/2022	36	58	59
09/01/2022	28	61	40

**The first column is always
your test group.**

**Other columns can be used as
control groups if they are a good
fit**

The pre-period should be at least twice as long as the post-period, to allow the model to plot the actual VS predicted outcome

**Any column with 0 should be
either removed or corrected**

Multiple 0s



Giulia Panozzo - @SequinsNSearch

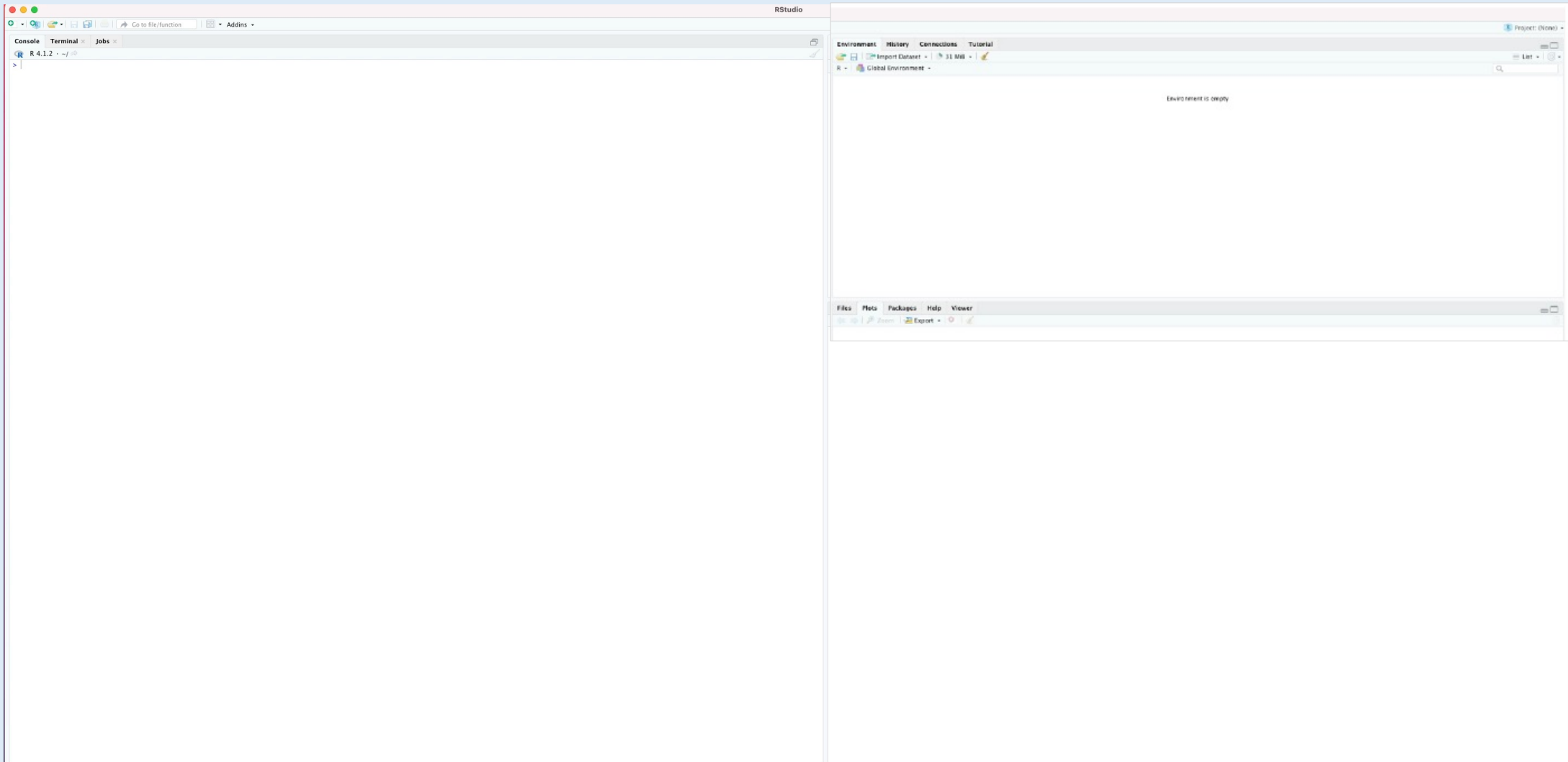
Isolated 0 in data set

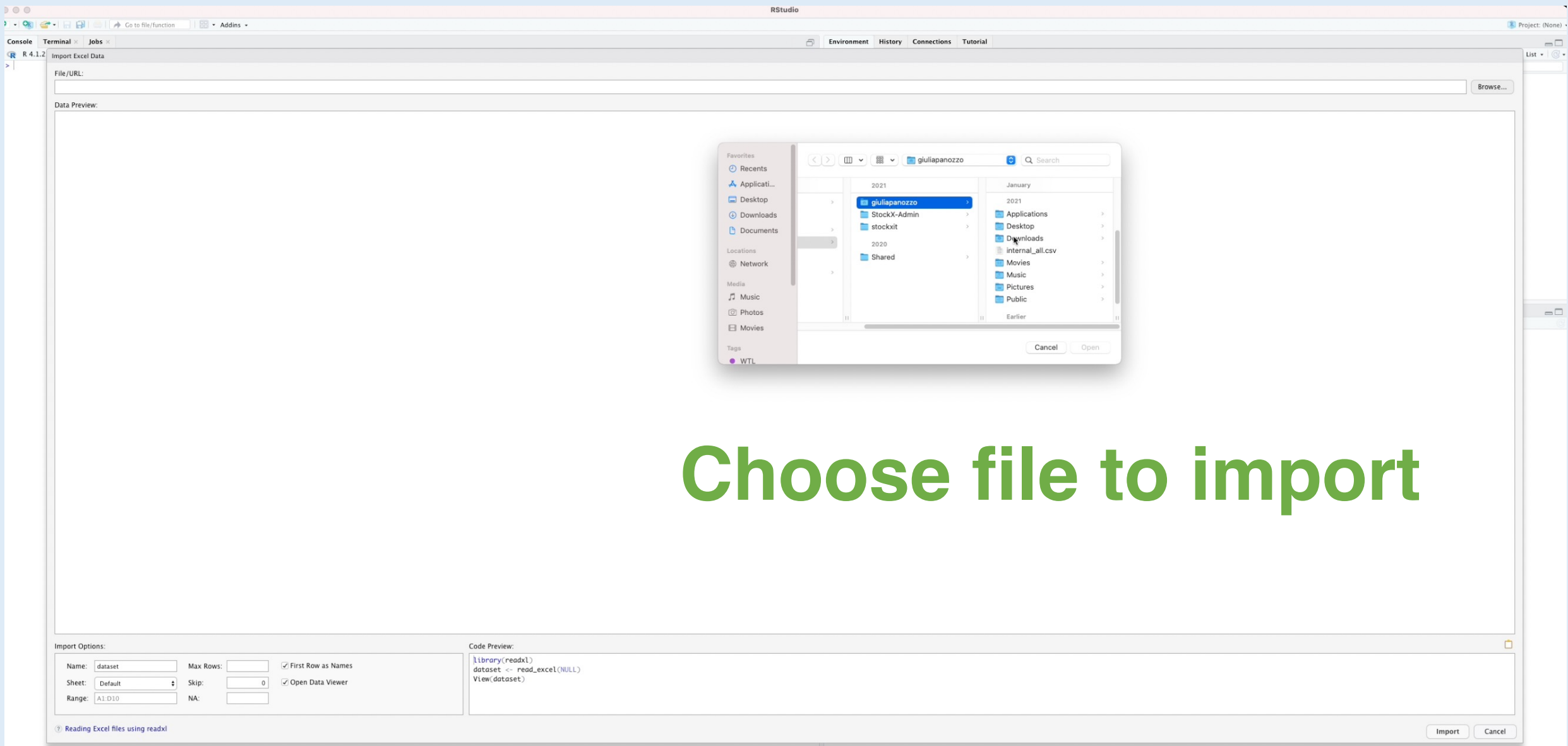


#brightonseo

VS

3. Run the script!





Choose file to import

Console Terminal Jobs

R 4.1.2 Import Excel Data

File/URL:
~/Desktop/Test_Example.xlsx

Data Preview:

date (double)	clicks_test (double)	clicks_control1 (double)	clicks_control2 (double)
2022-01-14	19	63	38
2022-01-15	26	72	52
2022-01-16	40	89	64
2022-01-17	28	71	52
2022-01-18	23	78	45
2022-01-19	18	68	48
2022-01-20	17	61	41
2022-01-21	12	47	38
2022-01-22	32	50	63
2022-01-23	28	45	57
2022-01-24	22	45	41
2022-01-25	22	71	38
2022-01-26	22	49	44
2022-01-27	23	62	47
2022-01-28	25	61	27
2022-01-29	20	46	46
2022-01-30	36	64	43
2022-01-31	14	59	27
2022-02-01	17	55	41
2022-02-02	22	51	47
2022-02-03	27	55	32
2022-02-04	18	38	37
2022-02-05	17	50	52
2022-02-06	13	48	39
2022-02-07	19	43	42
2022-02-08	24	52	49
2022-02-09	35	53	47
2022-02-10	24	38	40
2022-02-11	28	39	28
2022-02-12	21	47	51
2022-02-13	19	60	44
2022-02-14	7	82	83
2022-02-15	16	67	53
2022-02-16	17	51	50
2022-02-17	18	38	52
2022-02-18	20	43	59
2022-02-19	20	51	81

Import Options:

Name: Test_Example Max Rows: First Row as Names

Sheet: Default Skip: 0 Open Data Viewer

Range: A1:D10 NA:

Code Preview:

```
library(readxl)
Test_Example <- read_excel("Desktop/Test_Example.xlsx")
View(Test_Example)
```

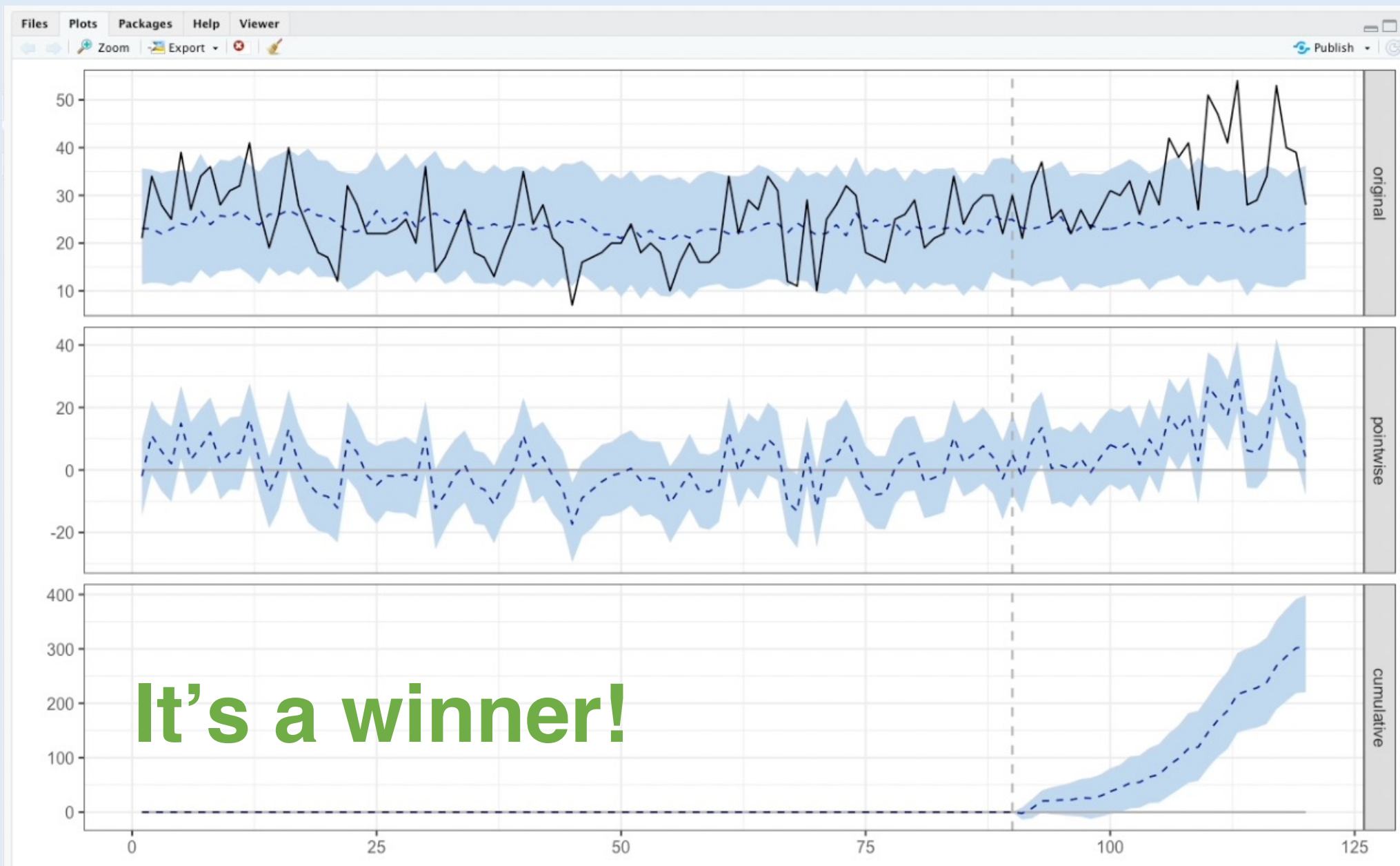
Import Cancel

Check preview

The screenshot displays the RStudio environment. The top pane shows a data table with 22 rows and 3 columns: `clicks_test`, `clicks_control1`, and `clicks_control2`. The bottom pane shows the R console with the following code:

```
R 4.1.2 · ~/
> library(readxl)
> Test_Example <- read_excel("Desktop/Test_Example.xlsx")
> View(Test_Example)
> pre.period<-c(1,90)
> post.period<-c(91,120)
> Test_Example$date<-NULL
> impact<-CausalImpact::CausalImpact(Test_Example,pre.period,post.period)
```

Set pre and post periods



```
Console Terminal x Jobs x
R 4.1.2 · ~/
> impact<-CausalImpact::CausalImpact(Test_Example,pre.period,post.period)
> plot(impact)
> summary(impact)
Posterior inference {CausalImpact}

          Average      Cumulative
Actual          34          1014
Prediction (s.d.) 24 (1.5)    709 (45.4)
95% CI           [21, 26]    [615, 793]

Absolute effect (s.d.) 10 (1.5)  305 (45.4)
95% CI           [7.4, 13]    [220.6, 399]

Relative effect (s.d.) 43% (6.4%)  43% (6.4%)
95% CI           [31%, 56%]    [31%, 56%]

Posterior tail-area probability p: 0.001
Posterior prob. of a causal effect: 99.8996%

For more details, type: summary(impact, "report")

> summary(impact,"report")
Analysis report {CausalImpact}

During the post-intervention period, the response variable had an average value of approx. 33.80. By contrast, in the absence of an intervention, we would have expected an average response of 23.62. The 95% interval of this counterfactual prediction is [20.51, 26.45]. Subtracting this prediction from the observed response yields an estimate of the causal effect the intervention had on the response variable. This effect is 10.18 with a 95% interval of [7.35, 13.29]. For a discussion of the significance of this effect, see below.

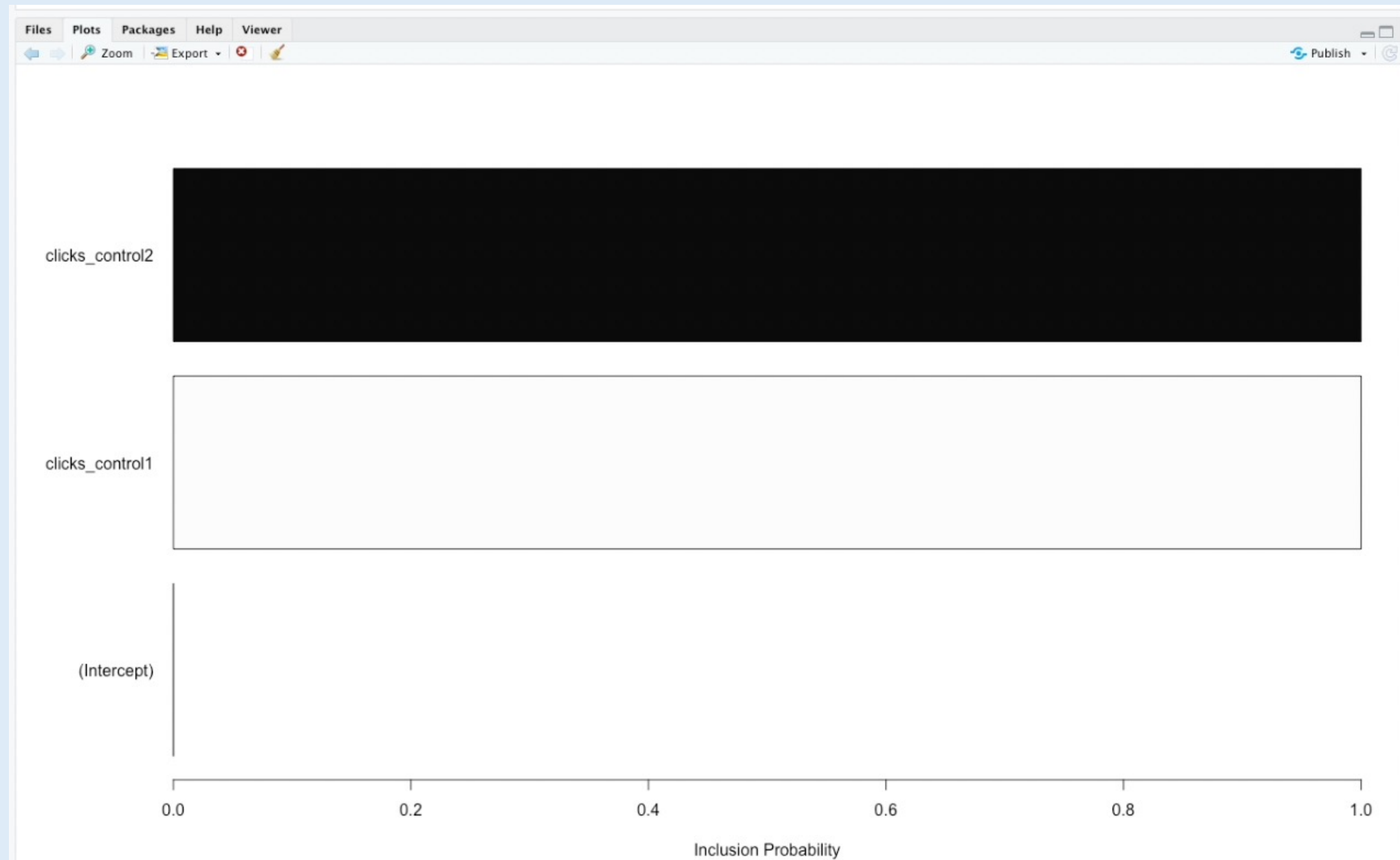
Summing up the individual data points during the post-intervention period (which can only sometimes be meaningfully interpreted), the response variable had an overall value of 1.01K. By contrast, had the intervention not taken place, we would have expected a sum of 0.71K. The 95% interval of this prediction is [0.62K, 0.79K].

The above results are given in terms of absolute numbers. In relative terms, the response variable showed an increase of +43%. The 95% interval of this percentage is [+31%, +56%].

This means that the positive effect observed during the intervention period is statistically significant and unlikely to be due to random fluctuations. It should be noted, however, that the question of whether this increase also bears substantive significance can only be answered by comparing the absolute effect (10.18) to the original goal of the underlying intervention.

The probability of obtaining this effect by chance is very small (Bayesian one-sided tail-area probability p = 0.001). This means the causal effect can be considered statistically significant.
> plot(impact$model$bsts.model, "coefficient")
>
```





Now give it a go!

```
#---Start by setting your pre and post period. Pre-period should be twice as long as your post period. Replace the numbers in parentheses with your relevant timeframes.  
pre.period<-c(1,90)  
post.period<-c(91,120)  
#---Now take out the date column: replace 'Test_Example' with the name of your document.  
Test_Example$date<-NULL  
#---Awesome! Your test group is now in the first column. Define the impact on your dataset, replacing 'Test_Example' with the name of your document.  
impact<-CausalImpact::CausalImpact(Test_Example,pre.period,post.period)  
#---Time to see the magic in action! Copy and paste one row at the time below.  
plot(impact)  
#---this will show the impact of the change on a graph.  
summary(impact)  
#---this will indicate exactly how significant (or not) the change is, in percentage.  
summary(impact,"report")  
#---this will give you an extensive summary of the prediction and the outcome.  
plot(impact$model$bsts.model, "coefficient")  
#---this will show you all of of the control groups that were considered a good fit as covariants.
```

Request access to this
script [here](#)

What I've learned from **(several)** trials and errors...

**The date column should always
be removed
when using this script**

Column titles can error out if they contain special characters, spaces, capitalised letters

Start small, then expand your datasets with additional controls and features once you're comfortable with the script

Statistics VS Everything Else

Limitations & Takeaways

1. External events can impact your data

Google May 2022 Broad Core Update Is Live - What We Are Seeing Now

May 26, 2022 • 7:51 am | (209)

by [Barry Schwartz](#) | Filed Under [Google Search Algorithm Updates](#)



Google Search Central ✓

@googlesearchc · [Follow](#)



Today we released the September 2022 core update. We'll update our ranking release history page when the rollout is complete:

Google algo updates

Google Search Update

An event has occurred in Google Search that might affect your site's data.

[See here for more details](#)

Tue, Feb 1

Google Search Indexing Issue On July 15th - Google Not Indexing New Content

Jul 15, 2022 • 8:44 am | (32)

by [Barry Schwartz](#) | Filed Under [Google Search Engine Optimization](#)



Tools tracking failures



Engineering releases

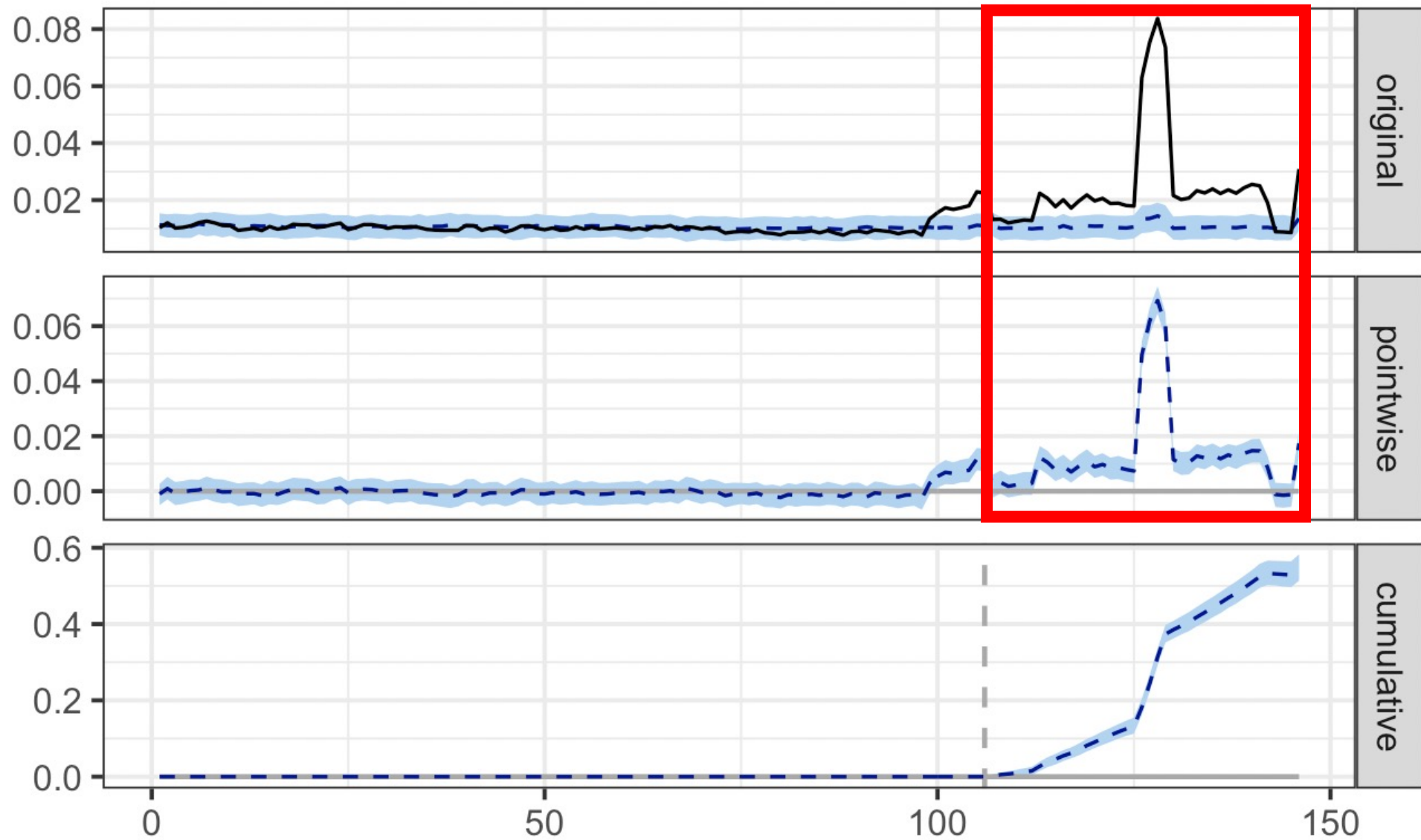


**Create a document to map
internal changes & external events**



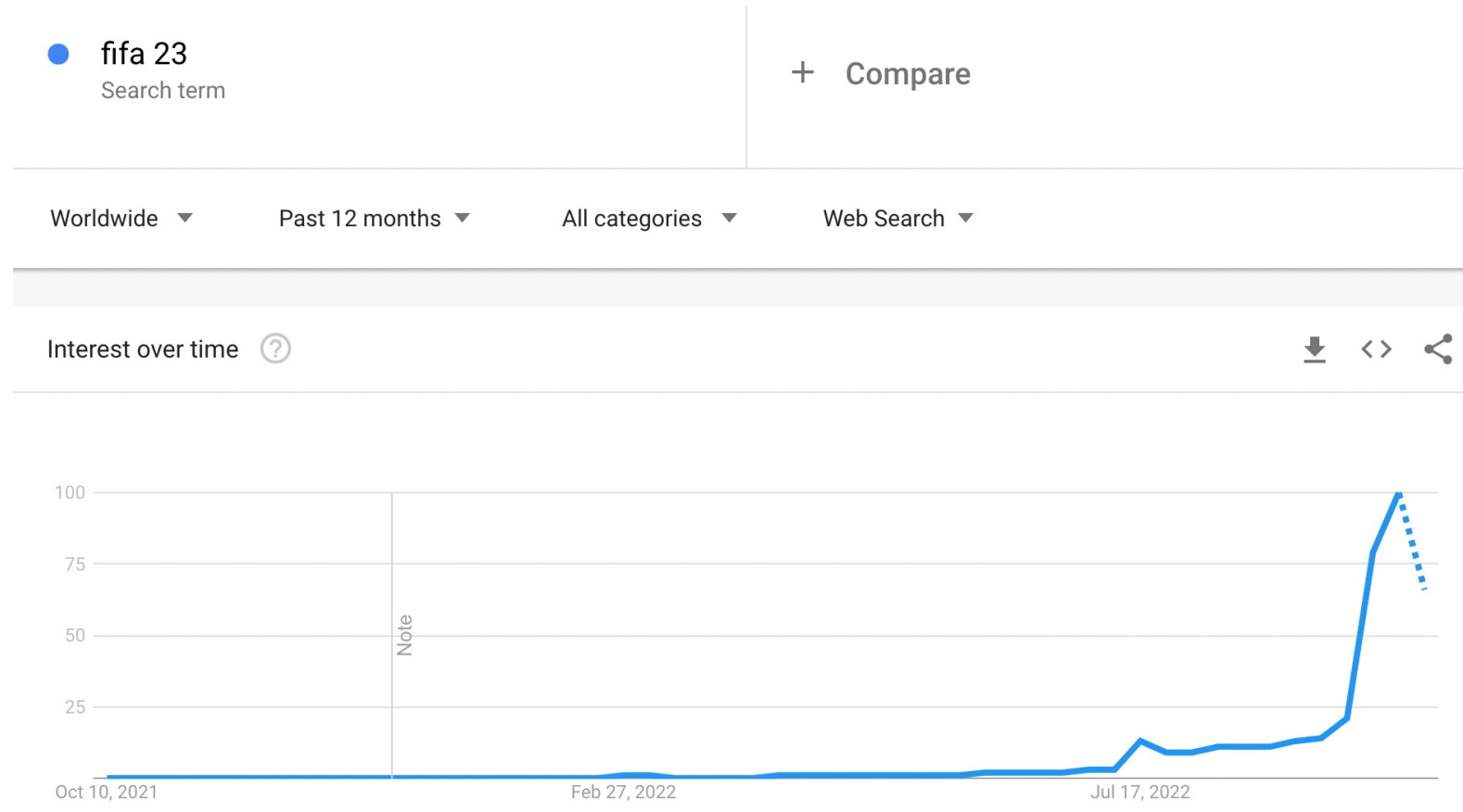
**This will allow you to take into account any
other known factors and isolate the treatment
in the analysis**

2. Mind the **Outliers!**

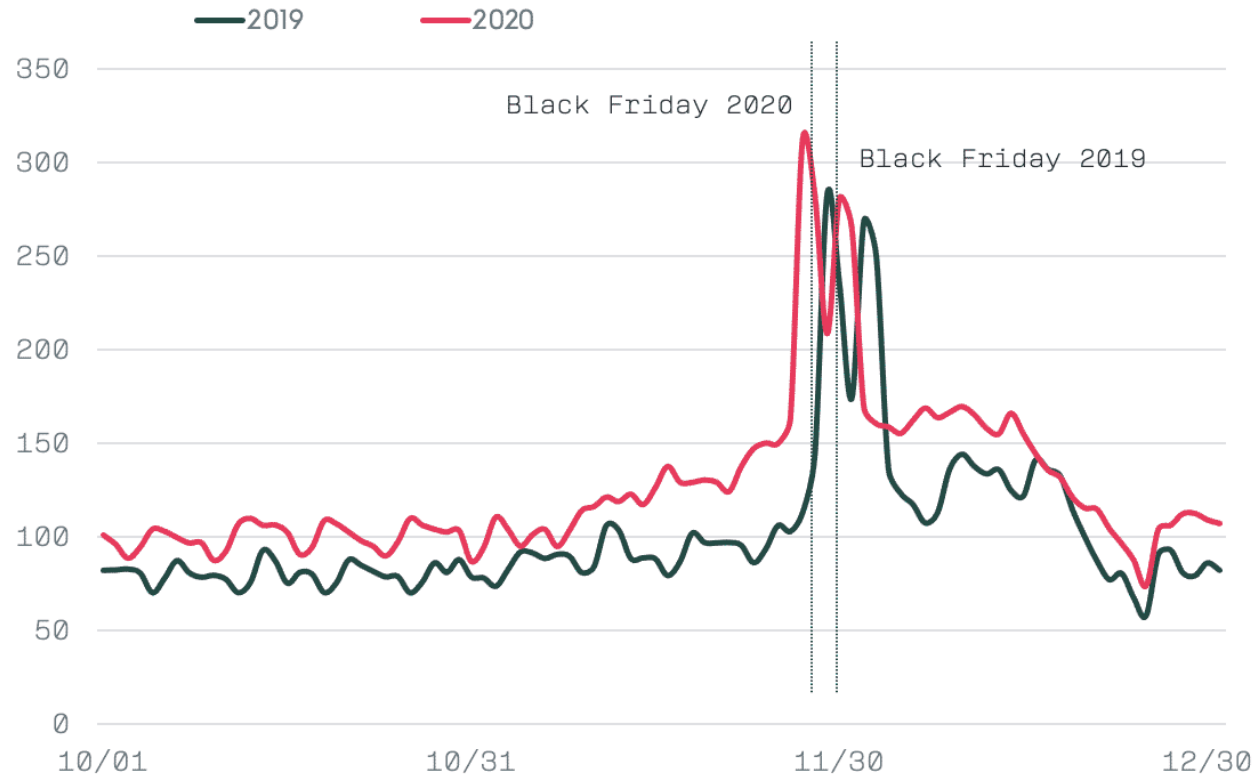


Outliers can originate from...

New product launches (within the test group)



Holidays and seasonal events



Source: Criteo Data, All Retail, US. Indexed Daily Sales, compared to average in October 1-28 2020. Same set of retailers with stable sales tracking during the period in 2019 and 2020.



Results only from one page

	Landing Page	Clicks	% Δ
1.	Page 1	5,627	787.5% ↑
2.	Page 2	333	-6.2% ↓
3.	Page 3	13	-69.8% ↓
4.	Page 4	7	-75.9% ↓
5.	Page 5	7	-75.9% ↓
Grand total		5,987	449.3% ↑

Tracking bugs



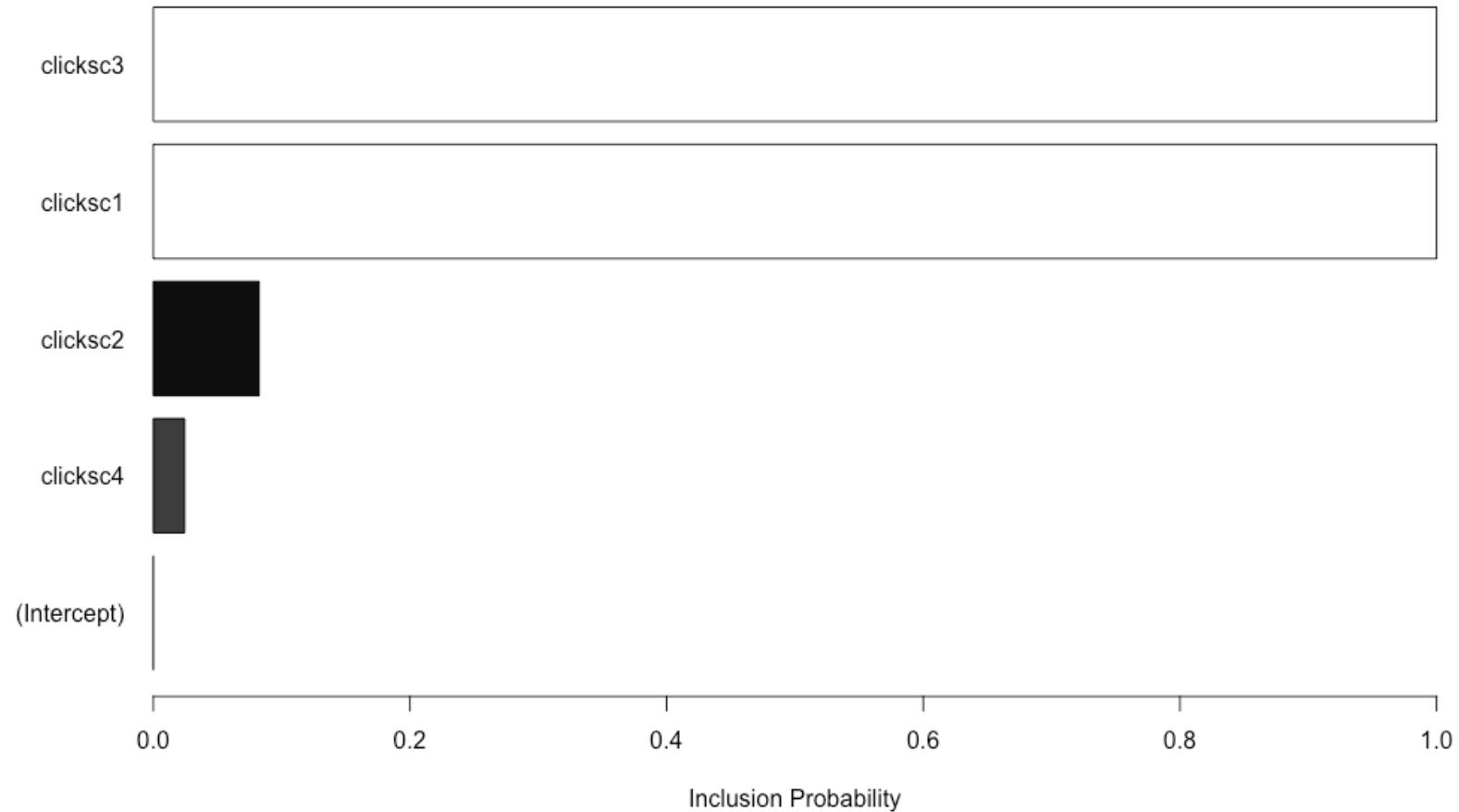
You can spot outliers and rule them out by...



Increasing the size of the test group



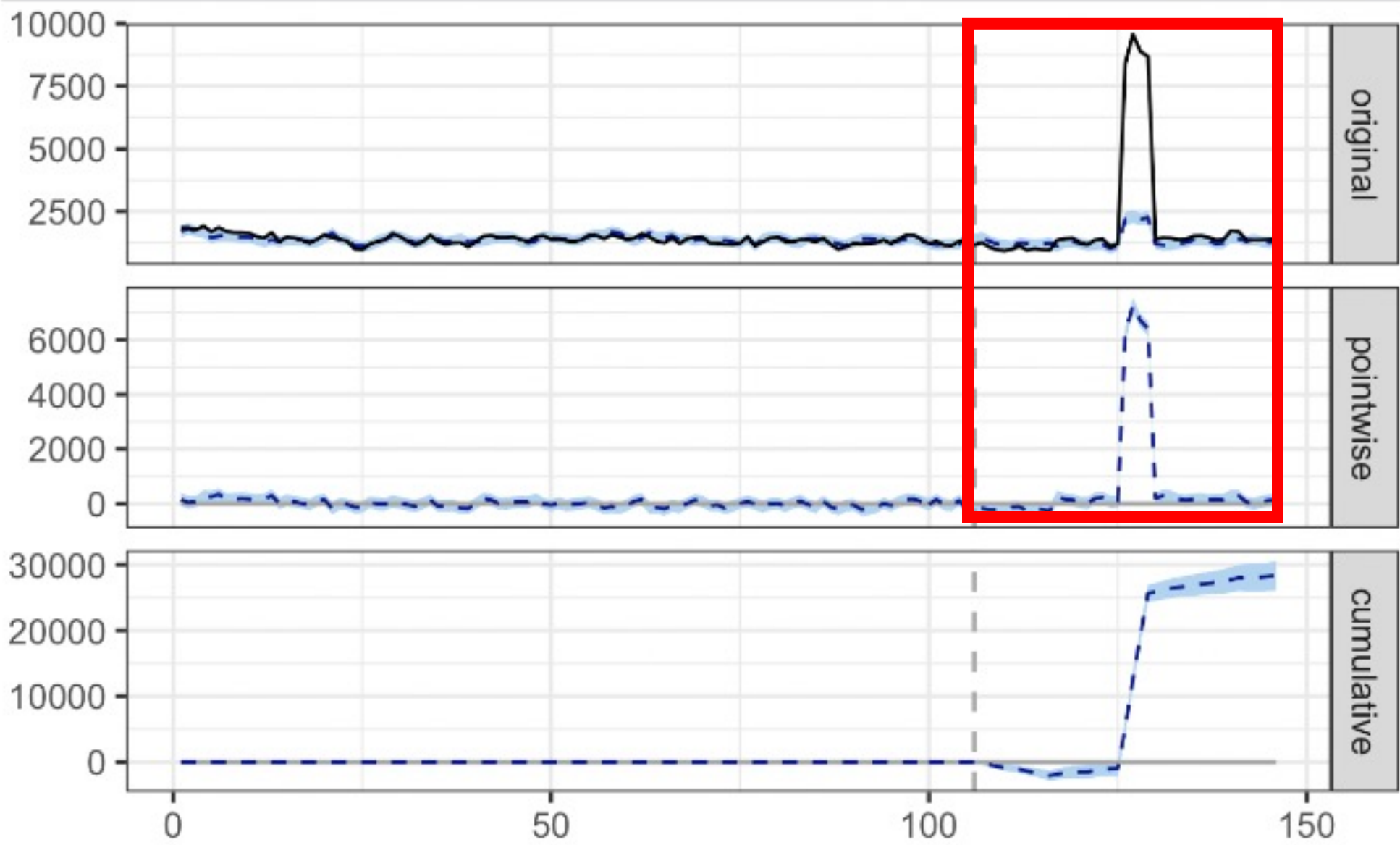
Adding control groups

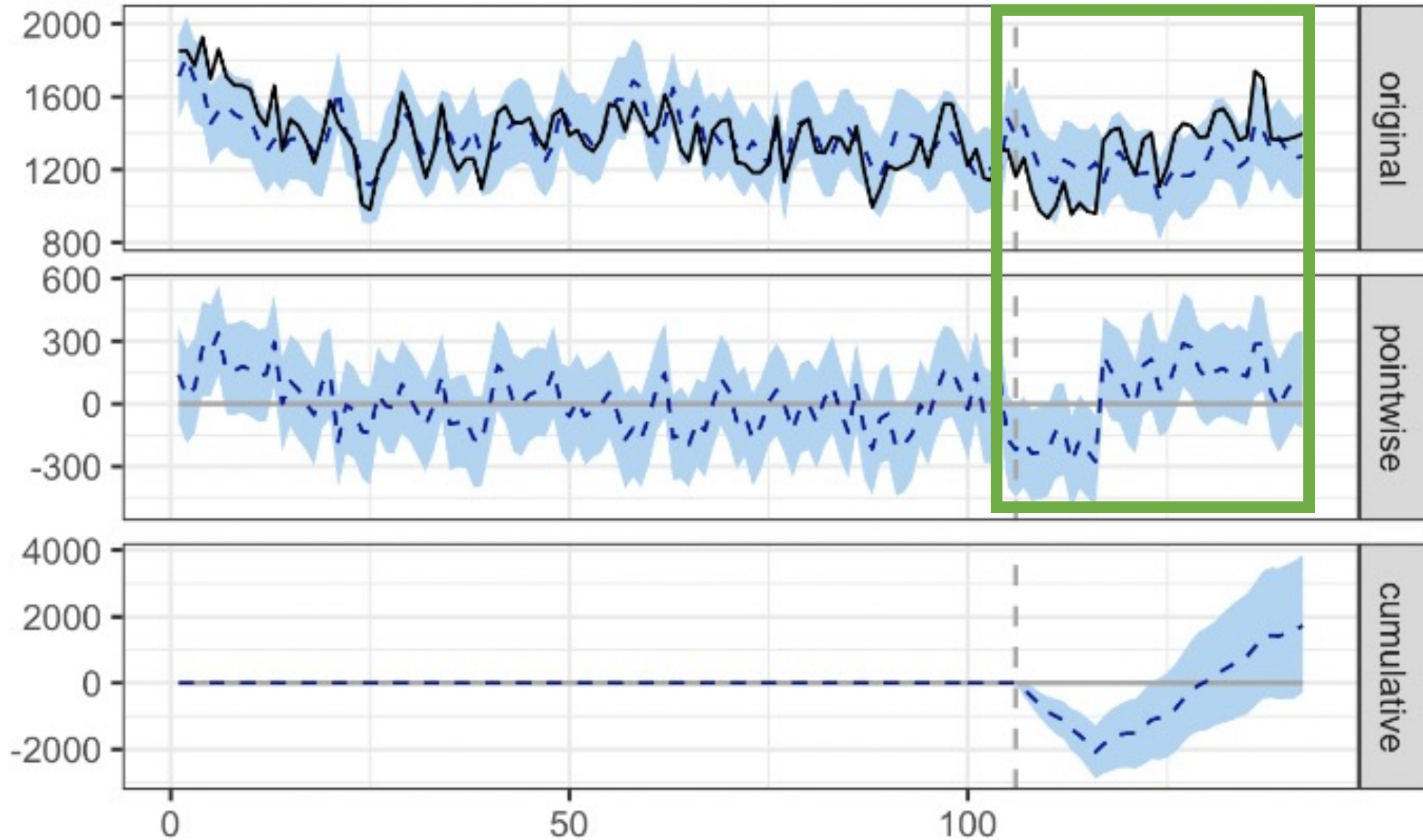


Pre-processing your raw data

2022-05-28	1,362	68,274	1.99%
2022-05-29	1,415	97,155	1.46%
2022-05-30	1,429	91,694	1.56%
2022-05-31	1,269	83,984	1.51%
2022-06-01	1,174	82,342	1.43%
2022-06-02	1,365	85,380	1.6%
2022-06-03	1,400	84,253	1.66%
2022-06-04	1,108	68,384	1.62%
2022-06-05	1,217	70,160	1.73%
2022-06-06	8,407	82,419	10.2%
2022-06-07	9,567	87,732	10.9%
2022-06-08	8,885	83,187	10.68%
2022-06-09	8,675	97,327	8.91%
2022-06-10	1,399	84,884	1.63%
2022-06-11	1,454	85,745	1.7%
2022-06-12	1,439	84,720	1.7%
2022-06-13	1,377	95,840	1.44%
2022-06-14	1,382	87,826	1.57%
2022-06-15	1,517	97,692	1.55%
2022-06-16	1,535	96,529	1.59%
2022-06-17	1,467	87,061	1.69%

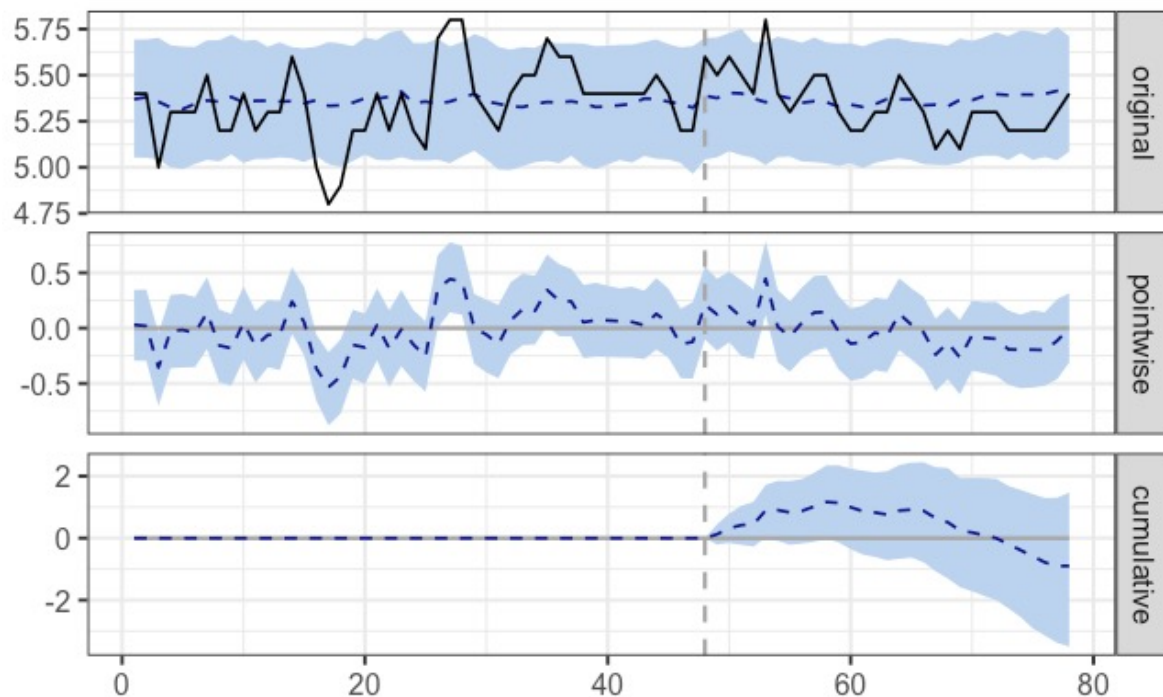
2022-06-03	1,400	84,253	1.66%
2022-06-04	1,108	68,384	1.62%
2022-06-05	1,217	70,160	1.73%
2022-06-06	8,407	82,419	10.2%
2022-06-07	9,567	87,732	10.9%
2022-06-08	8,885	83,187	10.68%
2022-06-09	8,675	97,327	8.91%
2022-06-10	1,399	84,884	1.65%
2022-06-11	1,454	85,745	1.7%
2022-06-12	1,439	84,720	1.7%





3. Beware of **confirmation bias**

Sometimes, your test will be **inconclusive**, or might be a **loser** even when you thought it'd be an easy **winner**





Giulia Panozzo - @SequinsNSearch

#brightonseo

**In that case, you can run the test a little longer,
or repeat the test with bigger groups**



**If it's still inconclusive or a loser, it's probably best
to revert the change and focus on other tests**



References and useful resources

- [How we use causal impact analysis to validate campaign success - Part and Sum](#)
- [Measuring No-ID Campaigns with Causal Impact - Remerge & Alicia Horsch](#)
- [Causal Impact – Data Skeptic](#)
- [R Studio on GitHub](#)
- [The Comprehensive R Archive Network](#)
- [Causal Impact for App Store Analysis - William Martin](#)

MeasureFest



**Thank You for
Listening!**

Giulia Panozzo



@SequinsNSearch



Slideshare.Net/GiuliaPanozzo1

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