Sales and Digital Advertising

Sally Cochrane

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Questions:

1. For several books with social media ads, there was no sales data. Why might this be? (Example: "Making Motherhood Work").

2. I removed "Catalog" ads because I don't know the exact books advertised. Is there a way to figure out which books were in, say, the "Literature social ad", to try to tie the units sold data to that?

Summary of Findings:

- Books that had a Facebook or Twitter ad run for them sold more units, on average, than books without an ad.
  - However, there was no relationship between the ad's performance (click through rate, bounce rate, etc.) and the units sold of the book.
- Books that had an Ideas post about them also sold more units than books without an Ideas post.
  - However, there was no relationship between the post's google analytics behavior (average time on page, bounce rate, etc.) and the units sold of the book.
- What might this mean?
  - It could mean that all the ads/posts are doing a good job of promoting the books.
  - It could also mean that you simply chose good books to promote, that would have done well anyway.

1. Did Books that Had a Facebook or Twitter Ad Sell More Units?

- Procedure:
  - This section only considers "display" and "paidsocial" ads on Facebook and Twitter between 6/30/2020 and 7/1/2021. I removed "Posts" and "Quick promote" posts for this analysis.
  - In order to be fair in comparing sales for books that did and did not have a social media ad run for them, I selected only books from the sales list that were published between 6/30/2020 and 7/1/2021. The sales data included books published earlier than that, but it wouldn't be fair to compare a book without an ad that was published in 1980 (and so had only a few sales this last year) to a book with an ad that was published this year. I also only used twitter and facebook ad manager data from the same date range as the sales data range (6/30/2020 to 7/1/2021), though I could look further back in time in a future study if we think the google analytics data is reliable for before June 2020.
  - Note that many of the books that are labeled as NOT having an ad here DID have a "Post" or a "Quick promote" post about them. I could analyze those books later, if you're interested.

– Units sold combines all book types (paperback, hardback, ebook, audio).

Unit Sales for Books With and Without a Social Media Ad
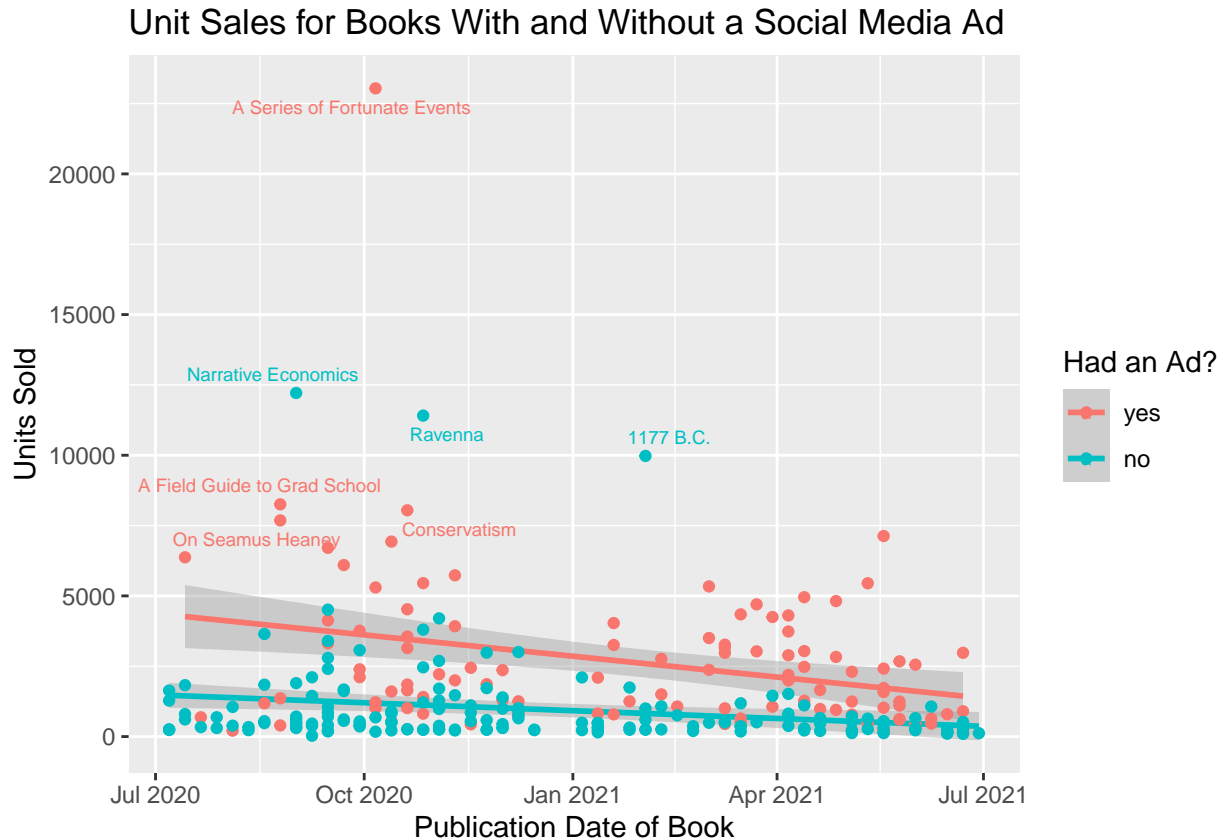
- This plot show that **books that had an ad on facebook or twitter at some point (red) had more unit sales than books that never had an ad (blue).** Books with ads sold an average of 2596 units (median 1929), while books without an ad sold an average of 964 units (median 489). It is estimated that **books with an ad had roughly 3.16 times as many units sold** as books without an ad. This difference is likely statistically significant.

- However, because the books that got a facebook or twitter ad were not chosen at random, I can't say that the ad *caused* the higher sales. It may be that you chose especially good books to run ads for, and they would have done well on their own anyway.

We can zoom in on the graph to see more clearly that books with an ad had higher sales on average (red), but that there is considerable overlap in the sales for books with and without an ad:

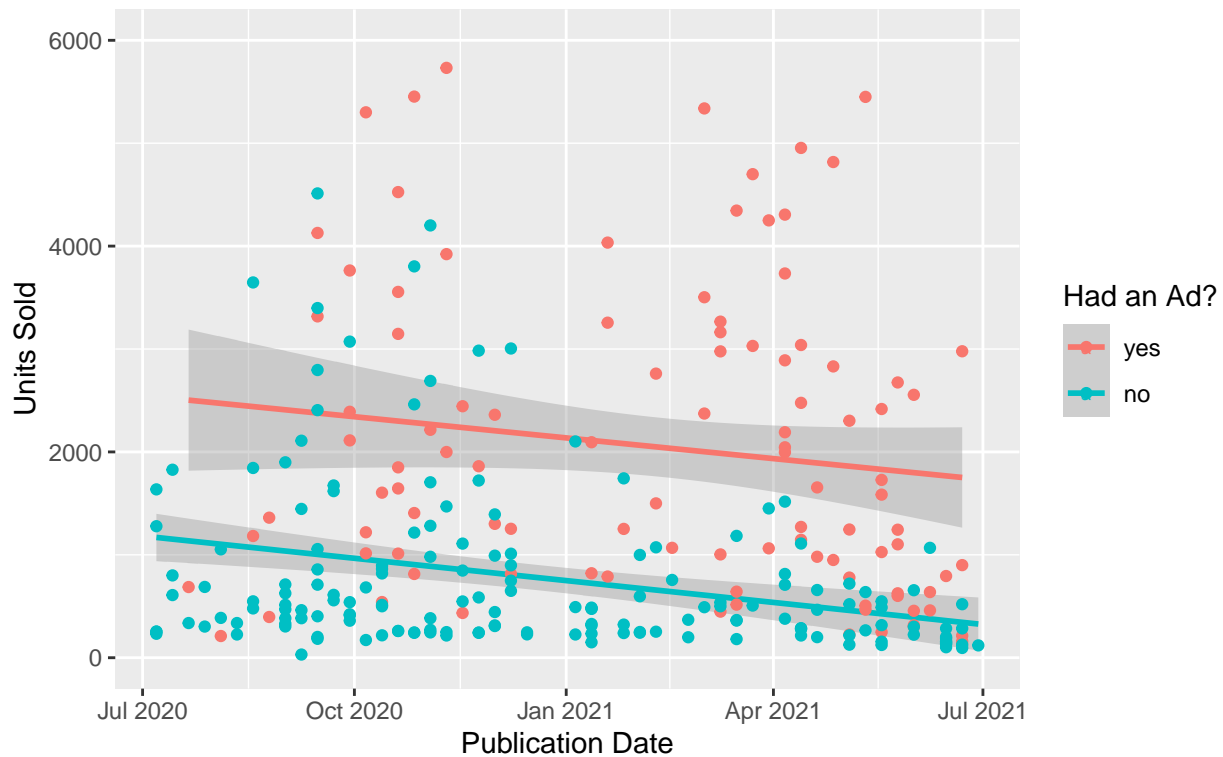## Zooming In on the Graph Above...
Sales for Social Ad vs. No Ad

Table 1: Statistics for Books With and Without an Ad

| Had Ad?	mean units sold	median units sold	Q1	Q3
yes	2595.6250	1929	937.5	3363.5
no	964.1871	489	254.0	995.5

- Notes:

  1. You can also see that books which were published more recently have lower sales, in general. This is likely just because they haven't had as long on the market yet.

  2. There is considerable overlap between sales numbers for books with and without an ad, so this is not a rule, just a trend.

  3. These graphs don't take into account *when* the social media ad was run.

Statistical Tests:
It is estimated that there were 3.16 times more units sold in the group with no social media ads than the group without social media ads. The 95% confidence interval for the multiplicative effect is 2.51 to 3.99 times, which, since it does not straddle zero, suggests the two groups' sales are significantly different.
The rank-sum test also indicates that the two groups' units sold are different, with a p-value < 0.001.

2. Does the Click-Through-Rate, Bounce Rate, or number of Impressions on Facebook/Twitter Ads Correlate to Sales?

- No, it doesn't look like there is any relationship between the click through rate (results rate), impressions, or bounce rate and units sold, on either platform.
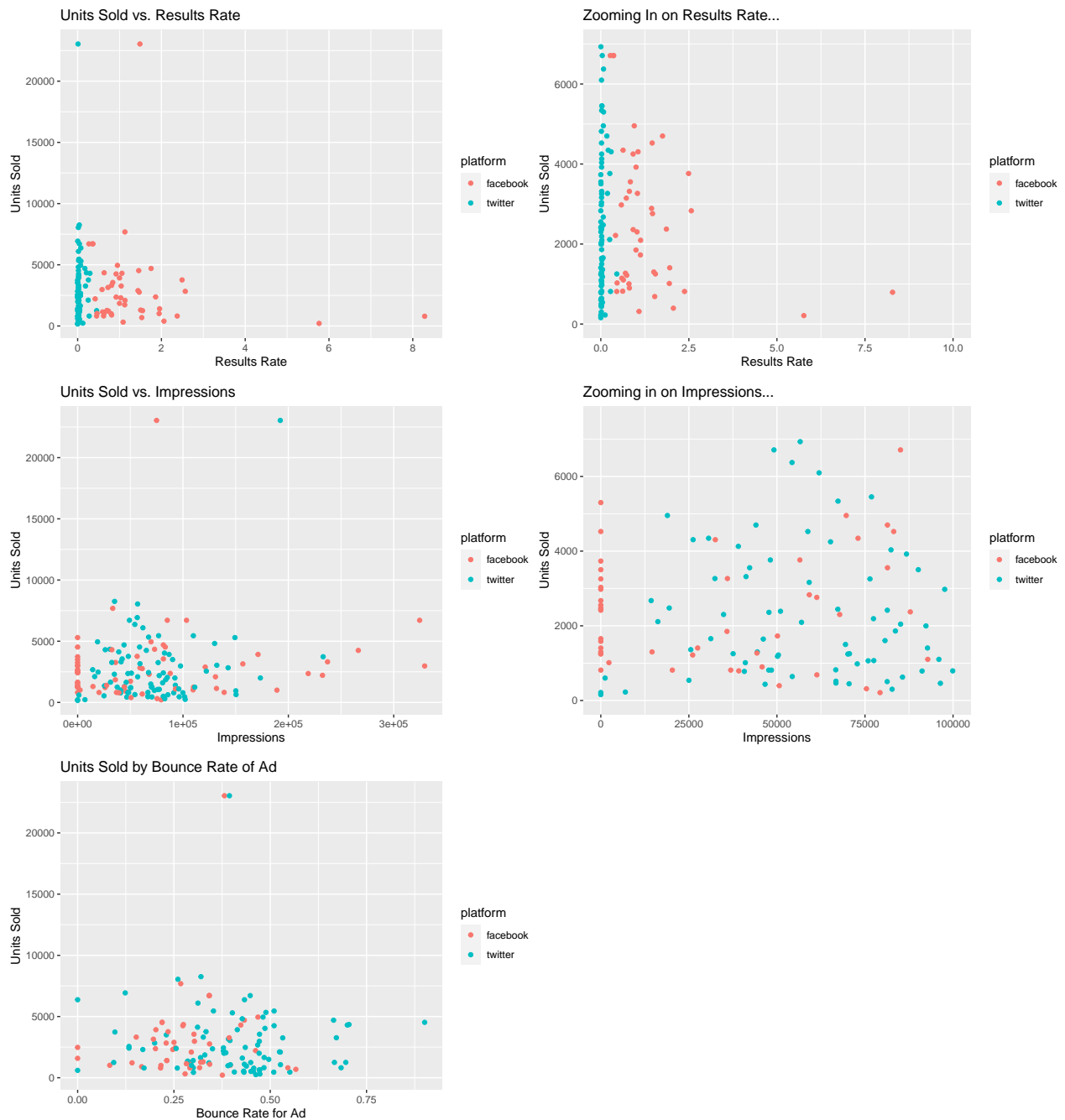

3. Do ads on one platform generate more sales than ads on the other?

- No, it looks like sales from books with ads on both platforms are about equal.

## Units Sold by Platform of the Ad
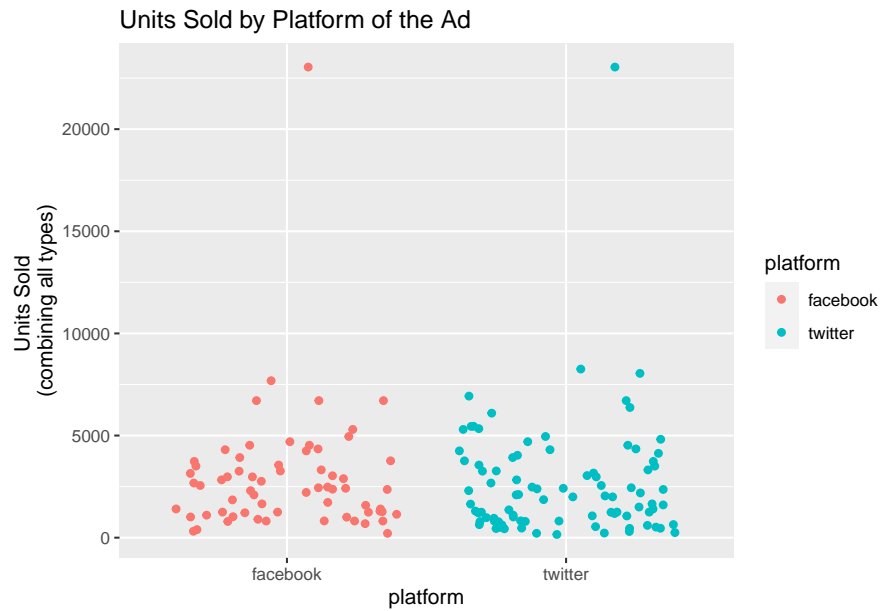
- Note: Some books had ads on both facebook and twitter. Books with more than one ad had more sales. Of books that had at least one social media ad in the time frame 6/30/2020 - 7/1/2021, books with two or more ads are estimated to have had approximately 1.9 times as many units sold as books with only one ad. The 95% confidence interval for this result is 1.3 to 2.7, indicating it is likely not due to chance.

Sales for Campaigns with One vs. Two or More Ads
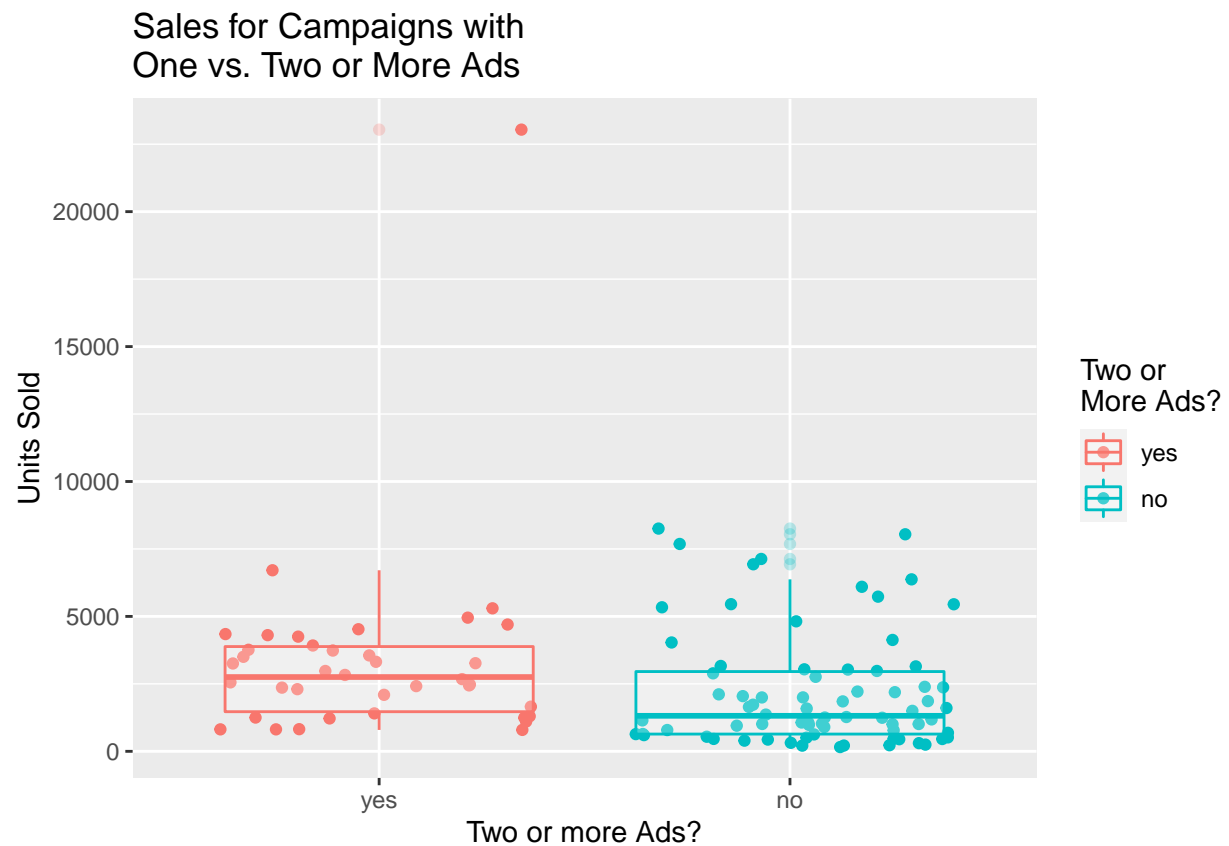
4. **Sales for books with and without an Ideas post:**

- Procedure:
  - This section looks at Ideas posts from June 1 2020 to June 28 2021, with data on the Ideas posts gathered from google analytics for that time frame.

  - I scraped those Ideas posts to see if they were about books from the list of books with sales figures from June 30 2020 - July 1 2021 (the sales dataset from Power BI).

  - To be fair when comparing sales figures for books that did and did not have an Ideas post about them, I only included books with a publication date between June 30 2020 - July 1 2021. This is because I only wanted to include books that had the chance of having an Ideas post written about them, and the google analytics data in this study only goes back to June 2020. If we think the google analytics data is reliable earlier than June 2020, this study could be extended back in time.

Units Sold for Books With and Without an Ideas Post About Them

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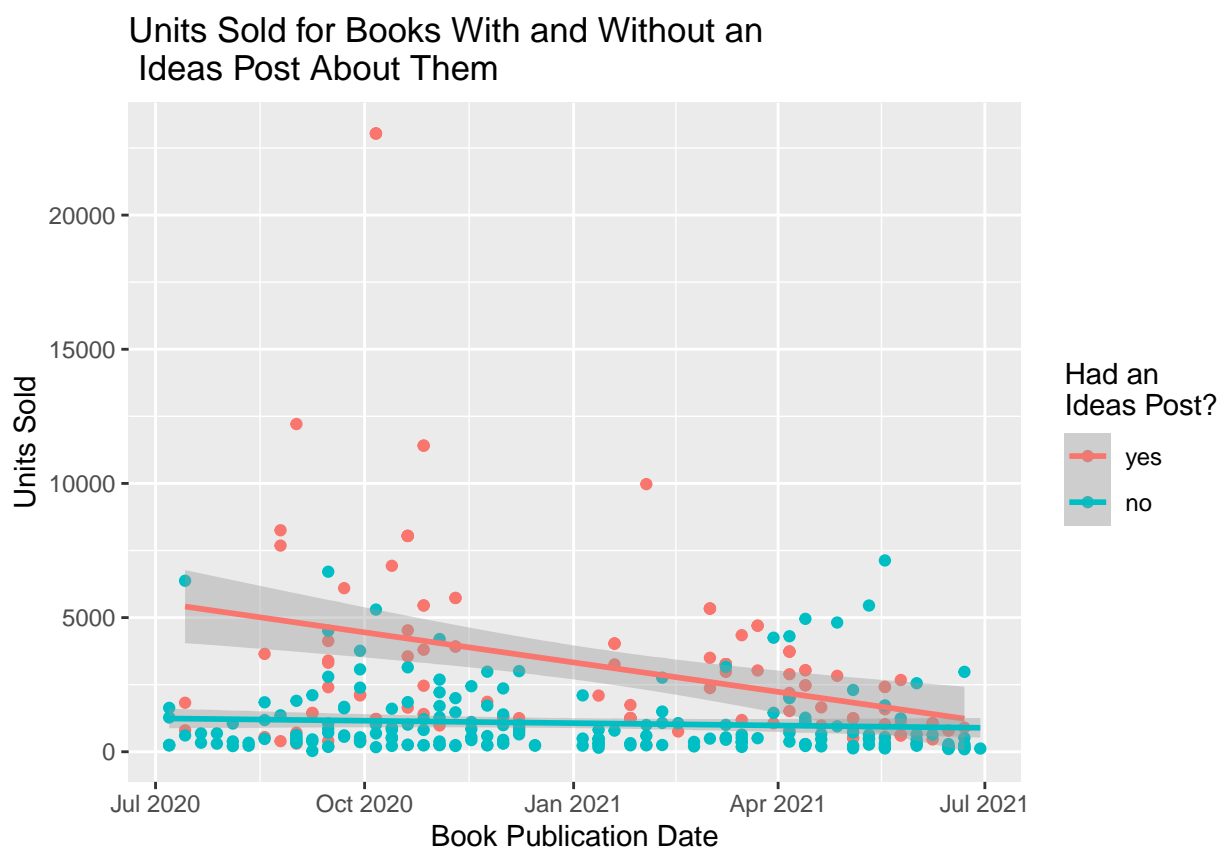
- The graphs above show that **books that had an Ideas post about them (red) sold more units than books without an Ideas post about them (blue),** for books published between June 30, 2020 and July 1, 2021. It is estimated that they sold **3.12 times** as many units as books without an Ideas post. This effect is likely statistically significant.

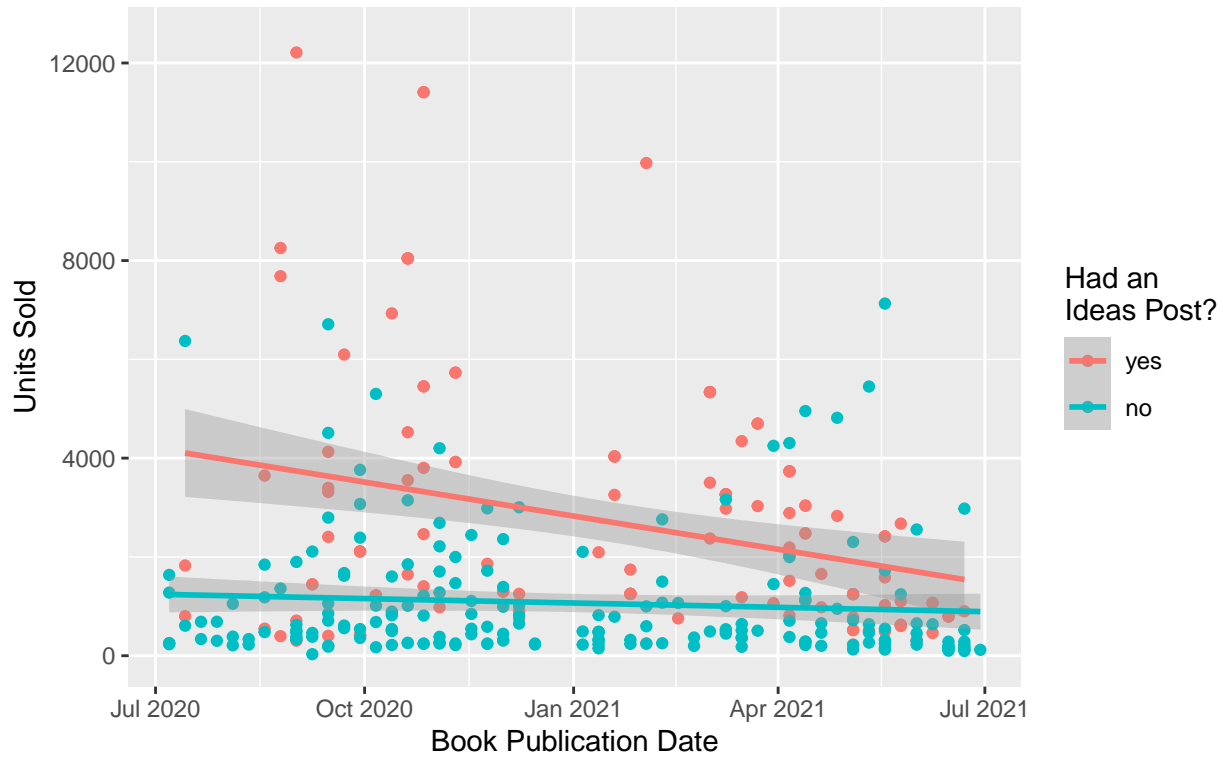Zoom in on Graph Above...
Sales for Ideas vs. No Ideas Post

Table 2: Statistics for Books With and Without an Ideas Post

| Had Ideas Post?	mean units sold	median units sold	Q1	Q3
yes	3146.809	2045.0	981.0	3734.00
no	1067.309	528.5	261.5	1264.25

Statistical tests: It is estimated that the books with an Ideas post have 3.12 times as many sales as books without an Ideas post. The 95% confidence interval for this multiplicative effect is 2.50 to 3.90, indicating that it is unlikely this difference is due to chance. The rank-sum tests confirms this, with a $p < 0.001$ for the difference in the two groups.

- Note: For some books there was more than one Ideas post about the book. It seems that having more posts may associated with more units sold, but this is not conclusive and the effect is small. It is estimated that **books with more than one Ideas post had approximately 1.4 times more units sold** than books with only one Ideas post, with a 95% confidence interval of 0.92 to 2.25 times the units sold. Since this interval covers zero, **it is not conclusive, but only suggestive** that there really is a difference between the two groups.

Sales for Books with Multiple Ideas Posts
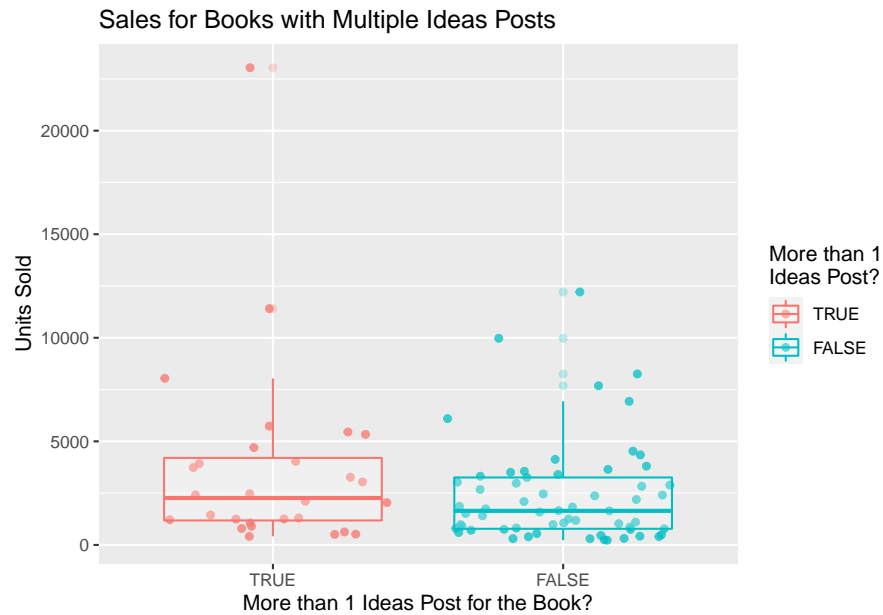
5. Is Behavior on an Ideas Post Related to Unit Sales of the Book?
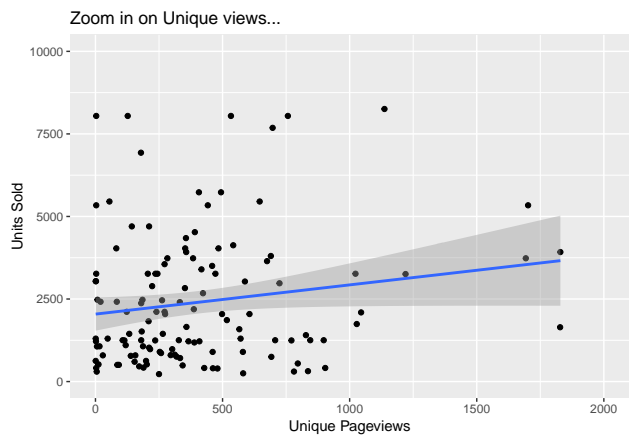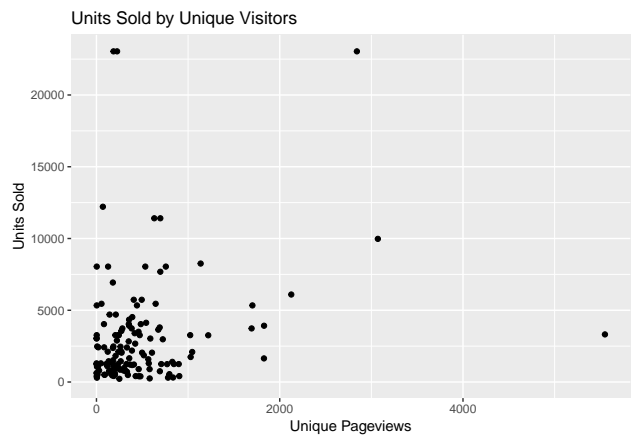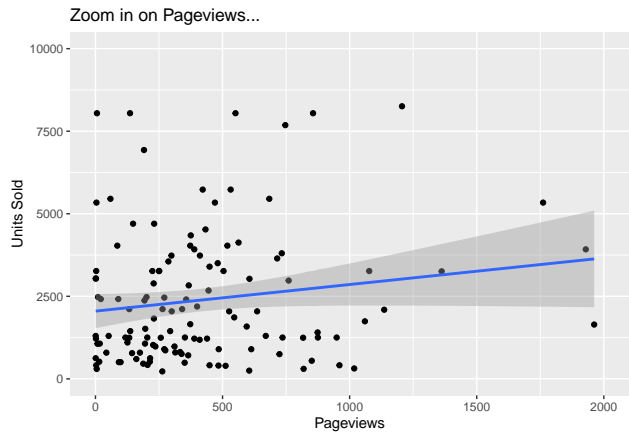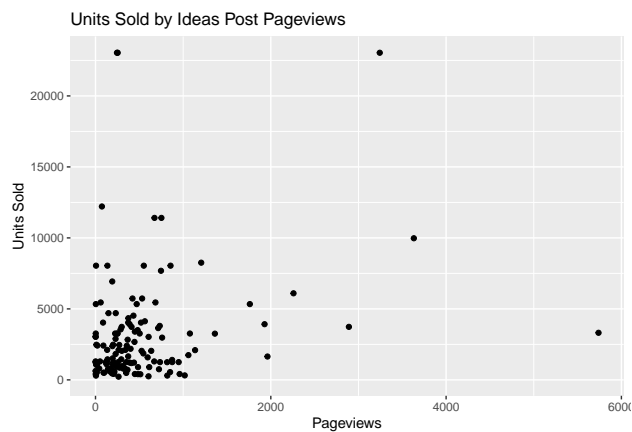
- There was no correlation between bounce rate for the Ideas post or average time spent on the page and units sold.
- It is possible, but not quite proven here, that there *might* be a relationship between pageviews and unique pageviews of an Ideas post and the number of units sold. If there is a relationship, though, it is very slight.

Units Sold by Ideas Post Exit Rate
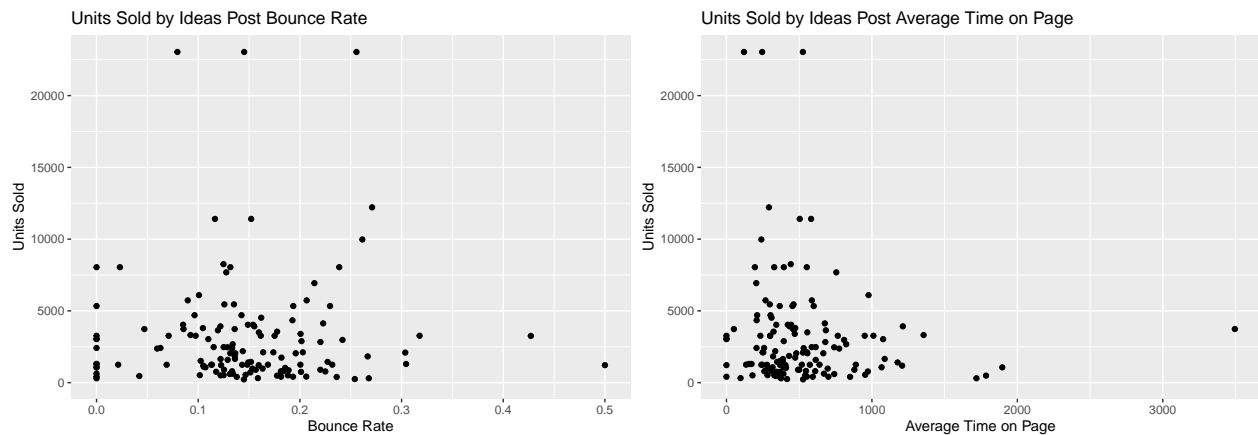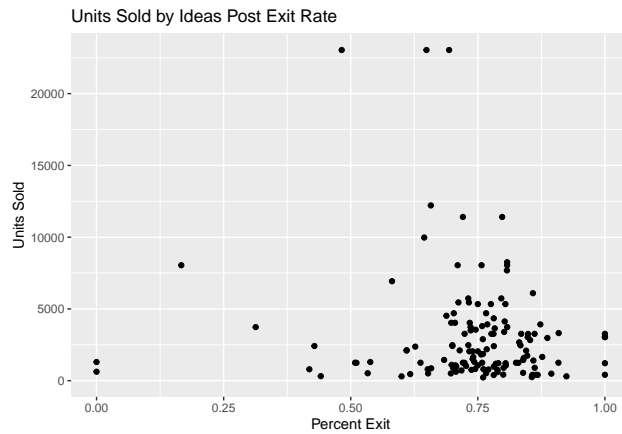
As you can see from the plots above, there is no relationship between bounce rate, time on page, and exit rate for an Ideas post and the units sold of the book.

However, there *may* be a relationship between pageviews and unique pageviews and units sold, though this is not conclusive and the relationship is slight, as the following plots show:

Units Sold by Ideas Post Pageviews

Zoom in on Pageviews...

Units Sold by Unique Visitors

Zoom in on Unique views...

6. Conclusion:

- For books published between June 2020 and July 2021, those that had a Facebook or Twitter ad run for them, or that had an Ideas post about them, sold more units than books that did not have an ad run. On average, they sold roughly 3 times as many units, all book types combined (paperback, hardback, audio, and ebook).

- However, since the books that were selected to have ads run and to have Ideas posts about them were not selected *at random*, we cannot say the ads or the Ideas posts *caused* the increase in sales. You may have just chosen really good books that were going to do well anyway to run ads and Ideas posts about!

- Of books that had a social media ad or an Ideas post, there was no relationship between the analytics performance of the ad or post (bounce rate, click-through-rate, etc.) and the units sold for the book. This probably means that all your ads and Ideas posts are doing similarly well to attract attention to the books, but it may also mean that you chose books to promote that would have done well anyway. For example, if an ad for a book has a really low click-through-rate (or a really high bounce rate) but the sales are high, it could mean that the people who bought the book were going to do so anyway without the ad. On the other hand, because not everyone clicks on ads (they often open new tabs to search for the book they've seen in an ad), the fact that books with an ad or an Ideas post tended to sell more units may indicate that people *were* inspired to buy the book from the ad or post, but that they did so in a new browser window or some other way un-trackable by google analytics.