Daily Deals: Prediction, Social Diffusion, and Reputational Ramifications

John Byers (BU), Michael Mitzenmacher (Harvard), Giorgos Zervas (Yale)
Daily deal? “Never heard of it!”

South Bay Sailing – Redondo Beach

$65 for Hour of Sailing for Up to Four ($135 Value)

- Value: $135
- Discount: 52%
- You Save: $70

Buy!

Time Left To Buy
1 day 9:03:04

267 bought
Limited quantity available

The deal is on!
Tipped at 7:22AM with 25 bought

The Fine Print
Expires Jun 16, 2012
Limit 3 per visit. Must reserve by 5/16/12. 2-week cancellation notice or fee up to Groupon price may apply. Subject to weather. Must sign waiver. Valid only from 9am to sunset. Children must be able to fit into life vest.
See the rules that apply to all deals.

Highlights
- Sail aboard a 26' J/80 boat
- Learn sailing basics
- Certified instructors
- No experience needed
What attracts us to Groupon?

“Groupon is a local e-commerce marketplace that connects merchants to consumers by offering goods and services at a discount.”

Revenue growth

- $800M
- $600M
- $400M
- $200M
- $0M

2008 2009 2010

Subscriber growth

- 50M
- 38M
- 25M
- 13M
- 0M

2008 2009 2010

Groupon says...

We have experienced rapid growth over a short period in a new market that we have created and we do not know whether this market will continue to develop or whether it can be maintained.
Groupon taps into a previously untapped market

- Q2 2011 electronic commerce sales: $47Bn
- Percentage of overall commerce still small
- Large untapped opportunity!
- Daily deal sites tap exactly into this market
Groupon taps into a previously untapped market

“We depend on the continued growth of online commerce.” [Groupon S-1]
How does Groupon make money?
Groupon sell coupons, retains ~50% of coupon value, passes the rest to the merchant.
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How does a merchant make money?

(+) From new customers with coupons
(?) From existing customers with coupons
(+) From existing customers without coupons
(–) Pays revenue share to Groupon
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How does a merchant make money?
(+): From new customers with coupons
(?) : From existing customers with coupons
(+): From existing customers without coupons
(-): Pays revenue share to Groupon

Complicated calculation!
Some of the above components vary over time.
How many existing customer will use Groupons?
How many new customers will the deal attract?
How many will be loyal customers?
Side-effects of deals? Quality of service vs. increased volume
How does Groupon make money?
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Side-effects of deals? Quality of service vs. increased volume

Groupon identifies failure to retain existing subscribers & merchants and to acquire new ones as risk factors. [Groupon S-1]
Can we predict the outcomes of Groupon deals?

- Groupon wants to pick and feature popular deals
- Merchants need to know the cost and potential of a Groupon deal
  - How many customers to expect? Manage customer volume, hire additional workers?
  - How much will the deal cost?
  - Is there a better customer acquisition strategy?
Research Questions

**Q1** Can we predict the outcomes of Groupon deals?
- Groupon wants to pick and feature popular deals
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  - How many customers to expect? Manage customer volume, hire additional workers?
  - How much will the deal cost?
  - Is there a better customer acquisition strategy?

**Q2** Can Groupon please both customers & merchants?
- Groupon promises: “**Valuable new customers, guaranteed**”
- Is this the case? Can Groupon attract **loyal** customers?
- What is the impact of Groupon on merchant reputation?
Research Questions

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Can Groupon please both customers & merchants?

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What drives sales? Are Groupons “social”?

- Groupon has more than 115M email subscribers
- Cost of subscriber acquisition in the first half of 2011: $345M
- Is this subscriber database the only driving force behind coupon sales?
- To what extent sales propagate via social networks?
Can we predict the outcomes of Groupon deals?

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  How many customers to expect? Manage customer volume, hire additional workers?
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Methodology
Regression model using data from daily deal sites

Monitored Jan 3rd to July 3rd

Collected 16,692 deals

Combination of Groupon API and scraping
Can we predict the outcomes of Groupon deals?

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- Monitored Mar 21st to July 3rd
- Collected 2,609 deals
- Scraping
Question 1: Outcome prediction

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Scraping

200GB of compressed data
Flat sales and revenue in local markets.

- Superbowl ads
- FTD offer
- 5 Nights in Puerto Vallarta
- 5 Days in Cabo San Lucas
- 7 Nights in the Caribbean

Sales

Revenue

Barnes & Noble
Body Shop
Old Navy

Groupon

Living Social
The number of Groupons sold per deal is declining: personalization strategy
South Bay Sailing – Redondo Beach

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Highlights
- Sail aboard a 26’ J/80 boat
- Learn sailing basics
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- No experience needed
Parameters of Groupon deals: Price
Parameters of Groupon deals: Price

- Price

- Sales
  - Los Angeles
  - Other cities
Parameters of Groupon deals: Price

![Graph showing the relationship between price and sales for Los Angeles and other cities. The graph includes a trend line indicating a negative correlation.](image-url)
But Groupon has other means to affect sales...
Linear regression model of Groupon deals

\[ \log q = \beta_0 + \beta_1 \log p + \beta_2 \log t + \beta_3 d + \beta_4 f + \beta_5 l + \beta_6 w + \beta_7 c + \beta_8 g \]
How well can we predict Groupon deals?

$R^2$ of model = 0.49
How do various deal parameters impact its outcome?

Price
Point price elasticity of coupons is 0.48, demand is inelastic.
1% increase in price leads to 0.48% decrease in sales.
Groupon and merchants have room for price-based optimization.

“Soft incentives”
For example, in expectation a featured deal produces 141% more sales.
In expectation Friday deals produce 27% more sales than Monday deals.
There are means other than price to control sales.

Can merchants put this to good use?
Consider merchants whose deals sell out.
If they could predict sales they could control customer volume through price and hence optimize profit.
Can Groupon please both customers & merchants?

- Groupon promises: “Valuable new customers, guaranteed”
- Is this the case? Can Groupon attract loyal customers?
- What is the impact of Groupon on merchant reputation?

Methodology
Merge datasets to quantify customer satisfaction with Groupon merchants

Collected 56,048 reviews for 2,332 merchants
Dataset spans 2,496 deals
Scraped Yelp website
What about the reputation of Groupon merchants?
What about the reputation of Groupon merchants?

This place is AHH-MAZING! As an avid sushi eater and explorer Ma Soba is exactly what a sushi place should be. I go at least once a week and sometimes twice (one week I went 4 times.. don't judge). I always go with my bf and we order the same rolls every time -- Jalapeno roll and Crunch Dragon roll. If we switch it up sometimes we do the Butterfly roll. But the Jalapeno is a MUST. BEST ROLL EVER! We sit at the sushi bar and the sushi chefs know us and like any good place -- if you're a regular you get a free treat. And the prices are decent and typical to Boston sushi.

One thing to note is that the wait staff could use some help. There are only 2 guys who seem to know how to be a waiter. They women are not that good, not friendly, very forgetful etc. But they aren't so terrible that I hate the place.

Go here!

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I've been talked into dining at Ma Soba on three occasions, each time it's been bad.

The most recent time was this week. There were 4 of us, all fresh from work and ready to have a relaxing dinner. Our waiter arrived at the table and brought with him a butt load of attitude. Really? I looked around and noticed that there was only one other occupied table in the restaurant so giving your only other paying customers attitude speaks volumes about the restaurant. Volumes. Our beverages arrived and included almost soapy tasting water. I mean, come on. The food followed about 25 minutes later and trust me, it was nothing more than average.

I don't get why this restaurant has any positive reviews. The waitstaff is awful and the food is just passable. One star says it all. AVOID!!!
What about the reputation of Groupon merchants?

I don't get why this restaurant has any positive reviews. The waitstaff is awful and the food is just passable. One star says it all. AVOID!!!

I convinced some of my friends to come here because I bought a Groupon here a week ago and some work colleagues who also agreed to buy the Groupon...never did. So I went with some other friends...thinking it has to be okay. So...if you're a picky sushi eater (which means you value thick slices, freshness, and innovation). This is not the place for you.

It has a good spot in Beacon Hill...it has a nice ambience...if you're handicapped, I have no idea how you use the bathroom because it's in the basement. The service isn't that great or bad...and the place isn't that crowded or filled with expert sushi eaters.

Tried a bunch of specialty rolls...which were all okay to bad. The coveted crunch dragon roll is good...and that was eaten up first...but everything else was just a disappointment.

Don't go...save your money...even if it's a Groupon.

We were pleasantly surprised with the service, food, ambience and being in the neighborhood.
- Our waiter was courteous, came at the right time and was always smiling.
- The food was much better than we had expected - we had sushi which was delicious and a crispy beef which was very good.
- The restaurant had a pleasant feeling to it, not overly formal but not totally casual. Having a window seat was especially nice.

We'll definitely return.
Why do Yelp reviews matter?

Yelp reviews are forever!
Reviews persist for future potential customers to peruse

Yelp drives merchant traffic
Merchants with higher ratings get more visibility on Yelp

Yelp ratings affect merchant revenues
1-star increase leads to 9% increased revenue. [Luca’11]

Merchants care about Yelp
They care enough to spam it (25% of Yelp reviews filtered)
Why do Yelp reviews matter?

**Yelp reviews are forever!**
Reviews persist for future potential customers to peruse.

**Yelp drives merchant traffic**
Merchants with higher ratings get more visibility on Yelp.

**Yelp ratings affect merchant revenues**
1-star increase leads to 9% increased revenue. [Luca’11]

**Merchants care about Yelp**
They care enough to spam it (25% of Yelp reviews filtered)

In the long run, Groupon can benefit from pleased customers and merchants.
How can we measure the impact of Groupon?

Merchant A

Groupon offer
How can we measure the impact of Groupon?
How can we measure the impact of Groupon?

Merchant A

Groupon offer

Merchant B

Groupon offer

Merchant C

Groupon offer
How can we measure the impact of Groupon?

Merchant A

Merchant B

Merchant C

Groupon offer
Yelp ratings before & after Groupon

<table>
<thead>
<tr>
<th></th>
<th>Avg. Rating</th>
<th>Reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before period</td>
<td>3.71</td>
<td>39,042</td>
</tr>
<tr>
<td>After period</td>
<td>3.59</td>
<td>17,006</td>
</tr>
</tbody>
</table>
Breakdown of reviews by mentions of keywords “Groupon” and “coupon”

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groupon mentioned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.98 (354)</td>
<td>3.36 (4,315)</td>
</tr>
<tr>
<td>No</td>
<td>3.36 (1,166)</td>
<td>3.71 (50,213)</td>
</tr>
</tbody>
</table>
This analysis struck a popular nerve...

“The consumers were being told: You will never pay full price again. The merchants were hearing: You are going to get new customers who will stick around and pay full price. Disappointment was inevitable.

“The New York Times

...by providing some quantification of what was already on people’s mind.”
It's been documented that anytime an influx of customers visits a business their online reviews tend to see a decrease in quality. This effect holds true for online as well as traditional advertising such as print, broadcast, radio.

Groupon is still the most effective and guaranteed marketing method for reaching hundreds of thousands of new customers and getting them into your business and engaged.
Question 3: Social diffusion

What drives sales? Are Groupons “social”?

- Groupon has more than 115M email subscribers
- Cost of subscriber acquisition in the first half of 2011: $345M
- Is this subscriber database the only driving force behind coupon sales?

Methodology

Merge datasets to look for evidence of diffusion of deals on social networks

Monitored Jan 3rd to July 3rd

Collected Facebook “Likes” for 16,692 deals in our dataset

Utilized Facebook API

Deals can be easily shared on Facebook
Strawman hypothesis of sales: You’ve got mail!

Non-subscriber ○ Subscriber
Strawman hypothesis of sales: You’ve got mail!

Non-subscriber  Subscriber
Strawman hypothesis of sales: You’ve got mail!

- Non-subscriber
- Subscriber
- Purchaser
Strawman hypothesis of sales: You’ve got mail!

- Non-subscriber
- Subscriber
- Purchaser
- Likes on FB
This hypothesis suggests linear relationship between likes and sales
• Sales not linear in likes, reject hypothesis
• We observe diminishing marginal gains of sales in likes
Alternative hypothesis: Social diffusion

Likes cascade on the social network
Alternative hypothesis: Social diffusion

Likes cascade on the social network
Alternative hypothesis: Social diffusion

Likes cascade on the social network

- Non-subscriber
- Subscriber
- Purchaser
- Likes on FB
Alternative hypothesis: Social diffusion

Likes cascade on the social network
Alternative hypothesis: Social diffusion

Likes cascade on the social network

Non-subscriber  Subscriber  Purchaser  Likes on FB
Alternative hypothesis: Social diffusion

Likes cascade on the social network

- Non-subscriber
- Subscriber
- Purchaser
- Likes on FB
Alternative hypothesis: Social diffusion

Likes cascade on the social network
Is our data consistent with theoretical cascade models?

Need to consider two key features of cascade models

1. How is the seed set selected?
   Our dataset does not answer this, but...
   Top 50% of FB users by degree responsible for most social interaction.
   [Wilson et al. ’09]

2. How do likes propagate? [Kempe et al. ’03]
   - **Independent Cascade**
     Fixed probability of activation $p$ by each active neighbor
   - **Weighted Cascade**
     User activated with probability $1/own\text{-}degree$ by each active neighbor
Alternative hypothesis: Social diffusion

Q: Is our data consistent with theoretical cascade models?

A: Yes, under previous two assumptions

**Independent Cascade**

- Top-k by degree
- Random

**Weighted Cascade**

- Top-k by degree
- Random
Conclusions

• Study “turned corner” when we used multiple data sources rather than looking head-on.

• Great opportunity to test well studied theoretical social diffusion models.

• Groupon sustainability: reviews go up, ratings go down. Is this a net win or loss for merchants? What happens in the longer run?

• Computer Scientists well placed to do these studies, but rich in interdisciplinary aspects.
Does reputation *really* matter?

At least according to Twitter....