

Collaborative Research Opportunity

Pricing Products for Non-Contractual Customers in a B2B Setting

Sponsored by Air Liquide

December 18th, 2020



Introductions

Wharton Customer Analytics

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Computational and Data Science Group Manager

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Data Science and Analytics Manager

Agenda

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About Our Sponsor: Air Liquide

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Research Proposal & Application Process

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Q&A

A Few Operational Notes

This webinar is intended for researchers & scholars. It should not be published or presented without permission from WCA.

Questions about our research programs or
for press inquiries:

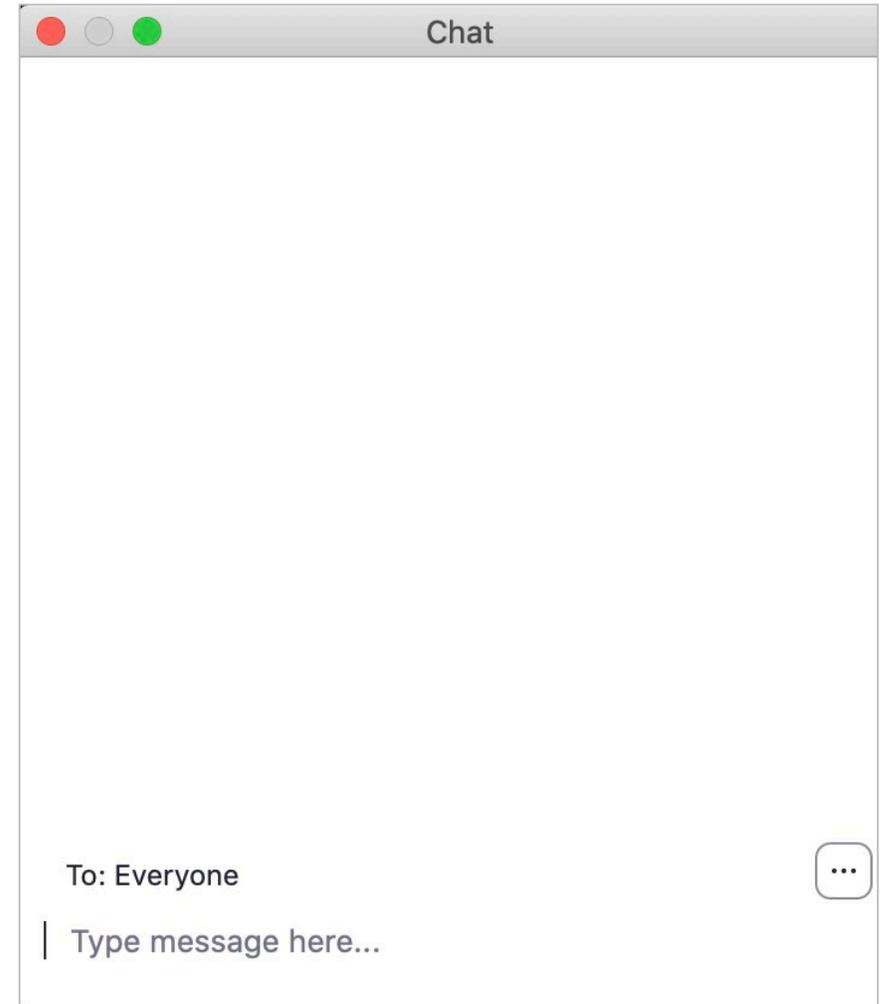
wca-research@wharton.upenn.edu

To work with WCA and the data sponsor, research teams must submit a proposal for approval. More details throughout this presentation.

Questions?

To ask a question, click the chat button at the bottom of your screen and type your question

- All questions will be answered live or via e-mail



About Air Liquide

2019 Key Figures



~67,000
EMPLOYEES



PRESENT IN
80 COUNTRIES



MORE THAN
3.7 MILLION
CUSTOMERS &
PATIENTS



REVENUE
€21.9bn



NET PROFIT
(GROUP SHARE)
€2.24bn



INVESTMENT
DECISIONS
€3.7bn

An Innovative Group

Innovation is at the Heart of the Group's Customer-Centric Transformation Strategy



330
new patents
filed in 2019

4,300
employees⁽¹⁾
contribute to
innovation

€317m
innovation
expenses⁽¹⁾

(1) 2019 Figures OECD Definition.

RESEARCH & DEVELOPMENT

OUR KEY FIGURES

AS OF DECEMBER 2019

5 
campuses
& 3 satellites

16 000 visitors

partnerships with laboratories, start-ups, industrial players and customers


18
ESSENTIAL
SMALL
MOLECULES

40 NATIONALITIES


567
EMPLOYEES


60 %

R&D PORTFOLIO
IS DEVOTED TO
REDUCE CO₂
EMISSIONS*

**by reducing the carbon content
of Air Liquide products or those
of its customers*

Problem To Solve

How to Price Products for Non-Contractual Customers in a B2B Setting?

Air Liquide wants to
identify an **OPTIMAL PRICING** strategy and
increase its confidence that it is neither
leaving money on the table nor overcharging

Problem Motivation

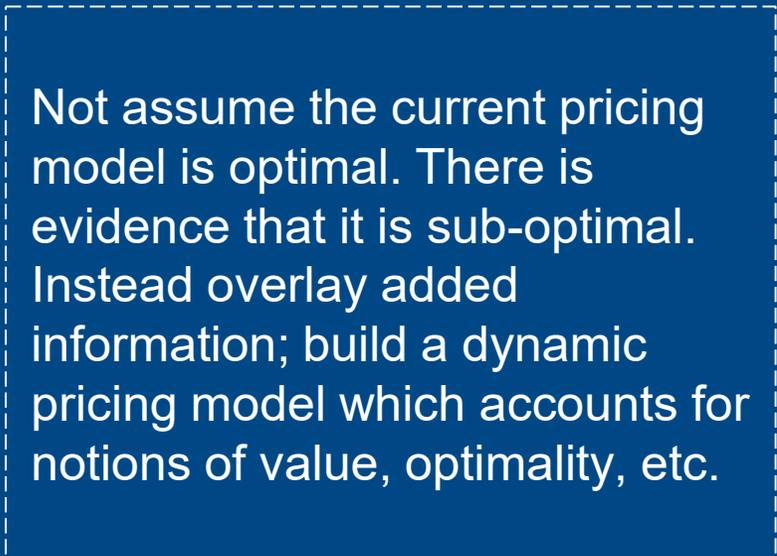
- Substantial variance in the pricing at a per product level (£60 to £700)
- One of two things:
 - Over charging
 - Seen in the form of price overrides (~25K lines override/month, 10% sales)
 - Leaving money on the table
 - Most likely; since the average price charged is closer to the floor
- Competitive landscape
 - Low competition concentration; only one other large competitor in the region
 - Should ideally, result in AL having greater negotiating power (we have 37% of the market share; competitor has 55%)
 - However, hard to learn competitors' pricing

Problem Motivation

- We have algorithms that emulate the current pricing model, today.



Assume this model *is*, in fact, optimal. That the price the AEs come up with somehow intuitively accounts for being able to maintain the relationship and prevent churn and be competitive in the market and yet, get the best price.



Not assume the current pricing model is optimal. There is evidence that it is sub-optimal. Instead overlay added information; build a dynamic pricing model which accounts for notions of value, optimality, etc.

AIR LIQUIDE BACKGROUND

Understanding who buys from Air Liquide

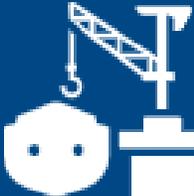
BARS AND PUBS



RESPIRING FRUIT TRANSPORTATION



SHIPYARDS



OUTDOOR LIGHTING



EVENT ORGANIZERS



FOUNDRIES



OUR CUSTOMERS ARE..

VARY IN INDUSTRY

VARY IN SIZE

USE OUR PRODUCTS IN A VARIETY OF DIFFERENT WAYS

NON-HOMOGENOUS

Research Opportunities

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Air Liquide is interested in developing innovative approaches to **dynamically pricing products for different types of B2B customers**

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Air Liquide is interested in developing innovative approaches to **dynamically pricing products for different types of B2B customers**

- Customers in this B2B setting are non-contractual, vary widely in their size, and make both recurring and non-recurring orders
- AL is open to any research that will help them **optimize their sales and pricing strategy** and improve their relationships with their non-contractual customers

Research Opportunities

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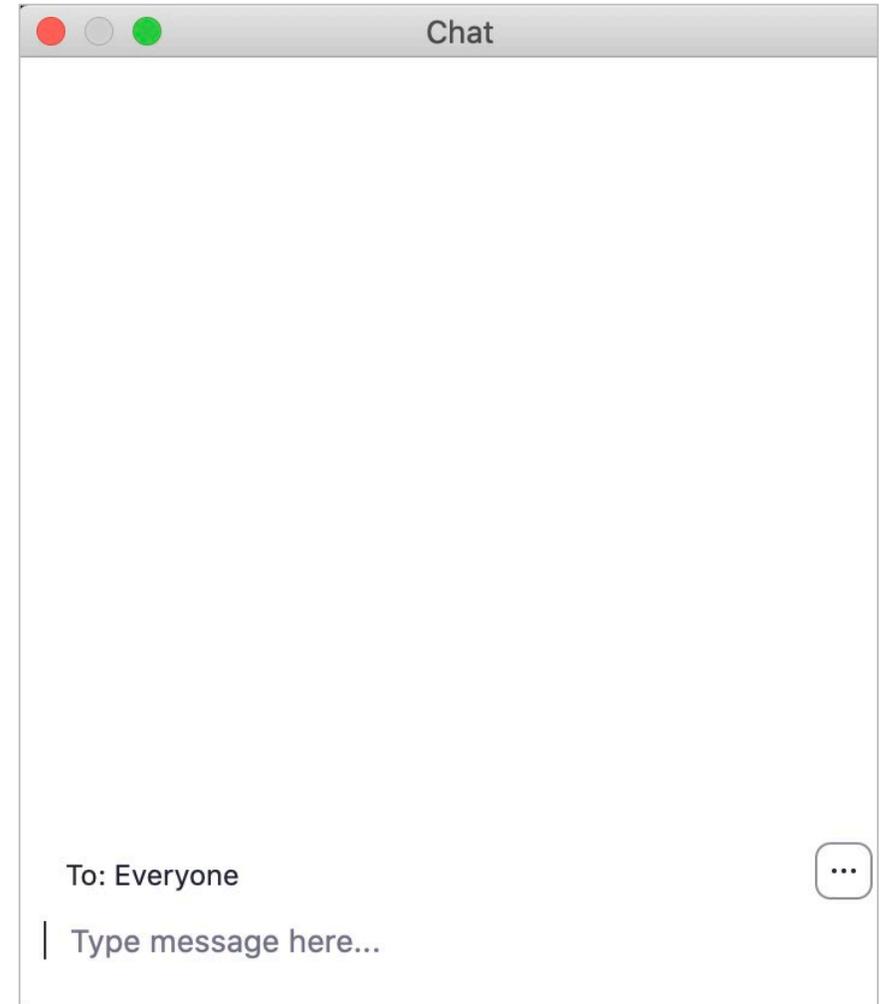
Specific issues the sponsor is interested in include:

- Studying the behavior of non-contractual customers to optimize sales and pricing
- Identifying customers' willingness to pay
- Identifying the best structure and approach to dynamic pricing for different types of customers, and determining the best pricing structure for each
- Identifying strategies for B2B value-based pricing in the long-term

Questions?

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About the Data

The Process



Customer Accepts

(OR) Negotiates

(revised quotes cannot be connected)



Quote converted into Order and seen in transactions data

(no reliable way to connect an accepted quote with transaction)



Sometimes the Quote is merely accepted and the AE records this in a customer-specific price list, which is applied to a later purchase

The Process



Order is entered by the AE / store salesperson for that Account and details of the Party Site to deliver to and the quantity are noted



Order is shipped



Order is delivered to the specific Party Site

About the Data

Researchers will be provided with 3 years of data, including product transactions from invoices and price quotes/offers for the products sold

- Transactions from Invoices: Individual line items from invoices
- Price Quotes/Offers: Individual price quotes for the products

** Sample code to load and join the data will also be provided!*

About the Data: Transactions from Invoices

Includes ~110,000,000 transactions from individual invoices over 3 years (01/01/2014 – 12/31/2016)

- Transactions only include line items that are cylinders
- Transactions include both recurring and non-recurring orders

** All dates are offset.*

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- Transactions only include line items that are cylinders
- Transactions include both recurring and non-recurring orders

Here are some other stats -- the data includes:

- ~797,000 unique invoices
- ~66,000 unique accounts (which are the customers)
- ~420 unique products

** All dates are offset.*

About the Data: Transactions from Invoices

Includes ~110,000,000 transactions from individual invoices over 3 years (01/01/2014 – 12/31/2016)

Some of the important attributes include:

- Account number
- Invoice number
- Product and hierarchies
- Date of transaction
- Region and territory
- Price for the product
- Quantity sold
- Total price paid
- The ID for the sales rep who is responsible for the account

Other stats:

- Includes ~797,000 unique invoices
- Includes ~66,000 unique accounts
- Includes ~420 unique products

* All dates are offset.

About the Data: Transactions from Invoices Snapshot

Here we see a snapshot of the transactions data

- Each row represents a single line item for an invoice
- The highlighted rows are line items for the same invoice

	Account Number	Product Number	Invoice Number	Date_x	Net Invoice Amount	Net Invoice Quantity	Average Selling Price	Territory	Sales_Person
0	123452	9588	66939984	2014-06-16	20816.7876	2	10408.3938	97	217
1	123452	40965	66939984	2014-06-16	8678.4096	2	4339.2048	97	217
2	119472	29459	66748964	2014-05-02	2683.5144	1	2683.5144	2	265
3	119472	17118	66748964	2014-05-02	7680.1914	1	7680.1914	2	265
4	47740	30460	66176913	2014-01-17	17476.3596	2	8738.1798	42	231

Account Number Product ID Invoice Number Date of Transaction

* Only a sample of the data is represented. Awarded teams will have access to the full dataset.

About the Data: Transactions from Invoices Snapshot (cont.)

Here we see a snapshot of the transactions data

- Each row represents a single line item for an invoice
- The highlighted rows are line items for the same invoice

	Account Number	Product Number	Invoice Number	Date_x	Net Invoice Amount	Net Invoice Quantity	Average Selling Price	Territory	Sales_Person
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Annotations for row 4:

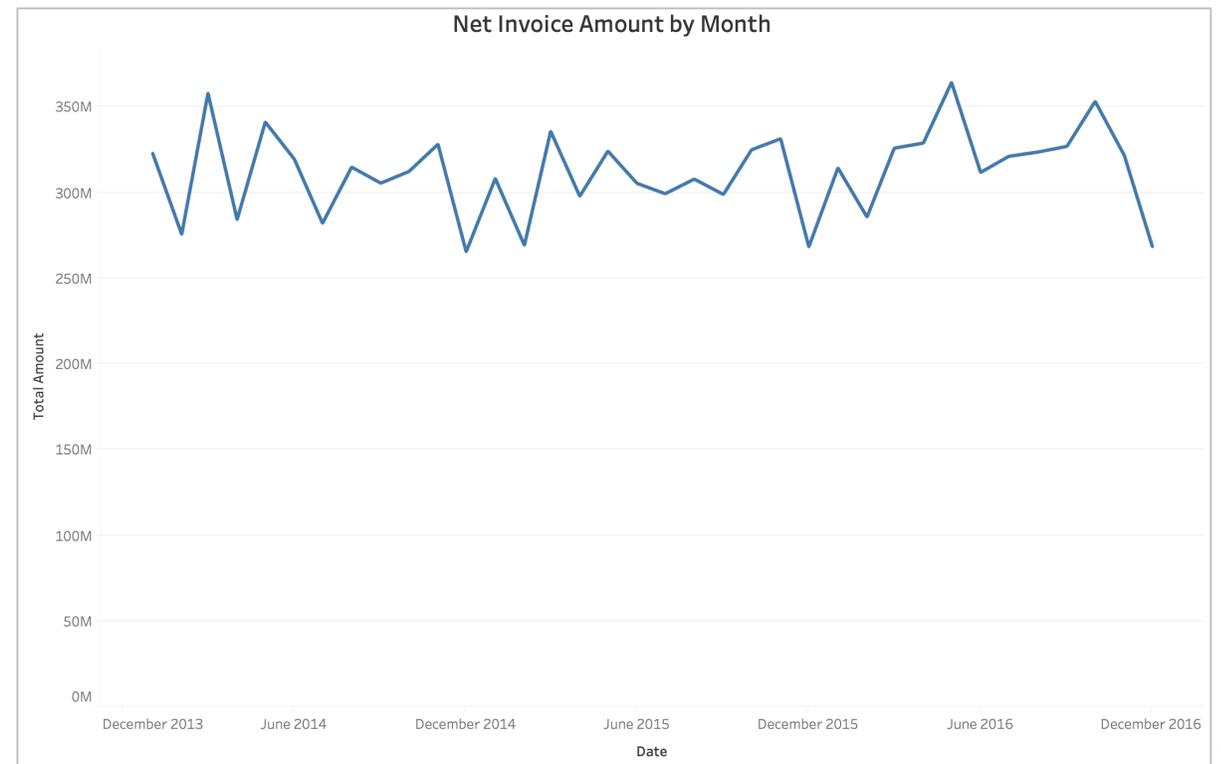
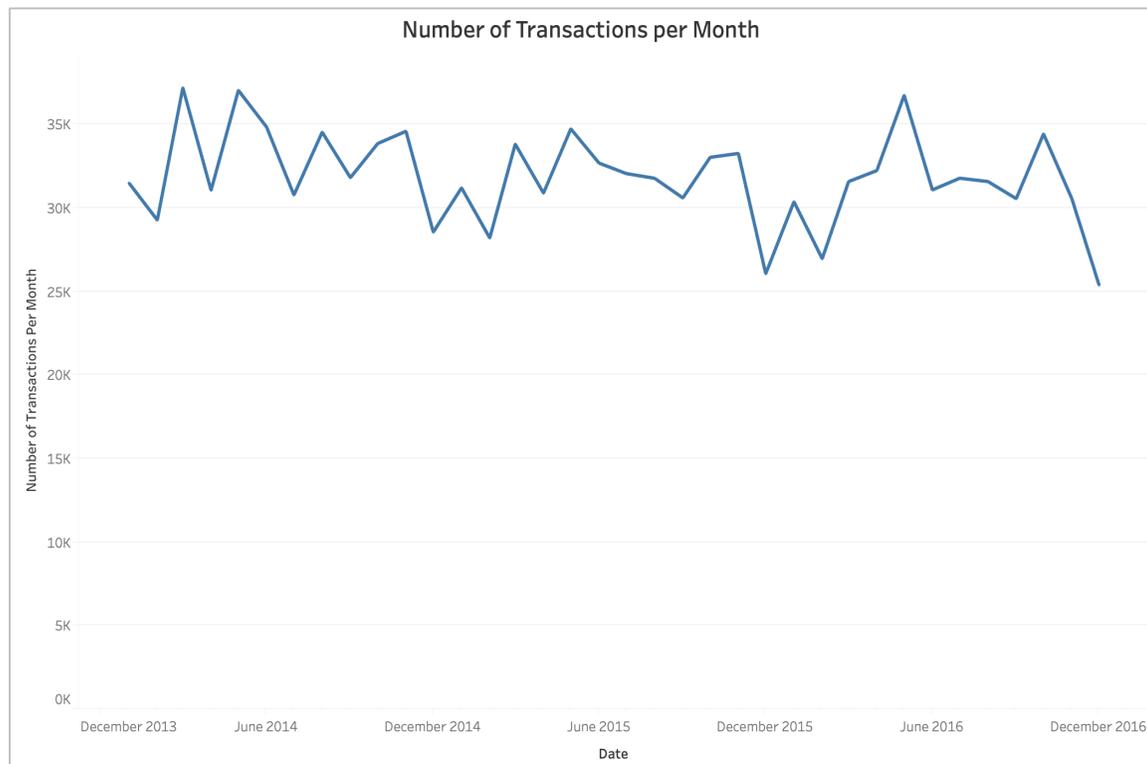
- Total Price Paid (points to Net Invoice Amount: 17476.3596)
- Quantity Sold (points to Net Invoice Quantity: 2)
- Price for the Product (points to Average Selling Price: 8738.1798)
- Territory (points to Territory: 42)
- Sales Rep ID (points to Sales_Person: 231)

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About the Data: Number of Transactions vs Net Invoice Amount By Month

This shows the distribution of transactions and net invoice amount over the 3-year period (01/01/2014 – 12/31/2016)

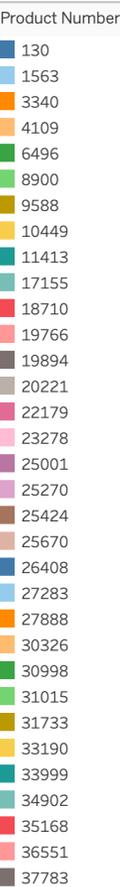
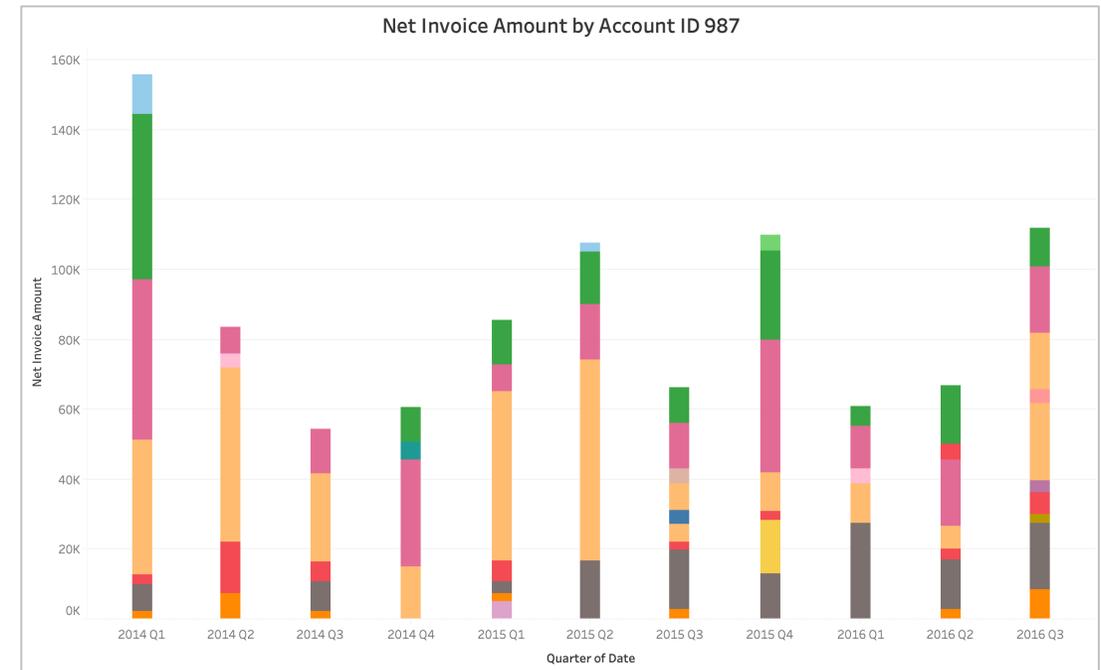
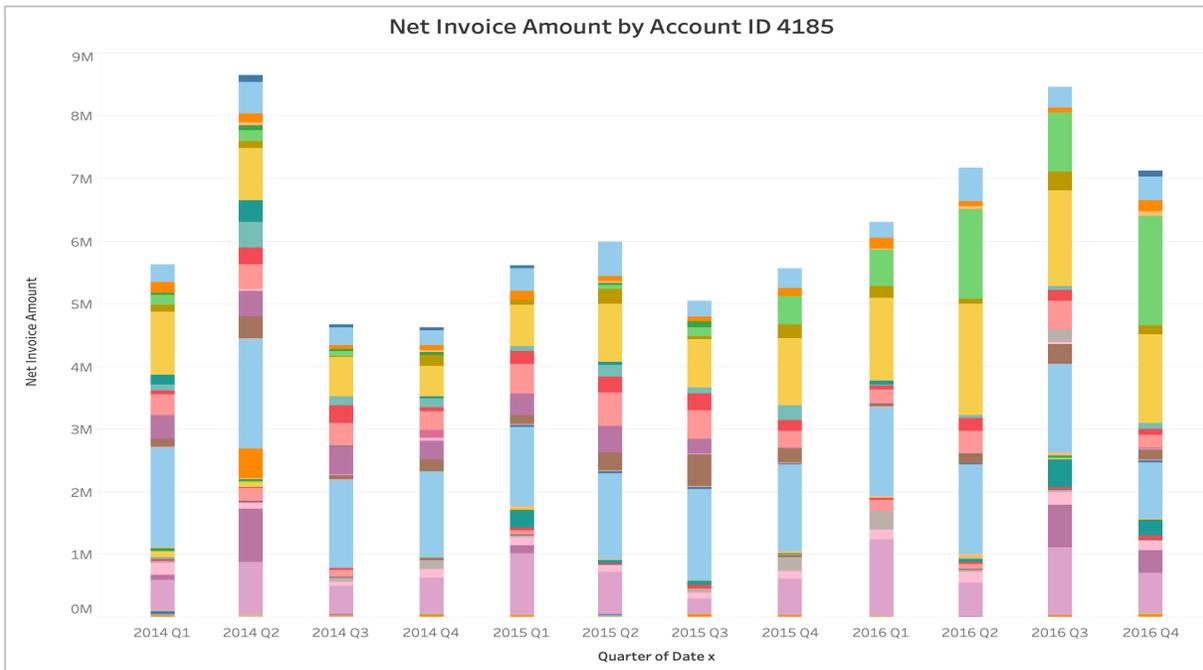
- On the left we see the number of transactions, and on the right we see the total sales for those transactions



About the Data: Net Invoice Amount Per Product By Quarter

This shows the distribution of product sales for 2 different accounts over the 3-year period (01/01/2014 – 12/31/2016)

- On the left we see the quarterly sales of 43 unique products purchased by account 4185, and on the right we see the quarterly sales of 19 unique products purchased by account 987



About the Data: Price Quotes/Offers

Includes ~918,000 price quotes/offers over 3.5 years (01/04/2013 – 05/15/2017)

- ~442,000 (~48%) price quotes/offers were accepted. (The rest were rejected.)
- ~1,487 (~3%) price quotes/offers that were accepted can be joined to corresponding invoice transactions

** All dates are offset.*

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Here are some other stats -- the data includes:

- ~22,000 unique accounts

** All dates are offset.*

About the Data: Price Quotes/Offers

Includes ~918,000 price quotes/offers over 3.5 years (01/04/2013 – 05/15/2017)

Some important attributes include:

- Account number
- Date of the price quote
- Price quoted for the product
- Quantity quoted
- Total price quoted for the invoice
- Quote status (Accepted, Draft, Inactive, Order Submitted)
- Product
- The sales Rep who created the quote

Other stats:

- Includes ~22,000 unique accounts

** All dates are offset.*

About the Data: Price Quotes/Offers Snapshot

Here we see a snapshot of the quotes data

- Each row represents a price quote for a product
- The highlighted row is a submitted quote for product 31946

ACCOUNT_NUMBER	QUOTE_CREATION_DATE	QUANTITY	TOTAL_QUOTE_AMOUNT	UNIT_SELLING_PRICE	QUOTE_STATUS	ITEM	QUOTE_CREATED_BY	
25	9963	2014-11-10	1.0	5537.9604	0.0000	Accepted	4845	146
26	9963	2014-12-19	1.0	3420.3078	1745.6250	Order Submitted	9438	146
27	9963	2014-12-19	1.0	3420.3078	1512.1302	Order Submitted	31946	146
28	9963	2015-01-05	1.0	70982.9778	31560.9000	Draft	33999	146
29	9963	2015-01-05	1.0	70982.9778	36041.9892	Draft	19766	146
30	9963	2015-02-01	2.0	49268.5200	23461.2000	Order Submitted	7289	146

Account ID

Date the Price was Quoted

Quantity

Total Price Quoted for the Invoice

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About the Data: Price Quotes/Offers Snapshot

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30	9963	2015-02-01	2.0	49268.5200	23461.2000	Order Submitted	7289	146

Price Quoted for the Product

Quote Status

Product ID

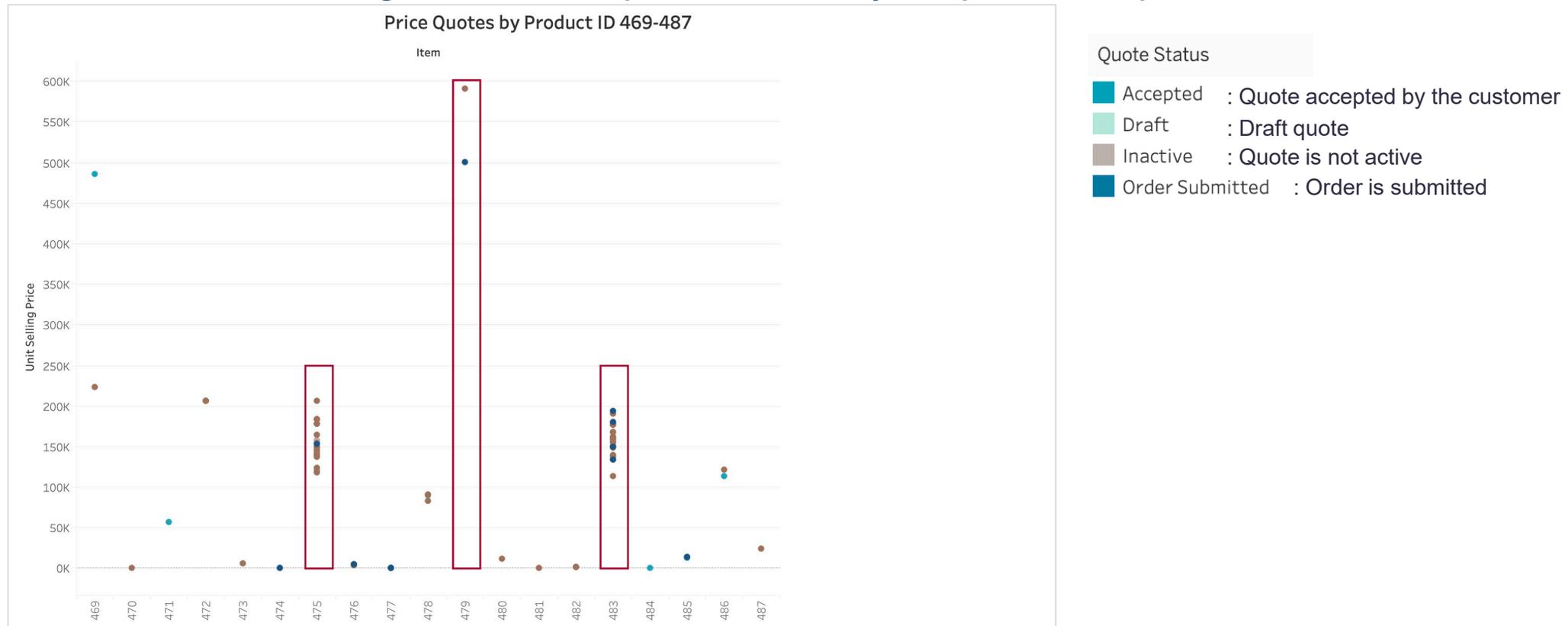
Sales Rep Who Quoted the Price

* Only a sample of the data is represented. Awarded teams will have access to the full dataset.

About the Data: All Price Quotes Per Product

This shows the price variability for a sample of products

- The vertical points represent different price quotes for the same product
- You can see a large amount of price variability for particular products



About the Data: Accepted Price Quotes Per Product

This shows the price variability for a sample of products

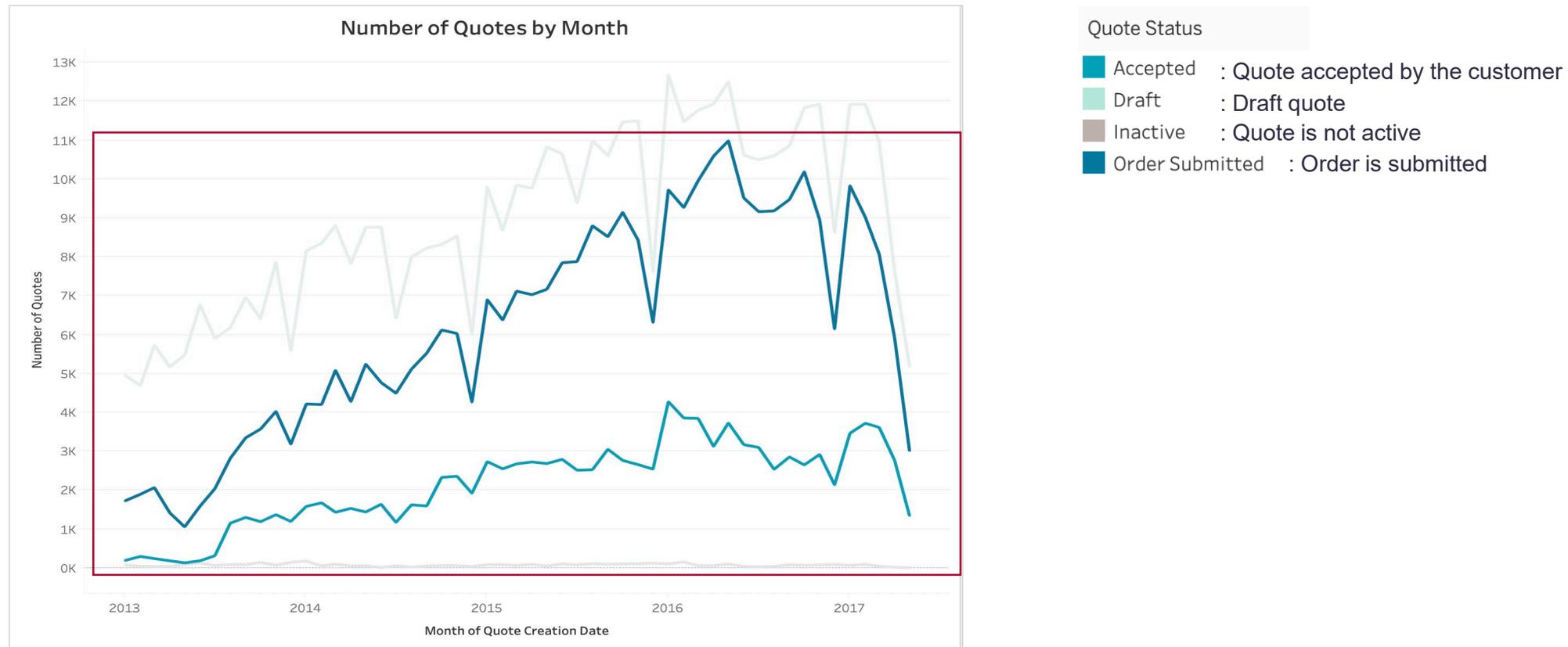
- The vertical points represent different price quotes for the same product
- Quotes with a status of “Accepted” or “Order Submitted” are considered accepted quotes



About the Data: Price Quotes/Offers Over Time

This shows the distribution of quotes over the 3.5 year period (01/04/2013 – 05/15/2017)

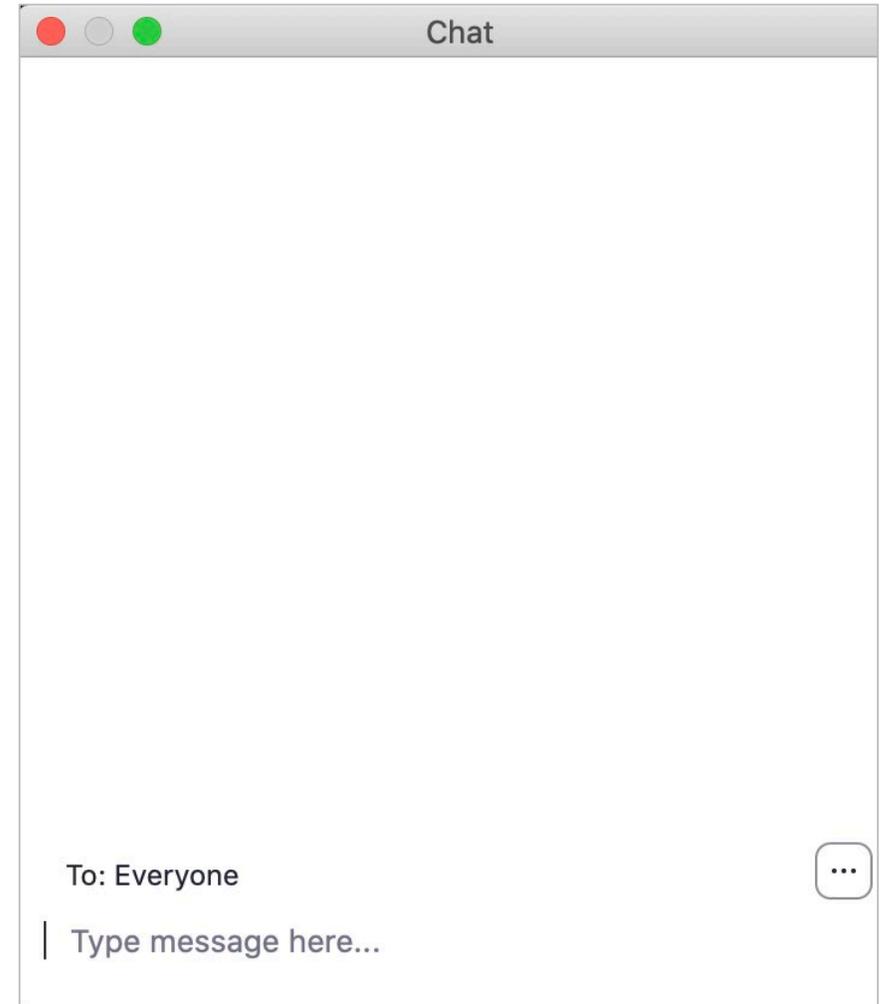
- Again, quotes with a status of “Accepted” or “Order Submitted” are considered accepted quotes



Questions?

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Researcher Proposal & Application Process

Research Proposal Format

Researchers will apply and submit a proposal online. Proposals should be in PDF format, no more than 2000 words, and include the following information:

- Title
- Author(s) name, title, affiliation and e-mail address: Please designate a corresponding author (Note: Teams are strongly encouraged, e.g. doctoral student(s) + faculty)
- Author bios: Include up to a paragraph-long biography highlighting what each team member will contribute to the project
- Abstract
- Summary information: Include a single “slide” that visually summarizes the team & project

Research Proposal Format (cont.)

Researchers will apply and submit a proposal online. Proposals should be in PDF format, no more than 2000 words, and include the following information:

- **Introduction:** Describe expected contribution(s), covering both the academic and practical aspects. Describe how you will approach the project and the key methods and ideas that you would like to bring to the table. Please keep it concise, and cite relevant work as necessary to explain your academic contribution. There is no need to include a lengthy literature review.
- **Detailed project proposal:** Please include supporting detail that will help us assess the feasibility of your approach and its compatibility with existing data
- **Data Needs:** Bulleted list of data required or requested for analysis. While we can't guarantee the inclusion of these items, we are happy to investigate the availability
- **Languages/tools:** What you propose to use and how it fits the project. (Note: There are no restrictions on software)

How to Apply

Submit your proposal here: <https://wca.wharton.upenn.edu/research/how-to-price-products-for-non-contractual-customers-in-a-b2b-setting/>

- No later than Friday, January 15th, 2021

In addition to your proposal, we will be organizing some initial (virtual) pre-selection meetings with the company

- To discuss the project opportunity
- To determine if there is a good match in interests

Please contact us at wca-research@wharton.upenn.edu if you have any questions prior to submitting your proposal

Research Proposal Selection Process

Up to two research teams will be selected for the Research Opportunities

- Teams will be granted direct access to the data
- Teams will meet regularly with the sponsor, providing opportunities to share knowledge, clarify the business context, and refine the data
- While both teams will be working on a pricing model, they will be methodologically distinct

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Timeline

- In 2-4 weeks, research proposals will be due
- Within 6 weeks, several research teams will be selected for initial (virtual) meetings with the company
- Within 9 weeks, two research teams will be selected & notified
- Within 12 weeks, the projects will kick off

Research Proposal Selection Process (cont.)

Proposals will be evaluated based on:

- Novel approach to the project problem(s)
- Academic contribution and potential to significantly improve the research sponsor's pricing strategy
- Willingness to commit to a highly collaborative project, including regular interactions
- Willingness to share all code and findings with the company
- History of academic achievement

Other Questions

Q: When will the team have access to the data?

A: When the research team is selected to be a collaborator on the research project.

Q: Will additional data be available to the awarded team?

A: Yes, there will be some internal data available, including internal KPI metrics.

Proposal Review Committee

Research teams will be selected jointly by a committee of academics and company representatives

Wharton Customer Analytics

Brandon Krakowsky
Research & Education Director

Nicole Wang-Trexler
Associate Director, Data Science & Research

Elea Feit
Senior Fellow

Mary Purk
Executive Director

Raghu Iyengar
Faculty Co-Director

Air Liquide

Chinmayee Joshi
Data Scientist

Bin Yu
International Senior Expert and Data Science Manager

Julie Drapier
Computational and Data Science Group Manager

Xi-Lucy CHEN
Data Science and Analytics Manager

As well as other external reviewers ...

Other WCA Opportunities for Researchers

If you registered for this webinar, you will receive regular announcements regarding upcoming Research Opportunities:

- Predicting Exam Outcomes Based on Test-Taker Video Cues for a Self-Regulatory Organization
- Understanding the Customer Experience & Customer Needs for a Multinational Technology Company

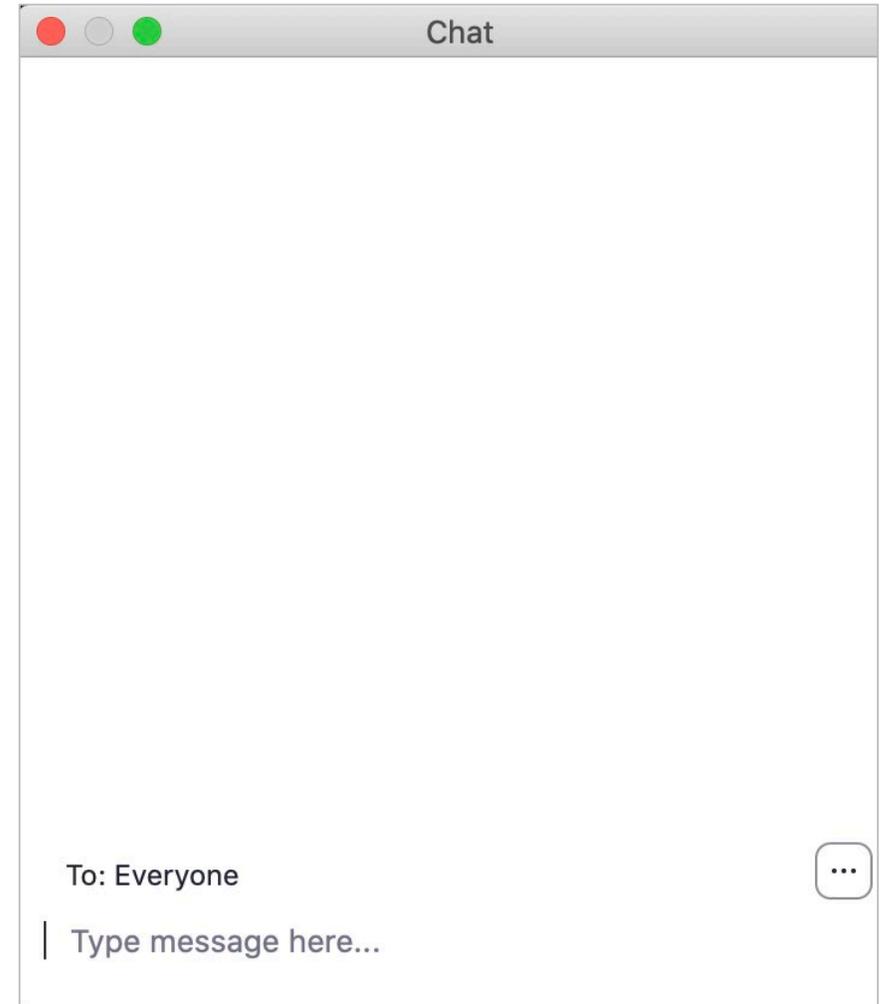
Please also find us at:

- Research Papers: <https://wca.wharton.upenn.edu/research/>
- Sign up for updates: <https://wca.wharton.upenn.edu/updates-and-stories/>
- E-mail us: wca-research@wharton.upenn.edu

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CUSTOMER ANALYTICS