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# Managing Marketing and Communication Mix in a Digital Era

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Ashish Kumar

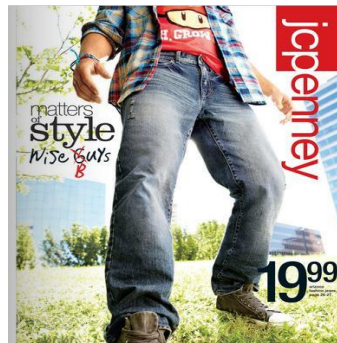
The State University of New York at Buffalo

# Motivation

The screenshot shows the JCPenney website's registration page for mobile alerts. The page has a red header with the JCPenney logo and navigation links. Below the header, there are logos for Macy's, Sephora, and HomeGoods. A red banner reads "Sign-up for Mobile Alerts". Below this, there is a form with fields for "First Name", "Last Name", "Email Address", "Phone Number", "City", "State", and "Zip Code". There are also checkboxes for "Send me offers" and "Send me coupons". At the bottom of the form, there is a "Sign Up" button and a "Cancel" button. Below the form, there is a small block of text regarding the terms of service and privacy policy.

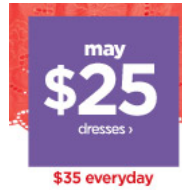


# Motivation



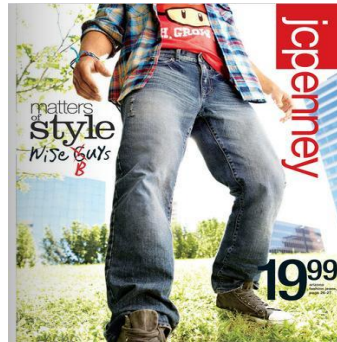


# Motivation



INBOX	
Checked items:	Delete Spam Move to...
<input type="checkbox"/>	Sender Subject
<input type="checkbox"/>	Neiman Marcus Santa forget something? Today's Midda
<input type="checkbox"/>	Office Depot Shirts & Socks Again? Get What You Re
<input type="checkbox"/>	jcp Rob Preston Don't miss these
<input type="checkbox"/>	PayPal Robert, it's not too late to make a differ
<input type="checkbox"/>	InformationWeek Anal iPad in the Enterprise   2011 Forecast: II

save more on the things you need now. jcp month-long values are 20-30% lower than our already great everyday prices. no coupons required.



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# Research Agenda

- Framework for Marketing and Communication Mix in a Multichannel Environment
    - Evaluate the Effectiveness of Marketing/Communication Mix
    - Study Customers' Channel Choice Behavior
    - Explore the Effectiveness of Digital Media Marketing
  - Efficient Allocation of Marketing Budgets
-

# Dissertation: Three Essays

#	Title
1	Investigating the Impact of Multiple Marketing and Communication Mix in a Multichannel Environment
2	The Role of Communication Media, Marketing Mix and Consumer Intrinsic Variables on Channel Choice
3	What Makes Emails Click: The Impact of Electronic Media on Consumer Choice in an Integrated Marketing Environment

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# **Investigating the Impact of Multiple Marketing and Communication Mix in a Multichannel Environment**

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# Research Agenda

- **Effects of Marketing and Communication Mix**
    - Marketing Activities
      - Price
      - Promotions
    - Multiple Communication Methods
      - Traditional (e.g., television)
      - New (e.g., emails)
    - Interactions & Dynamics
-

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# Research Agenda

- **Effects of Marketing and Communication Mix**
    - Marketing Activities
      - Price
      - Promotions
    - Multiple Communication Methods
      - Traditional (e.g., television)
      - New (e.g., emails)
    - Interactions & Dynamics
  - **Consumer Decisions**
    - Channel Choice (*where to buy*)
    - Category Incidence (*whether/ what to buy*)
    - Quantity/Order-size Decision (*how much to buy*)
    - Multiple Categories
-

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# Background

## ■ Channel Comparisons

- Channel and Consumer Characteristics (*Balasubramanian, Raghunathan and Mahajan 2005; Burke 2000*)
- Category Characteristics (*Chu , Chintagunta and Cebollada 2008; Chintagunta, Chu and Cebollada 2012*)
- Channel Dynamics (*Ansari, Mela and Neslin 2007*)

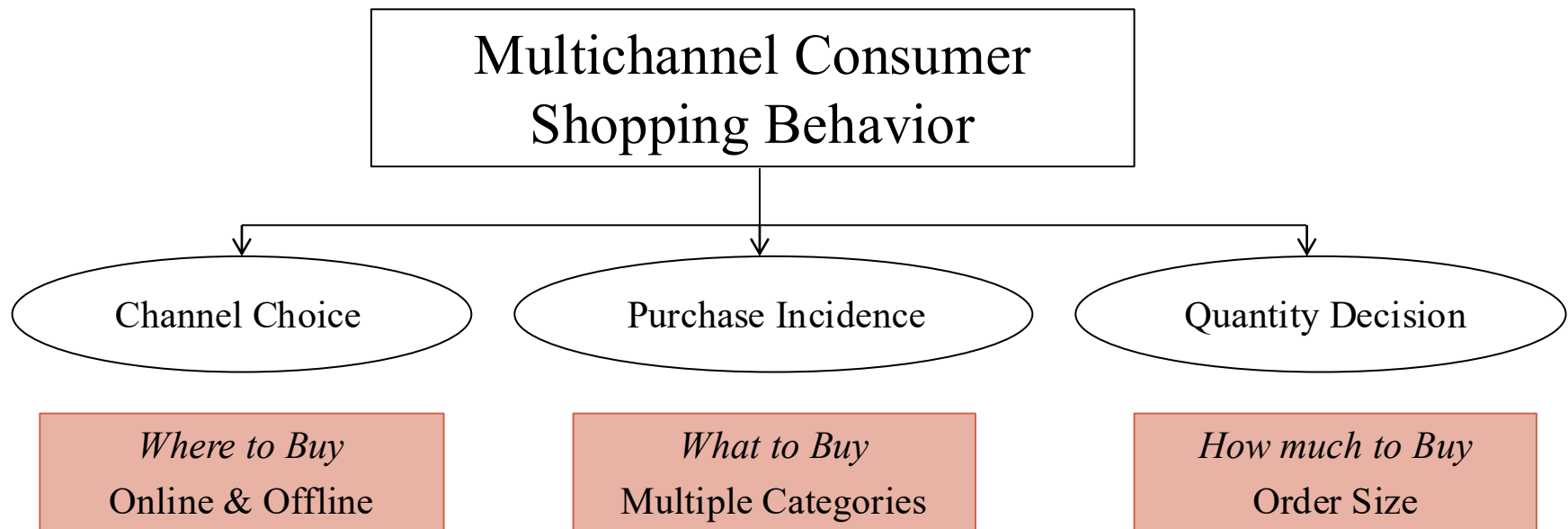
## ■ Role of Communication (traditional) Media

- *Verhoef and Donkers (2005); Thomas and Sullivan (2005); Villanueva, Yoo and Hanssens (2008)*

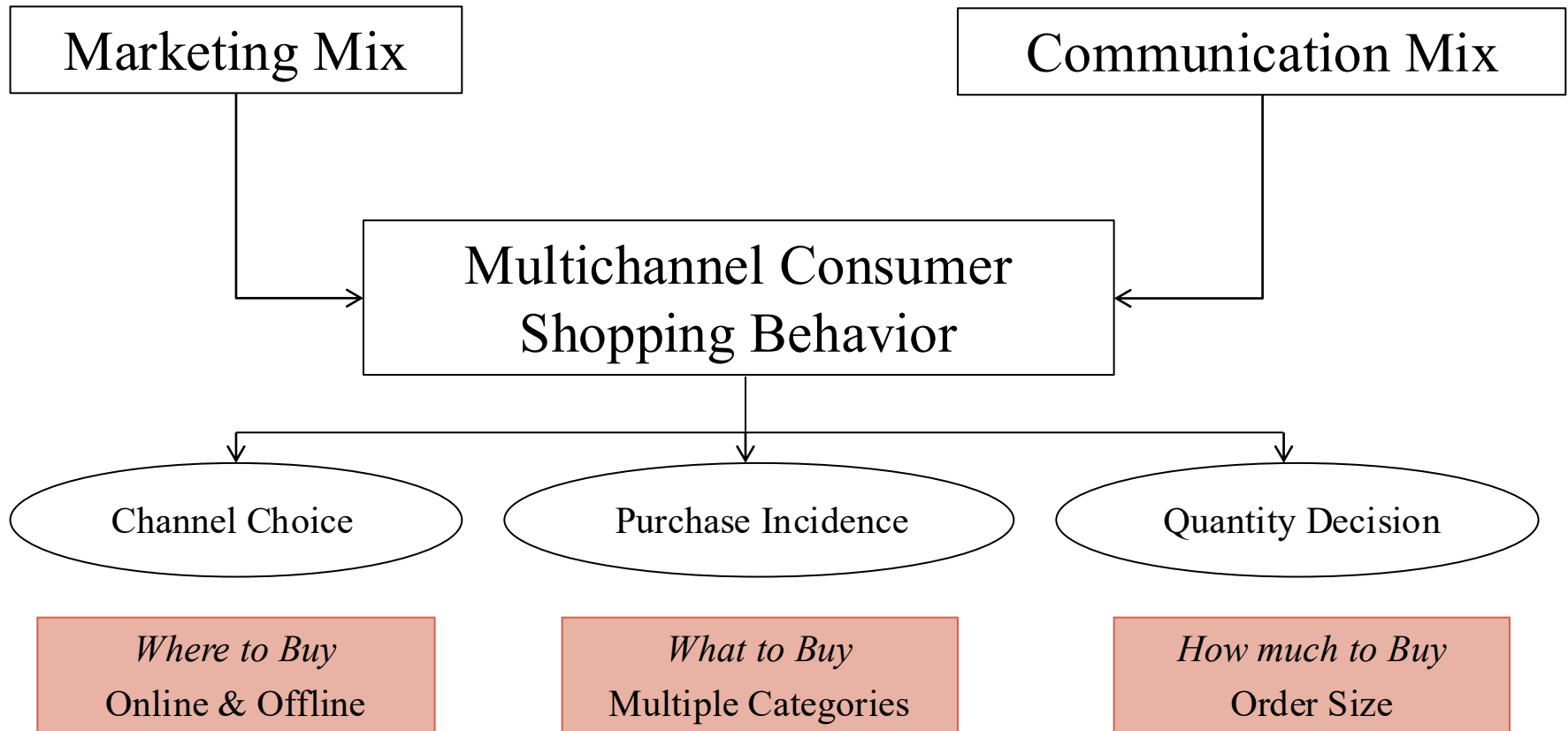
## ■ Optimal Resource Allocation

- *Kushwaha and Shankar (2008)*
-

# Conceptual Framework



# Conceptual Framework



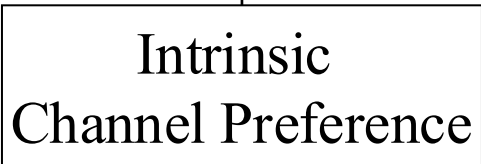
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# Model: Channel Choice

Consumer  $h$  selecting channel  $c$  at time  $t$   
(Binary Choice)

$$Z_{ct}^h = \rho_c^h + \kappa_c^h D_{ct}^h + \pi_c^h T_{ct}^h + \varphi_c^h P_{ct}^h + \tau_c^h F_{ct}^h + \eta_{ct}^h$$

Intrinsic  
Channel Preference



# Model: Channel Choice

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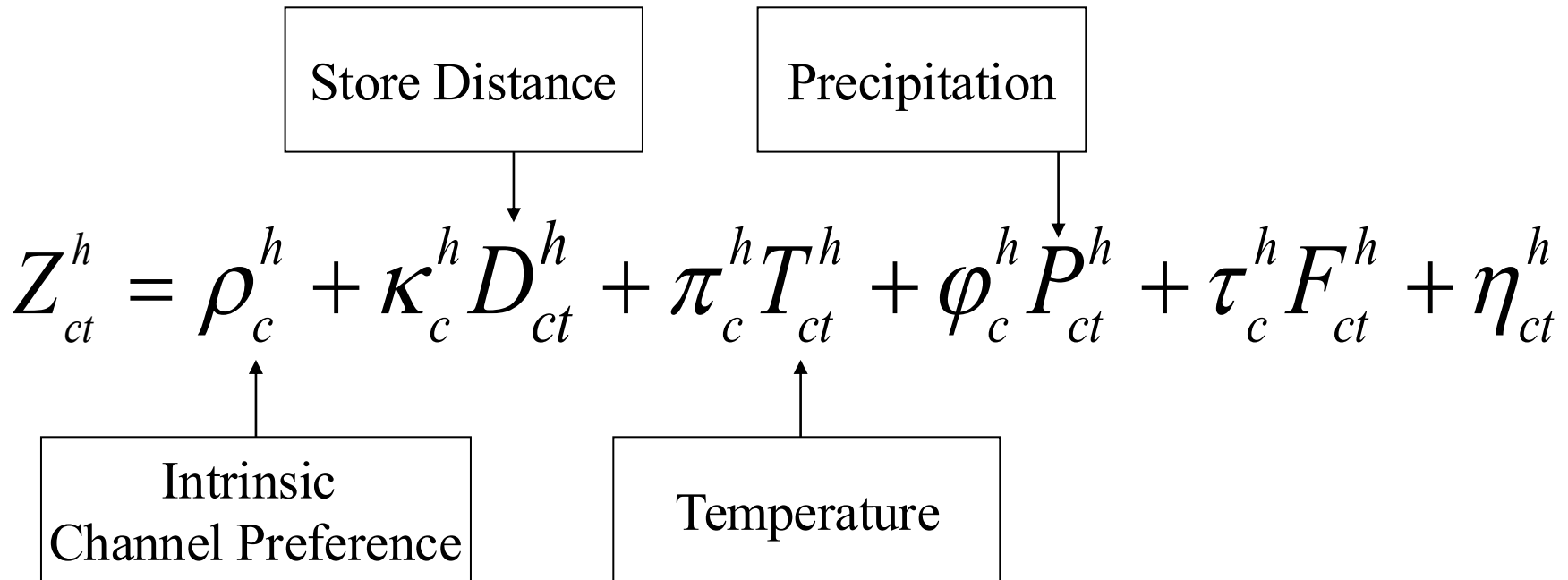
Store Distance

$$Z_{ct}^h = \rho_c^h + \kappa_c^h D_{ct}^h + \pi_c^h T_{ct}^h + \varphi_c^h P_{ct}^h + \tau_c^h F_{ct}^h + \eta_{ct}^h$$

Intrinsic  
Channel Preference

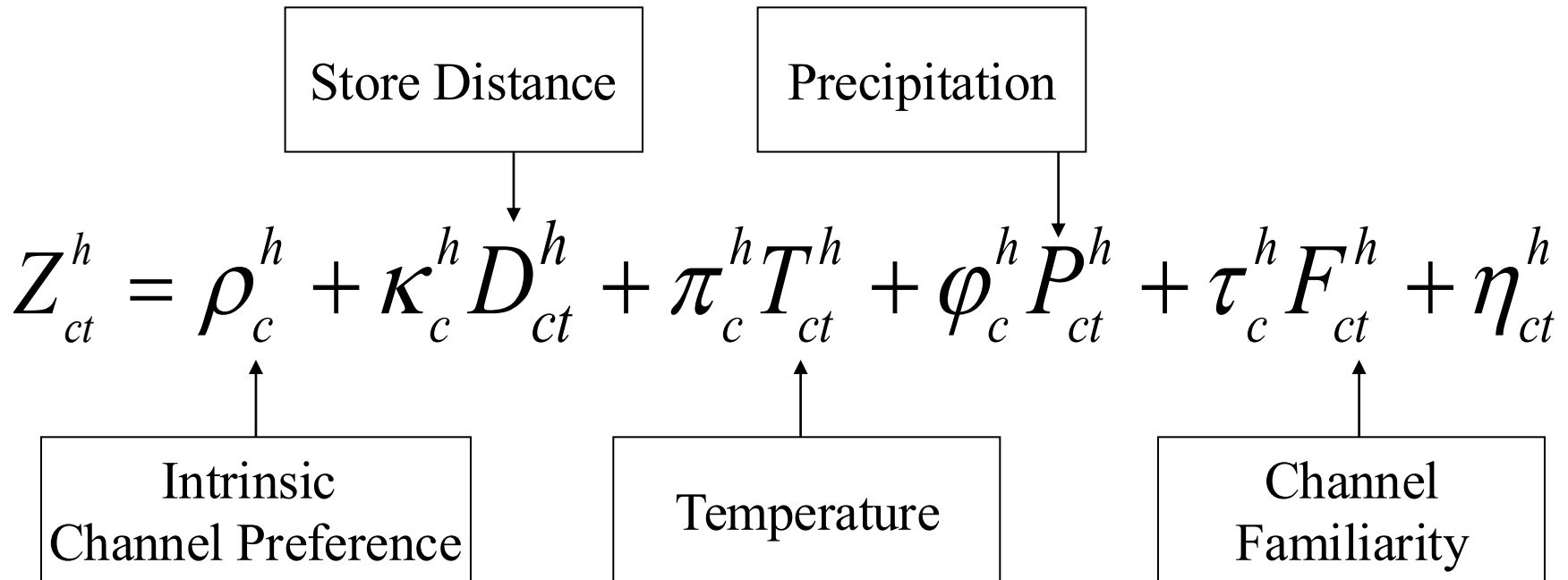
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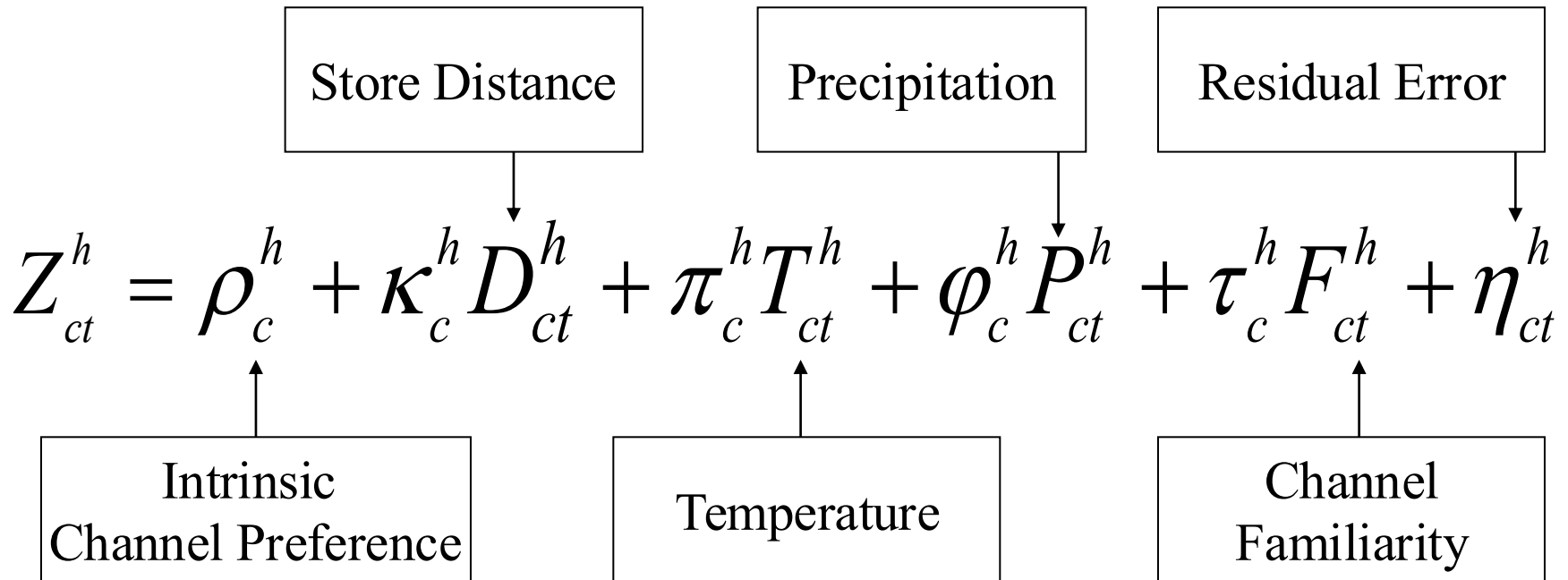
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# Model: Category Incidence

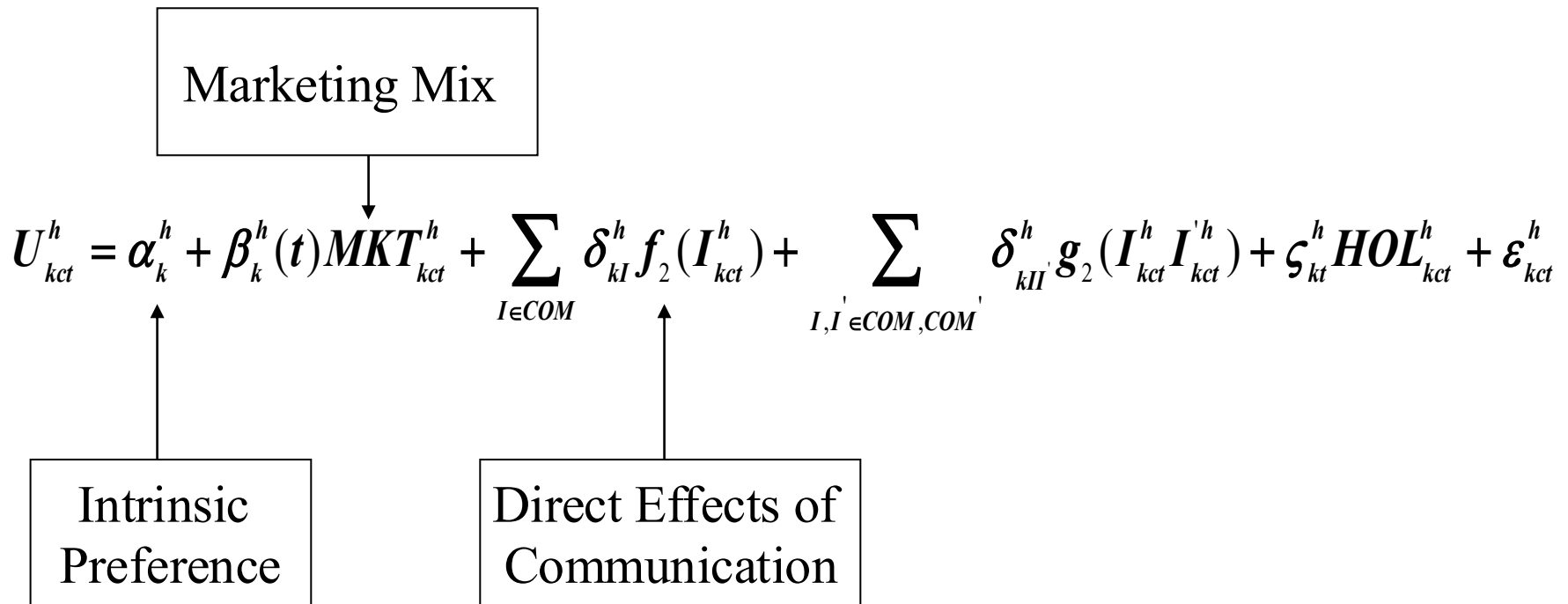
Consumer  $h$  purchasing in category  $k$  using channel  $c$  at time  $t$  (Multivariate Choice)

The diagram illustrates the components of the utility function  $U_{kct}^h$ . A box labeled "Marketing Mix" has a downward arrow pointing to the  $MKT_{kct}^h$  term in the equation. A box labeled "Intrinsic Preference" has an upward arrow pointing to the  $\alpha_k^h$  term in the equation.

$$U_{kct}^h = \alpha_k^h + \beta_k^h(t)MKT_{kct}^h + \sum_{I \in COM} \delta_{kI}^h f_2(I_{kct}^h) + \sum_{I, I' \in COM, COM'} \delta_{kII'}^h g_2(I_{kct}^h I_{kct}'^h) + \zeta_{kt}^h HOL_{kct}^h + \varepsilon_{kct}^h$$

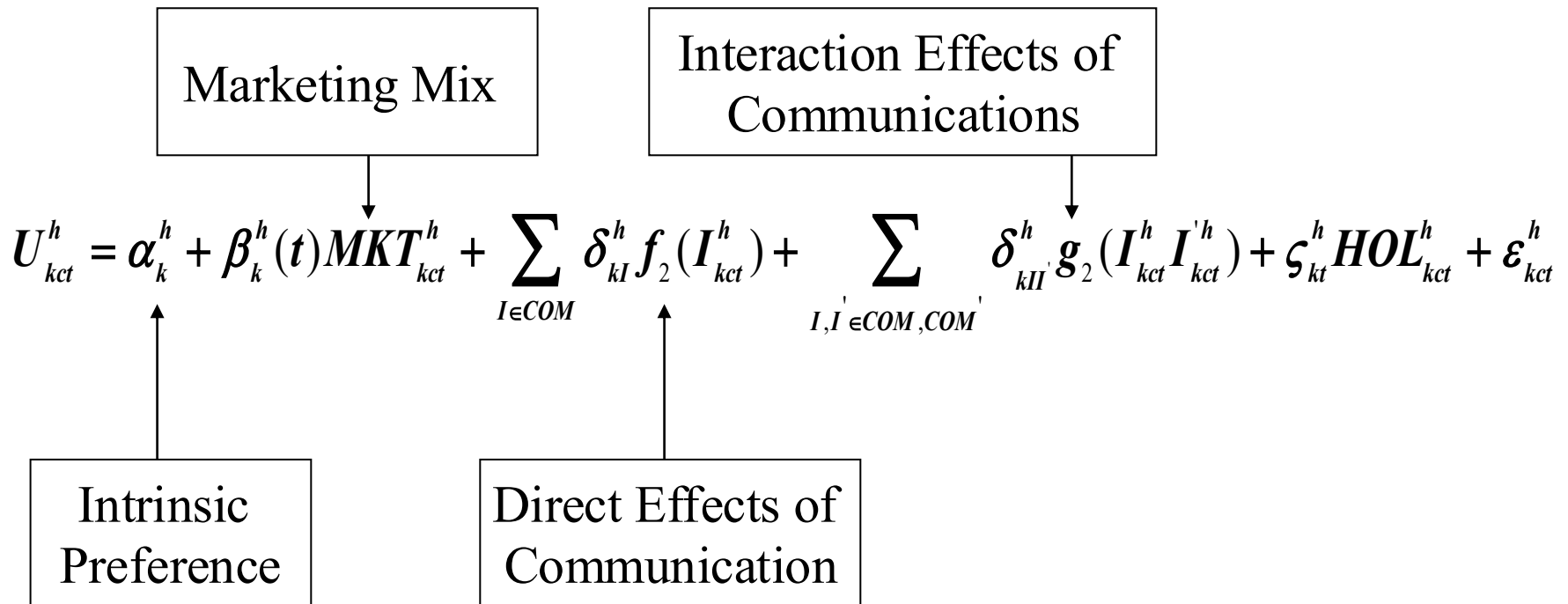
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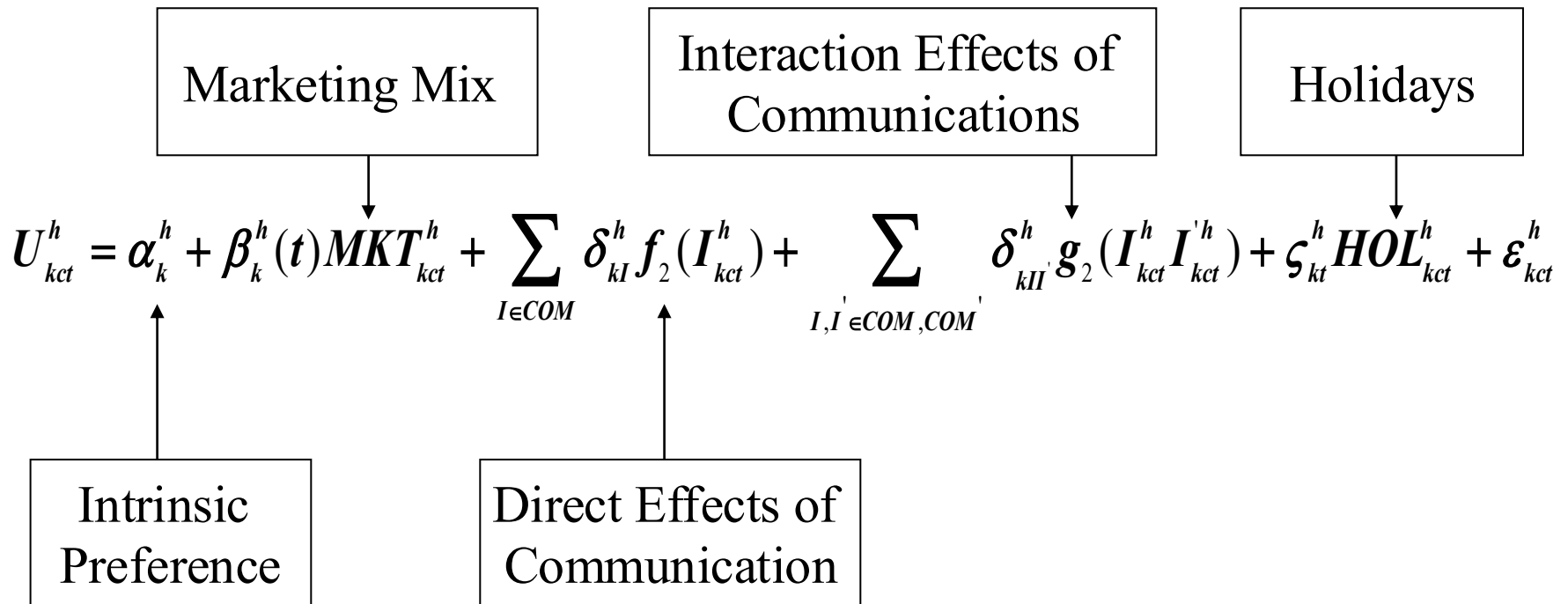
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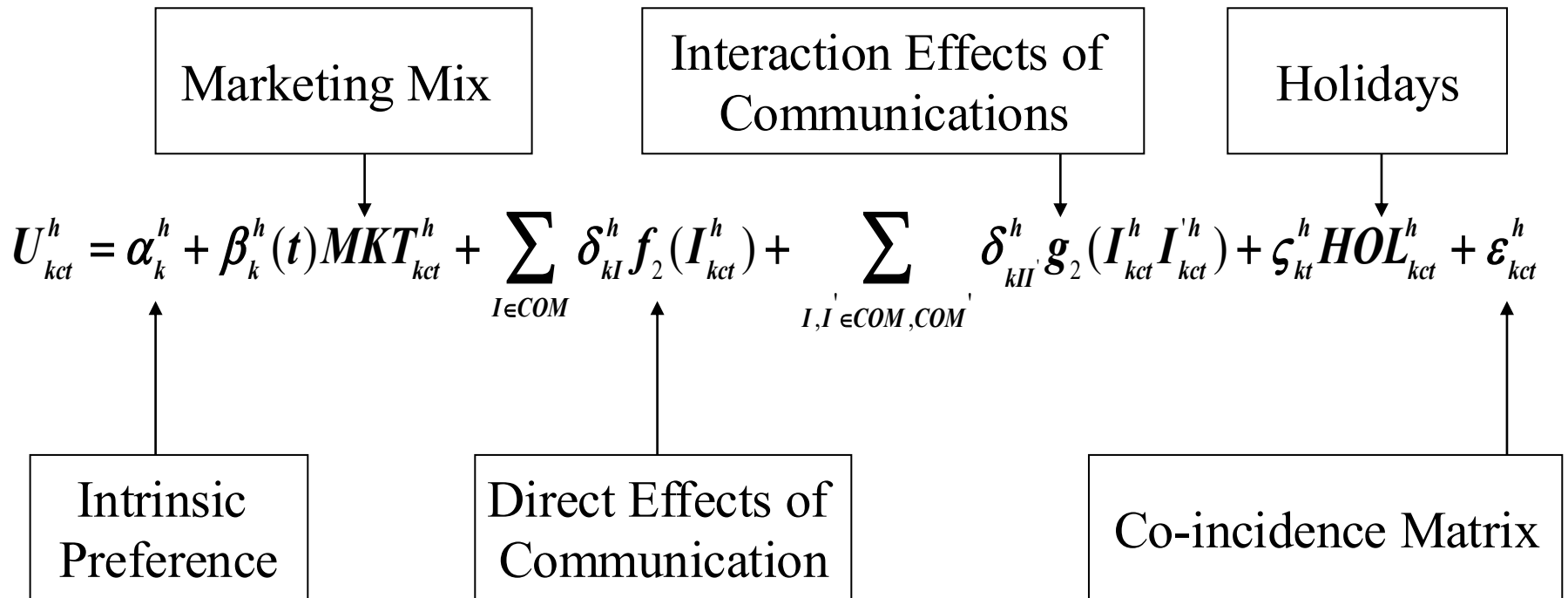
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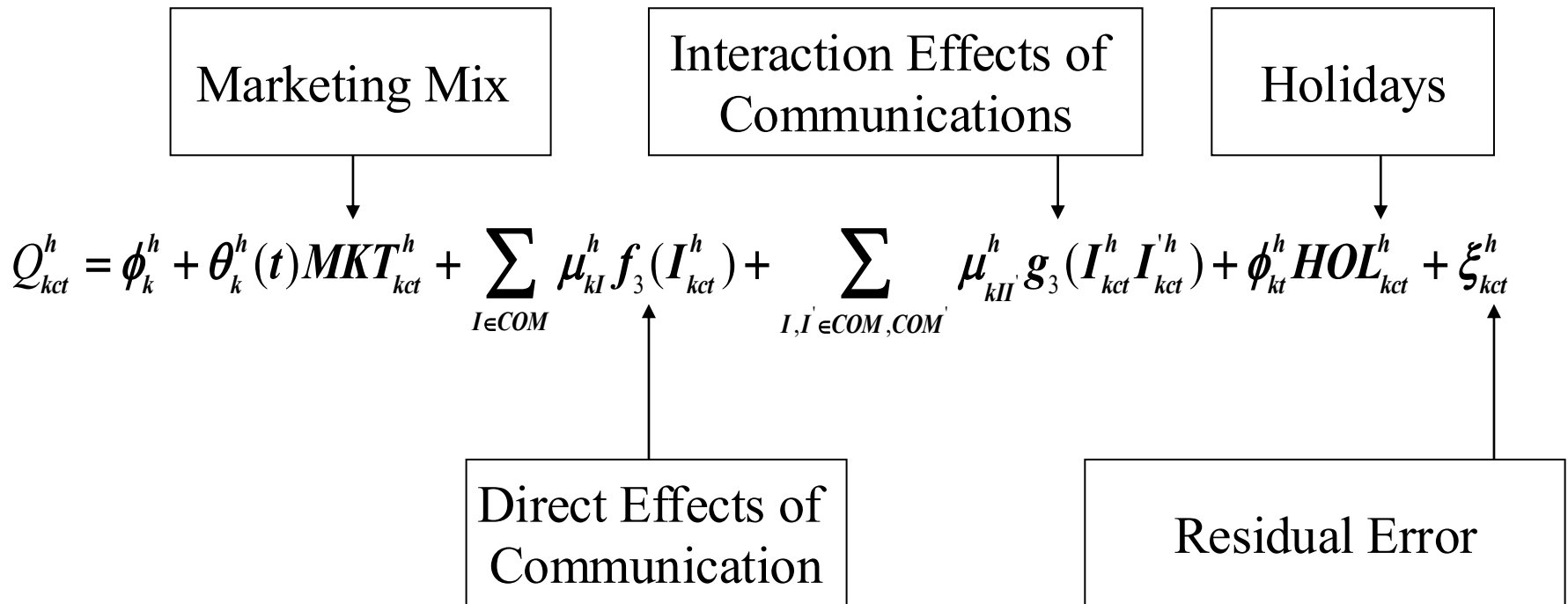
# Model: Category Incidence

Consumer  $h$  purchasing in category  $k$  using channel  $c$  at time  $t$  (Multivariate Choice)



# Model: Quantity Decision

Consumer  $h$  purchasing in category  $k$  using channel  $c$  at time  $t$  (*Quantity Decision*)



# Model: Communication Dynamics (Decay and Stock)

$$\delta_{kl}^h f_2(I_{kct}^h) = \delta_{kl}^h \sum_{i \in I} \lambda_{Ik}^{r_{hit}} d_{hit}$$

Coefficient of Communication  $I$

'Decay' effect

Indicator

# of periods elapsed

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'Decay' effect

Indicator

# of periods elapsed

Logit Transformation

$$\lambda_{Ik} = \frac{\exp(\omega_{Ik})}{1 + \exp(\omega_{Ik})}$$

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Coefficient of Communication  $I$

'Decay' effect

Indicator

# of periods elapsed

Logit Transformation

$$\lambda_{Ik} = \frac{\exp(\omega_{Ik})}{1 + \exp(\omega_{Ik})}$$

Interactions

$$\delta_{kII'}^h g_1(I_{kct}^h I_{kct}^{h'}) = \delta_{kII'}^h \sum_{i, i' \in I, I'} \lambda_{Ik}^{r_{hit}} \lambda_{I'k}^{r_{hi't}} d_{hit} d_{hi't}$$

# Model: Marketing Mix Dynamics

Category Incidence

$$\beta_k^h(t) = \beta_{0k}^h + \beta_{1k}^h \ln(\text{CatExp}_{kt}^h)$$

Base Sensitivity

Category Experience

# Model: Marketing Mix Dynamics

Category Incidence

$$\beta_k^h(t) = \beta_{0k}^h + \beta_{1k}^h \ln(\text{CatExp}_{kt}^h)$$

Base Sensitivity

Category Experience

Quantity Decision

$$\theta_k^h(t) = \theta_{0k}^h + \theta_{1k}^h \ln(\text{CatExp}_{kt}^h)$$

# Model: Other Details

## ■ Heterogeneity

$$\Phi_{kct}^h = [\rho_c^h, \alpha_k^h, \phi_k^h]'$$

$$\Phi_{kct}^h = \gamma_{kc} + \Gamma G_t^h + \eta_{kct}^h$$

## ■ Error Structure

$$[\varepsilon_{kct}^h, \xi_{kct}^h, \eta_{ct}^k] \sim MVN(0, \Sigma)$$

$$\begin{bmatrix} 1 & \sigma_{11} & 0 & 0 & \sigma_{31} \\ \sigma_{11} & 1 & 0 & 0 & \sigma_{32} \\ 0 & 0 & 1 & \sigma_{22} & \sigma_{33} \\ 0 & 0 & \sigma_{22} & 1 & \sigma_{34} \\ \sigma_{31} & \sigma_{32} & \sigma_{33} & \sigma_{34} & 1 \end{bmatrix}$$

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# Model: Observed and Latent Relationship

- Channel Choice: Binary Probit

$$z_{ct}^h = \begin{cases} 1 & \text{if } Z_{ct}^h > 0 \\ 0 & \text{otherwise} \end{cases}$$

# Model: Observed and Latent Relationship

- Channel Choice: Binary Probit

$$z_{ct}^h = \begin{cases} 1 & \text{if } Z_{ct}^h > 0 \\ 0 & \text{otherwise} \end{cases}$$

- Incidence and Quantity: Type II Tobit

$$y_{kct}^h = \begin{cases} 1 & \text{if } U_{kct}^h > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$q_{kct}^h = \begin{cases} \exp(Q_{kct}^h) & \text{if } U_{kct}^h > 0 \\ 0 & \text{otherwise} \end{cases}$$

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# Model Estimation

- Bayesian Inference using MCMC Methods
  - Conjugate Priors for the Parameters
  - MH-algorithm for Drawing Decay Parameters
  - 50,000 Draws with a Burn-in of 40,000
-

# Data

- Wine and Spirits
- Wine, Spirits and Liquor (WSL) Sold only in Special Licensed (Private) Stores
  - Can Ship only In-State
  - Cannot Sell Beer
  - Supermarkets Cannot Sell WSL Products
- Returns of WSL Products not Permitted



# Data: (2)

- Scanner Data from a Retailer in NY state
  - January 2008 to July 2010

- Two Main Categories

- Wines
- Spirits



- Both Offline/Online Consumers

- Pure Offline (400)
- Pure Online (50)
- Online and Offline (50)

# Data: (3)

## ■ Communication Mix Variables

### ■ Traditional

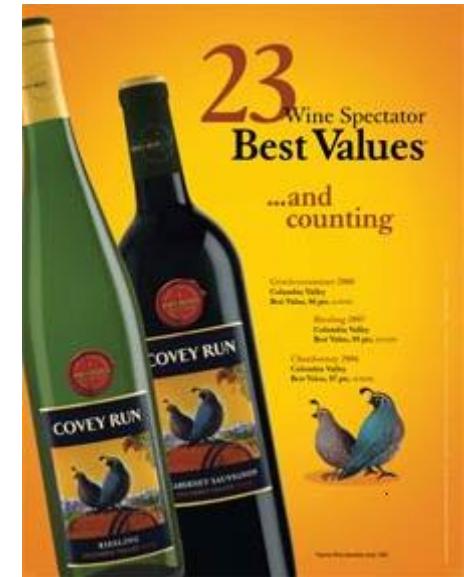
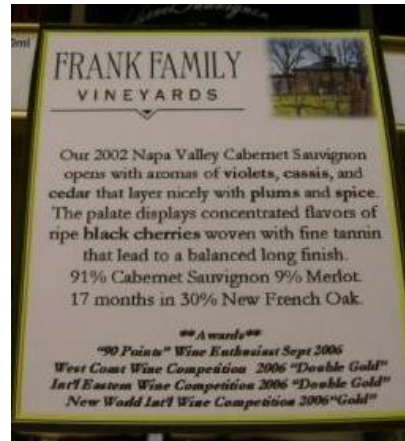
- Catalogs
- Newspaper
- Television
- Radio

### ■ New

- Email
- Educational Programs
- Informational Shelf Talkers (IST's)
- Web Advertisements

## ■ Marketing Mix Variables

- Price
- Various Promotions



# Data Descriptive

- Pairwise Category Incidences

	Wine	Spirit
Wine	6,830	...
Spirit	3,771	2,804

- Purchase Quantity

	Mean	Median	SD
Wine (ml)	3,273	1,500	2,978
Spirit (ml)	1,170	750	1,374

# Data Descriptive: (2)

## ■ Marketing Mix

Category	Price (\$/ml)	Promotion Depth (%)
Wine	0.015	40.82
Spirit	0.021	37.04

## ■ Communication Mix

Variable	Mean	SD
Emails (per month)	6.17	1.74
Catalog (per year)	3.93	0.57
Educational Prog. (per month)	3.12	4.66
Newspaper Ad (per week)	2.02	1.06

# Results – Channel Choice

	Offline Channel
	Posterior Mean
Intercept ( $\rho_c^h$ )	<b>-0.69</b>
Store Distance ( $\kappa_c^h$ )	<b>-0.17</b>
Temperature ( $\pi_c^h$ )	<b>0.26</b>
Precipitation ( $\varphi_c^h$ )	<b>-0.31</b>
Channel Familiarity ( $\tau_c^h$ )	<b>0.10</b>

\*Significant estimates are denoted in boldface

# Results – Marketing Mix

	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Intercept	<b>3.48</b>	<b>2.82</b>	<b>4.89</b>	<b>1.82</b>
Price	<b>-5.20</b>	<b>-5.58</b>	<b>-3.18</b>	<b>-3.83</b>
Promotion	<b>3.22</b>	<b>0.49</b>	<b>2.01</b>	<b>0.47</b>
Holidays	<b>0.28</b>	<b>0.18</b>	<b>0.14</b>	<b>0.10</b>

\*Significant estimates are denoted in boldface

# Results – Communication Mix

	Incidence		Order Size	
	Wine	Spirit	Wine	Spirit
Email	0.68	0.80	1.01	0.69
Catalog	<b>0.42</b>	<b>0.39</b>	<b>2.61</b>	<b>2.28</b>
EduProg	<b>0.18</b>	-0.15	<b>2.27</b>	-1.67
Newspaper	<b>1.18</b>	<b>1.11</b>	<b>0.27</b>	<b>0.23</b>
Television	<b>1.01</b>	<b>4.77</b>	<b>0.94</b>	<b>0.75</b>
Radio	<b>1.54</b>	<b>1.86</b>	<b>0.37</b>	<b>0.18</b>
ISTs	<b>0.61</b>	<b>0.59</b>	<b>0.65</b>	<b>0.57</b>
Web-Ads	<b>4.52</b>	<b>0.55</b>	<b>0.91</b>	<b>0.50</b>

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\*Significant estimates are denoted in boldface

# Results – Communication Mix: Interactions

	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Email-Email	<b>0.61</b>	<b>0.60</b>	<b>2.19</b>	<b>1.63</b>
Cat-Cat	0.99	0.24	1.37	0.26
Edu-Edu	0.13	-1.14	0.85	0.65
Tel-Tel	<b>2.90</b>	<b>3.13</b>	<b>3.60</b>	<b>2.63</b>
Email-Cat	1.74	-1.61	0.07	0.11
Cat-News	<b>0.21</b>	-0.18	<b>0.05</b>	<b>0.05</b>
Tel-Email	<b>0.88</b>	<b>0.87</b>	<b>0.42</b>	<b>0.32</b>
Tel-Cat	<b>4.96</b>	<b>4.81</b>	<b>1.21</b>	<b>0.95</b>
Tel-News	<b>0.48</b>	<b>0.48</b>	<b>0.12</b>	<b>0.09</b>

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# Results – Communication Mix: Interactions

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Edu-Edu	0.13	-1.14	0.85	0.65
Tel-Tel	<b>2.90</b>	<b>3.13</b>	<b>3.60</b>	<b>2.63</b>
Email-Cat	1.74	-1.61	0.07	0.11
Cat-News	<b>0.21</b>	-0.18	<b>0.05</b>	<b>0.05</b>
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Tel-News	<b>0.48</b>	<b>0.48</b>	<b>0.12</b>	<b>0.09</b>

\*Significant estimates are denoted in boldface

# Results – Dynamics

Communication Mix: Decay Parameters				
	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Email	<b>0.19</b>	<b>0.12</b>	<b>0.49</b>	<b>0.47</b>
Catalog	<b>0.35</b>	<b>0.43</b>	<b>0.40</b>	<b>0.49</b>
EduProg	<b>0.84</b>	<b>0.11</b>	<b>0.50</b>	<b>0.45</b>
Newspaper	<b>0.67</b>	<b>0.66</b>	<b>0.43</b>	<b>0.52</b>
Television	<b>0.25</b>	<b>0.23</b>	<b>0.51</b>	<b>0.53</b>
Radio	<b>0.21</b>	<b>0.20</b>	<b>0.45</b>	<b>0.56</b>

Marketing Mix: Dynamics (Posterior Mean)				
	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Price*ln(CatExp)	<b>0.28</b>	<b>0.19</b>	<b>0.13</b>	<b>0.15</b>

\*Significant estimates are denoted in boldface

# Results – Dynamics

Communication Mix: Decay Parameters				
	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Email	<b>0.19</b>	<b>0.12</b>	<b>0.49</b>	<b>0.47</b>
Catalog	<b>0.35</b>	<b>0.43</b>	<b>0.40</b>	<b>0.49</b>
EduProg	<b>0.84</b>	<b>0.11</b>	<b>0.50</b>	<b>0.45</b>
Newspaper	<b>0.67</b>	<b>0.66</b>	<b>0.43</b>	<b>0.52</b>
Television	<b>0.25</b>	<b>0.23</b>	<b>0.51</b>	<b>0.53</b>
Radio	<b>0.21</b>	<b>0.20</b>	<b>0.45</b>	<b>0.56</b>

Marketing Mix: Dynamics (Posterior Mean)				
	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Price*ln(CatExp)	<b>0.28</b>	<b>0.19</b>	<b>0.13</b>	<b>0.15</b>

\*Significant estimates are denoted in boldface

# Results – Dynamics

Communication Mix: Decay Parameters				
	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Email	<b>0.19</b>	<b>0.12</b>	<b>0.49</b>	<b>0.47</b>
Catalog	<b>0.35</b>	<b>0.43</b>	<b>0.40</b>	<b>0.49</b>
EduProg	<b>0.84</b>	<b>0.11</b>	<b>0.50</b>	<b>0.45</b>
Newspaper	<b>0.67</b>	<b>0.66</b>	<b>0.43</b>	<b>0.52</b>
Television	<b>0.25</b>	<b>0.23</b>	<b>0.51</b>	<b>0.53</b>
Radio	<b>0.21</b>	<b>0.20</b>	<b>0.45</b>	<b>0.56</b>

Marketing Mix: Dynamics (Posterior Mean)				
	Incidence		Order-Size	
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Price*ln(CatExp)	<b>0.28</b>	<b>0.19</b>	<b>0.13</b>	<b>0.15</b>

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# Results – Dynamics

Communication Mix: Decay Parameters				
	Incidence		Order-Size	
	Wine	Spirit	Wine	Spirit
Email	<b>0.19</b>	<b>0.12</b>	<b>0.49</b>	<b>0.47</b>
Catalog	<b>0.35</b>	<b>0.43</b>	<b>0.40</b>	<b>0.49</b>
EduProg	<b>0.84</b>	<b>0.11</b>	<b>0.50</b>	<b>0.45</b>
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Radio	<b>0.21</b>	<b>0.20</b>	<b>0.45</b>	<b>0.56</b>

Marketing Mix: Dynamics (Posterior Mean)				
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Price*ln(CatExp)	<b>0.28</b>	<b>0.19</b>	<b>0.13</b>	<b>0.15</b>

\*Significant estimates are denoted in boldface

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# Summary of Results

- Channel Choice
  - Communication Mix
    - New Media are Important
    - Significant Interactions among Traditional and New Media
    - Communication Decay
    - In-store and Web Marketing Activities act Synergistically
  - Marketing Mix have Significant Effects
  - Categories are Substitutes
-

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# Managerial Implications

- **Media Selection**

- Traditional Media
- New Media

- **Role of Marketing Efforts**

- Inducing Consumers to Buy
- Encouraging How Much to Buy

- **IMC Strategy**

- Media Planning (e.g., Scheduling, Selection and Targeting)
  - Synergistic Effects of Marketing/Communication Activities
-

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# **The Role of Communication Media, Marketing Mix and Consumer Intrinsic Variables on Channel Choice**

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# Research Agenda

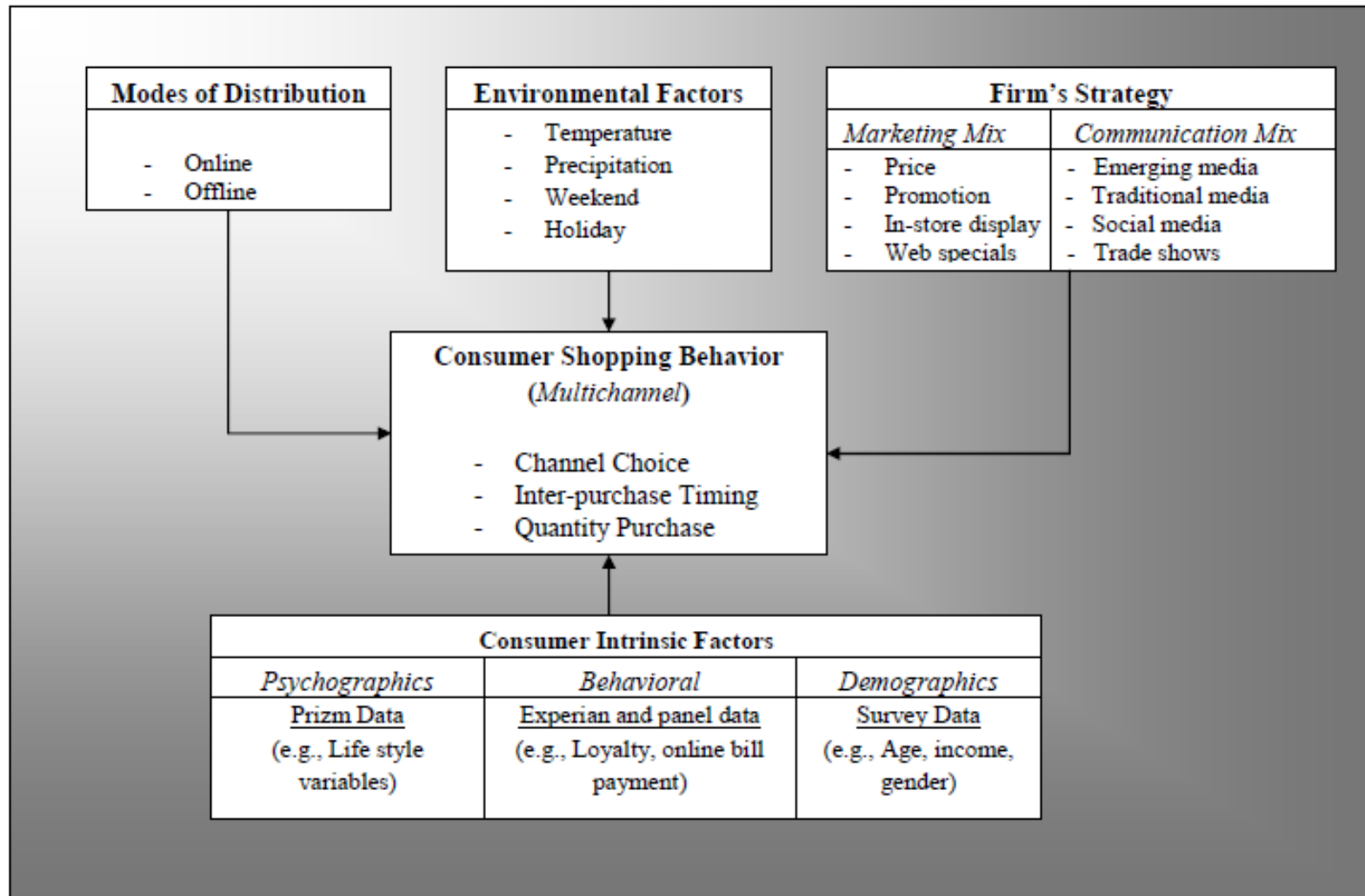
- **Factors Influencing Multichannel Shopping**
    - Consumer Intrinsic Variables
      - Demographics
      - Psychographics
      - Behavioral
    - Multiple Marketing Tools
      - Marketing Mix (e.g., price, promotions)
      - Communication Mix
  - **Customer Lifetime Value**
  - **Superior Targeting**
-

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# Background

- **Multichannel Customer Management**
    - *Balasubramanian, Raghunathan, and Mahajan 2005; Neslin and Shankar 2009*
    - *CLV (Kumar 2010)*
  - **Customer Channel Choice**
    - *Kumar and Venkatesan 2005*
  - **Customer Channel Migration**
    - *Ansari, Neslin, and Mela 2007*
  - **Differential Customer Responses**
    - *Price (Chu, Chintagunta, and Cebollada 2007)*
    - *Benefits of shopping (Forman, Ghose, and Goldfarb 2004)*
    - *Incidence and order-size (Lewis, Singh, and Fay 2006)*
-

# Conceptual Framework



# Modeling Framework

## Channel Choice

$$U_{hjt} = \alpha_{hj} + \beta_{hj} X_{hjt}^C + \delta_{hj} W_{hjt}^C + \omega_{hj} Z_{hjt}^C + \varepsilon_{hjt}^C$$

---

$X$

Marketing Mix  
Variables

$W$

Environmental  
Variables

$Z$

Consumer Intrinsic  
Variables

---

# Modeling Framework

## Channel Choice

$$U_{hjt} = \alpha_{hj} + \beta_{hj} X_{hjt}^C + \delta_{hj} W_{hjt}^C + \omega_{hj} Z_{hjt}^C + \varepsilon_{hjt}^C$$

---

## Interpurchase Timing

$$\lambda_{hj}(t) = \lambda_{0j}(t; \theta_{0j}) \exp(\varphi_{hj} + \eta_{hj} X_{hjt}^I + \mu_{hj} W_{hjt}^I + \varpi_{hj} Z_{hjt}^I + \nu_{hjt}^I)$$

---

$X$

Marketing Mix  
Variables

$W$

Environmental  
Variables

$Z$

Consumer Intrinsic  
Variables

---

# Modeling Framework

## Channel Choice

$$U_{hjt} = \alpha_{hj} + \beta_{hj} X_{hjt}^C + \delta_{hj} W_{hjt}^C + \omega_{hj} Z_{hjt}^C + \varepsilon_{hjt}^C$$

---

## Interpurchase Timing

$$\lambda_{hj}(t) = \lambda_{0j}(t; \theta_{0j}) \exp(\varphi_{hj} + \eta_{hj} X_{hjt}^I + \mu_{hj} W_{hjt}^I + \varpi_{hj} Z_{hjt}^I + \upsilon_{hjt}^I)$$

---

## Quantity Choice

$$\ln(Q_{hjt}) = \gamma_{hj} + \kappa_{hj} X_{hjt}^Q + \pi_{hj} W_{hjt}^Q + \phi_{hj} Z_{hjt}^Q + \xi_{hjt}^Q$$

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$X$

Marketing Mix  
Variables

$W$

Environmental  
Variables

$Z$

Consumer Intrinsic  
Variables

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# Model Estimation

- Bayesian Inference Using MCMC Methods
  - Conjugate Priors for the Parameters
  - MH-Algorithm when Full Conditional Posterior Distribution is of Unknown Form
-

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# Data

- Scanner Panel Data
  - Survey Data
    - Sent to 5000 Consumers
    - Received 1290 Responses
  - Survey Questions
    - Internet Usage
    - Media Usage
    - Multi-Channel Shopping Attitudes
    - Activity on Social Media Sites
    - Demographics
-

# Results – Channel Choice

<b>Parameter</b>	<b>Mean</b>	<b>SD</b>
Intercept	<b>1.1035</b>	0.4003
Email	0.0045	0.0483
Catalog	<b>0.8136</b>	0.0891
Newspaper	<b>-0.0134</b>	0.0064
Temperature	<b>0.0145</b>	0.0022
Precipitation	<b>-1.1288</b>	0.2176
Weekend	<b>-0.3732</b>	0.0758
Distance	<b>0.0102</b>	0.0020
Distance <sup>2</sup>	<b>-0.0010</b>	0.0001
Shopping Convenience	<b>0.1287</b>	0.0581
Shopping Enjoyment	<b>-0.1123</b>	0.0423
Privacy Concern	<b>0.1290</b>	0.0108
Web Site Navigation Comfort	<b>-0.1719</b>	0.0494
Internet Risk	<b>0.2308</b>	0.0815
Sales Consciousness	<b>-0.2897</b>	0.0566
Deal Proneness (Coupon)	<b>0.1430</b>	0.0415

# Results – Channel Choice

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Deal Proneness (Coupon)	<b>0.1430</b>	0.0415

# Results – Inter-purchase Timing

Parameter	Offline Channel		Online Channel	
	Mean	SD	Mean	SD
Inventory	<b>-0.2931</b>	0.0246	<b>-0.0430</b>	0.0146
Email	0.0473	0.0216	<b>0.8380</b>	0.1161
Catalog	<b>2.9343</b>	0.1775	<b>2.1352</b>	0.1344
Newspaper	<b>0.2089</b>	0.0261	0.3025	0.3475
Web Ads	-0.1422	0.2205	<b>0.4888</b>	0.0588
Holidays	<b>0.0560</b>	0.0091	<b>-0.0695</b>	0.0228
Social Media Participation	0.0351	0.9132	<b>0.1236</b>	0.0485
Possession	<b>5.3857</b>	2.6970	<b>-4.9484</b>	1.5866
Time Pressure	<b>2.4931</b>	0.4417	<b>4.4150</b>	0.3125
Impulsive Buying	<b>3.8115</b>	0.2949	<b>7.8330</b>	0.2863
Sales Consciousness	<b>-5.3302</b>	0.3744	<b>-5.1030</b>	0.1132
Infotainment	0.0354	0.1775	<b>0.4403</b>	0.0789
Financial Security Concern			<b>-0.0534</b>	0.0140
Technology Comfortness			<b>0.0293</b>	0.0135
Display Usage	<b>-8.2347</b>	2.1736		
Feature Usage	<b>2.2602</b>	1.1851		
Shape Parameter	<b>0.8216</b>	0.1212	<b>0.2567</b>	0.1104
		Mean		SD
Frailty Correlation		0.6523		0.2145

# Results – Inter-purchase Timing

Parameter	Offline Channel		Online Channel	
	Mean	SD	Mean	SD
Inventory	<b>-0.2931</b>	0.0246	<b>-0.0430</b>	0.0146
Email	0.0473	0.0216	<b>0.8380</b>	0.1161
Catalog	<b>2.9343</b>	0.1775	<b>2.1352</b>	0.1344
Newspaper	<b>0.2089</b>	0.0261	0.3025	0.3475
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Shape Parameter	<b>0.8216</b>	0.1212	<b>0.2567</b>	0.1104
		Mean		SD
Frailty Correlation		0.6523		0.2145

# Results – Quantity Decision

<b>Parameter</b>	<b>Mean</b>	<b>SD</b>
Intercept	<b>2.2421</b>	0.0480
Price	<b>-0.2532</b>	0.0264
Promotion	<b>0.4777</b>	0.0118
Email	0.0247	0.0432
Catalog	<b>0.0128</b>	0.0028
Educational Program	<b>0.5514</b>	0.2955
Newspaper	<b>0.0034</b>	0.0011
Television	<b>0.0021</b>	0.0006
Radio	<b>0.0112</b>	0.0039
Web Ads	<b>-0.1601</b>	0.0113
IST	<b>1.1679</b>	0.4152
Holiday	0.0062	0.0174
Variety Seeking	<b>-0.0045</b>	0.0077
Innovativeness	<b>0.0035</b>	0.0014

# Results – Quantity Decision

<b>Parameter</b>	<b>Mean</b>	<b>SD</b>
Intercept	<b>2.2421</b>	0.0480
Price	<b>-0.2532</b>	0.0264
Promotion	<b>0.4777</b>	0.0118
Email	0.0247	0.0432
Catalog	<b>0.0128</b>	0.0028
Educational Program	<b>0.5514</b>	0.2955
Newspaper	<b>0.0034</b>	0.0011
Television	<b>0.0021</b>	0.0006
Radio	<b>0.0112</b>	0.0039
Web Ads	<b>-0.1601</b>	0.0113
IST	<b>1.1679</b>	0.4152
Holiday	0.0062	0.0174
Variety Seeking	-0.0045	0.0077
Innovativeness	<b>0.0035</b>	0.0014

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# Summary of Results

- **Channel Choice**
    - Shopping Convenience
    - Shopping Enjoyment
    - Website Navigational Comfort
    - Internet Risk
    - Privacy Concern
  - **Interpurchase Timing**
    - Financial Security Concern
    - Sales Consciousness
  - **Quantity Decision**
    - Innovativeness
-

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# **What Makes Emails Click: The Impact of Electronic Media on Consumer Choice in an Integrated Marketing Environment**

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# Research Agenda

- **Effectiveness of Email Campaigns**
    - Email Contents (e.g., subject line, layout, images etc.)
    - Email Activities (e.g., click-through rate, view rate, forwarding)
    - Perceptions of Email Campaigns
  - **Interplay with Other Marketing Mix**
    - Advertising (e.g., TV ads)
    - Promotions (e.g., Weekly specials)
  - **Impact on Sales**
    - Both Direct and Indirect
-

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# Model

- Campaign Level Responses
    - Number of Emails Opened
    - Number of Emails Unsubscribed
    - Purchase Amount (\$)
  
  - Responses Modeled Jointly
  
  - Bayesian Estimation
-

# Data

- Email Campaigns
- Two years (2008-2010)
- Coding of Email Attributes
  - Subject Line Length
  - Number of Images
  - Number of Links
  - Time Gap

**Special Features of the Week**

Our Wine Associates will get you ready to kick back and enjoy your weekend. They've picked some of their current favorite wines, so you'll get special savings on them with your Premier Card. And they'll be sampling several of these wines Thursday, Friday and Saturday from noon to 8 P.M.

**Discover the quality of South America**  
These wines demonstrate the quality and refinement that you'd find from France or California — but at half the price! Here are some recent arrivals you won't want to miss.

**Bordeaux-style Pinot**  
One of Chile's top wine producers has created a Pinot Noir with the look, Bordeaux grape (Cabernet), 1.5 from the creator of Quetzal and Magallanes.  
**\$36.00 750 mL**  
compare at 10.00

**Specials from our weekly ad**  
There's always a sale at Premier, and our [weekly ad](#) continues through the month. Here are a few examples of the hundreds of items on sale.

**Big Bottle of the Week**  
**Woodbridge Cabernet** still carries the Mendocino name and is still one of the great value wines of California.  
**\$18.99 1.5 L**  
compare at 14.99

**Spirit of the Week**  
The original and still the best. **Baileys Irish Cream** is delicious on its own or in a cocktail, try it in a Christmas Martini. Original, Caramel Cakes and Dark Chocolate.  
**\$19.99 750 mL**  
compare at 24.99

**Wine of the Week**  
A Prize or discovery from Italy. **Vino Rosso Chiaro** is great everyday value for pizza or pasta. It's so good!  
**\$7.99 750 mL**  
compare at 9.99

You are receiving this e-mail because you submitted an application for a Premier Card. Leave us your e-mail address and contact our mailing list for sales and special events. To unsubscribe, [click here](#) or send your request to:

# Data Descriptive

<b>Variable</b>	<b>Mean</b>	<b>SD</b>
Emails Sent (Customers/Campaign)	25945.35	2355.28
Emails Opened (Customers/Campaign)	6568.55	400.23
Direct Lead Generation (in \$)	16.45	44.09
Indirect Lead Generation (in \$)	2779.20	2942.15
Size of Email (in Kilobytes)	51.06	11.13
No. of Images per Campaign	9.08	3.66
Printed Page Size	1.30	0.42
No. of Words in Subject Line	7.88	2.28
No. of Purchase Links	3.96	2.68
No. of Non Purchase Links	5.68	1.79
Email Ranking	5.59	0.77
Emails opened on Computers	170.76	347.32
Emails opened on Handheld devices	43.37	90.45
Time Gap between Emails	3.36	2.22
Emails having Facebook Link (%)		68.05
Emails having Twitter Link (%)		49.75
Emails Sent on Weekends (%)		2.19
Emails Sent on Holidays (%)		3.54
Emails Launched before Noon (%)		76.22
Emails containing Web Ads (%)		23.41
Emails containing Catalog reminder (%)		85.36
Emails containing Weekly specials (%)		21.83
Emails containing Educational Class Information (%)		68.78

# Results – Open and Unsubscribe

Parameter	Open Rate		Unsubscribe Rate	
	Mean	SD	Mean	SD
Intercept	<b>8.8077</b>	0.6618	<b>3.3609</b>	0.5839
Weekend	<b>-0.6906</b>	0.2528	<b>-0.6366</b>	0.2559
Holiday	0.4060	0.3222	0.0403	0.3190
Launch Time	<b>-0.5151</b>	0.0921	<b>-0.2379</b>	0.0918
Email Size	0.0104	0.0062	<b>0.0112</b>	0.0061
No. of Images	-0.0421	0.0254	-0.0292	0.0254
Printed Page Size	-0.0917	0.1049	0.0117	0.1054
Words In Subject Line	<b>-0.0870</b>	0.0170	<b>-0.0398</b>	0.0172
No. of Purchase Links	<b>-0.1103</b>	0.0274	<b>-0.0749</b>	0.0278
No. of Non-Purchase Links	<b>0.0778</b>	0.0247	0.0175	0.0249
Facebook Link	<b>0.9489</b>	0.1413	<b>0.4721</b>	0.1437
Twitter Link	-0.0786	0.1013	0.0568	0.1022
Email Theme	<b>-1.2122</b>	0.1112	<b>-0.5921</b>	0.1110
Banner	-0.7349	0.6229	-0.0112	0.5782
Web Ad	<b>-0.7673</b>	0.1146	<b>-0.2766</b>	0.1147
Catalog	<b>-0.3190</b>	0.1755	<b>-0.4647</b>	0.1770
Weekly Specials	<b>0.3729</b>	0.0545	<b>-0.5095</b>	0.1104
Educational Class	<b>0.4978</b>	0.1089	<b>-0.3934</b>	0.1087
Email Rank	<b>0.1285</b>	0.0552	0.0165	0.0549
Computer	<b>0.0022</b>	0.0005	<b>0.0015</b>	0.0005
Handheld Device	<b>-0.0043</b>	0.0017	<b>-0.0045</b>	0.0017
Time Gap	<b>0.3402</b>	0.0467	<b>0.1996</b>	0.0471
Time Gap <sup>2</sup>	<b>-0.0232</b>	0.0060	<b>-0.0126</b>	0.0061

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Educational Class	<b>0.4978</b>	0.1089	<b>-0.3934</b>	0.1087
Email Rank	<b>0.1285</b>	0.0552	0.0165	0.0549
Computer	<b>0.0022</b>	0.0005	<b>0.0015</b>	0.0005
Handheld Device	<b>-0.0043</b>	0.0017	<b>-0.0045</b>	0.0017
Time Gap	<b>0.3402</b>	0.0467	<b>0.1996</b>	0.0471
Time Gap <sup>2</sup>	<b>-0.0232</b>	0.0060	<b>-0.0126</b>	0.0061

# Results – Sales

Parameter	Mean	SD
Intercept	-7.1522	1.1258
Indirect Lead Generation	0.0829	0.0332
Email Open Rate	0.0269	0.0095
Email Unsubscribe Rate	-0.4469	0.0637
Web Ad	-0.1452	0.0855
Catalog	8.3514	1.1310
Weekly Specials	0.2476	0.0543
Time Gap	-0.1018	0.0460
Time Gap <sup>2</sup>	0.0107	0.0059
No of Purchase Links	0.0502	0.0179
Email Theme	-0.7606	0.0691

# Results – Sales

Parameter	Mean	SD
Intercept	-7.1522	1.1258
Indirect Lead Generation	0.0829	0.0332
Email Open Rate	0.0269	0.0095
Email Unsubscribe Rate	-0.4469	0.0637
Web Ad	-0.1452	0.0855
Catalog	8.3514	1.1310
Weekly Specials	0.2476	0.0543
Time Gap	-0.1018	0.0460
Time Gap <sup>2</sup>	0.0107	0.0059
No of Purchase Links	0.0502	0.0179
Email Theme	-0.7606	0.0691

---

# Summary of Results

- Email Campaign

- Design
- Execution

- Impact on Sales

- Direct
  - Indirect
-

---

# Overall Conclusions

- Study of New Marketing Environment
    - Multichannel
    - Multiple Communications
  - Channel Choice
    - Consumer Characteristics
  - Design of Marketing Communication
    - Email
-

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Thank You

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# Appendix: Essay I

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# Simplifying Communication Media

## ■ Aspects of Communication

- Decay Effect
- Stock Effect
- Interactions

## ■ Assumptions

- Communication of a Given Type has same Effect
  - e.g., all individual emails have same effects
- Communications are Exchangeable
  - e.g., all emails received within a week have same effect

## ■ Recursive Definition of Direct and Indirect effects

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# Simplifying Communication Media: (2)

$$f_1(I_{kct}^h) = COM_{Ikht} = \sum_{i \in I} \delta_{hki} \lambda_{Ik}^{r_{hit}} d_{hit}$$

The effect of all communications in a group has same effect ( $\delta_{hki}$ )

$$COM_{Ikht} = \delta_{hki} \sum_{i \in I} \lambda_{Ik}^{r_{hit}} d_{hit}$$

Recursive definition for term in summation

$$RCOM_{Ikht} = \sum_{i \in I} \lambda_{Ik}^{r_{hit}} d_{hit}$$

# Simplifying Communication Media: (3)

Week 1  $RCOM_{Ihk1} = \sum_{i \in I} d_{hi1} = N_{Ih1}$

Week 2  $RCOM_{Ihk2} = N_{Ih2} + \lambda_{Ik} RCOM_{Ihk1}$

Week t  $RCOM_{Ihkt} = N_{It} + \lambda_{Ik} RCOM_{Ihkt-1}$

Own Interaction

$$g_1(I_{kct}^h I_{kct}^h) = COM\_COM_{Ihkt} = \sum_{i, i' \in I, I'} \delta_{hkII} \lambda_{Ik}^{r_{hit}} \lambda_{Ik}^{r_{hi't}} d_{hit} d_{hi't}$$

# Simplifying Communication Media: (4)

The effect of all communications in a group has same effect ( $\delta_{hkl}$ )

$$COM\_COM_{Ihkt} = \delta_{hkl} \sum_{i,i' \in I} \lambda_{Ik}^{r_{hit}} \lambda_{Ik}^{r_{hi't}} d_{hit} d_{hi't}$$

Recursive definition for term in summation

$$RCOM\_COM_{Ihkt} = \sum_{i,i' \in I} \lambda_{Ik}^{r_{hit}} \lambda_{Ik}^{r_{hi't}} d_{hit} d_{hi't}$$

# Simplifying Communication Media: (5)

Week 1 
$$RCOM\_COM_{Ihk1} = \sum_{i,i' \in I} d_{hit} d_{hi't} = \binom{N_{Ih1}}{2} = \frac{N_{Ih1}(N_{Ih1} - 1)}{2}$$

Week 2 
$$RCOM\_COM_{Ihk2} = \frac{N_{Ih2}(N_{Ih2} - 1)}{2} + N_{Ih2} \lambda_{Ik} N_{Ih1} + \lambda_{Ik}^2 \frac{N_{Ih1}(N_{Ih1} - 1)}{2}$$

$$RCOM\_COM_{Ihk2} = \frac{N_{Ih2}(N_{Ih2} - 1)}{2} + N_{Ih2} \lambda_I RCOM_{Ih1} + \lambda_I^2 RCOM\_COM_{Ihk1}$$

Week t

$$RCOM\_COM_{Ihkt} = \frac{N_{Iht}(N_{Iht} - 1)}{2} + N_{Iht} \lambda_{Ik} RCOM_{Ihkt-1} + \lambda_{Ik}^2 RCOM\_COM_{Ihkt-1}$$

Cross Interaction

$$RCOM_{Iht\_COM_{I'ht}} = RCOM_{Iht} \times RCOM_{I'ht}$$

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# Essay I – Simulation Study

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# Simulation Study: Media Planning

## ■ Media Scheduling

### Percentage Change in Quantity

	Continuous Campaign		Burst Campaign		Pulsing Campaign	
	Wine	Spirit	Wine	Spirit	Wine	Spirit
Email*	0.5305	0.4727	0.0077	0.0239	1.0425	0.4907
Catalog†	0.0258	0.0086	1.6615	0.4348	1.6747	0.0930
EduProg†	1.6362	-0.0386	0.0675	-0.0338	1.6725	-0.0062
Newspaper*	0.9079	0.4816	0.0053	0.0003	0.9140	0.4842
Television*	0.4352	0.4470	0.0060	0.0003	0.4515	0.4488
Radio*	0.4276	0.0523	0.0006	0.0047	0.4289	0.0484

\*Reallocation of existing resources

†Reallocation with simulating the amount

# Simulation Study (2): Media Planning

## ■ Media Targeting

### Percentage Change in Quantity

	Pure Online Consumer		Pure Offline Consumers		Multichannel Consumers	
	Wine	Spirit	Wine	Spirit	Wine	Spirit
Email	0.0109	0.0045	0.6986	0.1302	1.4138	0.3934
Catalog	0.0188	0.0545	0.8040	0.5983	2.0688	0.7509
EduProg	NA	NA	0.9414	-0.0291	0.9345	0.0004

# Simulation Study (3): Media Planning

## ■ Media Selection: Dispersion vs. Concentration

