The effects of out-of-stock, return, and cancellation amounts on the order amounts of an online retailer

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The Effects of Out-of-Stock, Return, and Cancellation Amounts on the Order Amounts of an Online Retailer

Abstract

Despite the spectacular success of online retailers in recent decades, some inherent weaknesses, including out-of-stock, returns, and order cancellations, still negatively influence the financial performance of online retailers. The aims of this study are: 1) to examine the effects of these undesirable sales situations on the financial performance (in this study, the order amounts) of an online retailer; and 2) to investigate the moderating effects of price ranges (low, medium, and high) on the relationships of these undesirable sales situations with financial performance. A total of 2,484 transaction data sets involving 260 brands obtained from an online fashion retailer are used to test the proposed hypotheses. In the pooled model, out-of-stock amounts have a negative impact, return amounts have no impact, and cancellation amounts have a positive impact on order amounts. Interestingly, however, these relationships vary with price groups, which verifies the moderating effects of price groups. Our findings provide new insights into managing undesirable sales situations by price group.

Keywords: out-of-stocks, returns, cancellations, online retailers, price
1. Introduction

Over several decades, e-commerce has achieved remarkable success and emerged as one of the fastest growing retail sectors. According to the United States Department Commerce (2017), U.S. e-commerce increased by 15.1% from 2015 to 2016, and 2016 sales amounted to $394.9 billion. Despite the significant growth of online retailers in recent decades, undesirable sales situations, such as out-of-stocks, returns, and cancellations, remain problematic. In 2015, online and in-store retailers in the U.S. lost $1.75 trillion in sales due to out-of-stocks, overstocks, and returns, and these losses have become greater over time (Gustafson, 2015).

The consequences of undesirable sales situations increase for online retailers. Even though the media have reported that more consumers encounter out-of-stocks in physical stores (75%) than online stores (63%) (Gustafson, 2015), the negative impacts of out-of-stocks can intensify for online stores. Consumers tend to be less loyal to online stores and focus on transaction-by-transaction purchases, with about half of out-of-stocks eventually resulting in order cancellations (Bellman, 2001). A separate report found that for the entire U.S. retailing section, merchandise returns accounted for about 10% of retail sales in 2017 (Appriss Retail, 2018), but for e-commerce, return rates were much higher, ranging from approximately 20% to 40% by product category (Dennis, 2017).

In line with the inherent weaknesses of online retailing in undesirable sales situations, many researchers have examined the antecedents and consequences of out-of-stocks, returns, and order cancellations from the perspectives of consumers (i.e., consumer buying behaviors) and manufacturers and retailers’ operations and management costs (Corsten and Gruen, 2004; Kim and Lennon, 2011; Narayanan, 2003; Verhoef and Sloot, 2006). Thus, there is a gap of understanding of the effects of undesirable sales situations on financial performance. In addition,
most studies have focused on a singular undesirable sales situation: out-of-stocks (e.g., Campo et al., 2003; Corsten and Gruen, 2004), returns (e.g., Grewal et al., 2004; Ofek et al., 2011), or cancellations (e.g., Huang et al., 2018; Xie and Gerstner, 2007). However, a comprehensive approach to these undesirable sales situations is needed because they occur concurrently.

This study examines out-of-stock, return, and cancellation amounts using transaction data gathered from an online fashion retailer to better understand how these undesirable sales situations jointly influence firm financial performance (in this study, order amounts). It is notable that these undesirable situations are more severe for online fashion retailers because fashion products are seasonal, and consumers strongly prefer to touch and try on them before purchasing them (Grewal et al., 2004). This touch-and-feel experience of fashion and apparel products is regarded as a particular challenge in online apparel retailing (Workman and Cho, 2013). In addition to the main effects of undesirable situations, we examine whether product price moderates the relationships between undesirable sales situations and financial performance because price is a major determinant of consumers’ buying behaviors and processes (e.g., Chiang and Jang, 2006; Swinyard, 1993).

The contributions of this study are as follows. First, it adds to the online retailing literature by jointly examining the impacts of undesirable sales situations (out-of-stocks, returns, and cancellations) on financial performance. Understanding the effects of undesirable sales situations is especially important in newer omni-channel environments because consumers can always choose other brands and retailers in undesirable situations. Our findings enrich the literature by providing empirical evidence and rationales for the effects of these undesirable situations. Second, this study provides practical marketing guidelines to handle undesirable situations by price group. By examining the relationships between undesirable situations and
financial performance by price group, managers can better understand how to more effectively manage inventory and to develop customer care services for returns and cancellations.

2. Literature Review and Hypothesis Development

Effects of out-of-stocks

Previous studies have concluded that out-of-stocks lead to both short- and long-term losses. Short-term losses are generated when customers delay purchases and switch to competing stores (e.g., Kim and Lennon, 2011), while long-term losses include negative word-of-mouth and loss of market share and patronage (e.g., Zinn and Liu, 2001). Doyle (2006) found that most grocery shoppers perceive out-of-stocks as highly irritating situations motivating them to move away a store, resulting in lost sales and customers. Out-of-stock situations also lead consumers to switch to other stores and cancel purchases altogether, indicating that retailers might experience significant sales decrease (Campo et al., 2003). One study found that retailers can lose nearly half of intended purchases when customers encounter out-of-stocks (Corsten and Gruen, 2004). Helm et al. (2013) reported the most common responses when encountering out-of-stock situations are store switching (41.5%), followed by purchase postponement (22%), item switching (18.1%), order cancellations (12.2%), and brand switching (6.3%). In sum, out-of-stock situations translate into sales losses of approximately 4%–14% (Corsten and Gruen, 2004; Emmelhainz et al., 1991; Gruen et al., 2002), and their impacts are increasing, resulting in $634.1 billion in lost retail sales in 2014, a rise of 39% from 2013 (Gustafson, 2015).

Consumers typically respond to out-of-stocks in five ways: 1) finding a substitute from the same brand; 2) finding a substitute from a different brand; 3) delaying the purchase until the item is back in stock at the original store; 4) not purchasing the item at all; or 5) purchasing the
item at a different store (Corsten and Gruen, 2004; Kim and Lennon, 2011). Consumer reactions to out-of-stock situations differ by various factors, including brand and store loyalty, product price, product category, shopping frequency, transaction cost, purchase urgency, and temporary out-of-stocks vs. assortment changes (Campo et al., 2000; Corsten and Gruen, 2004; Sloot et al., 2005). For example, in response to out-of-stocks, brand-loyal consumers are less likely to switch to a different brand but may postpone the purchase (e.g., buy the product later when it is restocked) or leave a store to buy the brand’s product elsewhere if the product is available at other retailers (Corsten and Gruen, 2004). In contrast, store-loyal consumers are more likely to substitute (e.g., brand switch or find a different size or type in a same brand), postpone (e.g., buy later at the same store), or cancel purchases (Helm et al., 2013).

Even though consumer reactions to out-of-stocks vary by diverse factors, the literature generally supports the negative impacts on retailers from out-of-stocks. In line with previous findings, we propose the following hypothesis:

\[ H1: \text{Out-of-stock amounts have a negative effect on order amounts}. \] 

Effects of returns

In the retailing industry, product returns are considered to be a major cost for retailers and a source of potential customer dissatisfaction (Lee, 2015; Petersen and Kumar, 2009). First, regarding retailers’ costs, according to a National Retail Federation report, overall merchandise returns were estimated to be 10% of retail sales in 2017, causing $351 billion in lost sales for U.S. retailers (Appriss Retail, 2018). This finding indicates that returns negatively influence firm

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1 Due to the monthly observations in our data, we use one-month lagged variables for undesirable sales situations and the order amount in the current month. See the data section for a detailed explanation.
revenue (Lee, 2015). Hidden costs are also associated with product return processes (Ofek et al., 2011). As customers increasingly expect free shipping for online purchases and returns, retailers need to develop effective reverse logistics solutions used to take back merchandise from consumers. Reverse logistics incur additional costs, which firms should absorb as the price of doing business (Friedman, 2018). Product returns, especially for high-involvement products such as fashion and luxury items, are more serious for online retailers. Product returns reduce online retailers’ profits by an average of 3.8% (Petersen and Kumar, 2009). On average, 22% of apparel sales are returned, and some luxury retailers commonly experience returns on up to 80% of merchandise sold (Mulpuru, 2017).

Second, regarding customer dissatisfaction, the consumer behavior literature views product returns as negative, undesirable situations because product returns are attributed to many dissatisfaction reasons, including product failure, damaged products, incorrect delivery, incomplete shipment, consumer fraud and lower than expected product quality (Chu et al., 1998; Cole, 1989; King and Denis, 2006; Kotler and Keller, 2012). Product returns, therefore, are considered to be an indicator of consumer dissatisfaction.

Interestingly, however, a few recent studies have argued that product returns are not related to product dissatisfaction or failure (Lee, 2015; Lee and Yi, 2017). Instead, product returns are increasing due to consumers’ hedonic shopping attitudes and enjoyment (Lawton, 2008; Lee and Yi, 2017). Other studies have also reported that consumers’ motivations for product returns include no trouble found (68%), followed by buyers’ remorse (27%), and that only about 5% of returns are made due to product defects (Accenture Communications & High Tech, 2007; King and Dennis, 2006; Lawton, 2008).
Lenient (no-questions-asked) return policies used as a promotion tool by giant retailers such as Nordstrom, Target, and Saks are another reason for increased returns (Griffis et al., 2012; Grind, 2013; Lee and Yi, 2017). Consequently, consumers, especially online shoppers, consider easier, simpler returns to be a major driver of purchases. This trend is so prevalent that 33% of global consumers identify online return policies as a major reason for purchases (McGregor, 2015). In 2017, 67% of consumers confirmed return policies before making purchases (Friedman, 2018). From current market perspectives, therefore, returns might not be a negative reaction by consumers. Instead, flexible return policies can be associated with increased sales.

In line with the association of consumers’ motivation for returns and retailers’ recent return policies, increased returns might not harm the sales amounts of online retailers in particular. That is, return guarantees and lenient return policies are effective at significantly reducing consumers’ perceived risk and thus lead to consumer purchases and increased sales (Lee, 2015). Liberal return policies also encourage repeat purchase behavior, satisfaction, and loyalty among customers, which result in higher sales and profits for online retailers (Lawton, 2008). Moreover, a recent study found that lenient return policies by online retailers increase future purchase intentions (Oghazi et al., 2018). However, Petersen and Kumar (2009) found that stricter return policies result in lower sales and profits for companies. Given all these results, return amounts reflecting lenient return policies are expected to be positively related to order amounts. The following hypothesis is suggested.

\[ H2: \text{Return amounts have a positive effect on order amounts.} \]
Effects of cancellations

The broad concept of order cancellations refers to orders finally cancelled for any reason, including returns and refunds (Cheung and Zhang, 1999). The narrow concept of order cancellations refers to orders unfulfilled by retailers. These orders are cancelled before the products and services are delivered to the customers (Li et al., 2018).

The reasons for order cancellations defined narrowly fall in two categories. First, retailers cancel orders in cases of out-of-stocks, pricing errors, and failure of backorders (Dick’s Sporting Goods, Inc., 2018). Unlike in offline store retailing where out-of-stocks are certainly noticeable, online stores’ websites sometimes present products as if they are available for purchase (Kim and Lennon, 2011). According to Kim et al. (2006), almost 44% of online women’s apparel retailers do not provide accurate in-stock status information, eventually leading to order cancellations. Second, consumers may cancel orders before receiving the products. In this case, cancelling the order reflects regret at making the order or risks perceived by consumers (Bae et al., 2011). We use this specific type of cancellations made by consumers as the cancellation concept in this study to exclude the effects generated by out-of-stocks.

Order cancellations dampen retailers’ financial performance in several ways. Retailers waste time and costs in order processing and need to build up unnecessary inventory. Order cancellations create cost issues for retailers, lost chances to sell products, and unexpected buildup of inventory, all of which affect retailers’ optimal total costs (Cheung and Zhang, 1999). Furthermore, order cancellations cause operational difficulties and make the supply chain more complicated (Karp, 2017; Li et al., 2018). For example, if a consumer cancels an order while the product is on the way to the consumer, the retailer needs to track the order accurately, determine where to order the product back (e.g., offline stores and warehouses), and provide logistical
support to restock the product (Karp, 2017). Due to this complexed process and operational
difficulties, in practice, most retailers allow customers to cancel orders only within specific time
periods, and some consumers take advantage of order cancellations as a tool to find better deals
before completing their purchases (Huang et al., 2018).

However, it is also possible that cancellations can promote purchases from online
retailers and online retailer performance.

Recently, Li et al. (2018) studied consumer demand for cancellations of online grocery
items and found that overall, a relatively high proportion of refunds of original orders, as a form
of partial cancellations, help an e-grocery’s market growth. Doherty et al. (2015) conducted a
survey with online retailers and demonstrated that order cancellations are a significant service
element of post-purchase e-service quality, and the service quality positively influences
consumer-oriented success, including opportunities to develop and manage long-term customer
relationships and increase the potential market for a wider product range.

Consumers perceive greater risks in online shopping, particularly in delivery and privacy,
than physical-store shopping (Bezes, 2016). Fashion products have an especially strong
disadvantage in the online context due to the lack of opportunities to feel and try on garments. As
the risk and uncertainty of products in online stores increases and ultimately impacts consumer
purchase decisions for fashion products (Grewal et al., 2004), order cancellations often occur
(Ofek et al., 2011). As a risk-reducing strategy, order cancelations can encourage customers to
make online purchases. The risk-reducing roles may be more significant in online stores due to
the inability to physically evaluate fashion apparel products (Aghekyan-Simonian et al, 2012).

Based on the literature, we suggest that order cancellations, as a promotional tool and a
service component, are likely to reduce perceived risks and increase consumer purchases. Thus,
even if consumers cancel specific orders, they are more likely to revisit the online retailer to purchase other products. Hence, the third hypothesis is as follows:

**H3: Cancellation amounts have a positive effect on order amounts.**

_Moderating effects of price_

Price is a determinant of the consumer decision process. In general, high-price products require a highly involved process in which consumers conduct intense information searches on products and brands to make purchase decisions (Swinyard, 1993). While performing intense information searches and product evaluations, consumers tend to develop preferences for specific products and brands and to form strong brand loyalty (e.g., Assael 1987). In contrast, lower-price products do not require consumers to invest much time and effort, resulting in low brand loyalty (LeClerc and Little, 1997). Similarly, consumer responses to undesirable sales situations with online retailers differ across price ranges. Online shopping involves great perceived financial, delivery, privacy, and other risks (Bezes, 2016), which affect consumer reactions. However, these reactions may be weakened or strengthened by brand loyalty generated based on price ranges.

When consumers experience undesirable sales situations in the high-price product category, they may be less likely to be affected due to their brand loyalty. For example, in out-of-stock situations, brand-loyal customers postpone purchases and do not switch to different brands (Corsten and Gruen, 2004). In contrast, undesirable sales situations in the low-price product category may affect consumer purchase behaviors differently. For example, in out-of-stock situations, consumers can easily replace the focal products with alternative products because such substitutions of low-price products do not cause any loss or risk.
In the case of returns when consumers are not satisfied with the delivered products, consumers who buy high-price products might not repurchase products because they have high expectations for the size, fit, design, and color of the brands to which they are loyal. However, consumers who buy low-price products may not have high expectations for specific brands and might repurchase these brands’ products as long as they can find alternatives.

Finally, order cancellations are a tool that makes consumers perceive lower risk in purchases from online fashion retailers (Aghekyan-Simonian et al., 2012), thus contributing to increased sales. The risk-reducing role of order cancellations may be more salient for high-price products because cancellations can significantly mitigate the high financial risk associated with high prices. However, order cancellations might not be as effective for low-price products with low financial risks.

Consumer responses to undesirable sales situations, therefore, can vary across price ranges possibly due to the brand loyalty and involvement derived from prices. Although we leave the signs of moderating effects as empirical questions, we hypothesize that price ranges moderate the effects of undesirable sales situations on order amounts as follows.

*H4: The effects of out-of-stock, return, and cancellation amounts on order amounts are moderated by price ranges.*

3. Data

Our study draws on the 2011 monthly transaction data on 260 brands from one of Korea’s largest online shopping malls. To examine stable patterns, we include only brands with consecutive observation periods of more than 6 months. In the end, we analyze 2,484 observations. The data include order, out-of-stock, return, and cancellation amounts, which we
use to examine the effects of undesirable sales situations in the previous month on the order amount in the current month. We use the lagged variables of undesirable sales situations because consumers’ new order decisions and the firm’s handling time after undesirable sale situations might not always be associated with immediate actions in the same month. Rather, we are interested in consumer decisions with a time gap, which enables examining longer and more stable relationships between the customers and the firm.

For control variables, we select consumers’ coupon usage amounts and 12-month dummy variables. Coupons are widely used marketing promotions and encourage purchases by providing economic benefits, leading to a positive effect on sales (e.g., Chiou-Wei and Inman, 2008; Levy et al., 1983; Lu et al., 2013; Sigala, 2013). Online coupons enjoy recent popularity and provide unique advantages as they are issued to targeted consumers, and consumers can redeem them at the moment of purchase. Many studies show evidence of positive relationships between online coupons and financial performance (e.g., Lu et al., 2013; Siglar, 2013), and we also expect the coupon amount in the current month to act as an immediate sales stimulator and have a positive effect on the order amount in the current month. Given that many fashion items are seasonal, we also consider the 12-month dummy variables.

Based on the hypothesis that the effects of undesirable sales situations vary with the price range, we evenly split the brands into the three price groups: low-, medium-, and high-price groups. The price ranges are determined by the distribution of the average price of brands. The lowest average price is $3.4 (a brand in the kids’ category), and the highest average price is $765.1 (an international premium brand in the accessories category). In our data, brands with average prices of less than $35 are classified in the low-price group, brands with average prices of $35–$85 are classified in the medium-price group, and brands with average prices of more
than $85 are classified in the high-price group. Each price group accounts for approximately 33% of the total brands.

Table 1. Descriptive Statistics

<table>
<thead>
<tr>
<th>Price Group</th>
<th>Number</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brands</td>
<td>Obs.</td>
<td>Order Price ($)</td>
<td>Order Amt ($1K)</td>
<td>Out-of-Stock Amt ($1K)</td>
<td>Return Amt ($1K)</td>
<td>Cancellation Amt ($1K)</td>
<td>Coupon Amt ($1K)</td>
</tr>
<tr>
<td>Low (&lt;$35)</td>
<td>87</td>
<td>831</td>
<td>23.217</td>
<td>3.287</td>
<td>0.169</td>
<td>0.234</td>
<td>0.181</td>
<td>0.233</td>
</tr>
<tr>
<td>Medium (&lt;=$85)</td>
<td>94</td>
<td>889</td>
<td>54.196</td>
<td>21.977</td>
<td>1.035</td>
<td>2.460</td>
<td>1.175</td>
<td>1.857</td>
</tr>
<tr>
<td>High (&gt;85)</td>
<td>79</td>
<td>764</td>
<td>146.336</td>
<td>70.692</td>
<td>4.311</td>
<td>9.990</td>
<td>4.987</td>
<td>5.394</td>
</tr>
<tr>
<td>Total</td>
<td>260</td>
<td>2,484</td>
<td>72.172</td>
<td>30.708</td>
<td>1.754</td>
<td>4.034</td>
<td>2.017</td>
<td>2.402</td>
</tr>
</tbody>
</table>

The order amount is the amount in the current month, while the other amount variables are the amounts in the previous month.

Table 2. Correlation Coefficients Matrix

<table>
<thead>
<tr>
<th>Variables</th>
<th>Order Price</th>
<th>Order Amt</th>
<th>Out-of-Stock Amt</th>
<th>Return Amt</th>
<th>Cancellation Amt</th>
<th>Coupons Amt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order Price ($)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Amt ($1K)</td>
<td>0.209***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out-of-Stock Amt ($1K)</td>
<td>0.226***</td>
<td>0.822***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return Amt ($1K)</td>
<td>0.230***</td>
<td>0.903***</td>
<td>0.839***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancellation Amt ($1K)</td>
<td>0.253***</td>
<td>0.871***</td>
<td>0.819***</td>
<td>0.895***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Coupon Amt ($1K)</td>
<td>0.160***</td>
<td>0.892***</td>
<td>0.671***</td>
<td>0.777***</td>
<td>0.698***</td>
<td>1</td>
</tr>
</tbody>
</table>

The order amount is the amount in the current month, while the other amount variables are the amounts in the previous month.

***: p-value<0.01
Table 2 presents the correlation coefficients of the major continuous variables in the dataset. In general, the correlations of order amounts with undesirable sales situations and coupon amounts are high (see the third column labeled “Order Amt”). The correlation coefficients between the independent variables seem high. However, they do not cause a multi-collinearity problem in estimating the models because the variance inflation factors (VIFs) range from 1.38 to 7.6, less than the typical problematic VIF of 10.

4. Model

We examine the effects of brand $i$’s out-of-stock, return, and cancellation amounts in the previous month $t-1$ on the order amount in the current month $t$. The three types of amounts in the previous month represent the firm’s inventory problem (out-of-stocks) and consumers’ shopping behaviors (returns and cancellations). The order amount in the current month shows consumers’ subsequent activities. We set up a fixed effects model in Equation 1, also depicted in Figure 1.

Figure 1. Conceptual Model

$\text{Order}_t = \beta_{0i} + \beta_1 \text{OutStock}_{it-1} + \beta_2 \text{Return}_{it-1} + \beta_3 \text{Cancel}_{it-1} + \beta_4 \text{Coupon}_{it} + \sum \gamma_{i \text{month dummy}} + \epsilon_{it}$

(1)
The variables are defined as follows:

- **Order**: order amount in the current month $t$
- **OutStock, Return, and Cancel**: out-of-stock, return, and cancellation amounts in the previous month $t-1$. All of these variables are automatically recorded by the online retailer when relevant situations occur. For example, out-of-stocks are recorded by the online retailer when it does not have products in stock after taking online orders.
- **Coupon**: consumers’ coupon usage amount used in the current month $t$
- **Month dummy**: 12-month dummy variables

The parameter $\beta_0$ captures individual-brand fixed effects. The parameters $\beta_1, \beta_2,$ and $\beta_3$ capture the effects of out-of-stock, return, and cancellation amounts on order amounts. The parameter $\beta_4$ represents the effects of the coupon amount in the current month on order amount in the current month, while $\gamma_i$ captures the effects of month dummy variables. We assume that the error term follows a normal distribution with zero mean and non-zero variance. To examine whether there are differences in the effects of the undesirable sales situations, we separately estimate Equation (1) by price group: low, medium, and high.

**5. Estimation Results**

We present the estimation results in Table 3. The second column (Pooled Model Coefficient) shows the estimation results of the pooled data, while the other columns give the estimation results of each price group. We interpret the pooled model for comparison and then the separate models, focusing on the coefficients significant at the 0.05 or lower level.
### Table 3. Estimation Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pooled Model Coefficient</th>
<th>Group 1 (Price&lt;$35) Coefficient</th>
<th>Group 2 ($35&lt;Price&lt;$85) Coefficient</th>
<th>Group 3 (Price&gt;$85) Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.239</td>
<td>0.122</td>
<td>0.803</td>
<td>4.288</td>
</tr>
<tr>
<td></td>
<td>(8.023)</td>
<td>(1.754)</td>
<td>(6.061)</td>
<td>(12.853)</td>
</tr>
<tr>
<td>Out-of-Stock Amounts $t$</td>
<td>-0.324*</td>
<td>-2.164***</td>
<td>-3.349***</td>
<td>-0.280</td>
</tr>
<tr>
<td></td>
<td>(0.171)</td>
<td>(0.463)</td>
<td>(0.421)</td>
<td>(0.268)</td>
</tr>
<tr>
<td>Return Amounts $t$</td>
<td>-0.033</td>
<td>1.175**</td>
<td>0.98***</td>
<td>-0.213</td>
</tr>
<tr>
<td></td>
<td>(0.117)</td>
<td>(0.555)</td>
<td>(0.231)</td>
<td>(0.188)</td>
</tr>
<tr>
<td>Cancellation Amounts $t$</td>
<td>3.618***</td>
<td>0.318</td>
<td>3.812 ***</td>
<td>3.163***</td>
</tr>
<tr>
<td></td>
<td>(0.181)</td>
<td>(0.54)</td>
<td>(0.376)</td>
<td>(0.292)</td>
</tr>
<tr>
<td>Coupon Amounts $t$</td>
<td>4.07***</td>
<td>2.469***</td>
<td>2.612***</td>
<td>4.931***</td>
</tr>
<tr>
<td></td>
<td>(0.082)</td>
<td>(0.504)</td>
<td>(0.099)</td>
<td>(0.153)</td>
</tr>
<tr>
<td>February</td>
<td>-3.852</td>
<td>0.96</td>
<td>-1.863</td>
<td>-10.828*</td>
</tr>
<tr>
<td></td>
<td>(2.631)</td>
<td>(1.137)</td>
<td>(3.117)</td>
<td>(6.396)</td>
</tr>
<tr>
<td>March</td>
<td>4.195*</td>
<td>3.956***</td>
<td>4.102</td>
<td>1.162</td>
</tr>
<tr>
<td></td>
<td>(2.417)</td>
<td>(0.85)</td>
<td>(2.931)</td>
<td>(6.387)</td>
</tr>
<tr>
<td>April</td>
<td>-1.871</td>
<td>1.429**</td>
<td>-2.054</td>
<td>-4.226</td>
</tr>
<tr>
<td></td>
<td>(2.191)</td>
<td>(0.726)</td>
<td>(2.808)</td>
<td>(5.877)</td>
</tr>
<tr>
<td>May</td>
<td>-6.15***</td>
<td>0.73</td>
<td>-2.904</td>
<td>-17.483***</td>
</tr>
<tr>
<td></td>
<td>(2.073)</td>
<td>(0.705)</td>
<td>(2.619)</td>
<td>(5.438)</td>
</tr>
<tr>
<td>June</td>
<td>-1.768</td>
<td>0.942</td>
<td>-0.121</td>
<td>-6.569</td>
</tr>
<tr>
<td></td>
<td>(1.977)</td>
<td>(0.678)</td>
<td>(2.454)</td>
<td>(5.204)</td>
</tr>
<tr>
<td>July</td>
<td>-6.108***</td>
<td>0.605</td>
<td>-1.899</td>
<td>-16.223***</td>
</tr>
<tr>
<td></td>
<td>(1.914)</td>
<td>(0.655)</td>
<td>(2.366)</td>
<td>(5.078)</td>
</tr>
<tr>
<td>August</td>
<td>-6.232***</td>
<td>-0.214</td>
<td>-3.8*</td>
<td>-14.007***</td>
</tr>
<tr>
<td></td>
<td>(1.847)</td>
<td>(0.634)</td>
<td>(2.281)</td>
<td>(4.886)</td>
</tr>
<tr>
<td>September</td>
<td>omitted</td>
<td>omitted</td>
<td>omitted</td>
<td>omitted</td>
</tr>
<tr>
<td>October</td>
<td>2.444</td>
<td>0.71</td>
<td>3.292</td>
<td>6.281</td>
</tr>
<tr>
<td></td>
<td>(1.868)</td>
<td>(0.638)</td>
<td>(2.3)</td>
<td>(4.98)</td>
</tr>
<tr>
<td>November</td>
<td>-0.323</td>
<td>1.147*</td>
<td>0</td>
<td>2.813</td>
</tr>
<tr>
<td></td>
<td>(1.891)</td>
<td>(0.642)</td>
<td>(2.365)</td>
<td>(5.039)</td>
</tr>
<tr>
<td>December</td>
<td>-1.247</td>
<td>0.607</td>
<td>0.76</td>
<td>-3.433</td>
</tr>
<tr>
<td></td>
<td>(1.944)</td>
<td>(0.657)</td>
<td>(2.434)</td>
<td>(5.19)</td>
</tr>
<tr>
<td>R² Value</td>
<td>0.963</td>
<td>0.945</td>
<td>0.944</td>
<td>0.970</td>
</tr>
</tbody>
</table>

The numbers in parentheses are standard errors. The dummy variables of September across the models are omitted due to multicollinearity among month dummy variables.

***: p-value<0.01, **: p-value<0.05, and *: p-value<0.1

In the pooled data model that does not consider the different effects across the price groups, the effect of the out-of-stock amount in the previous month on the order amount in the current month is negative ($\hat{\beta}_1=-0.324$) at a significance level of 0.1., indicating H1 is accepted.
There is no effect from the return amount in the previous month, showing H2 is rejected, while the effect of the cancellation amount in the previous month on the order amount in the current month is strongly positive ($\hat{\beta}_3 = 3.618$), indicating H3 is supported. Overall, the signs of the effects of the undesirable sales situations at the aggregated level are mixed. As expected, coupon amounts have a strong positive effect on order amounts ($\hat{\beta}_4 = 4.07$). Regarding the monthly effect, the order amounts in May, July, and August are lower ($\hat{\gamma} = -6.15, -6.108, \text{ and } -6.232$) than in January, but the order amounts in other months are the same as in January. These three months are associated with the holidays and summer vacation, when consumers may reduce spending on purchasing fashion items.

Regarding the main topics, we look at estimation results across the price groups and test whether our hypotheses are supported. First, the effect of the out-of-stock amount in the previous month on the order amount is strongly negative in the low- and medium-price groups ($\hat{\beta}_1 = -2.164$ and -3.349, respectively) but is not significant in the high-price group. Notably, the effects of the out-of-stock amounts in the price groups are much stronger than the effects of the out-of-stock amounts in the pooled data mainly because we separate the high-price group from the pooled data. The varying significance levels of the out-of-stock amounts imply that while low- and medium-price brands experience reduced orders due to out-of-stock situations, high-price brands are robust to out-of-stock situations.

Second, the effect of the return amount in the previous month on the order amount in the current month is positive in the low- and medium-price groups ($\hat{\beta}_2 = 1.175$ and 0.98, respectively) but is not significant in the high-price group. These findings recall that the effects of return amounts are not significant in the full data model, but the analysis by price group
reveals differences among brands. These positive effects may imply that after consumers return low- and medium-price products in the previous month, they reorder the same or similar products possibly due to acceptable defects. The insignificant effect in the high-price group indicates that consumers who purchase high-price products respond differently to products they do not like after delivery.

Third, the effect of the cancellations amount in the previous month on the order amount is not significant in the low-price group but is positive in the medium- and high-price groups ($\hat{\beta}_1 = 3.812$ and $3.163$, respectively). The results indicate that it is possible that consumers reorder cancelled products in the current month after canceling products in the previous month possibly because they find better deals or products with better fit.

The results strongly support H4 due to the different magnitudes of the effects across the price groups. It is notable that the effects of all the undesirable sales situations are significant in the medium-price group, among all the price groups. That is, brands in the medium-price group seem to be sensitive to undesirable sales situations in both positive and negative ways. We test whether there are any differences in the effects across the price groups. According to the F-test, there are significant differences in the coefficients of each price group ($F_{(30,2439)} = 14.7$, $p$-value<0.01). It, therefore, is necessary to examine the coefficients of the separate price groups.

The effects of coupon amounts increase across the price groups ($\hat{\beta}_4 = 2.469$, 2.612, and 4.931 for the low-, medium-, and high-price group, respectively). Coupons reduce the final payment, so they may be more effective in the high-price group. Seasonality effects vary across the price groups. In the low-price group, order amounts are higher in March and April than the base month, January, but the other months are the same. In the medium-price group, order amounts are lower at the significant level of 0.1 in August than in January and other months. In
the high-price group, the order amounts are significantly lower in May, July, and August than other months. A possible explanation is that people do not spend money on fashion products in holidays months and the summer vacation season.

The $R^2$ values are around 0.95, which is high. Based on the high $R^2$ values of the models with only fixed effects (the $R^2$ values are 0.934, 0.832, and 0.847 for the low-, medium-, and high-price group, respectively), the unique effects of brands mostly explain order amounts.

6. Conclusion

Discussion and Implications

This study comprehensively examines how undesirable sales situations (measured as the out-of-stock, return, and cancellation amounts in the previous month) influence an online fashion retailer’s financial performance (measured as the order amount in the current month). To understand customers’ different reactions, the moderating effects of three price groups on the relationships between undesirable sales situations and order amounts are also evaluated. The major findings and their implications are discussed as follows.

First, among undesired sales situations, out-of-stocks have significant negative impacts on order amounts. This finding is consistent with the literature and market reports pointing to negative impacts from out-of-stocks on firm performance (e.g., Corsten and Gruen, 2004; Gustafson, 2015). These results emphasize the importance of inventory management. The moderating effect of price group on the relationships between out-of-stock and order amounts is confirmed. Negative effects of out-of-stocks are found in the low- and medium-price groups but not the high-price group.
The different effects of out-of-stocks across the price groups suggest that managers need to manage inventory by brand types associated with price ranges. In particular, low- and medium-price products tend to be low-involvement products, so consumers can easily find substitutes for them by staying in the same store or shifting stores. Based on these negative effects, conducting inventory management to avoid out-of-stocks seems to be more critical for the low- and medium-price groups.

In contrast, out-of-stocks may not be a serious issue for high-price products because the order amounts are not affected. Consumers purchasing high-price products may generate high involvement and brand loyalty through intensive search processes, so these consumers may wait for the products in which they are interested to be restocked. It, therefore, is important to manage brand loyalty as a way to control the negative effects of out-of-stocks. In addition to brand loyalty, high loyalty to the focal online retailer in this study could contribute to the strong reactions to out-of-stocks. The focal online retailer is operated by one of Korea’s largest fashion firms and is well known for its loyal consumers in the high-price category. As pointed out by Corsten and Gruen (2004), loyal customers in this category may find alternative items for out-of-stock products instead of switching to different online retailers. It thus is helpful for retailer managers to build up strong relationships with loyal customers to prevent the negative effects of out-of-stocks.

Second, unlike our expectation, return amounts do have no impact on general order amounts. However, returns have positive influences on order amounts in the low- and medium-price groups. The positive effects in these groups are consistent with the recent market perspective that flexible return policies are an important factor in consumers’ purchase decisions (Friedman, 2018; McGregor, 2015). Lawton (2008) also argued that increased returns do not
harm the sales and profits of online retailers. Even though this study considers only order amounts, not including hidden costs, the findings imply that managers need to consider returns not simply as an undesirable sales situation but also as an inevitable service to motivate repurchases by consumers, at least in the low- and medium-price groups.

However, in the high-price group, product returns do not have significant impacts on order amounts. This result implies that unsatisfied consumers who purchase high-price products do not consider purchasing products from the same brands. Managers responsible for high-price products (e.g., fine jewelry and luxury accessories) need to more carefully manage their targeted consumers with better communication about products and services before purchases and more flexible return policies, so returns caused by dissatisfaction with high-price products do not discontinue repurchases.

Finally, cancellation amounts are found to have a positive influence on overall order amounts. The finding implies that as long as the retailer provides more options for consumers, cancellation before fulfilling customer orders is not an undesirable situation. Rather, it can be another promotion tool for online retailers.

Cancellation amounts have positive influences on order amounts in the medium- and high-price product groups. This positive effect is in line with recent research highlighting online consumers’ demands for order cancellations and the positive impacts of order cancellations on online retailers’ performance (Doherty et al., 2015; Li et al., 2018). That is, this finding implies that order cancellations can boost product sales if used as a customer service in the purchase process. The differences in effects across price groups may be related to the perceived risks associated with price ranges. If high-price products have higher perceived risks, then consumers are less likely to buy these products online compared to low-price products. In this case,
cancellations may be an effective tool to mitigate consumers’ perceived risks related to products and online retailers. Although order cancellations create costs and complications in the supply chain (Cheung and Zhang, 1999; Karp, 2017), this finding suggests the managerial implication that cancellations of products in certain price ranges during the shopping process can be utilized as a tool to improve financial performance.

Limitations and future research

We present the study limitations, which are mainly due to the nature of the data, and suggest future research directions. First, this study uses aggregated data that do not include customer-level information, such as demographic information, the sequences of transactions, and the reasons for returns and cancellations. Future research should obtain deeper understanding of the casual relationships from the perspectives of individual customers. The second limitation is related to the seasonality and trendiness of fashion products, which are distinct even within brands. For example, an out-of-stock situation with an item that is trendy for a season may have more significant impact on sales due to high demand only during the season. Future research, therefore, needs to incorporate the characteristics of individual items within brands to reflect consumer demand for and reactions to online fashion products. Finally, this research focuses on the order amount in the current month at the brand level. To more accurately evaluate financial performance (i.e., profits) at the retailer level, it is necessary to consider relevant factors determining financial performance, such as costs for returns and inventory.
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