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Demand-Supply Mismatches and Stock Market Reaction: Evidence from Excess Inventory Announcements

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This paper documents that excess inventory announcements, an indication of demand-supply mismatch, are associated with an economically and statistically significant negative stock market reaction. The results are based on a sample of 276 excess inventory announcements made during 1990–2002. Over a two-day period (the day of the announcement and the day before the announcement) the mean (median) stock market reaction ranges from −6.79% to −6.93% (−4.51% to −4.79%), depending on the benchmark used to estimate the market reaction. The percent of sample firms that experience negative market reaction ranges from 73% to 74%. When excess inventory is at the announcing firm's customers, the market reaction is more negative than when the excess inventory is at the announcing firm. The stock market reaction is less negative for excess inventory announcements made by larger firms but is more negative for firms with higher growth prospects and with higher debt-equity ratios.

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1. Introduction

Recently many practitioners and academicians have used examples of firms suffering from excess inventory to discuss issues related to supply chain management (Fisher et al. 2000, Billington et al. 2002, Chopra and Sodhi 2004, Narayanan and Raman 2004). Although excess inventory is likely to have a negative effect on firm performance, there is little systematic empirical analysis of the magnitude of performance effects from excess inventory and the determinants of the performance effects. This is surprising, given the central role of inventory management in operations management research and practice.

This paper empirically investigates how the stock market reacts to excess inventory. The evidence is based on an analysis of 276 excess inventory announcements made by publicly traded firms during 1990–2002. These announcements are an acknowledgement by a firm that it is suffering from excess inventory. Examples of such announcements include those about channel inventory buildup, production curtailment, temporary shutdowns, markdowns and promotions, and inventory write-offs to deal with excess inventories. We estimate benchmark-adjusted stock market reaction (abnormal returns) associated with announcements of excess inventory. We develop and test hypotheses concerning how the market reaction is influenced by whether the excess inventory is at the firm or at the firm's customers and by factors such as size, growth prospects, and debt-equity ratio of the announcing firm. We also analyze the market reaction to actions taken to deal with excess inventory and the reasons for excess inventory buildup.

Excess inventory indicates a demand-supply mismatch. Although it is widely believed that demand-supply mismatches have a negative impact on performance (Raman 1997, Fisher 1997, Lee et al. 1997), objective evidence on the magnitude of the

performance effects of demand-supply mismatches is just beginning to emerge. Hendricks and Singhal (2003, 2005) analyze the stock price effects of production and shipment delays. They focus on demand-supply mismatches when supply is lower than demand. When supply is higher than demand, firms bear the economic consequences of excess inventory. We document that excess inventory announcements are associated with an economically and statistically significant stock market reaction. Over a two-day period (the day of the announcement and the day before the announcement) the mean (median) stock market reaction ranges from −6.79% to −6.93% (−4.51% to −4.79%), depending on the benchmark used to estimate the market reaction. The percent of sample firms that experience negative market reaction ranges from 73% to 74%.

We provide evidence on how the stock price performance of the upstream unit (for example, a supplier) is affected when the downstream unit (for example, a retailer) has excess inventory. Our results indicate that firms pay a steep price even if excess inventory buildup is in other parts of the supply chain. When a firm announces that its customers are carrying excess inventories, the additional penalty of inventory buildup at the customer is about 2.5%.

We find that firm size, growth prospects, and debt-equity ratio influence the market's reaction to excess inventory announcements. Excess inventory announcements by larger firms are associated with less negative market reactions than those associated with smaller firms. The relation between growth prospects and market reaction is negative, indicating that firms with higher growth prospects have more negative market reactions. Firms with higher debt-equity ratios experience a more negative reaction. We present results on how the market reaction differs by actions taken to deal with excess inventory and the reasons for excess inventory buildup.

The next section discusses prior empirical research on inventories and performance and contrasts it with this paper. Section 3 discusses the hypotheses examined in this paper. Section 4 describes the sample collection. The methodology for estimating abnormal returns is described in §5. Section 6 presents the results on the stock market reaction to excess inventory announcements. Section 7 presents the regression results to test our hypotheses. Additional exploratory results are presented in §8. The final section summarizes the paper.

2. Literature Review

Although there is an extensive body of operations management literature that examines inventory management issues using normative models, there are very few studies that empirically link inventory performance to financial performance measures. Earlier literature mainly focuses on the effect of just-in-time (JIT) adoption (which can lead to lower inventories) on profitability (Huson and Nanda 1995, Balakrishnan et al. 1996, Kinney and Wempe 2002, Fullerton et al. 2003). The results are mixed, with some studies finding improvement in profitability with just-in-time adoption and others reporting no improvement. More recently, Roumiantsev and Netessine (2007) analyze panel data for a sample of more than 700 firms and find that better earnings are associated with responsive inventory management.

Recent research has started to probe the link between inventory levels and stock returns. Thomas and Zhang (2002) and Chen et al. (2005) examine whether there are differences in long-term stock returns of firms that operate with different levels of inventory turnover. Thus, for example, they are comparing the performance of Dell (high inventory turnover) against Gateway (low inventory turnover). Their analysis of long-term stock returns is based on annual data covering more than 20 years across all firms that report inventories.

Although our paper also examines the relationship between inventories and stock returns, our approach is different. We examine the stock market reaction around the time when firms announce that they are holding excess inventories. We focus on specific announcements of excess inventory buildup and link this to the stock market reaction.

Inventory write-offs are one of the many actions that firms can take to deal with excess inventories. Two studies have explored the relation between inventory write-offs and the stock market reaction. Francis et al. (1996) examine the causes and effects of asset write-offs by considering all types of write-offs,

including inventory write-offs. Lai (2005) hypothesizes that inventory has a signaling role and that the stock market punishes firms when they hold "bad" inventory. He uses inventory write-offs as an indication of "bad" inventory and, based on a sample of 61 inventory write-off announcements, reports that the stock market reaction to write-off announcements is insignificantly different from zero.

Although inventory write-off announcements are part of our sample of excess inventory announcements, there are some key differences between our work and that of Francis et al. (1996) and Lai (2005). First, our analysis includes other actions and not just inventory write-offs that firms take to deal with excess inventories. More specifically, we consider at least four different types of major actions that firms take to deal with excess inventories. In this sense, our sample of excess inventory announcements is broader than that of Francis et al. (1996) and Lai (2005). Second, we examine how the stock price performance of a firm is affected when the firm's customers have excess inventory, something that has not been examined yet in the literature. This shows how poor performance by one link can affect the performance of other links in the chain. Third, we develop and test hypotheses regarding factors that influence the stock market reaction and provide a more detailed analysis of the effect of excess inventory on stock prices than what is currently available in the literature.

3. Hypotheses

Excess inventory will adversely affect the net cash flows of the firm. On the cost side, most obvious are inventory holding costs, which include the financial and physical costs (storage costs, insurance, taxes, spoilage, losses, interest, etc.). The magnitude of other costs depends on the industry and the actions taken to deal with excess inventory. In industries where technology changes are rapid and product life cycles are short, component prices can drop rapidly. For firms with excess inventories of components and parts in such industries, the drop in value is part of the cost of holding excess inventory. Similarly, the cost of providing price protections and accepting product returns increases with excess inventory. Callioni et al. (2005) discuss various inventory-driven costs using a case study at Hewlett-Packard.

Firms can reduce inventory through curtailing production and temporarily shutting down facilities, and by using inventory write-offs and markdowns and promotions. Curtailing production or temporarily shutting down facilities can increase the cost per unit, as most of the fixed costs are still incurred. Curtailing production can cause unfavorable manufacturing variances because of under-absorbed overhead. In some situations, firms might incur one-time costs for closing and restarting facilities. The cost of inventory write-offs is obvious—all the money tied up in inventory has little value and has to be scrapped or sold at bargain prices. If excess inventory results in markdowns, profit margins are squeezed. Furthermore, markdowns may involve additional marketing, distribution, and selling costs, all of which further depress margins. Overall excess inventory reduces revenues, increases costs, and reduces profitability.

Some indirect consequences of excess inventory can affect stock prices. With excess inventory a firm can have limited pricing power, giving customers the upper hand. Excess inventory can limit the resources and funding avenues available to a firm, which can affect its ability to respond to new business opportunities. Furthermore, a firm's ability to introduce new products can be hampered because of the need to clear the distribution channel of excess inventory.

Excess inventory can reflect poorly on the ability and competence of the firm's management team as well as on the effectiveness of the firm's supply chain processes. Excess inventory can indicate that some of these basic supply chain processes are not working smoothly. It can indicate a lack of coordination and collaboration among supply chain partners, poor forecasting ability, and a lack of flexibility and agility to adjust to demand shifts. The inability to execute basic supply chain processes can negatively affect the firm's reputation. It can also be damaging from the standpoint of investor confidence. Excess inventory can raise concerns about the quality of earnings by increasing the uncertainty about future earnings and sales growth. Investors may be skeptical about the firm's future prospects and may value the firm at a lower price-earnings ratio than similar firms.

Based on the above discussion, we expect that excess inventory will have a negative effect on a firm's stock price. Our first hypothesis stated in alternate form is

Hypothesis 1. *The announcements of excess inventory will have a negative stock market reaction.*

Our second hypothesis is that when excess inventory is with the customers of the announcing firm, the stock market reaction will be more negative than when it is with the announcing firm. There are a number of reasons for proposing this hypothesis, First, when excess inventory is with the announcing firm's customers, the announcing firm has less control over how the inventory will be reduced and over the speed of inventory reductions. The announcing firm's actions are likely to depend on the actions the customers take. The lack of control over customer actions can increase the uncertainty about how quickly inventory levels will reach normal levels. Second, inventory buildup at customers could indicate that the firm has poor supply chain visibility and that its information sharing and collaboration processes with supply chain partners are not functioning as well as expected. This could raise concerns about the robustness and reliability of the firm's supply chain management processes. Third, inventory buildups at customers could suggest that the announcing firm may have engaged in "channel stuffing" or "trade loading," which could raise concerns about earnings management and the possibility of lawsuits and litigation. Thus, our second hypothesis is

Hypothesis 2. *When excess inventory is with the customers of the announcing firm, the stock market reaction will be more negative than when it is with the announcing firm.*

We expect the stock market reaction to be more negative for excess inventory announcements made by firms with high growth prospects than by firms with low growth prospects. Excess inventories can be a signal that future growth prospects are not that good and that high performance expectations are unlikely to be met. The inability to meet market expectations can have a more severe negative impact in high growth firms. Furthermore, for firms with high growth prospects, excess inventory can raise concerns about the quality of earnings by increasing the uncertainty about future earnings and sales growth. In some cases, firms with high growth prospects may face intense competition, short product life cycles, and high demand variability. In such situations, excess inventories can constrain the strategic options available to the firm. For example, in a short product life cycle environment, firms may have to resort to heavier discounting to dispose of the inventory or basically write off everything because customers do not want the older products. Ability to forecast demand in a high growth environment is a critical capability. The presence of excess inventory could indicate that the firm's forecasting ability is poor. Thus, our hypothesis is

Hypothesis 3. *The stock market reaction to excess inventory announcements will be more negative for firms with high growth prospects than low growth prospects.*

We expect that the stock market reaction to excess inventory announcements will be more negative for smaller firms than for larger firms. Because smaller firms are likely to be more focused, their performance is likely to critically depend on matching demand with supply for their limited set of products. Failure to do this could have a more severe impact on the profitability of smaller firms. Smaller firms may have less financial flexibility to absorb the cash flow consequences of excess inventory and may have to take more drastic actions to reduce inventories. They may have limited influence and power to deal with excess inventories, particularly when the excess inventory buildup is with their customers. Finally, investors and analysts have lower incentives to search for information before announcement. Hence, excess inventory announcements may have more of a surprise element in the case of smaller firms. Bhushan (1989) finds that the aggregate supply of and demand for analyst services is an increasing function of firm size. Studies of market reactions to earnings announcements find stock price reactions to earnings news are magnified for smaller firms when compared to larger firms (Collins et al. 1987, Bhushan 1989). Thus, our hypothesis is

Hypothesis 4. *The stock market reaction to excess inventory announcements will be more negative for smaller firms than larger firms.*

Our final hypothesis is that the stock market reaction to excess inventory announcements will be more negative for lower debt-equity ratio firms than higher debt-equity ratio firms. Jensen and Meckling (1976),

Galai and Masulis (1976), Smith and Warner (1979), and Masulis (1980) show that any changes in the market value of the firm are shared between the debt holders and shareholders of a firm. Furthermore, the extent of change in the market values borne by stakeholders is a function of the debt-equity ratio. Specifically, the higher (lower) the debt-equity ratio, the less (more) the shareholders (debt holders) will bear the change in the market value. Because excess inventory is likely to reduce the market value of the firm, we expect that firms with high debt-equity ratios will experience a less negative market stock price reaction. Accordingly, our hypothesis is

Hypothesis 5. *The stock market reaction to excess inventory announcements will be more negative for lower debt-equity ratio firms than for higher debt-equity ratio firms.*

4. Sample Selection and Description

To generate our sample, we use a preliminary set of key words to collect a small sample of excess inventory announcements from different publications. We read these announcements to identify additional phrases and words that are commonly used to announce excess inventory and the proximity of the key words to each other. The final set of key words include inventory or inventories close to words such as obsolete, excess, glut, buildup, reduce, bloated, charge, write-off, write-down, liquidate, accumulate, or revalue. These key words are used to search and download the full text of all announcements that appeared in the *Wall Street Journal* (WSJ) and the *Dow Jones News Service* (DJNS) during 1990–2002. The online supplement provides more details on sample construction.

To be included in the sample, the announcement must be about a firm experiencing an excess inventory situation. In cases where the same information is reported in several announcements, only the earliest announcement is included. This could happen when both the WSJ and the DJNS carry the same news. Follow-up announcements of a specific excess inventory situation are excluded. An example is an earnings announcement that refers to an earlier excess inventory announcement. We exclude announcements where an excess inventory situation is disclosed with other actions, as such announcements are contaminated and confounded by other news. For example, an announcement may disclose that a firm is writing off more than one type of asset, including inventory. We also exclude announcements where an excess inventory situation is disclosed with earnings announcements. Finally, to be included in the sample, the firm mentioned in the announcement must have stock returns information on the Center for Research on Security Prices (CRSP) database. Based on the above criteria, the sample consists of 276 announcements. Examples of some announcements are:

> Champion International Corp plans to curtail production at two of its paper mills to reduce its office-paper inventory. (*WSJ* August 4, 1998)

> Eastman Kodak is cutting 15% to 20% of the prices of older formulations photographic film in a fourth-quarter promotion to liquidate inventory. (*WSJ* September 30, 1997)

The 276 announcements are from 236 distinct firms. Panel A of Table 1 presents statistics on the sample based on the most recent fiscal year completed before the date of the excess inventory announcement. The median observation represents a firm with market value of $630.7 million equity, total assets of $515.7 million, sales of $671.1 million, and sales growth of 16.4%. Nearly 50% of our sample firms are in the highest size quintile; 6% are in the smallest size quintile, when size quintiles are created based on the market value of all publicly traded firms listed in CRSP. We estimate inventory turnover as the ratio of cost of goods sold to ending inventory. To ensure comparability, we convert all inventory and cost of goods sold data to first-in, first-out (FIFO) basis by using the information on last-in, first-out (LIFO) reserves. The median inventory turnover is 3.9. The median inventory level is $109.8 million.

Panel B of Table 1 gives the number of announcements by year. Nearly 21% of the announcements are made during 1990–1994, 42% during 1995–1998, and 37% during 1999–2002. Announcements are nearly equally distributed across the four fiscal quarters. Based on the National Bureau of Economic Research's dating procedure for recessions, our sample includes two recessionary periods. The first recessionary period is from July 1990 to March 1991, and the second one is from March 2001 to November 2001. Thus,

Table 1 Sample Description

Panel A: Descriptive statistics for sample of 276 announcements of excess inventory.

Measure	Mean	Median	Std. dev.	Maximum	Minimum
Market value of equity (million $)	6,693.8	630.7	16,338.7	112,194.5	3.6
Total assets (million $)	16,111.8	515.8	54,687.2	323,969.0	1.1
Sales (million $)	11,198.5	671.1	35,004.7	175,353.0	1.4
Sales growth (%)	34.2	16.4	64.6	517.6	−54.7
Inventory turns	5.9	3.9	11.7	173.7	0.3
Inventory level (million $)	1,108.3	109.8	3,259.4	22,035.0	0.9

Note. Sample statistics are based on most recent fiscal year completed before date of excess inventory announcement.

Panel B: Distribution of announcement year for 276 announcements of excess inventory.

Year	Number of announcements	% of announcements
1990	14	5.07
1991	9	3.26
1992	11	3.99
1993	10	3.62
1994	13	4.71
1995	25	9.06
1996	32	11.59
1997	22	7.97
1998	37	13.41
1999	23	8.33
2000	25	9.05
2001	42	15.21
2002	13	4.71
1990–2002	276	100.00

18 months of the 132 months (14% of the months) in our sample are from recessionary periods. About 15% of our announcements (42 of the 410 announcements) are made during the recessionary months. The sample is quite diverse in terms of industry representation, with firms from 91 different three-digit standard industrial classification (SIC) codes included in the sample.

Excess inventory announcements often provide information about who is holding the excess inventory, the actions taken to deal with it, and the reasons for it. Of the 276 announcements, 158 (57% of the sample) indicate that the announcing firm had excess inventory and 118 (43% of the sample) indicate that the customers of the announcing firm have excess inventory. Out of 276 announcements, 38 did not provide any information about the actions taken by the firm to deal with excess inventory. For the remaining announcements, 221 indicate a single action and 17 indicate multiple actions. Of the 221 announcements that indicate a single action, 72 announcements mention inventory write-offs, write-downs, revaluation, and adjustments; 74 mention production curtailment or temporary shutdown of plants; 49 mention customers taking actions to reduce inventory; and 21 mention reduction of inventory through markdowns and promotions. Nearly 61% of the announcements give no reasons for the buildup of excess inventory. Of the announcements that do give reasons, the primary reasons are sluggish demand (73 announcements) and obsolete and discontinued inventory (12 announcements).

To get a perspective on the performance of our sample firms prior to the excess inventory announcements, we compare the financial performance of each sample against the median performance of its industry. Each sample firm's industry consists of all firms that have the same three-digit SIC code as the sample firm does. Table 2 reports the comparative results for the most recent fiscal year completed before the date of the excess inventory announcement. Results are reported for return on assets (ROA), return on sales, sales over assets, and inventory turnover. The median ROA of the sample firms is 14.37%—higher than the median ROA of the industry (11.51%). The median of

Table 2 Comparison of Performance of Sample Firms and Performance of Their Industry

Performance measure	Performance of the sample firms		Performance of the industry		Paired difference between the sample firms and industry	
	Median	Mean	Median	Mean	Median	Mean
Return on assets (%)	14.37	13.95	11.51	10.00	3.07[a]	3.95[a]
Return on sales (%)	12.97	9.96	9.36	6.67	4.29[a]	3.29
Sales over assets (%)	106.55	126.94	120.10	122.50	−2.82	4.44
Inventory turnover	3.92	5.91	4.04	4.67	−0.17	1.24

Notes. Industry includes all firms with the same three-digit SIC code as that of the sample firm. Comparative results are based on the most recent fiscal year completed before the date of the excess inventory announcement. For the paired difference between the sample firms and its industry, the Wilcoxon signed-rank test is used to test if the median is different from zero and the *t*-test is used to test if the mean is different from zero.

[a]Significant at the 1% level (two-tailed tests).

the paired difference between the ROA of the sample firms and their respective industry is 3.07%, significantly different from zero at the 1% level. Sample firms also do better than the industry on return on sales. There is not much difference between the sales over assets of sample firms and those of the industry. The median inventory turnover of the sample firms is 3.92, whereas the median inventory turnover of the industry is 4.04. The median of the pairwise difference between the sample firm and its industry is −0.17, insignificantly different from zero. The inventory turnover of the sample firms is similar to that for their industry.

5. Estimating Abnormal Returns

To document the stock market reaction to excess inventory announcements, we use the event study methodology to estimate abnormal returns. An abnormal return is the difference between the return on a stock and the return on an appropriate benchmark, where the benchmark is chosen to control for factors that can explain stock returns. The idea is that after controlling for these factors, whatever is unexplained is considered abnormal and can be attributed to the event under study. This section discusses the key details of the methodology for estimating abnormal returns, including the choice of period over which abnormal returns are measured and the methods used to estimate abnormal returns.

5.1. Time Period for Measuring Abnormal Returns

Consistent with the approach used in most event studies, we measure abnormal returns over a two-day event period. If the excess inventory announcement is made in the WSJ, the event period includes the day of the announcement and the trading day before the announcement date to account for the possibility that information about the event could have been released the day before the publication of the WSJ article. If the excess inventory announcement is made in the DJNS after 4:00 P.M. Eastern Standard Time (EST), then the announcement date is set to the next trading day to account for the fact that investors cannot act until the next trading day on the information contained in any information made after 4:00 P.M. EST. If the announcement made in the DJNS is before 4:00 P.M. EST, then no adjustment is necessary to the announcement date. As with the WSJ announcements, for announcements made in the DJNS, the event period includes the day of the announcement and the trading day before the announcement date. Calendar day is translated to event time as follows. The announcement calendar day is Day 0 in event time, the next trading day is Day 1, and the trading day before the announcement day is Day −1, and so on. Consistent with most event studies, our focus will be on estimating and interpreting the abnormal returns during the event period (Days −1 and 0).

5.2. Model for Estimating Abnormal Returns

Although there are many methods for estimating abnormal returns, we compare buy-and-hold returns of the sample firms against the buy-and-hold returns of benchmark firms to generate the abnormal returns. As suggested by the reviewers, this may be the most appropriate method of estimating the abnormal returns, as excess inventory may be related to the economy or industry conditions prevailing at the time of the excess inventory announcements. Let $BHR_{i\tau}$ and $BHR^b_{i\tau}$ be the buy-and-hold return over τ days on the sample firm i and the benchmark for sample firm i, respectively. $BHAR_{i\tau}$, the buy-and-hold abnormal return over τ days for sample firm i is

$$BHAR_{i\tau} = BHR_{i\tau} - BHR^b_{i\tau}, \tag{1}$$

and the mean buy-and-hold abnormal return over τ days $\overline{BHAR}_{i\tau}$ is

$$\overline{BHAR}_{i\tau} = \sum_{i=1}^{N} BHAR_{i\tau}/N, \tag{2}$$

where N is the number of sample firms.

We use three different benchmarks to estimate the buy-and-hold abnormal returns. The first is the CRSP value-weighted market return.The second is the value-weighted industry return, where for each sample firm, the benchmark is the value-weighted return of all firms that have at least the same three-digit SIC code as that of the sample firm. The third is the value-weighted size return, where for each sample firm, the benchmark is the value-weighted return of all firms that are in the same size decile as the sample firm, when size deciles are created based on the market value of all publicly traded firms listed in CRSP.

Let $\sigma(BHAR_{i\tau})$ be the cross-sectional standard deviation of the buy-and-hold abnormal returns. To test the null hypothesis that the mean buy-and-hold abnormal return is equal to zero, we use the following parametric test statistics:

$$t_{BHAR} = \overline{BHAR}_{i\tau}/(\sigma(BHAR_{i\tau})/\sqrt{N}). \quad (3)$$

We also use two nonparametric statistics to test the null hypothesis. We report the median abnormal return and use the Wilcoxon-signed-rank test to test whether the median is significantly different from zero. We also report the percent of sample firms that experience negative abnormal performance and use the binomial sign test to test whether the percent of sample firms experiencing negative performance is significantly different from 50%.

6. Empirical Results on Buy-and-Hold Abnormal Returns

Panel A of Table 3 presents summary statistics of the abnormal returns from the three different benchmarks. The results for the value-weighted industry benchmark are based on 274 sample firms, because for two sample firms we could not find any benchmark firms that have at least the same three-digit SIC code as that of the sample firm. Focusing on the results when the value-weighted market index is used as the benchmark, we observe that the mean raw return for the sample is −6.89%, whereas the mean return for the value-weighted market return is 0.01%. The mean abnormal return is −6.90% (t-statistic of −9.43) and the median abnormal return is −4.65% (Z-statistic of the Wilcoxon-signed-rank test is −9.37). Both the mean and the median abnormal returns are significantly different from zero at the 1% level. Of the abnormal returns, 73.19% are negative. If for a given firm the probability of observing a negative abnormal return equals 0.5, then the probability of observing 73.19% negative returns out of a sample of 276 is less than 1% (binomial sign test Z-statistic is −7.71).

Panel B of Table 3 gives the distribution of the event period abnormal returns. The distribution is negatively skewed, with nearly 48% of the sample firms experiencing abnormal returns more negative than −5%, and 31% of the sample firms experiencing abnormal returns more negative than −10%. The evidence shows that announcements of excess inventory are associated with economically and statistically significant negative abnormal returns.

Table 3 Results on Buy-and-Hold Abnormal Returns for Event Period (Days −1 and 0)

Panel A: Statistics on buy-and-hold abnormal returns.

	Benchmarks		
Performance	Value-weighted market return	Value-weighted industry return	Value-weighted size return
Raw return of sample firms (%)	−6.89	−6.80	−6.89
Raw return of benchmark (%)	0.01	−0.01	0.04
Mean abnormal return (%)	−6.90	−6.79	−6.93
t-statistic	−9.43[a]	−9.73[a]	−9.52[a]
Median abnormal return (%)	−4.65	−4.79	−4.51
Wilcoxon-signed rank Z-statistic	−9.37[a]	−9.64[a]	−9.44[a]
% of abnormal returns negative	73.19	74.09	74.28
Binomial sign test Z-statistic	−7.71%[a]	−7.98[a]	−8.07[a]
Sample size	276	274	276

[a]Significant at (two-tailed tests) 1% level.

Panel B: Frequency distribution of buy-and-hold abnormal returns.

	Benchmarks (%)		
Range of abnormal returns	Value-weighted market return percent of obs	Value-weighted industry return percent of obs	Value-weighted size return percent of obs
$R \le -30.0\%$	5.79	5.11	5.43
$-30.0\% < R \le -20.0\%$	6.88	6.57	7.25
$-20.0\% < R \le -15.0\%$	6.52	5.84	6.16
$-15.0\% < R \le -10.0\%$	11.96	10.95	14.13
$-10.0\% < R \le -5.0\%$	17.02	20.07	14.86
$-5.0\% < R \le 0.0\%$	25.00	25.55	26.45
$0.0\% < R \le 5.0\%$	18.84	18.98	17.39
$5.0\% < R \le 10.0\%$	5.43	4.01	6.16
$R > 10.0\%$	2.54	2.92	2.17

The results using the value-weighted industry return and value-weighted size return as benchmarks are similar to the results from the value-weighted market return. When the value-weighted industry return is used as the benchmark, the mean (median) abnormal return is −6.79% (−4.79%), with nearly 74% of the sample firms experiencing negative abnormal returns. When the value-weighted size return is used as the benchmark, the mean (median) abnormal return

is −6.93% (−4.51%), with nearly 74% of the sample firms experiencing negative abnormal returns.

To test the sensitivity of our results, we also estimate the abnormal returns from traditional single-factor models such as the market model, the market adjusted model, the mean adjusted model using both pre and postestimation periods, estimation periods of different lengths, and using both value and equally weighted market returns (see Brown and Warner 1985, MacKinlay 1997 for more details). We also estimate abnormal returns using the four-factor model in Carhart (1997). The results for these models are very similar to the results in Table 3. The detailed results are not reported here but are available on request from the authors.

To test for the stock market reaction in the days surrounding the event period, we estimate the daily abnormal returns over an 11-day period, starting 5 trading days before to 5 trading days after the announcement of excess inventory (Days −5 to 5). The detailed results are not reported here but are available on request from the authors. As expected, the strongest stock market reaction is observed on Days −1 and 0. When the value-weighted market return is used as the benchmark, the Day −1 mean abnormal return is −1.45% (t-statistic of −3.66), median abnormal return is −0.39% (Z-statistic of the Wilcoxon-signed-rank test is −3.54), and 58.34% of the abnormal returns are negative (binomial sign test Z-statistic is −2.77). The results for Day 0 are even more negative. The mean abnormal return is −5.51% (t-statistic of −8.61), the median abnormal return is −2.62% (Z-statistic of the Wilcoxon-signed-rank test is −8.88), and 70.66% of the abnormal returns are negative (binomial sign test Z-statistic is −6.88). Although average daily abnormal returns show a slight negative drift before and after the excess inventory announcement, the days outside of the event period (Days −1 and 0) do not experiences statistically stock market reaction across all three measures of abnormal performance—the mean, the median, and the percent of daily abnormal returns that are negative.

We next analyze the postannouncement abnormal stock price of our sample firms. The primary reason for doing this is to determine whether the market overreacts or underreacts to excess inventory announcements. We begin our estimation period on Day 6 and estimate abnormal returns over the next 120 days, so our estimation period ends on Day 125. Because a month typically has 20 trading days, we are estimating abnormal returns over a six-month period after the announcement. Summary results for the 120-day postannouncement buy-and-hold abnormal returns are as follows:

120-day postannouncement Buy-and-Hold Abnormal Returns

Benchmark	Mean (%)	Median (%)	% Negative
Value-weighted market return	−1.01	−5.00	55.15
Value-weighted industry return	1.11	−2.34	53.71
Value-weighted size return	−0.71	−4.23	56.25

The results indicate that the buy-and-hold abnormal returns over 120 days are generally not statistically significant. The mean abnormal returns range from −0.71% to −1.01% and are insignificantly different from zero. The median ranges from −2.34% to −5.00%, with only the median from the value-weighted market return significantly different from zero at the 10% level in two-tailed tests. The percent negative ranges from 53.71% to 56.25%, with only the percent negative from the value-weighted size return significantly different from 50% at the 5% level in a two-tailed test. Overall, the evidence suggests that that there is no postannouncement drift in abnormal returns.

It is useful to compare the magnitude of the stock market reaction for excess inventory announcements to the stock market reaction to other types of demand-supply mismatches. Hendricks and Singhal (2003) focus on demand-supply mismatches when supply is lower than demand and find that the mean (median) abnormal return over a two-day event period is −7.18% (−5.64%). Delays in new product introductions also cause demand-supply mismatches. In the case of delays in new product introductions, Hendricks and Singhal (1997) find that the mean (median) abnormal return over a two-day event period is −5.25% (−2.10%). A more recent study of new

product introduction delays by Chen et al. (2003) finds that the mean (median) abnormal return over a two-day event period is −11.40% (−4.06%). Cleary, any form of demand-supply mismatches causes an economically and statistically significant negative stock market reaction.

7. Hypothesis Testing and Cross-Sectional Regression Analysis of Event Period Abnormal Returns

This section presents results to test the various hypotheses discussed in §3. We estimate several multivariate regressions to examine how variables representing our hypotheses and various control variables influence the abnormal returns over the event period. The dependent variables in our regressions are the abnormal returns using the value-weighted market, value-weighted industry, and value-weighted size as the benchmarks.

7.1. Variables to Represent Hypotheses Discussed in §3

Excess Inventory at Customer—Defined as an indicator variable with a value one if customers of the announcing firm hold the excess inventory, zero otherwise. Predicted sign of the coefficient is negative.

Firm Size—Measured as the natural logarithm of sales in the most recent fiscal year ending before the announcement date. Predicted sign of the coefficient is positive.

Book-to-Market Ratio—The proxy for growth potential, measured as the ratio of book value of equity to the market value of equity. We compute this ratio using the book value of equity and the market value of the equity reported in the most recent fiscal year ending prior to the announcement date. The higher the ratio is, the lower the growth prospects are. Predicted sign of the coefficient is positive.

Debt-to-Equity Ratio—Measured by the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. We use book value of the debt and market value of equity as reported in the most recent fiscal year ending prior to the announcement date. Predicted sign of the coefficient is positive.

7.2. Control Variables

The stock market reaction to excess inventory announcements may be influenced by differences across sample firms on variables such as inventory turnover, sales growth, and competitiveness of the industry. We test our hypotheses after controlling for a number of firm and industry-level control variables. Each sample firm's industry is defined as all firms that have the same three-digit SIC code as it has. We consider the following control variables.

Inventory Turnover—Previous research has established a link between inventory and stock returns (Francis et al. 1996, Thomas and Zhang 2002, Chen et al. 2005, Lai 2005). Although there is a debate about the direction and strength of the relationship, Raman (2006) argues that the relationship between inventory and stock returns is quite significant. We use the following two variables to control for inventory turnover.

Firm inventory turnover—Measured as the inventory turnover (cost of goods sold divided by year end inventory) in the most recent fiscal year completed before the date of the excess inventory announcement.

Industry inventory turnover—The median inventory turnover in the most recent fiscal year completed before the date of the excess inventory announcement.

Sales Growth—Sales growth expectation could influence the market's assessment about future profitability. An excess inventory situation could indicate that sales growth expectations were too optimistic, and the stock market reaction may be more negative for firms with high sales growth expectations. We use the following two variables to control for sales growth.

Firm sales growth—Measured as the sales growth from the most recent fiscal year completed before the date of the excess inventory announcement to the fiscal year that includes the date of the announcement. Note that this measure reflects the effect of change in sales in the announcement fiscal year.

Industry sales growth—Measured as the median sales growth from the most recent fiscal year completed before the date of the excess inventory announcement to the fiscal year that includes the date of the announcement. Note that this measure reflects the effect of change in sales in the announcement fiscal year.

Recession Period—It is possible that the stock market may view excess inventory announcements made during the recessionary period differently than announcements made during nonrecessionary periods. For example, the market may partially expect an excess inventory situation in a recessionary environment so the actual announcement of excess inventory may be less of a surprise to the market. As mentioned in §4, our sample includes two recessionary periods. The first recessionary period is from July 1990 to March 1991; the second is from March 2001 to November 200. To represent the recessionary period, we define an indicator variable that has a value equal to one if the announcement is made during July 1990 to March 1991 and March 2001 to November 2001, and zero otherwise.

Industry Competitiveness—The stock market reaction may be influenced by the competitiveness of the announcing firm's industry. In a more competitive industry, other firms may be in a position to take advantage of an excess inventory situation experienced by a competitor, so the impact of excess inventory may be more negative. Industry competitiveness is measured as one minus the Herfindahl index. For each sample firm, we compute the Herfindahl index in the most recent fiscal year completed before the date of the excess inventory announcement using sales of all firms with the same primary three-digit SIC code as that of the sample firm. The Herfindahl index for an industry is defined as the sum of the squared fraction of industry sales of each firm that is in the industry. A higher (lower) value of one minus the Herfindahl index means a more (less) competitive industry.

In estimating abnormal returns using the value-weighted market return as the benchmark, we do not explicitly control for factors such as the stock returns of firms that are in the sample firm's industry and are similar in size to the sample firm. To prevent any potential bias that may arise from this, we include control variables that measure the returns of firms that are in the sample firm's industry and returns of firms that are similar in size to the sample firm. We use the following variables.

Value-Weighted Industry Return—The event period return on the portfolio comprised of all other firms with the same three-digit SIC code as the sample firm.

Value-Weighted Size Return—The event period return on the portfolio comprised of all firms that are in the same size decile as that of the sample firm, when size deciles are created based on the market value of all publicly traded firms listed in CRSP.

In regressions where the dependent variable is the abnormal returns estimated using the value-weighted industry return as the benchmark, we do not explicitly control for the returns of firms that are similar in size to the sample firm. To control for size, we include the value-weighted size return as a control variable. Similarly, in regressions where the dependent variable is the abnormal returns estimated using the value-weighted size return as the benchmark, we do not explicitly control for the returns of the firms that are in the sample firm's industry. To control for industry, we include the value-weighted industry return as a control variable.

7.3. Regression Results

Table 4 reports the regression results for the three different models. The dependent variable in Model 1 is the abnormal returns estimated using the value-weighted market return, in Model 2 it is the abnormal returns estimated using the value-weighted industry return, and in Model 3 it is the abnormal returns estimated using the value-weighted size return. Our regressions results are based on a sample of 264 firms, as we lose a few firms because they had missing data for the control variables and/or the hypotheses variables.

The estimated coefficient of the indicator variable "excess inventory at customer" is negative and statistically significant at the 5% level in a one-tailed test. This indicates that when excess inventory is with customers, the abnormal return is more negative than when the excess inventory is at the announcing firm. The results indicate that the additional penalty of inventory buildup at customer is approximately 2.5%. A key implication of our results is that firms can pay a steep price even if excess inventory buildup is in other parts of the supply chain. Such negative economic impacts should provide incentives for various supply chain partners to collaborate and cooperate to avoid excess inventory in supply chains and refrain from practices that cause inventory buildups.

As predicted, the estimated coefficient for the book-to-market ratio is positive and significantly different

Table 4 Estimated Coefficients (*t*-Statistics in Parentheses) from Regressions of Event Period Abnormal Returns

Independent variables		Abnormal returns based on Value-weighted market return (1)	Value-weighted industry return (2)	Value-weighted size return (3)
Intercept		−0.142 (−2.72)[a]	−0.153 (−3.00)[a]	−0.146 (−2.83)[a]
Excess inventory at customer	−	−0.025 (−1.79)[c]	−0.022 (−1.65)[c]	−0.026 (−1.88)[c]
Book-to-market ratio	+	0.054 (3.29)[a]	0.054 (3.42)[a]	0.053 (3.24)[a]
Firm size	+	0.017 (4.94)[a]	0.018 (5.22)[a]	0.018 (5.10)[a]
Debt-to-equity ratio	+	−0.082 (−2.30)[b]	−0.087 (−2.51)[a]	−0.089 (−2.50)[a]
Inventory turnover of the firm		0.001 (1.10)	0.001 (0.67)	0.001 (1.03)
Inventory turnover of the industry		−0.004 (−1.54)	−0.003 (−1.27)	−0.003 (−1.32)
Sales growth of the firm		0.012 (1.36)	0.010 (1.08)	0.009 (0.96)
Sales growth of the industry		−0.032 (−0.52)	−0.014 (−0.24)	−0.013 (−0.23)
Recessionary period		0.042 (2.20)[b]	0.041 (2.13)[b]	0.042 (2.16)[b]
Industry competitiveness		−0.040 (−0.84)	−0.035 (−0.76)	−0.039 (−0.82)
Value weighted industry return		0.878 (4.87)[a]		0.878 (5.16)[a]
Value weighted size return		−0.165 (−0.29)	0.672 (1.28)	
Number of observations		264	264	264
Model *F* value		6.83[a]	5.41[a]	7.38[a]
R squared (%)		24.62	19.10	24.35
Adjusted *R* squared (%)		21.01	15.56	21.05

[a]Significant at the 1.0% level.
[b]Significant at the 2.5% level.
[c]Significant at the 5.0% level.

from zero at the 1.0% level. Thus, firms with higher book-to-market ratio (lower growth prospects) experience less negative abnormal returns than firms with lower book-to-market ratio (higher growth prospects). The coefficient of firm size is positive and statistically significant at the 1% level, indicating that larger firms experience less negative abnormal returns than smaller firms.

We had predicted that the coefficient of debt-to-equity ratio would be positive. Our prediction was based on how changes in market value of the firm are shared between bondholders and shareholders of the firm (Galai and Masulis 1976, Smith and Warner 1979, Masulis 1980). The coefficient of this variable is negative and statistically significant at the 1% level. One possible conjecture for this result is that excess inventory "overhang" could lead to financial distress and could increase the probability of bankruptcy. In this case, shareholders of firms with a high debt-equity ratio have more to lose, as they are the last in the line to get paid.

In the case of the control variables, the coefficients of the firm inventory and industry inventory turnover are insignificantly different from zero, indicating that previous year's inventory turnover has little influence on the stock market reaction. It appears that excess inventory buildup is a surprise to the market. The coefficients of sales growth and industry growth are also insignificantly different from zero. The estimated coefficient of the indicator variable "recessionary period" is positive and statistically significant, indicating that announcement of excess inventory made during recessionary periods is viewed less negatively by the market. This may be because the market partially anticipates that recessions would lead to excess inventory so that the reaction to the actual announcements may be less of a surprise. Although the coefficient of industry competitiveness is negative, it is insignificantly different from zero.

The coefficient of the value-weighted industry return is positive and highly significant, but the coefficient for the value-weighted size return is insignificantly different from zero. The results show that it is important to control for industry-specific factors that are not otherwise captured by abnormal returns estimated using the value-weighted industry return or the value-weighted size return as benchmarks.

For the three models in Table 4, the *F*-values range from 5.41 to 7.38, indicating that all the models are significant at the 1% level or better. Adjusted R^2 values are between 15% and 21%; this is reasonable given that our regressions are based on cross-sectional data.

To explore the sensitivity of our results, we repeat our regressions analysis with the following changes (detailed results are not reported here but are available on request from the authors)—

Replace the firm inventory turnover and industry inventory turnover variables with a variable that represents the difference between these two variables. The coefficient of this variable is insignificantly different from zero. As an additional sensitivity test, we divide our sample into two groups based on inventory turnover. The first (second) group includes firms whose inventory turnover is higher (lower) than the median inventory turnover of their industry. Using Fisher (1997) classification, the first group can be viewed as firms with efficient supply chains (121 sample firms), and the second group can be viewed

as firms with responsive supply chains (143 sample firms). We replace the firm inventory turnover and industry inventory turnover variables with indicator variables representing these two groups of firms. The difference between the stock market reactions for the two groups is insignificantly different from zero. The other results are very similar to the results presented in Table 4.

Replace the firm sales growth and industry sales growth with a variable that represents the difference between these two variables. The coefficient of this variable is insignificantly different from zero. The other results are similar to the results presented in Table 4.

Use sales growth of the firm and the industry estimated from the most recent fiscal year completed two years before the date of the excess inventory announcement to the fiscal year completed before the date of the excess inventory announcement. This measure reflects the change in sales in the fiscal year before the announcement fiscal year. The coefficient for the industry sales growth is insignificantly different from zero. The coefficient for the sales growth of the firm is -0.029 (t-value $= -2.70$), significantly differently from zero at the 1% level. The results indicate that the stock market reacts more negatively when firms with high sales growth suffer from excess inventory. This provides additional support that growth prospects affect the stock market reaction to excess inventory. The other results are similar to the results presented in Table 4.

Include the industry-adjusted ROA in the period before the announcement. This variable tests if the stock market reaction is influenced by prior accounting performance. The coefficient of industry-adjusted ROA is insignificantly different from zero. The other results are very similar to the results presented in Table 4.

We repeat our analyses by excluding three observations that we identified as high influential observations using the Cook's distance. The results excluding these observations are very similar to the results presented in Table 4.

Our sample excludes announcements in which excess inventory situations are disclosed with earnings announcements. To test whether this creates any selection bias, we run our analyses by including such announcements. The sample size is 409, the mean (median) abnormal return is -5.56% (-3.10), and 69% of the abnormal returns are negative. These results are similar to the results for the sample that excludes such announcements (see Table 3). The regression results with this sample are very similar to the results presented in Table 4, except that the coefficient of debt-equity ratio is negative but not statistically significant.

8. Analyses of Effect of Various Actions and Reasons on Abnormal Returns

This section presents some exploratory results on the effect of different actions taken to deal with excess inventory on abnormal returns and the effect of different reasons for excess inventory on abnormal returns. Specifically, we focus on two issues. First, does the stock market react negatively to all actions (reasons)? Second, is the stock market reaction to a particular action (reason) different from all other actions (reasons)? We provide evidence on these two issues by estimating several multivariate regression models using the three models in Table 4. Because the results are very similar, we report the results from Model 1—the model where the dependent variable is the abnormal returns estimated using the value-weighted market return as the benchmark.

8.1. Analysis of Effect of Actions on Abnormal Returns

We examine whether the stock market reacts negatively to the different actions that firms can take to deal with excess inventory. Based on the information in the announcement, we partition the actions into the following seven mutually exclusive categories.

Inventory Write-Offs—Include charges against earnings in the form of write-offs, write-downs, adjustments, revaluation, and reserves to deal with excess inventories (sample size is 67).

Customer Reducing Inventories—Includes actions taken by customers (dealers, wholesaler, distributor, retailers, etc.) to reduce or adjust inventories at their end (sample size is 46).

Production Curtailments—Includes production cutbacks, production slowdowns, temporary worker layoffs, and temporary shutdown of selected facilities (sample size is 73).

Markdowns and Promotions—Includes price cuts and discounts to liquidate or reduce excess inventories (sample size is 20).

Other Actions—Includes actions not classified into the four actions above (sample size is five).

Multiple Actions—Includes announcements that specified more than one action—for example, markdowns and promotions as well as production curtailments (sample size is 16).

No Action Indicated—The announcement did not specify any action (sample size is 37).

We estimate the coefficients of these actions in a multivariate regression by replacing the intercept in the regression Model 1 in Table 4 with seven indicator variables to represent the seven action categories, thereby allowing each category to have its own intercept. The indicator variable for each action category has a value one if the action belongs to that category and zero otherwise. We then estimate the mean stock market reaction for a particular action by holding all other independent variables at their mean values. The mean stock market reaction (t-values in parenthesis) for the seven actions is

Inventory write-offs	−5.25% (−2.43)
Customer reducing inventories	−7.33% (−2.66)
Production curtailments	−5.42% (−2.49)
Markdowns and promotions	−9.15% (−3.11)
Other actions	−10.38% (−2.51)
Multiple actions	−8.28% (−2.74)
No action given	−10.16% (−3.10)

The results indicate that all actions have negative stock market reaction. The mean stock market reaction for inventory write-offs is −5.25%. This result is consistent with Francis et al. (1996), who find that inventory write-offs have significant negative stock market reaction. This reaction is based on negative association (regression coefficient) between abnormal returns and the amount of inventory write-offs normalized by total assets. When customers take actions to reduce inventories, the mean stock market reaction is −7.33%. When firms curtail production or temporarily shut down plants to draw down inventories, the mean stock market reaction is −5.42%. The mean stock market reaction for firms using markdowns to reduce inventories is −9.15%.

We next examine whether the stock market reaction for a particular action is different from all other action categories considered together. For each action category, we start with Model 1 in Table 4 (our baseline regression) and add an indicator variable that has a value one if the action belongs to that action category and zero otherwise. The coefficient of this indicator variable is an estimate of how much the stock market reaction for the action category differs from the stock market reaction for all other action categories considered together (the intercept). We repeat this seven times for the seven different action categories. The results indicate that none of the indicator variable coefficients is statistically significant. We also do a contrast test among all pairs of actions to test if the mean stock market reaction for different actions is significantly different. The results indicate that none of the pairwise contrast tests is statistically significant. Basically, the stock market reaction is not significantly different across the various actions firms used to try to deal with the excess inventory.

8.2. Analysis of Effect of Reasons for Excess Inventory on Abnormal Returns

We next examine whether the stock market reacts negatively to the different reasons for excess inventory buildup. Based on the information in the announcement, we partition the reasons into the following five mutually exclusive categories.

Sluggish Sales—Includes various reasons demand is sluggish (sample size is 73).

Obsolete and Discontinued Inventory—Includes various reasons for the presence of obsolete and discontinued inventory (sample size is eight).

Other Reasons—Includes reasons such as poor forecasting, new product introduction issues, and other very infrequently mentioned reasons (sample size is 19).

Multiple Reasons—Includes announcements that specified multiple reasons—(sample size is four).

No Reason Given—The announcement did not specify any reason (sample size is 160).

We estimate the coefficients of these reasons in a multivariate regression by replacing the intercept in the regression Model 1 in Table 4 with five indicator variables to represent the five reason categories, thereby allowing each category to have its own intercept. The indicator variable for each reason category

has a value of one if the action belongs to that category and zero otherwise. We then estimate the mean stock market reaction for a particular action by holding all other independent variables at their mean values. The mean stock market reaction (t-values in parenthesis) for the five reasons is

Sluggish sales	−9.54% (−3.41)
Obsolete and discontinued inventory	−2.72% (−1.84)
Other reasons	−8.42% (−2.92)
Multiple reasons	2.27% (−0.88)
No reason given	−5.99% (−2.82)

The results indicate that all reason categories except multiple reasons (based on four observations) have a negative stock market reaction. The mean stock market reaction for sluggish sales is −9.54% and −2.72% for obsolete and discontinued inventory.

We next examine whether the stock market reaction for a particular reason is different from all other reason categories considered together. For each reason category we start with Model 1 in Table 4 and add an indicator variable that has a value of one if the reason belongs to that reason category and zero otherwise. The coefficient of this indicator variable is an estimate of by how much the stock market reaction for the reason category differs from the stock market reaction for all other reason categories considered together (the intercept). We repeat this five times for the five different reason categories.

The results indicate that only the coefficient on the sluggish sales variable is negative and statistically significant, indicating that excess inventory buildup due to sluggish sales is viewed more negatively by the market than other reasons. Pairwise contrast tests among all pairs of reasons also indicate that the coefficients of sluggish sales are more negative than the coefficients of some of the other reasons for excess inventory.

9. Summary

Based on an analysis of 276 excess inventory announcements made by publicly traded firms during 1990–2002, we document that excess inventory announcements are associated with an economically and statistically significant negative stock market reaction. Over a two-day period (the day of the announcement and the day before the announcement), the mean (median) stock market reaction ranges from −6.79% to −6.93% (−4.51% to −4.79%), depending on the model used to estimate the market reaction. The percent of sample firms that experience negative market reaction ranges from 73% to 74%. We find that when excess inventory is at the announcing firm's customers, the market reaction is more negative than when the excess inventory is at the announcing firm. The market reaction is less negative for excess inventory announcements made by larger firms. We also find that the stock market reaction is more negative for firms with higher growth prospects and firms with higher debt-equity ratios.

The evidence presented in this paper has a number of implications. It highlights the need for firms to be fully aware of what is happening in their supply chain. The evidence indicates that even when the inventory buildup is at a downstream unit (customers), the upstream unit (supplier) pays a steep cost for this buildup, as evidenced by the negative market reaction. This suggests the need for visibility into the internal operations of supply chain partners so that inventory buildups can be avoided or dealt with earlier rather than later. Excess inventory is an indication of demand-supply mismatches. Many experts have argued that the probability of such mismatches can be significantly reduced if supply chain partners work collaboratively and cooperatively, share information with each other, and build relationships based on trust. Others have expressed frustration with the slow pace of adoption of these practices. The economic consequences of excess inventory could be a catalyst in bringing about the desired behavioral changes.

There are a number of directions for future research. It could be useful to build an understanding of some of the underlying drivers of excess inventory and to find whether the negative effect of excess inventory varies by these drivers. It would also be useful to gain a deeper understanding of the operating and organizational characteristics of firms that have excess inventory situations. Given the significant negative stock market reaction, it would be important to examine whether firms with excess inventory subsequently suffer from poor operating performance. This would provide additional evidence to corroborate the negative market reaction that we document. Furthermore, nearly 25% of the sample firms experience positive

stock market reaction. It would be useful to develop and test hypotheses that can explain why and when the market reacts positively. It might also be useful to see whether analysts revise their forecasts and buy and sell recommendations in anticipation of excess inventory situations.

Electronic Companion

An electronic companion to this paper is available on the *Manufacturing & Service Operations Management* website (http://msom.pubs.informs.org/ecompanion.html).

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