1-2018

# The impact of advertising share of voice on the idiosyncratic risk of the firm

Sungkyun MOON
*Singapore Management University*, skmoon@smu.edu.sg

Kapil R. TULI
*Singapore Management University*, kapilrtuli@smu.edu.sg

Anirban MUKHERJEE
*Singapore Management University*, anirbanm@smu.edu.sg

# Advertising Share of Voice and Idiosyncratic Risk

Integrating literature in marketing, finance and accounting, this study examines the impact of a firms' advertising share of voice (ASOV) on investors' uncertainty about its future financial performance, i.e., firms' idiosyncratic risk. Drawing on signaling theory, authors propose that ASOV serves as a signal for investors such that higher ASOV reduces idiosyncratic risk. Consistent with this argument, analysis of 2,777 publicly listed firms over a two-decade period (1995-2014) shows that ASOV has a significant negative effect on idiosyncratic risk. In addition, consistent with the argument that ASOV is a more credible signal when firms have higher cash flows; authors find that the negative impact of ASOV on idiosyncratic risk is stronger for firms with higher cash flows. Similarly, results support arguments that ASOV is a more appropriate signal for firms that have low quality disclosures and are in industries that are more competitive. Taken together, this study identifies specific conditions under which senior managers and financial analysts can expect ASOV to be a valuable marketing instrument to lower a firms' idiosyncratic risk.

*Keywords:* advertising share of voice, signaling, idiosyncratic risk, accounting, marketing-finance interface

Advertising agencies and trade publications frequently report and underscore the importance of a firm's advertising share of voice (see Advertising Weekly 2016). Financial analysts, also consider advertising share of voice (ASOV) an important metric. For example, Goldman Sachs financial analysts raised concerns about McDonald's future earnings as "… it is losing advertising share of voice," (Wall Street Journal 2013). Senior managers too echo this view. For example, Marvin Ellison, the CEO of JC Penney, notes in an earnings conference call that "we are putting more dollars into marketing just to make sure that our share of voice is strong" (JC Penney 2016). Similarly, Bill Simon, the CEO of Walmart notes, "We have a comprehensive marketing plan that's designed to ensure we have the number one share of voice" (Walmart 2013).

Given that firms invest significant resources in trying to maintain or enhance ASOV, it is important to assess its impact on the financial risk of a firm. Examining the impact of managerial actions, such as, ASOV, on financial risk of a firm is an important consideration for senior managers, analysts, and investors (Srinivasan and Hanssens 2009). Indeed, Hanssens and Pauwels (2016, p. 182) note that "marketing's ability to managing business risk is an integral part of its value creation." Accordingly, the primary objective of this study is to examine the impact of ASOV on the financial risk of a firm.

We examine financial risk of a firm as reflected in the idiosyncratic risk of its stock returns, i.e., the volatility in the stock returns of a firm that is not due to market-wide factors, but is due to the firm-specific factors (see Ang et al. 2006). Idiosyncratic risk accounts for almost 85% of risk of stock returns (see Goyal and Santa-Clara 2003). Recent research suggests that idiosyncratic risk is a better indicator of the financial risk of the firm than the overall market risk (see Atkeson, Weill, and Eisfeld 2014). Senior managers are also concerned about idiosyncratic risk because their compensation is tied to stock options (see Brown and Kapadia 2007). Importantly, idiosyncratic risk has a significant impact on both

discretionary spending (see Chakravarty and Grewal 2011) and the investment decisions made by managers (see Gilchrist, Sim and Zakrajsek 2014). The study seeks to make two contributions:

*First*, we present the first study that examines the impact of ASOV on idiosyncratic risk using a large-scale database of 2,777 publicly listed firms over a 20-year period. Drawing on the proposition that ASOV is a signal that can provide valuable information to investors (Chemmanur and Yan 2009; Joshi and Hanssens 2010), we propose that higher ASOV lowers investors' uncertainty about future firm performance, and therefore reduces a firm's idiosyncratic risk. Consistent with this argument, we find that ASOV has a significant negative impact on a firm's idiosyncratic risk. As such, the study is responsive to recent calls for examining the risk implications of marketing actions (e.g., Hanssens and Pauwels 2016). In addition, by bringing to fore the risk implications of ASOV, this study complements prior literature, which shows that ASOV has a positive effect on metrics such as market-share and profits (Steenkamp and Fang 2011) and firm value (McAlister et al. 2016).

*Second*, we synthesize marketing literature with insights from finance and accounting to propose that the negative impact of ASOV on idiosyncratic risk is stronger when investors consider it as a more credible and appropriate signal. As such, this study responds to a recent call that "identifying contingency factors that may affect the strength of marketing-performance chain is urgent" (Katsikeas et al. 2016, p. 16). Consistent with the argument that ASOV is a more credible signal when firms have higher cash flows, we find that the negative impact of ASOV on idiosyncratic risk is stronger for firms with higher cash flows. In addition, we propose that ASOV is a more appropriate signal in contexts where investors need more information to understand future firm performance. Consistent with the proposed hypotheses, we find that the negative impact of ASOV on idiosyncratic risk is stronger for firms with lower financial disclosure quality. We also find that ASOV is a more appropriate

signal for investors for firms in more competitive industries where it is difficult to predict future firm performance. Taken together, we identify specific conditions under which ASOV is more (or less) likely to be a useful marketing instrument to lower idiosyncratic risk.

## *HYPOTHESES*

### *ASOV and Idiosyncratic Risk*

Idiosyncratic risk reflects investors' uncertainty about the future cash flows of a firm such that greater uncertainty about future cash flows means higher idiosyncratic risk (Srinivasan and Hanssens 2009). As such, in examining the impact of ASOV on idiosyncratic risk, it is important to consider whether ASOV is likely to provide useful information to investors about its future cash flows.

Investors consider advertising spending as a signal that can provide information about the future financial performance of a firm (see Chemmanur and Yan 2009; Joshi and Hanssens 2010). Indeed, advertising is not cheap talk, and is expensive for the firm; both in terms of the direct cost of doing so, but also in terms of the potential damage to the firm reputation if the performance of its offerings does not meet customer expectations (see Jain and Wu 2000, p. 938). Building on this perspective, we consider ASOV as a signal for investors due to two reasons.

First, building and maintaining ASOV is expensive, as firms must commit resources in doing so. That is, ASOV is a costly signal. Second, ASOV is likely to translate into higher brand awareness (e.g., Draganska and Klapper 2011), leading to higher sales (McAlister et al. 2016) and market share (Pollay et al. 1996). Higher ASOV is also likely to allow a firm to charge higher relative price (Chaudhuri and Holbrook 2001). Recent research also shows that higher ASOV is likely to result in higher customer retention (Datta, Foubert, Van Heerde 2015). Taken together, these findings suggest that from an investor's perspective, ASOV is a valuable signal such that higher ASOV means greater stability of future cash-flows. In other

words, investors face less uncertainty about the future cash-flows of a firm that has higher ASOV. Therefore, we expect:

*H1: The higher the ASOV of a firm, the lower its idiosyncratic risk.*

*A Contingency Approach: Credibility and Appropriateness of the Signal of ASOV*

Literature on signaling theory suggests that the effectiveness of a signal is likely to depend on credibility and appropriateness of a signal (e.g., Connelly et al. 2011; Kirmani and Rao 2000; Moenaert and Souder 1996). For example, Saboo and Grewal (2013) propose that investors' reaction to signals related to customer and competitor orientation depends on the credibility and appropriateness of these signals. Similarly, Kirmani and Rao (2000) suggest that the credibility and appropriateness of signals are important when firms signal unobservable product quality. Therefore, we propose that value of ASOV as a signal is likely to depend on the extent to which investors consider ASOV to be a credible and appropriate signal.

*Credibility of ASOV as a Signal*

*Cash-flows.* Cash-flows are an important indicator of financial health (Vorhies, Morgan, and Autry 2009) and resources available to a firm (Bernardo and Chowdhry 2002). A firm with higher cash-flows is likely to have greater resources to maintain the investments required to sustain its market-based assets and capabilities (Katsikeas et al. 2016). As such, higher ASOV by a firm with higher cash-flows is likely to be considered a more credible signal because the firm has the resources available to maintain or even enhance its ASOV.

Firm ability to maintain its ASOV is an important consideration for investors because it serves as an assurance that they can expect the firm performance to be sustainable. In contrast, higher ASOV of a firm with lower cash-flows is likely to be viewed as a less credible signal because investors are likely to have doubts about the firm's ability to maintain its ASOV. That is, the impact of ASOV on investors' uncertainty about future firm

performance is likely to be weaker if the firm has lower (as compared to higher) cash-flows. Therefore, we expect:

> *H2: The negative impact of ASOV on the idiosyncratic risk of a firm is stronger (weaker) for firms with higher (lower) cash-flows.*

*Appropriateness of ASOV as a Signal*

Prior literature suggests that a signal is more appropriate for investors if there is high information asymmetry between them and managers (see Davila, Foster, and Gupta 2003; Janney and Folta 2006). Information asymmetry, in turn, can be present due to firm- or industry-level factors (see Connelly et al. 2011). Accordingly, we consider both firm- and industry-level factors to evaluate the appropriateness of ASOV as a signal.

At the firm level, we examine the moderating impact of disclosure quality of a firm. Disclosure quality of publicly listed firms is a critical issue that is closely studied by regulators, analysts, and investors (see Healy and Palepu 2001). This is because high disclosure quality means lower information asymmetry between investors and firms, a key consideration for regulators such as Securities and Exchange Commission (SEC). At the industry level, we consider competitive intensity and industry growth as they reflect information challenges for investors. For firms in highly competitive industries, it is more difficult for investors to assess their future performance as they are more likely to be faced with unexpected competitive actions (Hou and Robinson 2006). Similarly, it is more difficult for investors to predict future performance of firms in low growth industries as it is more difficult to anticipate their source of future cash-flows (Brauer and Wiersema 2012).

*Disclosure quality.* Disclosure quality reflects the value of information that is provided by a firm to investors such that high disclosure quality reduces information asymmetry between a firm and investors, and therefore makes it easier for investors to predict future cash flows (see Chen, Miao, and Shevlin 2015; Gao 2010). The information provided by high ASOV is likely to be more useful for investors when the disclosure quality of a firm

is low, as compared to when it is high. This is because low disclosure quality means that the information asymmetry between firm and investors is high and therefore there is a greater need for additional information provided by high ASOV for investors. Therefore, we expect:

*H3: The negative impact of ASOV on the idiosyncratic risk of a firm is stronger (weaker) for firms with lower (higher) disclosure quality.*

*Competitive Intensity.* For investors, high competitive intensity in an industry means that it is more difficult to predict firm performance as the competitive dynamics in such industries are more difficult to grasp (Saboo and Grewal 2013). This is because the number of competitors is usually higher and the number of options available to customers are also higher in more competitive industries (see Bansal et al. 2016). As such, for investors there is a greater need for additional information in highly competitive industries (see Connelly et al. 2011; Sanders and Boivie 2004). In contrast, if a firm is in a less competitive industry, it is relatively easier for investors to predict firm performance as there are fewer competitors to track and consumers also have fewer options (Giroud and Mueller 2011). As such, information provided by high ASOV is less valuable for investors in less competitive industries. Therefore, we expect:

*H4: The negative impact of ASOV on idiosyncratic risk is stronger when the firm is in an industry with high (versus low) competitive intensity.*

*Industry growth.* High growth rate in an industry means that more resources and opportunities are available for firms in that industry (e.g., Brauer and Wiersema 2012). The availability of resources and opportunities, therefore, is likely to make it easier for investors to predict the future performance of firms in such industries because there are less threats which are likely to require more information to evaluate firm future performance (see Baum and Wally 2003). This, in turn, reduces the investors' need for additional information for firms in high growth industries. In contrast, if a firm is in a low growth industry, it is more

difficult for investors to predict future performance. This is because it is more difficult to understand and identify the sources of future cash-flows of the firm if the industry itself is not growing and the resources are scarce (see Boyd 1995; Baum and Wally 2003). In such a scenario, the need for additional information to predict future cash-flows is higher for investors. As such, the value of information provided by ASOV for investors is likely to be higher if the firm is in a low growth industry. Therefore, we expect,

*H5: The negative impact of ASOV on idiosyncratic risk is stronger when the firm is in a low (versus high) growth industry.*

## *METHOD*

### *Data*

We obtain accounting-related information from the COMPUSTAT annual database, stock prices from the Center for Research in Security Prices (CRSP), and the Fama and French factors from Kenneth French's website.[1] In 1994, the Securities and Exchange Commission (SEC) clarified the disclosure standard for advertising via Financial Reporting Release No. 44 (FRR44). Therefore, to ensure that our sample represents a single regulatory paradigm, we focus on data after fiscal year 1995. In addition, given our focus on measuring ASOV in an industry, we only focus on industries where there are at least 5 firms that provide their advertising expenses. Finally, we follow standard practice in finance and exclude penny stocks, i.e., stocks whose price at the end of a fiscal year is less than $1, because such stocks have extreme illiquidity and could bias results (see Avramov, Chordia, and Goyal 2006, p. 2368; Ball, Kothari, and Shanken 1995). Our sample consists of 2,777 firms and 16,978 firm-year observations, over the 20-year period from fiscal year 1995 to 2014.

### *Variables and Measures*

*Dependent variable.* We use the Fama and French four-factor (FF4) model to estimate the idiosyncratic risk of a firm (Carhart 1997; Fama and French 1993). We estimate Equation

1 on the daily stock returns of a firm following the release of the firm's annual report and before the release of its annual report in the following year. Idiosyncratic risk is the standard deviation of the residuals from estimating Equation 1:

$$(1) \qquad (R_{ijd} - R_{fd}) = \alpha_{ij} + \beta_{mij}(R_{md} - R_{fd}) + \beta_{sij}(SMB)_d + \beta_{hij}(HML)_d + \beta_{uij}(UMD)_d + \varepsilon_{ijd},$$

where $R_{ijd}$ = daily return on stock of firm i in the industry j on day d, $R_{fd}$ = daily risk-free return on day d, $R_{md}$ = daily return on a value-weighted market portfolio on day d, $(SMB)_d$ = Fama-French size portfolio on day d, $(HML)_d$ = Fama-French market-to-book ratio portfolio on day d, and $(UMD)_d$ = the momentum factor on day d.

*Advertising share of voice.* Following McAlister et al. (2016), we measure a firm's *advertising share of voice* (ASOV) as the firm's annual advertising expenditure divided by total advertising expenditure in an industry (also see Steenkamp and Fang 2011). McAlister et al. (2016, p. 213) note that ASOV (i) is consistent with how consumers perceive and process information of advertisements (Sternthal and Lee 2005), (ii) takes into account the different levels of advertising across industries, and (iii) provides managerially relevant and insightful implications. Indeed, the impact of firm's marketing action (e.g., advertising) is often determined by the competitive feature of the action relative to that of competitors in the industry (Reibstein and Wittink 2005). Thus, the measure of ASOV gives *"a better sense of the wisdom* for *competitive responsiveness"* (Reibstein and Wittink 2005, p. 8).

*Control variables*. Table 1 outlines the definition, data sources, and supporting literature for the use of the control variables.

[Insert Table 1 About Here]

First, we include firm-level control variables. We control for firm size by using total assets because firms with greater assets have more stable stock returns (Rego, Billett, and Morgan 2009). In addition, we include cash flows because firms with higher cash flows have more

stable stock returns. Finally, we also control for firm financial leverage and liquidity as firms with higher leverage have higher idiosyncratic risk and those with higher liquidity are expected to have lower idiosyncratic risk (see Table 1).

To isolate the impact of ASOV on idiosyncratic risk, it is also important to account for the quality of a firm's financial disclosures. This is because firms with higher quality of disclosures have more stable returns (see Bushee and Noe 2000). Following recent research in accounting, we use the level of disaggregation of the financial reports of a firm to measure of the quality of its financial disclosures (see Chen, Miao, and Shevlin 2015). Specifically, the higher the level of disaggregation of the financial reports of a firm, the greater is the information available to investors, and therefore, the greater is the quality of its financial disclosures (see Chen, Miao, and Shevlin 2015, p. 1025-1030).

Following Chen, Miao, and Shevlin (2015), we start by counting the non-missing items both in the firm's balance sheet and its income statement. By using the nesting feature of the firm's financial report, we calculate the ratio of non-missing items to the total items in the balance sheet and income statement.[2] For the balance sheet, we identify 11 groups, which are associated with 25 second-level items and 93 subaccounts. We count the non-missing items in 93 subaccounts for the balance sheet and generate the value-weighted ratio of the non-missing items for each group based on the magnitude of the group over the total assets. For the income statement, we generate the equal-weighted ratio of the non-missing items to the total items. Then, we use the average of each ratio for the balance sheet and income statement as disclosure quality. High ratio indicates the high level of disaggregation in financial reporting, suggesting high disclosure quality.

Second, we incorporate industry covariates to control for the extent to which industry conditions affect firm performance and risk (see Table 1). Consistent with recent research, we use the five-digit North American Industry Classification System (NAICS) to identify an

industry (e.g., Alvarez and Shimer 2011; Uslay, Altintig, and Winsor 2010). We control for competitive intensity by measuring the Herfindahl-Hirschmann index (HHI) for each industry and subtracting it from 1 (e.g., Deb, David, and O'Brien 2017; Fang, Lee, and Yang 2015). Finally, we control for the industry growth (see Table 1). Table 2 shows the descriptive statistics and the correlation matrix for the variables.

[Insert Table 2 About Here]

*Model*

Equation 3 outlines the model we use to test the hypotheses and Equation 2 represents the main-effects model without interaction terms:

$$(2) \quad IR_{ijt} = \beta_{0i} + \beta_1 ASOV_{ijt} + \beta_2 Cash\ Flow_{ijt} + \beta_3 Disclosure\ Quality_{ijt} + \beta_4 Competitive\ Intensity_{jt} + \beta_5 Industry\ Growth_{jt} + \beta_6 Firm\ Size_{ijt} + \beta_7 Leverage_{ijt} + \beta_8 Liquidity_{ijt} + \sum_{k=1}^{K} \gamma_k Year_t + \eta_{ijt}$$

$$(3) \quad IR_{ijt} = \beta_{0i} + \beta_1 ASOV_{ijt} + \beta_2 ASOV_{ijt} \times Cash\ Flow_{ijt} + \beta_3 ASOV_{ijt} \times Disclosure\ Quality_{ijt} + \beta_4 ASOV_{ijt} \times Competitive\ Intensity_{jt} + \beta_5 ASOV_{ijt} \times Industry\ Growth_{jt} + \beta_6 Cash\ Flow_{ijt} + \beta_7 Disclosure\ Quality_{ijt} + \beta_8 Competitive\ Intensity_{jt} + \beta_9 Industry\ Growth_{jt} + \beta_{10} Firm\ Size_{ijt} + + \beta_{11} Leverage_{ijt} + \beta_{12} Liquidity_{ijt} + \sum_{k=1}^{K} \gamma_k Year_t + \eta_{ijt}$$

where $\beta_0$ is the intercept; $\beta_1$ represents the main effect of ASOV on the idiosyncratic risk; $\beta_2$-$\beta_5$ represent the coefficients of the moderating effects; $IR_{ijt}$ denotes the idiosyncratic risk of

the firm *i* in industry *j* for fiscal year *t*. In addition, the model includes control variables outlined in Table 1 along with both firm-specific fixed effects ($\beta_{0i}$) and year fixed effects ($Year_t$ ). $\eta_{ijt}$ is a random error term for firm *i* in the industry *j* at fiscal year *t*.

*A Gaussian Copula Method for Addressing Endogeneity*

Extant literature in marketing suggests that advertising decision may be endogenous to firm performance because advertising expenditure is strategically determined in a firm (e.g., Sridhar et al. 2016). Therefore, we use the copula method proposed by Park and Gupta (2012) to address the endogeneity of ASOV (for empirical applications, see Mathys, Burmester, and Clement 2016; Datta, Foubert, and van Heerde 2015). In line with Park and Gupta (2012) and Datta, Foubert, and Van Heerde (2015), we generate the copula correction term for ASOV by using Equation 4:

$$(4) \qquad Copula\_ASOV_{ijt} = \phi^{-1}(H_{ASOV}(ASOV_{ijt})),$$

where $\phi^{-1}$ is the inverse of normal cumulative distribution function and $H_{ASOV}(\bullet)$ denotes the empirical cumulative distribution function of ASOV for firm i in the industry j at the fiscal year t. For identification, the endogenous variable needs to be non-normally distributed (Park and Gupta 2012). Both the histogram of ASOV (see Figure 1) and a Shapiro-Wilk test ($w=0.515$, $z=22.353$, $p<0.001$) ensure that the condition is satisfied.

[Insert Figure 1 About Here]

Therefore, we include the copula correction term to address concerns related to endogeneity of ASOV. As such, the final model (Equation 5) is:

$$\begin{aligned}(5) \qquad IR_{ijt} = {} & \beta_{0i} + \beta_1 ASOV_{ijt} \\ & + \beta_2 ASOV_{ijt} \times Cash\ Flow_{ijt} + \beta_3 ASOV_{ijt} \times Disclosure\ Quality_{ijt} \\ & + \beta_4 ASOV_{ijt} \times Competitive\ Intensity_{jt} + \beta_5 ASOV_{ijt} \times Industry\ Growth_{jt} \\ & + \beta_6 Cash\ Flow_{ijt} + \beta_7 Disclosure\ Quality_{ijt}\end{aligned}$$

$$+ \beta_8 \, Competitive\ Intensity_{jt} + \beta_9 \, Industry\ Growth_{jt}$$

$$+ \beta_{10} \, Firm\ Size_{ijt} + \beta_{11} \, Leverage_{ijt} + \beta_{12} \, Liquidity_{ijt}$$

$$+ \beta_{13} \, Copula\_ ASOV_{ijt} + \sum_{k=1}^{K} \gamma_k \, Year_t + \eta_{ijt}$$

Following Park and Gupta (2012), we calculate the standard errors of the estimates by using 200 bootstrapping replications. We mean-center the variables for model estimation.

## *RESULTS*

### *Main Effect*

Table 3 outlines the results of estimating Equation 5 (see Model 2, Table 3). In addition, we also include a simple "main-effects" model that includes all control variables outlined in Equation 5, but does not include the interaction terms (see Model 1, Table 3). As shown in Table 3, the estimation of the simple model provides significant support for the argument that ASOV lowers idiosyncratic risk of a firm ($\beta_1 = -0.004$, $p < 0.01$).

The Wald test for Model 2 shows that the model is significant ($p < 0.001$) and model fit statistics support the model with interaction terms (Model 2) over a main-effects only model (Model 1). The significant coefficient of the copula correction suggests that correcting for endogeneity of ASOV is indeed required (see Datta, Foubert, and Van Heerde 2015, p. 225). In addition, control variables have expected effects on idiosyncratic risk. We find that firm size, cash flow, liquidity, disclosure quality, and industry growth have significant negative impact on idiosyncratic risk. In contrast, leverage and competitive intensity increase idiosyncratic risk. Importantly, ASOV has a significant negative effect on idiosyncratic risk ($\beta_1 = -0.004$, $p < 0.05$). H1, therefore, is supported.

[Insert Table 3 About Here]

### *Moderating Effects*

*Firm-level:* Consistent with H2, the interaction between ASOV and cash flow is negative and significant ($\beta_2 = -0.025$, $p < 0.05$), i.e., the negative effect of ASOV on idiosyncratic risk is stronger for firms with higher cash flows. We also find that the interaction between ASOV and disclosure quality is positive and significant ($\beta_3 = 0.056$, $p < 0.001$). That is, the negative effect of ASOV on idiosyncratic risk is stronger for firms with lower disclosure quality. H3, therefore, is supported.

*Industry-level:* Consistent with H4, the interaction between ASOV and competitive intensity is significant and negative ($\beta_4 = -0.019$, $p < 0.01$). That is, the negative effect of ASOV on idiosyncratic risk is stronger for firms in industries with high competitive intensity. H5, however, is not supported as we find that the interaction between ASOV and industry growth is not significant ($\beta_5 = 0.004$, $p > 0.1$).

*Sensitivity Analyses*

To examine the robustness of our results, we conduct multiple sensitivity analyses (see Table 4). *First*, following Sridhar et al. (2016), we assess the sensitivity of results to sample composition by (a) dropping a random sample of 10% of the firms (Model 3), (b) removing the first two years (i.e., 1995 and 1996) of the sample (Model 4), and (c) removing the last two years (i.e., 2013 and 2014) of the sample (Model 5). *Second*, we examine the sensitivity of our conclusions to the use of alternative approaches for calculating the dependent variable, i.e., use of Fama and French (1993) model (Model 6), the market (Brown and Warner 1985) model (Model 7), and using simple stock return volatility (Sorescu and Spanjol 2008) measured by the standard deviation of daily returns (Model 8). As shown in Table 4, our conclusions remain largely unchanged across multiple sensitivity analyses.

[Insert Table 4 About Here]

## *DISCUSSION*

This study builds on and integrates literature in marketing, finance, and accounting to examine the impact of ASOV on idiosyncratic risk. We find that ASOV not only serves as a valuable signal for investors, but also that both firm and industry conditions have an impact on the credibility and appropriateness of this signal for investors. The study has implications for both marketing theory and managers.

### *Implications for Marketing Theory*

The study presents the first theoretical and empirical examination of the impact of ASOV on investors' uncertainty, i.e., idiosyncratic risk. The study, therefore, is responsive to the recent calls for research on risk aspects of marketing (e.g., Katsikeas et al. 2016). Indeed, Hanssens and Pauwels (2016, p. 183) highlight that risk analysis in marketing planning is one of the most promising areas for further research and is highly important "if marketing is to become an integral part of strategic and financial planning".

As shown in panel (A) in figure 2, the negative impact of ASOV on idiosyncratic risk is stronger for firms with higher cash flows. In fact, ASOV does not have a significant effect on idiosyncratic risk for firms that have lower cash flows. This finding is consistent with the proposed argument that higher ASOV is a more credible signal for investors for firms that have higher cash flows because it signals firm's capability to not only to maintain ASOV, but also to convert ASOV into financial outcomes such as sales and profits.

[Figure 2 About Here]

Importantly, by identifying cash flows as a boundary condition for the effects of ASOV on idiosyncratic risk, the study suggests that scholars should consider the moderating effects of cash flows when evaluating investors' evaluation of other marketing signals. For

example, it would be interesting to examine the moderating effect of cash flows for the oft-debated effects of customer satisfaction on firm value (e.g., Jacobson and Mizik 2009).

Consistent with the proposed hypothesis, we find that the negative impact of ASOV on a firm's idiosyncratic risk is stronger for firms with low quality of disclosures (see Panel (B), Figure 2). In fact, for firms with higher disclosure quality, ASOV does not have a significant effect on idiosyncratic risk. This suggests that high ASOV plays an important role in lowering investors' uncertainty especially when the quality of accounting disclosures is low. Low disclosure quality indicates high information asymmetry between investors and firms (Chen, Miao, and Shevlin 2015) and investors may suffer from insufficient information to forecast firm future performance. In this context, high ASOV is a more valuable and appropriate signal. This provides an insightful implication that ASOV, a marketing metric conveys useful and valuable information about firm performance to investors especially when there is insufficient information about the firm in financial markets.

The study, therefore, brings to fore the importance of considering an accounting perspective (e.g., disclosure quality) in evaluating the information value of marketing metrics. As such, future studies can build on our finding and examine the information value of other marketing metrics across different values of firm disclosure quality.

Finally, results also show that high ASOV is a more appropriate signal for investors of firms in highly competitive industries. Panel (A) in Figure 3 shows that the negative impact of ASOV on a firm's idiosyncratic risk is stronger when competitive intensity is higher. In contrast, if the firm is in an industry with lower competitive intensity, ASOV does not have a significant impact on idiosyncratic risk. The finding is consistent with the proposed argument that investors are likely to value ASOV more in a context where it is more difficult for them to understand the implications of competitive dynamics in an industry for future firm performance (Saboo and Grewal 2013).

*Implications for Managers*

Based on the empirical findings and theoretical discussion, we outline the specific implications for senior managers, financial analysts, and regulators. A direct implication of the current study is that senior managers should assess the impact of ASOV on idiosyncratic risk when evaluating its return on investment. In addition, financial analysts should consider the impact of ASOV on idiosyncratic risk in their valuation models.

A key contribution of the current study is that it identifies firm and industry specific boundary conditions under which ASOV is likely (or unlikely) to lower idiosyncratic risk. Specifically, if a firm has lower cash flows, then managers should recognize that investors are unlikely to find ASOV as a credible signal. In contrast, if the firm has high cash flows, investors are likely to consider ASOV as a credible signal that can lower idiosyncratic risk.

Results also identify ASOV as an avenue for overcoming information asymmetry between managers and investors due to the lack of disclosure quality of a firm. Specifically, if a firm has poor disclosure quality, managers can use ASOV as an instrument for provide additional information to investors and therefore lower idiosyncratic risk. In addition, also find that ASOV can be useful for managers of firms operating in highly competitive industries because investors find it to be a more appropriate signal of additional information in such industries.

In addition to managers, these results of direct import to regulators such as the Securities and Exchange Commission (SEC) and the Financial Accounting Standards Board (FASB). This is because both SEC and FASB seek to identify avenues for lowering the information asymmetry between the firm and investors. Given that ASOV has stronger impact on idiosyncratic risk in conditions of higher asymmetry (i.e., poor disclosure and higher competitive intensity), perhaps both SEC and FASB should encourage firms to report ASOV in their annual reports and/or communications to shareholders.

## *LIMITATIONS AND FURTHER RESEARCH*

This research has some limitations that may guide fruitful avenues for further research. *First*, we acknowledge that the data used to test hypotheses consists of firms that disclose advertising spending. As such, our findings are applicable to firms that derive their competitive advantage from "differentiators" as opposed to cost reduction (see McAlister et al. 2016, p. 219) . *Second*, we hypothesize that the impact of ASOV on investors' uncertainty is stronger when industry growth is low. Unfortunately, the empirical results do not support this hypothesis. This insignificant result might mirror an ongoing debate on advertising budget allocation during tough economic conditions (Edeling and Fischer 2016) as not all firms benefit from increasing advertising during unfavorable economic conditions (Srinivasan, Lilien, and Sridhar 2011). It is also possible that some investors will perceive high ASOV as more valuable while others may not when industry growth is low, making the moderating effect insignificant. Clearly, these are preliminary conjectures and more systematic research is required in this domain.

Third, we focus only on investors' uncertainty, i.e., a firm's equity risk. However, there is another type of firm risks such as the debt holder risk. As prior literature points out, marketing research has paid less attention to debt holder risk although it is also important for firms' risk management. Thus, it can be a fruitful avenue for further research to explore the impact of ASOV on debt holder risk (Katsikeas et al. 2016, p. 11).

*REFERENCES*

Advertising Weekly (2016), "The €2bn Video Advertising Imperative Touts Programmatic," (accessed Feb 16, 2017), [available at http://www.advertisingweek.com/news/article/-the-2bn-video-advertising-imperative-touts-programmatic-2]

Alvarez, Fernando, and Robert Shimer (2011), "Search and Rest Unemployment," *Econometrica*, 79 (1), 75-122.

Ang, Andrew, Joseph Chen, and Yuhang Xing (2006), "Downside Risk," *Review of Financial Studies*, 19 (4), 1191-239.

Avramov, Doron, Tarun Chordia, and Amit Goyal (2006), "Liquidity and Autocorrelations in Individual Stock Returns," *The Journal of Finance*, 61 (5), 2365-2394.

Ball, Ray, S. P. Kothari, and Jay Shanken (1995), "Problems in Measuring Portfolio Performance An Application to Contrarian Investment Strategies," *Journal of Financial Economics*, 38 (1), 79-107.

Bansal, Naresh, Kissan Joseph, Minghui Ma, and M. Babajide Wintoki (2016), "Do CMO Incentives Matter? An Empirical Investigation of CMO Compensation and Its Impact on Firm Performance." *Management Science*, Articles in Advance, 1-24.

Baum, J. Robert and Stefan Wally (2003), "Strategic Decision Speed and Firm Performance," *Strategic Management Journal*, 24 (11), 1107-1129.

Beaver, William., Paul Kettler, and Myron Scholes (1970), "The Association Between Market Determined and Accounting Determined Risk Measures," *The Accounting Review*, 45 (4), 654-682.

Bernardo, Antonio E., and Bhagwan Chowdhry (2002), "Resources, Real Options, and Corporate Strategy," *Journal of Financial Economics*, 63 (2), 211-234.

Brauer, Matthias F., and Margarethe F. Wiersema (2012), "Industry Divestiture Waves: How a Firm's Position Influences Investor Returns," *Academy of Management Journal*, 55 (6), 1472-1492.

Brown, Gregory, and Nishad Kapadia (2007), "Firm-Specific Risk and Equity Market Development, *Journal of Financial Economics*, 84 (2), 358-388.

Brown, Stephen J. and Jerold B. Warner (1985), "Using Daily Stock Returns: The Case of Event Studies," *Journal of Financial Economics*, 14 (1), 3-31.

Bushee, Brian J. and Christopher F. Noe (2000), "Corporate Disclosure Practices, Institutional Investors, and Stock Return Volatility," *Journal of Accounting Research*, 38 (Supplement), 171-202.

Carhart, Mark M. (1997), "On Persistence in Mutual Fund Performance," *The Journal of Finance*, 52 (1), 57-82.

Chaudhuri, Arjun, and Morris B. Holbrook (2001), "The Chain of Effects from Brand Trust and Brand Affect to Brand Performance: The Role of Brand Loyalty," *Journal of Marketing*, 65 (2), 81-93.

Chen, Shuping, Bin Miao, and Terry Shevlin (2015), "A New Measure of Disclosure Quality: The Level of Disaggregation of Accounting Data in Annual Reports," *Journal of Accounting Research*, 53 (5), 1017-1054.

Chemmanur, Thomas, and An Yan (2009), "Product Market Advertising and New Equity Issues," *Journal of Financial Economics*, 92 (1), 40-65.

Colgate Palmolive (2013), "Event Brief of Q3 2013 Colgate-Palmolive Earnings Conference Call - Final," October 24, 2013.

Connelly, Brian L., S. Trevis Certo, R. Duane Ireland, and Christopher R. Reutzel (2011), "Signaling Theory: A Review and Assessment," *Journal of Management*, 37 (1), 39-67.

Davila, Antonio, George Foster, and Mahendra Gupta (2003), "Venture Capital Financing and the Growth of Startup Firms," *Journal of Business Venturing*, 18 (6), 689-708.

Datta, Hannes, Bram Foubert, and Harald J. Van Heerde (2015), "The Challenge of Retaining Customers Acquired with Free Trials," *Journal of Marketing Research*, 52 (2), 217-234.

Deb, Palash, Parthiban David, and Jonathan O'Brien (2017), "When is Cash Good or Bad for Firm Performance?," *Strategic Management Journal*, 38 (2), 436-454.

Dotzel, Thomas, Venkatesh Shankar, and Leonard L. Berry (2013), "Service Innovativeness and Firm Value," *Journal of Marketing Research*, 50 (2), 259-276.

Draganska, Michaela, and Daniel Klapper (2011), "Choice Set Heterogeneity and the Role of Advertising: An Analysis with Micro and Macro Data," *Journal of Marketing Research*, 48 (4), 653-669.

Edeling, Alexander, and Marc Fischer, "Marketing's Impact on Firm Value: Generalizations from a Meta-Analysis," *Journal of Marketing Research*, 53 (4), 515-534.

Fama, Eugene F., and Kenneth R. French (1993), "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics*, 33 (1), 3-56.

Fang, Eric, Jongkuk Lee, and Zhi Yang (2015), "The Timing of Codevelopment Alliances in New Product Development Processes: Returns for Upstream and Downstream Partners," *Journal of Marketing*, 79 (1), 64-82.

Ferreira, Miguel A. and Paul A. Laux (2007), "Corporate Governance, Idiosyncratic Risk, and Information Flow," *The Journal of Finance*, 62 (2), 951-989.

Gao, Pingyang (2010), "Disclosure Quality, Cost of Capital, and Investor Welfare," *The Accounting Review*, 85 (1), 1-29.

Germann, Frank, Ebbes Peter, and Rajdeep Grewal (2015), "The Chief Marketing Officer Matters!," *Journal of Marketing*, 79 (3), 1-22.

Giroud, Xavier, and Holger M. Mueller (2011), "Corporate Governance, Product Market Competition, and Equity Prices," *The Journal of Finance*, 66 (2), 563-600.

Goyal, Amit, and Pedro Santa-Clara (2003), "Idiosyncratic Risk Matters!," *The Journal of Finance*, 58 (3), 975-1007.

Gruca, Thomas S. and Lopo L. Rego (2005), "Customer Satisfaction, Cash Flow, and Shareholder Value," *Journal of Marketing*, 69 (3), 115-130.

Hanssens, Dominique M., and Koen H. Pauwels (2016), "Demonstrating the Value of Marketing," *Journal of Marketing*, 80 (6), 173-190.

Healy, Paul M., and Krishna G. Palepu (2001), "Information Asymmetry, Corporate Disclosure, and the Capital Markets: A Review of the Empirical Disclosure Literature," *Journal of Accounting and Economics*, 31 (1), 405-440.

Heitzman, Shane, Charles Wasley, and Jerold Zimmerman (2010), "The Joint Effects of Materiality Thresholds and Voluntary Disclosure Incentives on Firms' Disclosure Decisions," *Journal of Accounting and Economics*, 49 (1), 109-132.

Hou, Kewei, and David T. Robinson (2006), "Industry Concentration and Average Stock Returns," *The Journal of Finance*, 61 (4), 1927-1956.

Janney, Jay J., and Timothy B. Folta (2006), "Moderating Effects of Investor Experience on the Signaling Value of Private Equity Placements," *Journal of Business Venturing*, 21 (1), 27-44.

JC Penny (2016), "Event Brief of Q3 2016 JC Penney Company Inc Earnings Call - Final", November 11, 2016.

Joshi, Amit, and Dominique M. Hanssens (2010), "The Direct and Indirect Effects of Advertising Spending on Firm Value," *Journal of Marketing*, 74 (1), 20-33.

Katsikeas, Constantine S., Neil A. Morgan, Leonidas C. Leonidou, and G. Tomas M. Hult, (2016), "Assessing Performance Outcomes in Marketing," *Journal of Marketing*, 80 (2), 1-20.

Kirmani, Amna, and Akshay R. Rao (2000), "No Pain, No Gain: A Critical Review of the Literature on Signaling Unobservable Product Quality," *Journal of Marketing*, 64 (2), 66-79.

Krishnan, Jayanthi, and Eric Press (2003), "The North American Industry Classification System and Its Implications for Accounting Research," *Contemporary Accounting Research*, 20 (4), 685-717.

Luo, Xueming and C.B. Bhattacharya (2009), "The Debate over Doing Good: Corporate Social Performance, Strategic Marketing Levers, and Firm-Idiosyncratic Risk," *Journal of Marketing*, 73 (6), 198-213.

Mathys, Juliane, Alexa B. Burmester, and Michel Clement (2016), "What Drives the Market Popularity of Celebrities? A Longitudinal Analysis of Consumer Interest in Film Stars," *International Journal of Research in Marketing*, 33 (2), 428-448.

McAlister, Leigh, Raji Srinivasan, Niket Jindal, and Albert A. Cannella (2016), "Advertising Effectiveness: The Moderating Effect of Firm Strategy," *Journal of Marketing Research*, 53 (2), 207-224.

————, Raji Srinivasan, and Minjung Kim (2007), "Advertising, Research and Development, and Systematic Risk of the Firm," *Journal of Marketing*, 71 (1), 35-48.

Moenaert, Rudy K., and William E. Souder (1996), "Context and Antecedents of Information Utility at the R&D/Marketing Interface," *Management Science*, 42 (11), 1592-1610.

Osinga, Ernst C., Peter S.H. Leeflang, Shuba Srinivasan, and Jaap E. Wieringa (2011), "Why Do Firms Invest in Consumer Advertising with Limited Sales Response? A Shareholder Perspective," *Journal of Marketing*, 75 (1), 109-124.

Panousi, Vasia, and Dimitris Papanikolaou (2012), "Investment, Idiosyncratic Risk, and Ownership," *The Journal of Finance*, 67 (3), 1113-1148.

Park, Sungho, and Sachin Gupta (2012), "Handling Endogenous Regressors by Joint Estimation Using Copulas," *Marketing Science*, 31 (4), 567-586.

Pe'er, Aviad, Ilan Vertinsky, and Thomas Keil (2016), "Growth and Survival: The Moderating Effects of Local Agglomeration and Local Market Structure," *Strategic Management Journal*, 37 (3), 541-564.

Pollay, Richard W., Sid Siddarth, Michael Siegel, Anne Haddix, Robert K. Merritt, Gary A. Giovino, and Michael P. Eriksen (1996), "The Last Straw? Cigarette Advertising and Realized Market Shares Among Youths and Adults, 1979-1993," *Journal of Marketing*, 60 (2), 1-16.

Reibstein, David J., and Dick R. Wittink (2005), "Competitive Responsiveness," *Marketing Science*, 24 (1), 8-11.

Rego, Lopo L., Matthew T. Billett, and Neil A. Morgan (2009), "Consumer-Based Brand Equity and Firm Risk," *Journal of Marketing*, 73 (6), 47-60.

Saboo, Alok R., and Rajdeep Grewal (2013), "Stock Market Reactions to Customer and Competitor Orientations: The Case of Initial Public Offerings," *Marketing Science*, 32 (1), 70-88.

Sanders, W. M., and Steven Boivie (2004), "Sorting Things Out: Valuation of New Firms in Uncertain Markets," *Strategic Management Journal*, 25 (2), 167-186.

Sorescu, Alina B. and Jelena Spanjol (2008), "Innovation's Effect on Firm Value and Risk: Insights from Consumer Packaged Goods," *Journal of Marketing*, 72 (2), 114-132.

Sridhar, Shrihari, Frank Germann, Charles Kang, and Rajdeep Grewal (2016), "Relating Online, Regional, and National Advertising to Firm Value," *Journal of Marketing*, 80 (4), 39-55.

Srinivasan, Raji, Gary L. Lilien, and Shrihari Sridhar, "Should Firms Spend More on Research and Development and Advertising During Recessions?," *Journal of Marketing*, 75 (3), 49-65.

Srinivasan, Shuba, and Dominique M. Hanssens (2009), "Marketing and Firm Value: Metrics, Methods, Findings, and Future Directions," *Journal of Marketing Research*, 46 (3), 293-312.

Srivastava, Rajendra K., Tasadduq A. Shervani, and Liam Fahey (1998), "Market-Based Assets and Shareholder Value: A Framework for Analysis," Journal of Marketing, 62 (1), 2-18.

Steenkamp, Jan-Benedict E.M., and Eric Fang (2011), "The Impact of Economic Contractions on the Effectiveness of R&D and Advertising: Evidence from US Companies Spanning Three Decades," *Marketing Science*, 30 (4), 628-645.

Sternthal, Brian and Angela Lee (2005), "Building Brands Through Effective Advertising," *in Kellogg on Branding*, Alice M. Tybout and Tim Calkins, eds. Hoboken, NJ: John Wiley & Sons, 129-149.

Unilever (2012), "Event Brief of Q4 2011 Unilever PLC Earnings Conference Call - Final," February 2, 2012.

Uslay, Can, Z. Ayca Altintig, and Robert D. Winsor (2010), "An Empirical Examination of the "Rule of Three": Strategy Implications for Top Management, Marketers, and Investors," *Journal of Marketing*, 74 (2), 20-39.

Vorhies, Douglas W., Robert E. Morgan, and Chad W. Autry (2009), "Product-Market Strategy and the Marketing Capabilities of the Firm: Impact on Market Effectiveness and Cash Flow Performance," *Strategic Management Journal*, 30 (12), 1310-1334.

Wall Street Journal (2013), "Losing the Taste For McDonald's," (accessed Feb 16, 2017), [available at http://blogs.wsj.com/corporate-intelligence/2013/10/15/losing-the-taste-for-mcdonalds/]

Walmart (2012), "Q3 2013 Walmart Stores, Inc. Prerecorded Earnings Conference Call - Final," November 15, 2012.

*FOOTNOTES*

[1] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[2] As Chen, Miao, and Shevlin (2015), we count the non-missing items of both the balance sheet and income statement in COMPUSTAT.

## TABLE 1. VARIABLES, MEASURES, AND SUPPORTING LITERATURE

| Variable | Measure | Source | Literature |
|---|---|---|---|
| ***Dependent variable*** | | | |
| *Idiosyncratic Risk* | Standard deviation of the residual of FF4 model by using daily stock returns following the release of the firm's annual report (10-K) and before the release of the subsequent annual report (10-K) | CRSP | Luo and Bhattacharya (2009); Osinga et al. (2011) |
| ***Independent variables*** | | | |
| *Advertising Share of Voice (ASOV)* | Annual advertising expenditure divided by total advertising expenditure in the industry | COMPUSTAT | McAlister et al. (2016); Steenkamp and Fang (2011) |
| *Cash Flow* | Net operating cash flow divided by total assets | COMPUSTAT | Gruca and Rego (2005) |
| *Disclosure Quality* | The level of disaggregation of the financial report of a firm | COMPUSTAT | Chen, Miao, and Shevlin (2015) |
| *Competitive Intensity* | The Herfindahl-Hirschmann index for the industry (i.e., the sum of the squares of firms' market shares in the industry) subtracted from 1 | COMPUSTAT | Hou and Robinson (2006); Fang, Lee, and Yang (2015) |
| *Industry Growth* | Natural log of sales of the industry in the current fiscal year less natural log of sales of the industry in the previous fiscal year | COMPUSTAT | Dotzel, Shankar, and Berry (2013); Pe'er, Vertinsky, and Keil (2016) |
| *Firm Size* | Natural log of total assets | COMPUSTAT | McAlister et al. (2016); Rego, Billett, and Morgan (2009) |
| *Leverage* | Total long-term debt divided by total assets | COMPUSTAT | Ferreira and Laux (2007); Dotzel, Shankar, and Berry (2013) |
| *Liquidity* | Ratio of current assets to current liabilities | COMPUSTAT | Luo and Bhattacharya (2009); McAlister, Srinivasan, and Kim (2007) |

## TABLE 2. DESCRIPTIVE STATISTICS AND CORRELATION MATRIX

| *Variables* | N | Mean | SD | Min | Max | *Correlation* 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1. Idiosyncratic Risk* | 16,978 | 0.034 | 0.020 | 0.008 | 0.130 | 1.000 | | | | | | | | |
| *2. ASOV* | 16,978 | 0.070 | 0.153 | 0.000 | 0.991 | ***-0.232*** | 1.000 | | | | | | | |
| *3. Cash Flow* | 16,978 | 0.052 | 0.177 | -1.144 | 0.355 | ***-0.443*** | ***0.135*** | 1.000 | | | | | | |
| *4. Disclosure Quality* | 16,978 | 0.693 | 0.111 | 0.000 | 0.864 | ***-0.349*** | ***-0.036*** | ***0.147*** | 1.000 | | | | | |
| *5. Competitive Intensity* | 16,978 | 0.826 | 0.134 | 0.058 | 0.967 | ***0.052*** | ***-0.253*** | ***-0.060*** | ***-0.028*** | 1.000 | | | | |
| *6. Industry Growth* | 16,978 | 0.059 | 0.134 | -0.660 | 0.717 | 0.006 | ***-0.044*** | ***-0.021*** | ***-0.096*** | ***0.089*** | 1.000 | | | |
| *7. Firm Size* | 16,978 | 5.962 | 2.105 | 0.282 | 11.361 | ***-0.551*** | ***0.458*** | ***0.368*** | ***0.113*** | ***-0.037*** | ***-0.044*** | 1.000 | | |
| *8. Financial Leverage* | 16,978 | 0.150 | 0.194 | 0.000 | 0.857 | ***-0.080*** | ***0.129*** | 0.007 | ***-0.169*** | -0.010 | ***-0.040*** | **0.304** | 1.000 | |
| *9. Liquidity* | 16,978 | 2.865 | 2.572 | 0.177 | 23.060 | ***0.071*** | ***-0.165*** | ***-0.085*** | ***0.112*** | ***0.070*** | ***0.017*** | **-0.259** | **-0.250** | 1.000 |

Notes:
a. All values are rounded to the three decimals.
b. We winsorize all variables at 1% to eliminate the influence of outliers.
c. The descriptive statistics are based on the variables before mean-centering.
d. Correlations in bold and italics are significant at $p < 0.05$ (two-tailed).

## TABLE 3. THE IMPACT OF ASOV ON IDIOSYNCRATIC RISK

| | *Model1: Main Effect Only* | | *Model2: Full Model* | | |
|---|---|---|---|---|---|
| *Hypothesized Variables* | *Coeff.* | *(SE)* | *Coeff* | *(SE)* | |
| **ASOV** | -0.004 | (0.002)*** | -0.004 | (0.002)** | *H1: Supported* |
| **ASOV x Cash Flow** | | | -0.025 | (0.012)** | *H2: Supported* |
| **ASOV x Disclosure Quality** | | | 0.056 | (0.006)**** | *H3: Supported* |
| **ASOV x Competitive Intensity** | | | -0.019 | (0.006)*** | *H4: Supported* |
| **ASOV x Industry Growth** | | | 0.004 | (0.004) | *H5: Not Supported* |
| *Control Variables* | | | | | |
| Intercept | -0.004 | (0.001)**** | -0.004 | (0.001)**** | |
| Cash Flow | -0.014 | (0.001)**** | -0.015 | (0.001)**** | |
| Disclosure Quality | -0.019 | (0.002)**** | -0.018 | (0.002)**** | |
| Competitive Intensity | 0.007 | (0.003)*** | 0.008 | (0.003)*** | |
| Industry Growth | -0.002 | (0.001)** | -0.002 | (0.001)** | |
| Firm Size | -0.005 | (0.000)**** | -0.005 | (0.000)**** | |
| Financial Leverage | 0.006 | (0.001)**** | 0.006 | (0.001)**** | |
| Liquidity | -0.000 | (0.000)**** | -0.000 | (0.000)**** | |
| Copula_ASOV | 0.002 | (0.000)**** | 0.002 | (0.001)**** | |
| Firm Fixed Effects | YES | | YES | | |
| Year Fixed Effects | YES | | YES | | |
| Number of Observations<br>(Number of Unique Firms) | 16,978<br>(2,777) | | 16,978<br>(2,777) | | |
| Wald $\chi^2$ (df) | 8,854.79 (28) | | 7,356.98 (32) | | |
| Wald Test Significance ($p > \chi^2$) | 0.0000 | | 0.0000 | | |
| Log Likelihood (df) | 54,829.53 (29) | | 54,878.54 (33) | | |
| Akaike Information Criterion (df) | -109,601.10 (29) | | -109,691.10 (33) | | |
| Bayesian Information Criterion (df) | -109,376.60 (29) | | -109,435.70 (33) | | |

Notes:
a. We calculate the standard errors of coefficients by bootstrapping with 200 replications.
b. The bootstrapping replication is based on the clusters of the number of firms.
c. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$ (Two-tailed)

## TABLE 4. SENSITIVITY ANALYSES

| | *Model2: Full Model* | *Model3: Dropping Random 10% of Firms* | *Model4: Dropping 1995 & 1996* | *Model5: Dropping 2013 & 2014* | *Model6: Using FF3 Model to Estimate DV* | *Model7: Using Market Model to Estimate DV* | *Model8: Using Stock Return Volatility as DV* |
|---|---|---|---|---|---|---|---|
| *Hypothesized Effects* | *Coeff.* | *Coeff.* | *Coeff.* | *Coeff.* | *Coeff.* | *Coeff.* | *Coeff.* |
| **ASOV** | -0.004** | -0.005** | -0.004** | -0.005** | -0.004** | -0.005** | -0.006*** |
| **ASOV x Cash Flow** | -0.025** | -0.028** | -0.028** | -0.019* | -0.026** | -0.026** | -0.028** |
| **ASOV x Disclosure Quality** | 0.056**** | 0.054**** | 0.059**** | 0.055**** | 0.056**** | 0.057**** | 0.062**** |
| **ASOV x Competitive Intensity** | -0.019*** | -0.023**** | -0.017*** | -0.018*** | -0.020*** | -0.020*** | -0.021**** |
| **ASOV x Industry Growth** | 0.004 | 0.007* | 0.005 | 0.005 | 0.004 | 0.004 | 0.003 |
| *Control Variables* | | | | | | | |
| Intercept | -0.004**** | -0.004**** | -0.004**** | -0.005**** | -0.004**** | -0.004**** | -0.005**** |
| Cash Flow | -0.015**** | -0.014**** | -0.015**** | -0.015**** | -0.015**** | -0.015**** | -0.015**** |
| Disclosure Quality | -0.018**** | -0.017**** | -0.018**** | -0.017**** | -0.018**** | -0.018**** | -0.019**** |
| Competitive Intensity | 0.008*** | 0.009**** | 0.008*** | 0.007*** | 0.008*** | 0.008*** | 0.009*** |
| Industry Growth | -0.002** | -0.002** | -0.002** | -0.002** | -0.002** | -0.002** | -0.002** |
| Firm Size | -0.005**** | -0.005**** | -0.005**** | -0.005**** | -0.005**** | -0.005**** | -0.004**** |
| Financial Leverage | 0.006**** | 0.006**** | 0.005**** | 0.006**** | 0.006**** | 0.006**** | 0.006**** |
| Liquidity | -0.000**** | -0.000**** | -0.000*** | -0.000*** | -0.000**** | -0.000**** | -0.000** |
| **Copula_ASOV** | 0.002**** | 0.002**** | 0.002**** | 0.002*** | 0.002**** | 0.002**** | 0.003**** |
| Firm Fixed Effects | YES | YES | YES | YES | YES | YES | YES |
| Year Fixed Effects | YES | YES | YES | YES | YES | YES | YES |
| Number of Observations<br>(Number of Unique Firms) | 16,978<br>(2,777) | 15,340<br>(2,499) | 16,079<br>(2,684) | 15,336<br>(2,643) | 16,978<br>(2,777) | 16,978<br>(2,777) | 16,978<br>(2,777) |
| Wald $\chi^2$ (df) | 7356.98 (32) | 8180.99 (32) | 7388.02 (30) | 6760.75 (30) | 8094.28 (32) | 7854.26 (32) | 9888.63 (32) |
| Wald Test Significance ($p > \chi^2$) | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

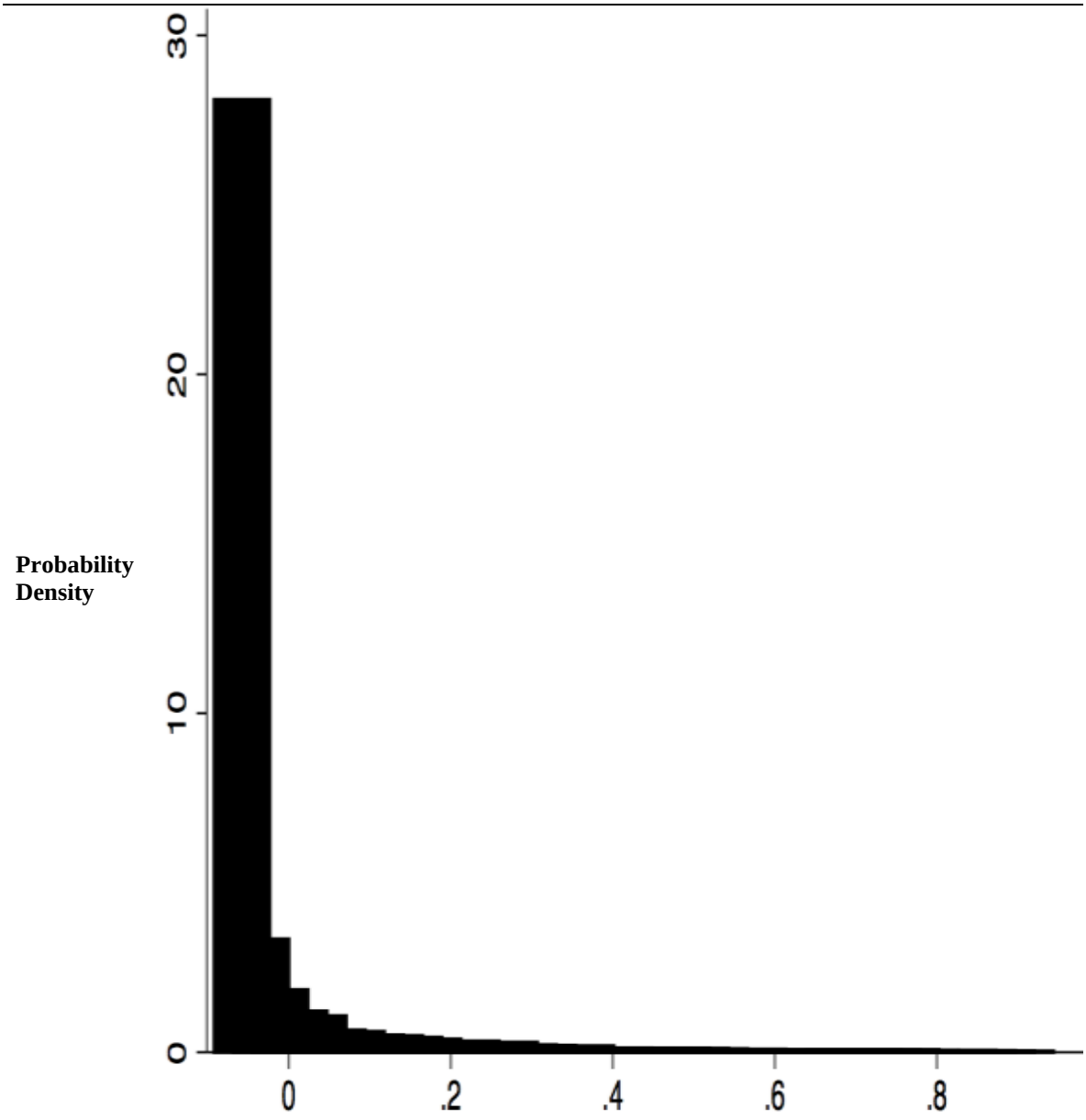
Notes: a. We calculate the standard errors of the estimates by bootstrapping with 200 replications.

b. The bootstrapping replication is based on the clusters of the number of firms.

c. * p < 0.1, ** p < 0.05, *** p < 0.01, **** p < 0.001 (two-tailed)

## FIGURE 1. TESTS FOR NON-NORMALITY OF ASOV

**(A) HISTOGRAM OF ASOV**



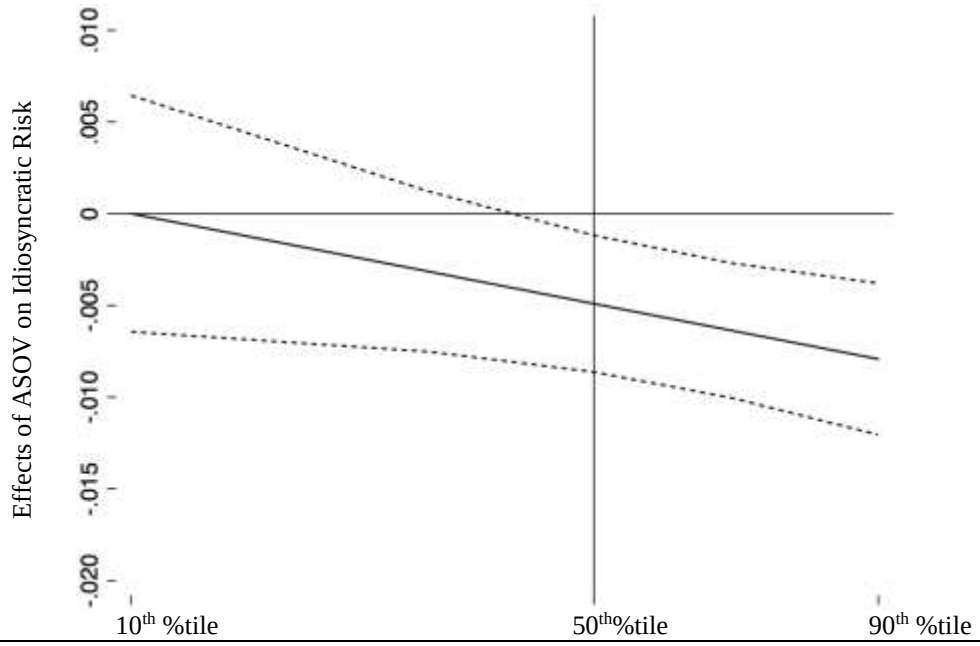

**(B) SHAPIRO-WILK TEST FOR NORMALITY**

| Variable | Observations | W | V | z | Prob>z |
|---|---|---|---|---|---|
| ASOV | 16,978 | 0.515 | 3785.354 | 22.353 | 0.000 |

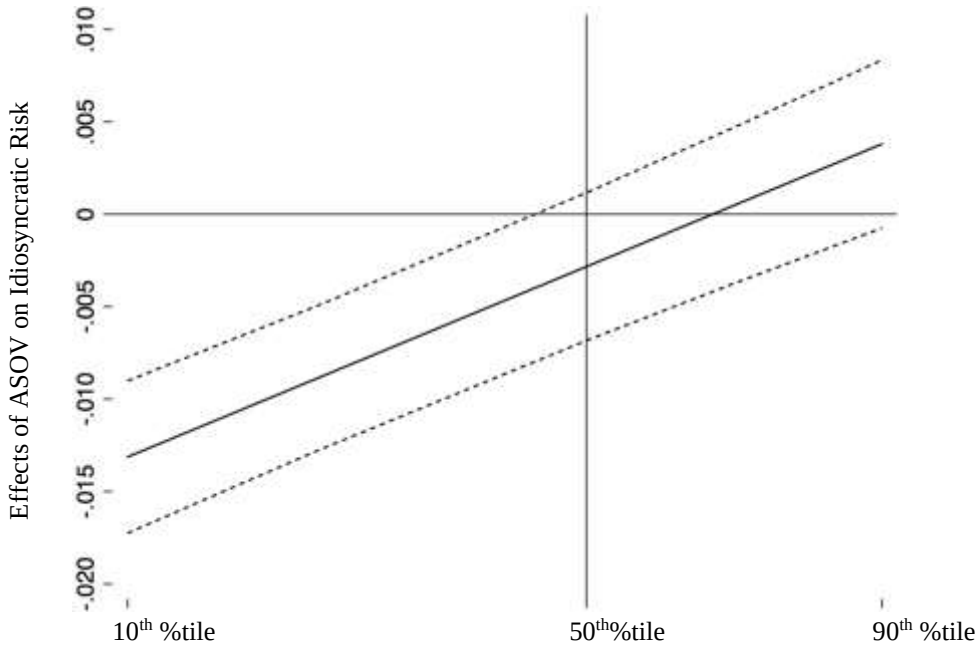
Notes:
a. In the histogram, the vertical axis represents probability density of each bar and the horizontal axis represents values of ASOV that range from 0 to 0.991.
b. W indicates Shapiro-Wilk test statistic. V represents the index for departure from normality and large values indicates non-normality. z is z test statistic to evaluate the null hypothesis of normality.

**FIGURE 2.**
**MARGINAL EFFECTS OF ASOV ON IDIOSYNCRATIC RISK**
**ACROSS CASH FLOW AND DISCLOSURE QUALITY**

*(A) Marginal Effects of ASOV on Idiosyncratic Risk*
*Across Values of Cash Flow*



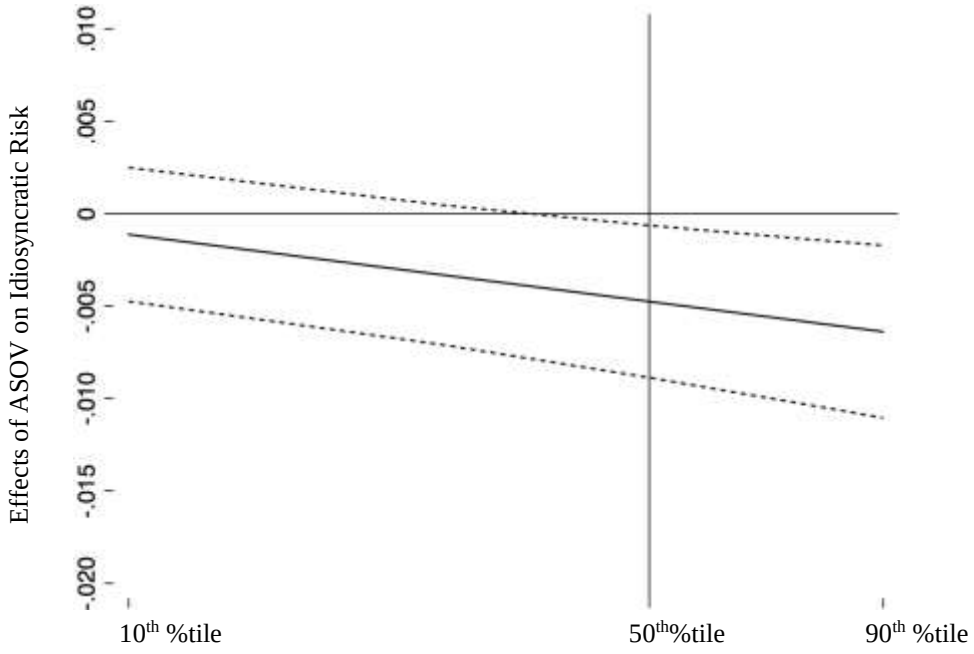

*(B) Marginal Effects of ASOV on Idiosyncratic Risk*
*Across Values of Disclosure Quality*



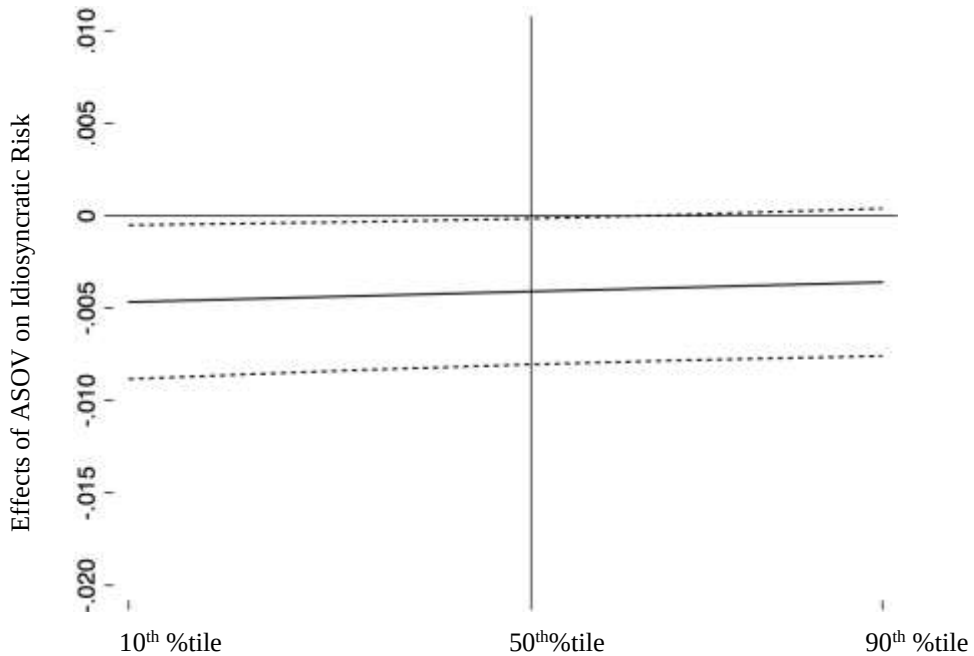

Notes:
a. We use the values from only between 10 percentile and 90 percentile of the distribution of each moderating variable when drawing each plot.
b.. The dotted line represents 95% confidence interval bands.

**FIGURE 3.**
**MARGINAL EFFECTS OF ASOV ON IDIOSYNCRATIC RISK**
**ACROSS COMPETITIVE INTENSITY AND INDUSTRY GROWTH**

*(A) Marginal Effects of ASOV on Idiosyncratic Risk*
*Across Values of Competitive Intensity*




*(B) Marginal Effects of ASOV on Idiosyncratic Risk*
*Across Values of Industry Growth*




Notes:
a. We use the values from only between 10 percentile and 90 percentile of the distribution of each moderating variable when drawing each plot.
b. The moderating effect of industry growth on the impact of ASOV on idiosyncratic risk is not significant.
c.. The dotted line represents 95% confidence interval bands.