Does Options Trading Reduce the Demand for Conditional Accounting Conservatism?

Abstract

We examine if options trading via organized markets reduces the demand for conditional conservatism by alleviating information asymmetry and by mitigating the shareholders-manager conflict. We build upon and extend prior evidence that options trading enhances stock market informational efficiency. Focusing on a large sample of firms from 1997 to 2019, we show that options trading is associated with less conditional conservatism in financial reporting. Moreover, firms reduce their level of conditional conservatism after being listed on the options market. Options trading's effect on conditional conservatism is greater among small firms, firms with low asset tangibility, and firms with long investment cycles. We find that options trading has little or no effect when economic policy uncertainty is high. We observe that the presence of financial analysts strengthens the negative association between options trading and conditional conservatism. We also document that options trading prominently influences conditional conservatism when investor sentiment is high.

Key words: conditional conservatism, options trading, information asymmetry

I. INTRODUCTION

There is an ongoing and vigorous debate among standard setters, policy makers, practitioners, and academics regarding accounting conservatism. For instance, in 2010, the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) considered that prudence (conservatism) conflicted with neutrality and therefore excluded it from their Conceptual Framework draft proposal. The decision to abandon conservatism drew widespread criticism from practitioners, politicians, and academics. The European Parliament actually threatened to cut its funding to the IASB if it did not reincorporate conservatism into its Conceptual Framework (Jones, 2013). Under pressure, in March 2018 the IASB reintroduced prudence in its framework as an attribute of neutrality (Pelger, 2020). Academic research provides ample evidence that financial statement users demand conservatism to attenuate information asymmetry problems (e.g., Ahmed *et al*., 2002; Kim and Zhang. 2016; LaFond and Watts, 2008; Ramalingegowda and Yu, 2012). However, we know little about what can substitute for conservatism in financial reporting. We address this gap by exploring if and how options trading reduces the need for conditional conservatism.

The options market is one of the critical components of financial markets, playing an important role in complementing the stock market (Ross, 1976) as well as enhancing transactional and information efficiency (Figlewski and Webb, 1993). In the last two decades, the total number of traded equity options contracts in the United States grew from 676 million in 2000 to 4,572 million in 2020 (Blanco and Garcia, 2021)[1]. Academic research on options trading also grew accordingly and points toward options trading enhancing the quality of firms' information

[1] Retrieved on April 14, 2021, from The Options Clearing Corporation web site: https://www.theocc.com/Market-Data/Market-Data-Reports/Volume-and-Open-Interest/Historical-Volume-Statistics

environments (e.g., Cao *et al.*, 2020a; Ho *et al.*, 1995; Hu, 2018). Recent developments in the options market and their documented impact on the information environment motivate us to explore the potential impact of options trading on firms' financial reporting attributes.

It is not obvious ex-ante whether and how options trading influences conditional accounting conservatism. On the one hand, there are at least two reasons that options trading may reduce the demand for conditional conservatism. First, shareholders and lenders demand conservatism, as it alleviates information asymmetry (e.g., LaFond and Watts, 2008; Watts, 2003a, 2003b; Garcia Lara *et al*., 2014). Options trading helps in this regard by improving firms' information environments and reducing information asymmetry (e.g., Cao *et al.*, 2020a; Hu, 2018). Thus, options trading may reduce the demand for conditional conservatism by alleviating information asymmetry. Second, shareholders demand conditional conservatism because asymmetric loss recognition reduces agency problems and encourages managers to invest in positive net present value (NPV) projects and quickly abandon negative NPV projects (Ball, 2001; Lafond and Roychowdhury, 2008). Options trading improves price efficiency, and thus stock prices better reflect the fundamental value of managers' investment decisions (Blanco and Wehrheim, 2017; Roll *et al.*, 2009). Accordingly, options trading may motivate managers to invest in value-enhancing projects. As such, options trading may decrease demand for conditional conservatism by aligning the interests of shareholders and managers.

On the other hand, there are at least two arguments consistent with options trading leading to a higher degree of conditional conservatism. First, discovering and conveying bad news to capital markets by options traders may lead to a sudden stock price plunge (Bhatia *et al*., 2014), which can trigger litigation. Therefore, managers may report bad news quickly, before options traders reveal it to the capital market. Second, options trading enhances stock price efficiency, which, in turn, may encourage managers to act in the interest of shareholders by investing in value-enhancing activities such as research and development (R&D) projects (Blanco and Wehrheim, 2017). However, this intensifies debtholder-shareholder conflicts due to debtholders' asymmetric pay-off structure with regard to risky projects (Watts, 2003a and 2003b). Kravet (2014) documents that lenders demand conditional conservatism to curb risk-taking by managers, and this could be one reason debtholders demand conservatism. Consequently, if price efficiency enhancement motivates managers to pursue risky projects, then we can expect debtholders, who do not benefit from risk-taking, to demand more conservatism to prevent managers from investing in risky projects. There are also reasons to expect that options trading may have no effect on conditional conservatism, as there are some studies that fail to find evidence of information production by options traders (e.g., Manaster and Rendleman 1982; Hu, 2014; Xing et al., 2010). Given these different theoretical views and research findings, the impact of options trading on conditional accounting conservatism is an open empirical question.

To examine how options trading impacts conditional accounting conservatism, we employ Ball and Shivakumar's (2005) model of conditional conservatism, which has been widely used in prior studies (e.g., Ge et al., 2019; Khan and Lo, 2019). We use options trading volume to capture the level of options trading activity (e.g., Lakonishok et al., 2007). We control for size, leverage, and market to book value, the standard controls from the conservatism literature (e.g., Khan and Watts, 2009). As there are many unobserved factors that may determine both options trading volume and the degree of conditional conservatism, Hence, we adopt a two-stage least square (2SLS) approach. Following prior studies on the impact of options trading on firms' outcomes (e.g., Blanco and Wehrheim, 2017; Roll et al., 2009), we use moneyness and open interest as instrumental variables of options trading volume to conduct 2SLS regressions.

Relying on a US sample of 37,887 non-financial firm-year observations from 1997 to 2019, we find that options trading attenuates the level of conditional conservatism in financial reporting. Results are robust to the inclusion of additional control variables, the use of an alternative definition of moneyness as the instrument variable, as well as the use of Basu's (1997) persistence of earnings changes model as an alternative proxy for conditional conservatism. Further substantiating our results, a difference-in-difference analysis shows that firms exhibit less conditional conservatism following options listing.

We perform further analyses to highlight specific scenarios where an active options market leads to a lower level of conditional accounting conservatism. We find that options trading has an effective impact on the use of conditional conservatism among small firms, firms with long investment cycles, and firms with low tangibility, i.e., firms in which there is likely more information asymmetry. These findings are consistent with our argument that by reducing information asymmetry, an active options market leads to lesser use of conditional conservatism. By contrast, we observe that options trading has little or no effect on conditional conservatism when the uncertainty (as proxied by economic policy uncertainty [EPU]) is largely exogenous to the firms. We document that the impact of options trading is more pronounced when financial analyst coverage is high, implying that analysts complement options trading as a means to reduce information asymmetry and, ultimately, the demand for conditional conservatism. Finally, Ge *et al.* (2019) argue that stocks tend to be overpriced during high sentiment periods, leading firms to exhibit more conservatism to reduce litigation risk that may result from future stock price declines. Hence, we expect the impact of options trading on conservatism to be more pronounced when investor sentiment is high, because options trading contributes to market efficiency and reduces the likelihood of stock overpricing. Our results are consistent with our expectation.

This study is at the intersection of the accounting conservatism and options trading literature streams and adds to our knowledge of both. First, while there is a wealth of evidence that financial statement users demand conditional accounting conservatism, little is known about mechanisms that can act as a substitute for it. Two studies seek to find mechanisms that lower the demand for conditional conservatism. Gong and Luo (2018) find that lenders' dealings with their borrowers' major customers act as substitutes for for the lenders' demands of conditional conservative reporting by the borrowers.. Burke *et al.* (2020) show that corporate social responsibility (CSR) reduces the demand for conditional conservatism. Our study extends this line of research by showing that options trading reduces the demand for conditional conservatism. We also extend prior work on how different aspects of capital markets affect conditional conservatism. For instance, it seems that institutional ownership (Ramalingegowda and Yu, 2012), financial analyst following (Sun and Liu, 2011), the presence of hedge funds (Cheng *et al.*, 2015), and an active short selling market (Jin *et al.*, 2018) relate with greater use of conditional conservatism. By contrast, we find that options trading leads to a lower level of conditional conservatism.

Second, this study contributes to an emerging but limited body of research on how options trading influences corporate policies. Previous studies find that options trading improves corporate resource allocation (Roll *et al.*, 2009), promotes innovation (Blanco and Wehrheim, 2017), reduces voluntary disclosure (Chen *et al.*, 2019), and shapes debt structure (Cao *et al.*, 2020b). However, there is scant research as to how options trading influences financial reporting choices, an important corporate policy.

The remainder of the paper is organized as follows: Section 2 discusses prior literature and research question development. Section 3 details the research design. Section 4 describes the sample and presents descriptive statistics. Section 5 reports empirical results, including additional analyses and robustness tests. The conclusion follows in Section 6.

II. LITERATURE REVIEW AND RESEARCH QUESTION

Conditional Conservatism

Accounting conservatism is one of the most important financial reporting features that results in exercising caution and high degrees of verification in reporting accounting numbers. The literature classifies accounting conservatism into two broad categories: conditional conservatism and unconditional conservatism (Beaver and Ryan, 2005). The difference between these two categories is that conditional conservatism depends on economic news, while accountants apply unconditional conservatism irrespective of economic news (Ruch and Taylor, 2015). We focus on conditional conservatism, as we have reasons to believe that options trading influences the demand for conditional conservatism.[2]

The literature on the determinants of conditional conservatism is vast and has grown substantially over the last twenty years. As pointed out by Ruch and Taylor (2015), the literature mainly focuses on conservatism, and three main users of accounting information including debtholders, shareholders, and governance users. Numerous empirical studies show that lenders demand conditional conservatism, as it provides more relevant information to them and reduces information asymmetry (e.g., Ahmed *et al.*, 2002; Beatty *et al.*, 2008). Shareholders also demand conditional conservatism to mitigate agency problems (LaFond and Watts, 2008). Prior studies

[2] In their review of the literature, Ruch and Taylor (2015) point out that most studies in this field focus on conditional accounting conservatism because it provides information about "uncertain events" and reduces information asymmetry. Our main rationale for the potential impact of an active options market on conditional conservatism lies in the argument that options trading decreases information asymmetry. As such, we examine the association between options trading and conditional accounting conservatism.

document that managers strategically use conditional conservatism to alleviate information asymmetries between them and shareholders (Kim *et al*., 2013). Moreover, a group of studies finds that governance mechanisms rely on conditional conservatism to facilitate the monitoring of managers and restrict their abilities to manipulate earnings upward (e.g., Ahmed and Duellman, 2007; García Lara, García Osma, & Penalva, 2009a).

However, little is known about mechanisms that may reduce the demand for conditional conservatism or act as a substitute for it.[3] In this article, we seek to fill this gap in the literature by examining the impact of an active options trading market on the degree of conditional conservatism.

Literature Review on Equity Options Trading

Equity options trading has been of interest to many researchers since April 26, 1973, the day it was initiated on the Chicago Board Options Exchange (CBOE). A large body of work provides evidence that options trading improves the quality of firms' information environments. For instance, the options market leads the stock market and contributes to the price discovery process around corporate news events such as earnings announcements by uncovering and delivering private information to the stock market (e.g., Jennings and Starks, 1986; Jin *et al*., 2012; Truong and Corrado, 2014). Ho *et al.* (1995) and Yu *et al.* (2010) show that analyst forecasts become more accurate following options listings and attribute their findings to the richer information sets associated with options trading. Hu (2018) documents that option listing reduces

[3] There are two notable exceptions. First, Burke *et al*. (2020) argue that CSR alleviates information asymmetry and thus it reduces the demand for conditional conservatism. Consistent with this view, they find a negative association between conditional conservatism and CSR. Second, Gong and Luo (2018) find that lenders have a lower demand for conditional conservatism when they have lending relationships with the borrower's major customers.

information risk and information asymmetry, with such effects being more significant when there is an active options market. Cao *et al.* (2020a) provide evidence that options trading improves stock price informativeness.

While most prior research focuses on how options trading influences the underlying stock market, our study belongs to an emerging line of research focusing on how the options market influences the underlying firms. Roll *et al.* (2009) initiate this line of research by showing that an active options market enhances firms' values. Roll *et al.* (2009) attribute their findings to (1) agents covering more contingencies, (2) an improvement in resource allocation, which is the result of information production associated with options trading; and (3) higher price efficiency, which improves corporate resource allocation.

Subsequent research provides evidence that is generally consistent with Roll *et al.'s* (2008) intuition. Naiker *et al.* (2013) argue and find that option listings and options trading reduce information asymmetry and improve the precision of the information, and thus result in a lower cost of equity capital. Blanco and Wehrheim (2017) find that options trading promotes innovation by alleviating information asymmetries associated with innovation activities, which motivate managers to invest in R&D projects. Cao *et al.* (2020b) document that the improved information environment associated with options trading allows firms to shift from bank loans to public bonds. Do *et al.* (2021) note that option listings are associated with smaller loan spreads and relaxed covenant restrictions, suggesting that the options market reduces information asymmetry between firms and banks. Chen *et al.* (2019) observe that options trading is negatively associated with voluntary disclosure. They conclude that as options trading reduces information asymmetry, it discourages managers from voluntarily disclosing information. Ali *et al.* (2020) argue that constant information production by options traders restricts managers from manipulating financial information, which reduces the litigation risk for auditors. Consistent with their argument, they find a negative association between options trading and audit fees. Blanco and Garcia (2021) report that options trading is associated with higher bond yields. They suggest that although options trading reduces information asymmetry between borrowers and lenders, it motivates risk-taking by managers, which results in higher bond yield. We extend this line of research relating to options trading and corporate policies by exploring how options trading affects conditional accounting conservatism.

Research Question Development

A priori, it is not clear how options trading relates to conditional conservatism. Options trading can reduce the demand for conditional conservatism for two reasons. First, lenders and shareholders demand conservatism to alleviate information asymmetry (e.g.,LaFond, and Watts, 2008) and limit managers' ability to opportunistically manipulate accounting numbers (Ball, 2001; García Lara *et al.*, 2020). However, it is well documented in the literature that options trading improves the firm's information environment and reduces information asymmetry (e.g., Cao *et al.*, 2020a; Hu, 2018). There is also evidence that options trading alleviates information asymmetry between firms and lenders, as it improves the firm's information environment (*Cao et al.*, 2020b; Do *et al*., 2019). Options traders who actively search for private information may also curb managers' ability to engage in earnings manipulation (Ali *et al*., 2020). As such, options trading may reduce the need for conditional conservatism by alleviating information asymmetry.

Second, Lafond and Roychowdhury (2008) provide evidence that shareholders demand conditional conservatism to mitigate agency problems. The rationale is that timely loss recognition discourages managers from investing in negative NPV projects for personal benefits and motivates them to abandon negative NPV projects more quickly (Ball, 2001). Options trading also improves investment efficiency, as it increases the sensitivity of a company's stock price to its investment decisions (Roll *et al*., 2009). In other words, informed options traders' activities help stock prices move towards their fundamental value and, as a result, better reflect the value of the firms' investments in different projects (Blanco and Wehrheim, 2017). Consequently, options trading motivates managers to follow the interests of shareholders, as the value of their investment decisions will be reflected in stock prices. Therefore, an active options trading market can act as a corporate governance mechanism that mitigates agency problems and thereby reduces the demand for conditional conservatism.

Nevertheless, there are at least two reasons to expect that options trading can induce firms to engage in conditional conservatism. First, options traders constantly search for hidden information, and their trading transmits private information to capital markets. If managers withhold bad news, then options traders may discover the bad news and convey it to capital markets, which may result in stock price declines (or crashes), which are associated with litigation (Johnson *et al*., 2001).[4] As such, we can expect that, in the presence of an active options market, managers report bad news in a timely manner to reduce the risk of litigation.[5]

Second, as previously mentioned, options trading aligns the interests of managers with those of the shareholders by improving price efficiency, as more efficient prices better reflect the fundamental value of investment decisions. Thus, options trading motivates managers to invest in risky projects such as R&D projects (Blanco and Wehrheim, 2017). Due to debtholders' asymmetric payoff structure, investment in risky projects may result in the transfer of wealth from

[4] Bhatia *et a*l. (2014) find a positive association between options trading and stock price crash risk.
[5] Financial analysts and short sellers also improve firms' information environments. However, Jin *et a*l. (2018) and Sun and Liu (2011) find that short selling and analyst coverage, respectively, are associated with a higher degree of conditional conservatism.

debtholders to shareholders (Jensen, & Meckling, 1976). However, Kravet (2014) finds evidence that conditional conservatism decreases management's incentives to engage in risky activity and, consequently, debtholders demand conditional conservatism to curb risk-taking. Therefore, it is reasonable to argue that debtholders demand conditional accounting conservatism despite the existence of an active options trading market.

Notwithstanding the above arguments, we may not find any relation between options trading and conditional accounting conservatism. Overall, the literature suggests that options trading improves the quality of firms' information environments (e.g., Cao *et al*., 2020a; Hu, 2018). However, some studies fail to support such an improvement. For instance, a number of studies that examine the lead-lag relation between the stock market and the options market find that the stock market leads the options market, suggesting that the options market has no informational advantage (e.g., Hu, 2014; Manaster and Rendleman, 1982; Xing *et al*., 2010).[6] Although the trading activity of informed options traders conveys private information to the other capital market participants, noise trading by uninformed traders may impede private information learning, thus weakening the impact of options trading on firms' information environments (Roll *et al*., 2010). Given these competing theoretical perspectives, the impact of options trading on conditional accounting conservatism is an open empirical question.

III. RESEARCH DESIGN

In this study, we employ the accrual-operating cash flow model developed by Ball and Shivakumar (2005), which is widely used in the literature (e.g., Ge *et al*., 2019; Khan and Lo,

[6] Black and Scholes (1973) theorize that, in a perfect market, options are redundant, as any option can be identically replicated by investing in a portfolio composed of the underlying stock and bond assets.

2019). This model suits a context in which there is options trading, since it relies solely on reported accounting numbers.[7] The intuition behind this model is that operating cash flow generated from durable assets tends to be persistent over time. Hence, current operating cash flow is positively associated with future cash flow, making it appropriate as a proxy for unrealized economic losses or gains. In the presence of conditional accounting conservatism, accruals capture economic losses (bad news) more quickly than economic gains (good news). Thus, when operating cash flow is negative (i.e., bad news), the association between accruals and operating cash flow should be positive. Ball and Shivakumar's (2005) model is as follows:

$$ACC_{i,t} = \beta_0 + \beta_1 DCFO_{i,t} + \beta_2 CFO_{i,t} + \beta_3 DCFO_{i,t} \times CFO_{i,t} + \varepsilon \quad (1)$$

Where $ACC_{i,t}$ represent total accruals for firm i in year t, defined as the difference between net income before extraordinary items and cash flow from operations, deflated by the beginning total assets. $CFO_{i,t}$ is cash flow from operations for firm i in year t, deflated by total assets at t-1. $DCFO_{i,t}$ is a dummy variable that equals to 1 if $CFO_{i,t}$ is negative and 0 otherwise. The coefficient for $CFO_{i,t} \times DCFO_{i,t}$ captures the conditional conservatism level.

[7] The measurement of conditional accounting conservatism using Basu's (1997) earning-return asymmetric timeliness model is not appropriate in our context. A key underlying assumption behind Basu's (1997) model is that stock returns capture economic news equally across various types of firms (Holthausen, 2003). However, given that an active options trading market (measured by options trading volume) improves price efficiency (Cao et al., 2020a), it is expected that the degree of economic news captured by stock returns varies in association with (or is influenced by) options trading volume across firms. We also do not know whether options trading leads stock prices to capture good and bad economic news equally. Hence, even though, in untabulated results, we observe the negative impact of options trading on conditional accounting conservatism using Basu's (1997) model, we do not rely on this model in our study. Consequently, models that rely on Basu's (1997) model (e.g. Khan and Watts, 2009), and on market data (e.g. Callen *et al,* 2010) are also not appropriate for this study. Similarly, models using proxies designed to capture conditional conservatism over multiple years (e.g., Givoly and Hayn, 2000) are also not appropriate for our study as we are interested in the dynamic activity in the options market in a year. In untabulated results, we observe a negative association between a firm-year measure (i.e., a score-based model) of Ball and Shivakumar's (2005) and options trading volume. However, regression-based x-Scores should not be used as dependent variables as such analyses come with serious biases and interpretation problems (Byzalov and Basu, 2021).

To examine the impact of options trading on conditional accounting conservatism, Ball and Shivakumar's (2005) model is augmented by introducing control variables and options trading volume, which is our proxy for options trading activity,[8] as follows:

$$ACC_{i,t} = \beta_0 + \beta_1 DCFO_{i,t} + \beta_2 CFO_{i,t} + \beta_3 DCFO_{i,t} \times CFO_{i,t} + \beta_4 DCFO_{i,t} \times Volume_{i,t} + \beta_5 CFO_{i,t} \times Volume_{i,t} + \beta_6 DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t} + \beta_7 Volume_{i,t} + \beta_8 DCFO_{i,t} \times Size_{i,t} + \beta_9 CFO_{i,t} \times Size_{i,t} + \beta_{10} DCFO_{i,t} \times CFO_{i,t} \times Size_{i,t} + \beta_{11} Size_{i,t} + \beta_{12} DCFO_{i,t} \times LEV_{i,t} + \beta_{13} CFO_{i,t} \times LEV_{i,t} + \beta_{14} DCFO_{i,t} \times CFO_{i,t} \times LEV_{i,t} + \beta_{15} LEV_{i,t} + \beta_{16} DCFO_{i,t} \times MB_{i,t} + \beta_{17} CFO_{i,t} \times MB_{i,t} + \beta_{18} DCFO_{i,t} \times CFO_{i,t} \times MB_{i,t} + \beta_{19} MB_{i,t} + \varepsilon \quad (2)$$

Where $Volume_{i,t}$ is the natural logarithm of 1 plus the aggregated annual options trading volume (in \$10,000) for firm i and the fiscal year t. Consistent with prior work (e.g., Khan and Watts 2009), we control for size ($Size_{i,t}$), leverage ($LEV_{i,t}$), and market to book ratio ($MB_{i,t}$). We control for industry and year fixed effects and cluster standard errors at the firm level.

We employ 2SLS regressions because endogeneity is a concern in our setting as it is highly likely that options trading volume is determined by the firm's financial reporting attributes. For instance, options traders may avoid firms that exhibit a high degree of conditional accounting conservatism. It is also possible that both options trading volume and the decision to use conditional conservatism are correlated with omitted variables. For example, firm-specific

[8] Our arguments rely on the informational role of informed traders who actively search for hidden information and finally bring hidden information to the capital market. As pointed out by Truong and Corrado (2014), an active options market provides opportunities for informed options traders to trade based on their information. As such, the information role of informed options traders varies with options trading volume (options trading opportunities). In other words, when options trading is low and speculative traders are not active, there are few opportunities for informed traders to trade based on their hidden information.

variables, such as firm-level uncertainty, capital structure, or CEO characteristics, may determine both options trading volume and the degree of conservatism.

We employ two instrumental variables of options trading volume to conduct our 2SLS regressions. The first instrumental variable is moneyness, which equals the annual average of the absolute difference between the option's strike price and the stock's market price at the end of the day. The second instrumental variable is open interest, which equals the natural logarithm of one plus the annual average of open option contracts. Both moneyness and open interest have been used by researchers to study the impact of options trading on firm values (Roll *et al*., 2009), cost of debt (Blanco and Garcia, 2021), stock price informativeness (Cao *et al*., 2020a), audit fees (Ali *et al*., 2020), and corporate policies such as innovation (Blanco and Wehrheim, 2017), voluntary disclosure (Chen *et al*., 2019), and debt structure (Cao *et al*., 2020b). Previous studies and our analyses show that both moneyness and open interest are positively and significantly related to options trading volume.[9] There is no reason to expect that moneyness or open interest is inherently related to the degree of conditional conservatism through a pathway other than options trading volume. Moreover, moneyness should be exogenous to financial reporting attributes, as exchanges regularly list new options with strike prices close to the current market price of the underlying stock (Roll *et al*., 2009). Thus, we deem moneyness and open interest to be suitable instrumental variables.

IV. SAMPLE AND DESCRIPTIVE STATISTICS

Sample

[9] Roll *et al*. (2009) provide an excellent discussion on the relevance of moneyness and open interest to options trading volume.

The sample includes only US firms for which there are listed option contracts. We construct our sample by combining firm-year observations from Compustat and OptionMetrics. Our sample begins in 1997 and ends in 2019. Financial industry firms are removed from the sample (SIC code 6000-6799). We drop observations with missing data to calculate the variables used in Ball and Shivakumar's extended model (2005, 2006). After truncating all continuous variables at the 1st and 99th percentiles, the main sample used in our study has 37,887 firm-year observations. The investor sentiment data are obtained from Professor Jeffrey Wurgler's personal website (http://people.stern.nyu.edu/jwurgler). The EPU data are collected from http://www.policyuncertainty.com. The analyst coverage data are extracted from the Institutional Brokers Estimate System (IBES) database.

Descriptive Statistics

Table 1 Panel A provides descriptive statistics for variables employed in equation (2). The mean (median) of (options trading volume) $Volume$ is 2.229 (1.813), which is comparable to the distribution 2.340 (1.862) in Chen et al. (2019). The mean and median of (cash flow) CFO is 0.076 (0.093). The mean (median) of (negative cash flow) $DCFO$ is 0.16 (0.000), suggesting that 16 percent of firm years in the sample experience negative cash flow. Table 1 Panel B reports the Pearson correlation among variables. Almost all variables are significantly ($p < 0.01$) correlated with each other, but not at levels that suggest multicollinearity: the highest correlation (0.733) is between CFO and $DCFO$, two variables that we expect to be correlated.

[Insert Table 1 about here]

V. RESULTS

Main Results

The main model of this study includes interactions between $Volume_{i,t}$ (options trading $Volume_{i,t}$) and Ball and Shivakumar's (2005) model's variables. Hence, following Wooldridge (2000), we construct additional instrument variables by interacting moneyness and open interest with $CFO_{i,t}$, $DCFO_{i,t}$, and $DCFO_{i,t} \times CFO_{i,t}$.[10] First-stage regression estimates are reported in Panels A (using moneyness as instrument) and B (using open interest as instrument) of Table 2. Consistent with prior studies, we find an economically and statistically significant positive relationship between both instrument variables and options trading volume.

Table 2 Panel C presents results from second-stage 2SLS regressions, with and without control variables included. The dependent variable is *ACC* (i.e., total accruals). For all different model specifications, the under-identification test of Kleibergen-Paap rk LM statistic is significant, indicating that instrument variables are not under-identified. The weak identification test of the Kleibergen-Paap F test statistic is significant. Consistent with the rule of thumb critical value proposed by Staiger and Stock (1997), the Cragg-Donald Wald F statistic is far greater than 10 across all specifications, indicating that the instruments are not weakly identified. The Cragg-Donald Wald F statistic also far exceeds all critical values put forward by Stock and Yogo (2005), suggesting that the group of instruments is sufficiently strong. The Anderson-Rubin F test and the level of Stock-Wright LM S statistic confirm that instrument variables are not weak. The Hansen

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[10] More specifically, following Wooldridge (2000) each interaction term between the endogenous variable (i.e., $Volume_{i,t}$) and exogenous variables (i.e., $CFO_{i,t}$, $DCFO_{i,t}$) is considered as an endogenous variable and their corresponding instrument variables are created by multiplying each instrument variable (i.e., moneyness and open interest) by exogenous variables. In other words, there are four endogenous variables ($Volume_{i,t}$, $DCFO_{i,t} \times Volume_{i,t}$, $CFO_{i,t} \times Volume_{i,t}$, $DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$) and if we use moneyness ($Money_{i,t}$) as the main instrument variable, then we have four instrument variables ($Money_{i,t}$, $DCFO_{i,t} \times Money_{i,t}$, $CFO_{i,t} \times Money_{i,t}$, $DCFO_{i,t} \times CFO_{i,t} \times Money_{i,t}$). In the first-stage regression, we estimate each endogenous variable by using all exogenous variables, including each instrument variables (Baltagi, 2011).

J statistic (0.000), a test of the over-identifying restrictions, indicates that all equations are exactly identified. Collectively, the statistical tests suggest that our 2SLS methodology is appropriate, and estimations are unlikely to suffer from weak-instruments bias.

[Insert Table 2 about here]

The coefficient on the variable of interest, $DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$, is negative and significant across all specifications in Panel C, indicating that an active options trading market is associated with a lower level of conditional conservatism. Using moneyness as the instrument for *Volume*, the coefficient for the variable of interest is -0.013 ($p < 0.01$) for the estimation without control variables and -0.098 ($p < 0.01$) for the estimation with control variables. Using open interest as the instrument for $Volume$, the coefficient for the variable of interest is -0.044 ($p < 0.01$) for the estimation without control variables and -0.122 ($p < 0.01$) for the estimation with control variables.[11]

LaFond and Watts (2008) hypothesize that "political costs" may lead large firms to be more conservative. Khan and Watts (2009) argue that large firms are subject to higher litigation risk and bear fixed costs of litigation. Hence, large firms may use more conditional conservatism to reduce their litigation risk. Consistent with this view, the coefficient on $DCFO_{i,t} \times CFO_{i,t} \times Size_{i,t}$ is positive and significant (0.162, $p < 0.01$ and 0.18, $p < 0.01$) in both 2SLS regressions with control

[11] We note that the coefficient on $DCFO_{i,t} \times CFO_{i,t}$ is negative and significant in some specifications in Table 2 Panel C and other tables. However, as explained by Burks *et al.* (2019), the coefficient on a term cannot be simply interpreted in the presence of interaction of that term and another variable. Hence, we can not interpret the coefficient on $DCFO_{i,t} \times CFO_{i,t}$ when there are interactions with this term and other variables, i.e., the three way interaction terms). In untabulated results, when we run a regression that includes only Ball and Shivakumar's (2005) terms and industry and year fixed effect, we find that the coefficient on $DCFO_{i,t} \times CFO_{i,t}$ is positive and significant (0.417, t=25.20, p<0.01).

variables, indicating that conditional conservatism increases with firm size.[12] The coefficient on the interaction term $DCFO_{i,t} \times CFO_{i,t} \times LEV_{i,t}$ is not statistically significant (0.017, $p < 0.591$; 0.027, $p < 0.373$) in either estimation, indicating that leverage has no impact on conditional conservatism in our sample. Prior research indicates that options-listed firms typically exhibit an easier access to debt and a lower level of information asymmetries (Cao *et al.*, 2020b; Do *et al.*, 2019). Therefore, a likely outcome is less demand from lenders for conditional conservatism. The coefficient on $DCFO_{i,t} \times CFO_{i,t} \times MB_{i,t}$ is positive and significant (0.007, $p < 0.05$; 0.007, $p < 0.05$) for both estimations, indicating that firms with high growth options (as proxied by $MB_{i,t}$) use more conditional conservatism to reduce agency problems and information asymmetries associated with growth options (Khan and Watts 2009).

Difference-in-Difference Regression Analysis

To further investigate the impact of options trading on conditional conservatism, we perform a difference-in-difference analysis to study the effect of options listing on conditional conservatism. The listing of options contracts is a decision that is made by exchanges and is out of managers' and shareholders' control. The criteria used by exchanges for options listing are mostly related to a firm's stock price, its number of shareholders, and its number of publicly held shares.[13] Therefore, options listing could be considered as a natural experiment to explore the

[12] LaFond and Watts (2008) and Khan and Watts (2009) also contend that "income aggregation" across multiple segments or projects and lower information asymmetries among big firms reduce the degree of conservatism. The positive and significant relation between size and conditional conservatism suggests that, on average, the impacts of political cost and litigation risk dominate the impacts of income aggregation and lower information asymmetries among big firms in our sample. However, we note that the majority of prior studies find a negative association between size and conditional accounting conservatism (e.g. Khan and Watts, 2009). A recent study by Ge et al. (2019) also finds a positive but insignificant association between size and conditional conservatism (proxied by Ball and Shivakumar's (2005) model of conservatism).

[13] For example, the CBOE required the following criteria for the firms to be listed in the options market as of December 2020:1) the firm's security must be National Market System registered stock; 2) there are at least 7,000,000 publicly held shares of the underlying security; 3) there are at least 2000 shareholders; 4) trading volume of the underlying

impact of options trading on underlying stocks, as well as on various corporate policies. However, there are some concerns about the endogeneity of the listing decision by exchanges (Mayhew and Mihov, 2004) and homogeneity of the options listing effects on firms (Truong and Corrado, 2014). As such, our difference-in-difference estimation results should be interpreted with the above-mentioned limitation in mind.

To conduct our difference-in-difference analysis, we first identify a treatment sample of 733 firms listed on the options market for the first time. We choose a pool of non-listed firms that have no history of options trading in the OptionMetrics database. We require both the treatment sample and the pool of non-listed firms to possess all required data to calculate variables in equation 2 for the five years preceding and the year following the year during which options are initially traded. To select the control sample, we follow the matching procedure of previous options-trading studies (e.g., Mendenhall and Fehrs, 1999; Naiker *et al.*, 2013) by first calculating the rank of size, leverage, market to book value, and cash flow in the year of options listing for firms with and without listed options. We then calculate the absolute difference in ranks for each variable between the listed firms and each non-listed firm from the same year of options listing and the same industry on the basis of its two-digit SIC code. Finally, we determine the listed firm's counterpart as the one with the smallest sum of absolute rank differences.

To perform the difference-in-difference estimation, we exclude the year of option listing and focus on the five years before and after the listing. We extend equation 2 as follows:

$$ACC_{i,t} = \beta_0 + \beta_1 DCFO_{i,t} + \beta_2 CFO_{i,t} + \beta_3 DCFO_{i,t} \times CFO_{i,t} + \beta_4 DCFO_{i,t} \times Volume_{i,t} + \quad (3)$$

$$\beta_5 CFO_{i,t} \times Volume_{i,t} + \beta_6 DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t} + \beta_1 Volume_{i,t} +$$

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security must be at least 2,400,000 shares in the past 12 months; 5) the price of the security must be at least \$3.00 for "covered security" (under Section 18(b)(1)(A) of the Securities Act of 1933) and at least \$7.50 for "uncovered security" three days before CBOE issues a certificate for listing.

$$\beta_1 DCFO_{i,t} \times Treatment_{i,t} \times Post_{i,t} + \beta_1 CFO_{i,t} \times Treatment_{i,t} \times Post_{i,t} + \beta_1 DCFO_{i,t} \times CFO_{i,t} \times Treatment_{i,t} \times Post_{i,t} + \beta_1 Treatment_{i,t} \times Post_{i,t} + \beta_1 DCFO_{i,t} \times Treatment_{i,t} + \beta_1 CFO_{i,t} \times Treatment_{i,t} + \beta_1 DCFO_{i,t} \times CFO_{i,t} \times Treatment_{i,t} + \beta_1 Treatment_{i,t} + \beta_1 DCFO_{i,t} \times Post_{i,t} + \beta_1 CFO_{i,t} \times Post_{i,t} + \beta_1 DCFO_{i,t} \times CFO_{i,t} \times Post_{i,t} + \beta_1 Post_{i,t} + \sum \beta(Control\ variables\ and\ their\ interaction\ with\ CFO\ and\ DFO) + \varepsilon$$

Where $Treatment_{i,t}$ is a dummy variable equal to 1 if a firm belongs to the treatment sample and 0 otherwise. $Post_{i,t}$ is a dummy variable equal to 1 for the years following the year of options trading for both option listed and matched firms and equal to 0 for the years preceding the options listing. The variable of interest in the above equation is $DCFO_{i,t} \times CFO_{i,t} \times Treatment_{i,t} \times Post_{i,t}$. The negative (positive) sign of coefficient on this variable indicates a decrease (increase) in the degree of conditional conservatism following option listing among the treatment group.

Table 3 presents results for our difference-in-difference analysis. The coefficient on the interaction term between $DCFO_{i,t}, CFO_{i,t}, Treatment_{i,t}$, and $Post_{i,t}$ is negative and significant (-1.324, $p < 0.01$), suggesting that, on average, firms exhibit less conditional conservatism following options listing. The value of adjusted R-squared is similar to the past studies that use difference-in-differences analysis in conditional conservatism (e.g., Khan and Lo 2019).

[Insert Table 3 about here]

Additional Analyses

In this section, we present additional analyses to gain further insights into the relation between options trading volume and conditional conservatism. We report only the second stage of 2SLS regressions, which are estimated using moneyness as the instrument variable.[14] For ease of exposition, results from regressions without control variables are not provided. Overall, the results from regressions without control variables are consistent with those reported.

Firm Size, Investment Cycle Length, and Asset Tangibility

We consider that an active options trading market reduces the demand for conditional conservatism by alleviating information asymmetries between insiders and outsiders. In this subsection, we examine subsamples of firms that are expected to suffer more (or less) from information asymmetry problems. More specifically, we use firm size, investment cycle length, and asset tangibility as proxies for expected information asymmetries.[15] The rationale for using size (the total assets at the end of the year) in our analysis is that larger firms benefit from a better information environment since they are more visible, and media and capital market participants have a greater incentive to follow them (Freeman, 1987). As suggested by Khan and Watts (2009), the length of the investment cycle (defined as depreciation expense scaled by total assets at the beginning of the year) is associated with uncertainty, which aggravates information asymmetries. The presence of intangible assets is associated with "inherent uncertainty," which exacerbates information asymmetries (Barth *et al.*, 2001). As such, we employ tangibility (the ratio of property, plant, and equipment to total assets at the beginning of the year) as a proxy for potential information asymmetry.

[14] Similar results are obtained when using open interest as instrument variable (untabulated).
[15] We do not use direct proxies for information asymmetries as options trading alleviates the level of information asymmetries (Hu, 2019). Rather, we use proxies for potential information asymmetries to examine how options trading reduces the demand for conservatism by reducing information asymmetries.

To examine how sensitive our results are to potential information asymmetry, subsamples are created by dividing the sample into terciles based on firm size, investment cycle duration, and asset tangibility. Table 4 presents results of the two extreme terciles of these partitions, with the middle tercile observations being left out. Table 4 Panel A presents results for subsamples of firm size. While the coefficient of interest $DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$ is significant in the subsample of small firms (-0.070, p < 0.01; -0.085, p < 0.01), it is non-significant in the subsample of large firms (0.31, P > 0.191; 0.231, p > 0.351). These results suggest that an active options trading market has little or no effect on the demand for conditional conservatism among large firms, which tend to have a transparent information environment (Freeman, 1987).

[Insert Table 4 about here]

Table 4 Panel B reports results for subsamples of firms with long and short investment cycles. The coefficient of the variable of interest, $DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$, is not significant in the model specification without control variables (-0.016, P > 0.450) and it is weakly (-0.047, p < 0.058) significant in the specification with control variables for the subsample of firms with a short investment cycle. In contrast it is significant in both equations for the subsample of firms with a long investment cycle (-0.062, p < 0.01; -0.147, p <p 0.01), implying that an active options market reduces demand for conditional conservatism when there is a high level of uncertainty about the firm's operations.

Table 4 Panel C displays results for subsamples of firms with high and low asset tangibility. The coefficient on $DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$ is significant in our specifications for the subsample of firms with low asset tangibility (-0.058, P<0.01& -0.108, P<0.01). However, our coefficient of interest is not significant in both equations for the subsample of firms with how asset tangibility, confirming that options trading volume is negatively associated with conditional accounting conservatism in the presence of potentially high information asymmetries. Collectively, these results suggest that options trading volume is associated with a lower level of conditional accounting conservatism when there is a high likelihood of information asymmetries.

Economic Policy Uncertainty

So far, results show that the negative impact of options trading on conditional accounting conservatism is more pronounced when there is a higher degree of uncertainty, which exacerbates information asymmetries. In this subsection, we examine how options trading influences conditional conservatism under different levels of EPU. EPU, as a type of uncertainty, induce information asymmetries. However, unlike other types of uncertainty, EPU is exogenous to managers, as they largely have no control over government policies and elections (Nagar *et al.*, 2019). Chui and Wei (2021) find a positive association between EPU and conditional conservatism, suggesting that there is a higher demand for accounting conservatism during high EPU periods.[16]

Options traders continuously look for information concealed by managers and ultimately decipher uncertainty about a firm by bringing the hidden information to the market. However, we argue that options trading may not alleviate the EPU-induced information asymmetry, because this type of uncertainty emanates from outside the firm. As such, we expect that options trading would have little or no impact on the association between high levels of EPU and conditional accounting

[16] Nagar *et al*. (2019) provide evidence that managers increase voluntary disclosure when EPU is high. However, they document that managers are not able to fully mitigate the EPU-induced information asymmetry by increasing voluntary disclosure. Dai and Ngo (2021) also show that US gubernatorial elections, which are associated with policy uncertainty, are associated with a higher degree of conditional conservatism.

conservatism. To examine this prediction, we divide our sample into terciles based on the average Baker, Bloom and Davis (2016) index over every fiscal year, our measure of EPU. Table 5 presents our results for this subsection. Similar to our previous analyses, we show results for the two extreme terciles (high/low), leaving out the middle tercile observations. Consistent with our expectation, for the equation without control variables, the coefficient on the interaction between $DCFO_{i,t}, CFO_{i,t}, Volume_{i,t}$ is not significant in the subsample of high EPU periods (-0.017, p > 0.312); however, it is significant in the subsample of low EPU periods (-0.067, p < 0.01). For the specification with control variable, the coefficient for $DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$ is significant under both low (-0.136, p < 0.01) and high EPU periods (-0.055, p < 0.01). However, consistent with our expectation, the value of the coefficient of interest is significantly higher (p < 0.01) in the subsample of high EPU periods, indicating that *Volume* has less influence on conditional conservatism under high EPU periods than under low EPU periods. In other words, when the source of uncertainty is largely exogenous to the firm and capital markets, an active options market has less influence on the level of conditional conservatism.

[Insert Table 5 about here]

Financial Analyst Coverage

Next, we explore how analyst coverage influences the impact of options trading on conditional conservatism. Sun and Liu (2011) hypothesize that financial analysts may affect conservatism in two opposite ways. On the one hand, financial analysts can act as a corporate governance mechanism and discipline managers to recognize bad news in a more timely fashion. On the other hand, financial analysts can serve as information intermediaries, decreasing the information asymmetries between managers and capital markets, if they play such a role, they may reduce the demand for conditional conservatism. Their empirical analyses show a positive association between financial analyst coverage and conditional conservatism, indicating that the governance function of analysts dominates their role as information intermediaries in shaping the financial reporting strategy of firms.

If an active options market is a substitute for analyst coverage in reducing information asymmetries between managers and investors, then the negative impact of options trading on conservatism is expected to be more prominent when analyst coverage is low. However, if an active options market acts as a complement for high analyst coverage, then it is expected to be more strongly related to a lower degree of conditional conservatism.

To investigate the impact of analyst coverage on the association between options trading and conditional conservatism, we partition firms into terciles based on the number of analysts following a firm. Table 6 shows results for the subsamples of firms with high and low analyst coverage (the middle tercile is left out). The coefficient on the interactions between $DCFO_{i,t}, CFO_{i,t}, Volume_{i,t}$ is negative and significant in all specifications. However, the absolute value of the coefficient of interest is higher in the subsample of high analyst coverage and the difference between the coefficient of interest in corresponding specifications is significant (P<0.01). Hence, the impact of options trading on conditional conservatism appears to be greater when there is more extensive analyst coverage, suggesting that both are complementary in reducing information asymmetry as well as the demand for conditional conservatism.

[Insert Table 6 about here]

Investor Sentiment

We next investigate how investor sentiment influences the association between options trading and conditional accounting conservatism. Baker and Wurgler (2006, 2007) define investor sentiment as optimism or pessimism towards stocks' and firms' future performances. Ge *et al.* (2019) argue that, during high sentiment periods, optimistic investors overvalue firms; however, after a high sentiment period, investors may suffer from stock price declines. As such, investors who suffer from the price declines may launch class action suits, accusing managers of misleading them by not reporting losses in a timely manner. Therefore, managers have a strong incentive to employ conditional accounting conservatism to reduce the litigation risk that follows high sentiment periods. Consistent with this argument, Ge *et al.* (2019) document a high (low) degree of conditional conservatism during high (low) sentiment periods. The literature shows that an active options trading market leads to stock price efficiency (e.g., Cao *et al*., 2020a; Hu, 2018; Roll et al., 2009) and reduces the likelihood of overpricing (Diamond and Verrecchia, 1987)Hence, options trading reduces the likelihood of overpricing when sentiment is high, which can alleviate some of the litigation risks managers face. Consequently, we expect that the negative impact of options trading on conditional conservatism will be more prominent during high sentiment periods.

To examine the sensitivity of our results to investor sentiment, we partition the sample into terciles based on the average Baker and Wurgler's (2006, 2007) index over every fiscal year, our proxy for investor sentiment. For the model specification without control variables, the coefficient of interest, the interaction between $DCFO_{i,t}, CFO_{i,t}, Volume_{i,t}$ is not significant in the subsample of low investors' sentiment (-0.017, $p > 0.434$); however, it is significant in the subsample of high sentiment periods (-0.076, $p < 0.01$). For the specification with control variables, the negative impact of options trading on conditional conservatism is also significantly higher ($p < 0.01$) in the subsample of high sentiment periods. Consistent with our prediction, the reported results in Table

5 indicate that the role of options trading in reducing conditional conservatism is more prominent in high sentiment periods.

[Insert Table 7 about here]

Robustness Tests

Alternative Measure of Conditional Conservatism

To provide further confidence in our results, we now employ Basu's (1997) persistence of earnings changes model as the alternative model for measuring conditional conservatism. This model does not rely on stock returns. The intuition behind this model is that under conditional accounting conservatism, firms report economic loss (bad news) as soon as anticipated. Hence, firms report "capitalized value of bad news." In contrast, firms require a "higher degree of verification" for reporting economic gains (good news) and thus they partially recognize "capitalized value of good news" as gains. Consequently, they partially recognize the "capitalized value of good news" in subsequent periods. Therefore, under conditional accounting conservatism, positive earnings changes are more persistent than negative earnings changes. Basu's (1997) persistence of earnings changes model is as follows:

$$\Delta NI_{i,t+1} = \beta_0 + \beta_1 D\Delta NI_{i,t} + \beta_2 \Delta NI_{i,t} + \beta_3 D\Delta NI_{i,t} \times \Delta NI_{i,t} + \varepsilon \quad (4)$$

Where $\Delta NI_{i,t+1}$ is the changes in income before extraordinary items from fiscal year t+1 to year t deflated by total assets at the beginning of year t for firm i, and $\Delta NI_{i,t}$ is the one-year lagged value of $\Delta NI_{i,t+1}$. $D\Delta NI_{i,t}$ is a dummy variable that equal 1 if $\Delta NI_{i,t}$ <0 and 0 otherwise. If economic losses (bad news) are recognized in a timelier fashion than economic gains (good news), negative earnings changes are expected to be less persistent than positive earnings changes and, as a result, the association between current negative earnings changes and future earnings changes will be negative. As such, the negative sign of the coefficient on $D\Delta NI_{i,t} \times \Delta NI_{i,t}$ captures the degree of conditional conservatism.

To employ Basu's (1997) persistence of earnings changes model, we add the options trading volume ($Volume_{i,t}$), size ($Size_{i,t}$), leverage ($Lev_{i,t}$), market to book value ($MB_{i,t}$), and their interactions with Basu's (1997) model variables. The modified model is as follows:

$$\Delta NI_{i,t+1} = \beta_0 + \beta_1 D\Delta NI_{i,t} + \beta_2 \Delta NI_{i,t} + \beta_3 D\Delta NI_{i,t} \times \Delta NI_{i,t} + \beta_4 D\Delta NI_{i,t} \times Volume_{i,t} + \beta_5 \Delta NI_{i,t} \times Volume_{i,t} + \beta_6 D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Volume_{i,t} + \beta_7 Volume_{i,t} + \beta_8 D\Delta NI_{i,t} \times Size_{i,t} + \beta_9 \Delta NI_{i,t} \times Size_{i,t} + \beta_{10} D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Size_{i,t} + \beta_{11} Size_{i,t} + \beta_{12} D\Delta NI_{i,t} \times Lev_{i,t} + \beta_{13} \Delta NI_{i,t} \times Lev_{i,t} + \beta_{14} D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Lev_{i,t} + \beta_{15} Lev_{i,t} + \beta_{16} D\Delta NI_{i,t} \times MB_{i,t} + \beta_{17} \Delta NI_{i,t} \times MB_{i,t} + \beta_{18} D\Delta NI_{i,t} \times \Delta NI_{i,t} \times MB_{i,t} + \beta_{19} MB_{i,t} + \varepsilon\varepsilon \quad (5)$$

The key variable of interest is $D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Volume_{i,t}$. If the coefficient on this variable is positive, then it can be concluded that the persistence of the earnings changes model confirms the negative impact of options trading on conditional conservatism. Using the same approach as in the main results, we apply the 2SLS method to address the concern regarding potential estimation errors stemming from endogeneity and omitted variables.

Table 8 Panels A and B present results for the first stage of our 2SLS method with either moneyness or open interest as instrument variables. The results for the second stage of our 2SLS method are reported in Table 8 Panels C and D. All statistical tests confirm the validity of our 2SLS regressions and the instrument variables. Our coefficient of interest, for the interaction between $D\Delta NI_{i,t}$, $\Delta NI_{i,t}$, and $Volume_{i,t}$, is positive and significant in all specifications, suggesting that an active options market is associated with less conditional conservatism[17].

[Insert Table 8 about here]

Other Robustness Analyses

In untabulated tests, we include the following control variables: sales growth (measured as changes in sales from year t to year t-1 deflated by beginning total assets), asset tangibility (measured as property, plant, and equipment scaled by beginning total assets), and a dummy variable that equals 1 if a firm operates in a highly litigious industry[18] and 0 otherwise (Deng *et al.*, 2018). Results remain qualitatively unchanged after including these additional control variables. In untabulated tests, following Roll *et al.* (2009), we use weighted moneyness (weighted by the proportion of total options trading volume for each stock) as the instrument variable, and we obtained similar results to those in Table 2.

VI. CONCLUSION

Recent developments in the US options market as well as the ongoing debate regarding the merits of accounting conservatism motivate our investigation as to whether and how options trading reduces the demand for conditional conservatism. Options traders improve a firm`s information environment and enhance market efficiency, as they have superior ability in

[17] As previously pointed out, a two way interaction cannot be interpreted in the presence of a three way interaction. In untabulated results, we find a negative and significant coefficient on when we include only Basu's (1997) persistence of earnings changes model terms, industry and year fixed effects (-0.147, t=-8.51, p<0.01).

[18] Following prior conservatism literature (e.g., Deng et al., 2018), we define firms that belong to Biotechnology (SIC codes 2833–2836 and 8731–8734), Computers (SIC codes 3570–3577 and 7370–7374), Electronics (SIC codes 3600–3674), and Retailing (SIC codes 5200–5961) as evolving in a highly litigious environment. Firms in these industries are assigning a binary variable of 1, 0 otherwise.

interpreting public information as well as in acquiring and conveying private information to investors. We argue that options trading decreases the demand for conservatism by reducing information asymmetry and by lowering agency shareholders-management agency conflicts, which are the two main reasons outsiders demand conservatism.

Using 2SLS regression analysis, we find that options trading is associated with a reduction in the level of conditional accounting conservatism as proxied by the accrual-operating cash flow model of Ball and Shivakumar (2005). Our findings are robust to the inclusion of additional control variables and use of an alternative proxy for conditional conservatism. Our difference-in-differences analysis of conditional conservatism surrounding options listing yields evidence that firms exhibit a lower degree of conditional conservatism after being listed on the options market. Further analyses reveal that options trading effectively affects conditional conservatism in small firms, and options trading's impacts are more pronounced in firms with low asset tangibility and firms with long investment cycles. We also find that options trading has a greater influence on conservatism when exogenous uncertainty is low, financial analyst coverage is high, and investor sentiment is high.

As with any empirical study of the association between options trading and corporate policies, our results are subject to potential biases caused by omitted variables and reverse causality. The 2SLS approach of using two different instrument variables is employed to address the issue of omitted variables and reverse causality. One can argue that firms that are listed on the options market have vastly different characteristics than non-listed firms. Thus, if other firms are listed on the options market, we may not observe a negative relationship between options trading volume and the degree of conditional conservatism. We acknowledge that the sample of options listed firms possess different characteristics than non-listed firms. For instance, options listed firms are notably larger than non-listed firms. However, our difference in difference analysis provides evidence that firms exhibit less conditional conservatism after being listed on the options market. Moreover, our results are primarily driven by small firms that are more similar to non-listed firms. Despite these limitations, overall, our evidence suggests that an active options market contributes to the firms' information environments and, thus, reduces the need for conditional accounting conservatism.

Our study has implications for standard setters by providing evidence that the demand for conditional conservatism varies with the development in the options market and, thus, the impact of the exclusion (or inclusion) of conservatism from financial standards on capital markets may depend on the development of the options market or, more comprehensively, on the development of financial markets as a whole. This study offers insight into the future of the demand for conditional conservatism by showing that, everything else being equal, the ongoing development of the options trading market reduces the need for conditional conservatism in the future. We believe our study opens the way for further research on the informational dynamics between options markets and corporate financial reporting. Future research could explore whether our results are generalizable to other countries and how different institutional environments influence the options markets' ability to reduce the demand for conditional conservatism. It could also explore how size determines the degree of conditional conservatism in different scenarios.

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Appendix

Variable definition

Variable	Definition
Variables in the Ball and Shivakumar (2005) model	
$ACC_{i,t}$	Total accruals defined as the difference between net income before extraordinary items (#IBC) and cash flow from operating activities (#OANCF), deflated by total assets at the beginning of the year (#AT)
$CFO_{i,t}$	Operating cash flow (#OANCF) for firm i in year t, scaled by total assets at the beginning of the year (#AT)
$DCFO_{i,t}$	A dummy variable that equals to 1 if $CFO_{i,t}$ is negative and 0 otherwise
Options trading related variables	
$Volume_{i,t}$	Natural logarithm of 1 plus the aggregated annual options trading volume (in \$10,000) for firm i and the fiscal year t
$Money_{i,t}$	Annual average of the absolute deviation of the option's strike price from the stock's market price ($\left\| \ln \left(\frac{stock\ price}{strike\ price}\right) \right\|$) at the end of day
$Open_{i,t}$	Natural logarithm of 1 plus annual average of open option contracts
Control variables	
$Size_{i,t}$	Natural logarithm of the total assets at the end of the year (#AT)
$LEV_{i,t}$	Sum of long-term debt (#DLTT) and current debt (#DLC) scaled by market value of equity at the end of the year (#CSHO × #PRCC_F)
$MB_{i,t}$	Market-to-book value measured as the market value of equity (#CSHO×#PRCC_F) divided by the book value of equity at the end of the year (#CEQ)
Variables used in creating subsamples for additional analysis	
Investment Cycle	Depreciation expense (#DP) scaled by total assets at the beginning of the year (#AT)
Asset Tangibility	Ratio of property, plant, and equipment (#PPEGT) total assets at the beginning of the year (#AT)
Investor Sentiment	The average Baker and Wurgler's (2006, 2007) index over the fiscal year
EPU Index	The average Baker et al.'s (2016) EPU index over the fiscal year
Analyst coverage	The average number of financial analysts following the firm during the fiscal year
Variables in the Basu (1997) persistence of earnings changes model	
$\Delta NI_{i,t+1}$	Income before extraordinary items (#IB) from fiscal year t+1 to year t deflated by total assets in the beginning of year t (#AT)
$\Delta NI_{i,t}$	Income before extraordinary items (#IB) from fiscal year t to year t-1 deflated by total assets in the beginning of year t-1 (#AT)
$D\Delta NI_{i,t}$	A dummy variable that equals to 1 if $\Delta NI_{i,t}$ is negative and 0 otherwise

Table 1: Descriptive statistics

Panel A: Summary statistics for key variables

Variable	N	Mean	SD	Median	P5	P25	P75	P95
ACC	37887	-0.072	0.095	-0.058	-0.238	-0.105	-0.024	0.052
Volume	37887	2.229	1.804	1.813	0.096	0.678	3.444	5.745
CFO	37887	0.076	0.149	0.093	-0.208	0.040	0.150	0.266
DCFO	37887	0.16	0.366	0.000	0.000	0.000	0.000	1.000
Size	37887	6.995	1.647	6.934	4.364	5.799	8.121	9.902
LEV	37887	0.396	0.699	0.159	0.000	0.012	0.456	1.605
MB	37887	3.321	4.102	2.367	0.599	1.465	4.007	10.015

Panel B: Pearson correlation coefficients

Variable	*ACC*	*Volume*	*CFO*	*NCFO*	*Size*	*LEV*	*MB*
ACC	1						
Volume	-0.008	1					
CFO	-0.062***	0.149***	1				
DCFO	-0.016***	-0.098***	-0.733***	1			
Size	0.143***	0.532***	0.302***	-0.399***	1		
LEV	-0.045***	-0.053***	-0.06***	-0.023***	0.245***	1	
MB	-0.047***	0.179***	0.046***	0.020***	-0.051***	-0.205***	1

Table 1 displays summary statistics for variables used in the main analysis. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level,

Table 2: The 2SLS regressions of options trading volume and conditional conservatism

Panel A: The first-stage IV regression estimates with moneyness as the instrument variable

	$Volume_{i,t}$		$DCFO_{i,t}$×$Volume_{i,t}$		$CFO_{i,t}$×$Volume_{i,t}$		$DCFO_{i,t}$×$CFO_{i,t}$×$Volume_{i,t}$	
$Money_{i,t}$	0.433*** (31.89)	0.328*** (28.86)	0.000 (0.62)	0.000 (-0.43)	0.005*** (2.9)	0.002 (1.05)	0.000*** (-2.67)	0.000 (-1.64)
$DCFO_{i,t}$×$Money_{i,t}$	-0.055*** (-2.81)	-0.015 (-0.88)	0.384*** (23.3)	0.324*** (21.55)	-0.008* (-1.92)	-0.002 (-0.45)	-0.002 (-0.53)	0.001 (0.44)
$CFO_{i,t}$×$Money_{i,t}$	-0.267*** (-4.02)	-0.236*** (-4.24)	0.002 (0.85)	0.003 (1.55)	0.344*** (21.76)	0.271*** (18.6)	0.000 (0.02)	0.000 (-0.74)
$DCFO_{i,t}$×$CFO_{i,t}$×$Money_{i,t}$	0.296*** (2.92)	0.231*** (2.69)	0.043 (0.57)	0.025 (0.39)	0.009 (0.23)	0.046 (1.31)	0.356*** (9.44)	0.321*** (10.15)
$DCFO_{i,t}$	2.863*** (14.46)	1.661*** (3.01)	-0.033** (-2.47)	0.009 (0.23)	2.148*** (43.33)	-0.941*** (-6.63)	0.009*** (4.65)	0.003 (0.5)
$CFO_{i,t}$	-0.135*** (-3.43)	0.972*** (8.01)	1.104*** (34.98)	-1.046*** (-10.58)	0.061*** (7.39)	0.152*** (6.44)	0.013 (1.88)*	0.065*** (3.51)
$DCFO_{i,t}$×$CFO_{i,t}$	-2.835*** (-11)	-1.992*** (-2.9)	-0.093 (-0.63)	-0.283 (-0.71)	-0.888*** (-9.96)	0.331 (1.39)	1.232*** (16.83)	-0.611*** (-3.25)
Observations	37887	37887	37887	37887	37887	37887	37887	37887
Control variables	NO	Y	NO	Y	NO	Y	NO	Y
Industry and Year FX	Y	Y	Y	Y	Y	Y	Y	Y
F test ***(Prob>F)***	764.31 (0.0000)	551.81 (0.0000)	223.37 (0.0000)	181.97 (0.0000)	661.50 (0.0000)	448.12 (0.0000)	132.58 (0.0000)	90.45 (0.0000)
Sanderson Windmeijer multivariate F test (Prob>F)	1744.40 (0.0000)	1342.07 (0.0000)	2009.60 (0.0000)	1609.03 (0.0000)	1444.59 (0.0000)	1042.34 (0.0000)	1654.90 (0.0000)	1258.82 (0.0000)

Table 2: The 2SLS regressions of options trading volume and conditional conservatism

Panel B: The first-stage IV regression estimates with open interest as the instrument variable

	$Volume_{i,t}$		$DCFO_{i,t}×Volume_{i,t}$		$CFO_{i,t}×Volume_{i,t}$		$DCFO_{i,t}×CFO_{i,t}×Volume_{i,t}$	
$Open_{i,t}$	0.744*** (95.56)	0.67*** (86.6)	0.002*** (3.24)	0.001* (1.69)	-0.012*** (-12.4)	-0.256*** (-10.59)	0.000*** (-3.79)	0.000 (-1.25)
$DCFO_{i,t}×Open_{i,t}$	0.015 (1.11)	0.005 (0.36)	0.749*** (62.14)	0.672*** (59.27)	0.009*** (3.68)***	0.014*** (5.88)	-0.004* (-1.73)	0.001 (0.38)
$CFO_{i,t}×Open_{i,t}$	0.77*** (16.89)	0.696*** (14)	0.015*** (3.9)	0.018*** (4.62)	0.969*** (93.78)	0.898*** (72.22)	-0.003*** (-4.05)	-0.003*** (-4.59)
$DCFO_{i,t}×CFO_{i,t}×Open_{i,t}$	-0.719*** (-10.58)	-0.657*** (-9.76)	0.043 (0.91)	0.042 (0.99)	-0.267*** (-10.58)	-0.013*** (-11.37)	0.705*** (30.53)	0.648*** (31.36)
$DCFO_{i,t}$	-4.25*** (-11.3)	-3.827*** (-9.09)	-0.152*** (-4.47)	-0.112*** (-3.23)	-5.416*** (-62.96)	0.062 (0.29)	0.031*** (4.9)	0.021*** (3.55)
$CFO_{i,t}$	-0.195* (-1.91)	-0.153 (-1.37)	-4.323*** (-47.44)	-4.921*** (-49.51)	-0.047** (-2.38)	-0.095*** (-4.78)	0.03* (1.66)	-0.031* (-1.79)
$DCFO_{i,t}×CFO_{i,t}$	4.105*** (7.43)	5.706*** (9.16)	-0.128 (-0.34)	1.846*** (4.28)	1.412*** (6.89)	-5.81*** (-62.99)	-4.051*** (-21.76)	-5.783*** (-30.14)
Observations	37887	37887	37887	37887	37887	37887	37887	37887
Control variables	NO	Y	NO	Y	NO	Y	NO	Y
Industry and Year FX	Y	Y	Y	Y	Y	Y	Y	Y
F test ***(Prob>F)***	8231.22 (0.0000)	6444.36 0.0000	1620.40 0.0000	1461.34 0.0000	8052.00 0.0000	5662.31 0.0000	1003.39 0.0000	764.60 0.0000
Sanderson Windmeijer multivariate F test (Prob>F)	18715.68 0.0000	15333.04 0.0000	18740.22 0.0000	15433.55 0.0000	16602.98 0.0000	11312.74 0.0000	18376.05 0.0000	13396.74 0.0000

Table 2

Panel C: Second-Stage Regression Estimates for Conditional Conservatism

	Dependent variable: $ACC_{i,t}$							
	Estimations with Moneyness as Instrument for Volume				**Estimations with Open Interest as Instrument for Volume**			
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
$DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$	-0.013***	-3.05	-0.098***	-6.08	-0.044***	-4.01	-0.122***	-9.09
$DCFO_{i,t} \times Volume_{i,t}$	-0.003**	-2.58	-0.015***	-5.03	-0.005**	-2.46	-0.014***	-5.61
$CFO_{i,t} \times Volume_{i,t}$	0.006***	4.12	0.058***	6.79	0.024***	4.76	0.067***	9.96
$Volume_{i,t}$	-0.001***	-3.64	-0.013***	-9.39	-0.003***	-3.81	-0.014***	-14.29
$DCFO_{i,t} \times CFO_{i,t}$	0.031***	16.16	-0.413***	-5.4	0.518***	18.04	-0.459***	-6.14
$DCFO_{i,t}$	-0.006	-1.44	-0.126***	-8.69	-0.01**	-2.1	-0.120***	-8.37
$CFO_{i,t}$	-0.020***	-17.56	0.145***	2.91	-0.344***	-19.35	0.170***	3.5
$DCFO_{i,t} \times CFO_{i,t} \times Size_{i,t}$			0.162***	9.31			0.180***	11.2
$DCFO_{i,t} \times Size_{i,t}$			0.026***	9.65			0.025***	9.59
$CFO_{i,t} \times Size_{i,t}$			-0.083***	-9.32			-0.090***	-10.98
$Size_{i,t}$			0.021***	16.11			0.022***	18.98
$DCFO_{i,t} \times CFO_{i,t} \times Lev_{i,t}$			0.027	0.89			0.016	0.54
$DCFO_{i,t} \times Lev_{i,t}$			-0.017***	-4.42			-0.016***	-4.21
$CFO_{i,t} \times Lev_{i,t}$			-0.139***	-6.24			-0.132***	-6
$CFO_{i,t}$			-0.014***	-7.91			-0.015***	-8.34
$DCFO_{i,t} \times CFO_{i,t} \times MB_{i,t}$			0.007**	2.02			0.007**	2.3
$DCFO_{i,t} \times MB_{i,t}$			0.000	0.26			0.000	0.05
$CFO_{i,t} \times MB_{i,t}$			-0.003	-1.46			-0.004*	-1.8
$MB_{i,t}$			0.001*	1.9			0.001**	2.14
Industry and Year Fixed Effects	YES		YES		YES		YES	
Observations	37,887		37,887		37,887		37,887	

Diagnostic Tests

Centered R2	0.0528	0.1073	0.055	0.1077
F test	130.98***	116.68***	127.63***	121.09***
Kleibergen-Paap rk LM Chi-sq	559.40***	672.76***	186.60***	224.63***
Kleibergen-Paap rk Wald F	430.81	413.80	330.43	459.53
Cragg-Donald Wald F statistic	10364.07	7186.85	16198.67	16097.03
Stock-Yogo weak ID F test critical values:				
5% maximal IV relative bias	16.85	16.85	16.85	16.85
10% maximal IV size	24.58	24.58	24.58	24.58
Anderson-Rubin Wald test F (P-Value)	10.38***	45.96***	9.30***	87.41***
Anderson-Rubin Wald test Chi-sq(P-Value)	41.63***	184.39***	37.31***	350.63***
Stock-Wright LM S statistic Chi-sq(P-Value)	41.99***	160.94***	37.25***	293.23***
Hansen J statistic	0.0000	0.0000	0.000	0.000

This Table presents the regression results of estimating equation 2 by using 2SLS approach. The sample period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.

Table 3: Difference-in-differences analysis based on options Listing

$ACC_{i,t}$	Coefficient	t-statistic	Coefficient	t-statistic
$DCFO \times CFO \times Treat \times Post$	-2.194***	-4.4	-1.324***	-2.81
$DCFO \times Treat \times Post$	-0.499***	-6.45	-0.245***	-3.29
$CFO \times Treat \times Post$	0.05	0.37	0.11	0.99
$Treat \times Post$	0.002	0.11	-0.002	-0.17
$DCFO \times CFO \times Treat$	2.911***	10.6	1.527***	5.8
$DCFO \times Treat$	0.672***	7.3	0.270***	3.3
$CFO \times Treat$	-0.274**	-2.06	-0.305***	-2.67
$Treat$	0.035**	2.08	0.037**	2.58
$DCFO \times CFO \times Post$	0.323	0.72	1.025**	2.5
$DCFO \times Post$	0.022	0.32	0.226***	3.91
$CFO \times Post$	0.19	1.51	0.263***	3.16
$Post$	-0.023	-1.31	-0.03***	-2.68
$DCFO \times CFO$	-0.334**	-2.53	0.533**	2.29
$DCFO$	-0.14***	-3.8	0.023	0.29
CFO	-0.259**	-1.99	0.001	0.00
$Constant$	-0.038**	-2.04	-0.091***	-3.53
$Control\ Variables\ included$	NO		YES	
Number of obs	14,660		14,660	
Adj R-squared	0.7182		0.8157	

This Table presents difference-in-differences analysis based on options listing. The sample period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.

Table 4: Cross-sectional analyses: firm size, investment cycle length, and asset tangibility

Panel A:Subsample of firms with different size

	Small Size Firms				Big Size Firms			
$ACC_{i,t}$	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
$DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$	-0.070***	-3.02	-0.085***	-3.41	0.31	1.31	0.231	0.93
$DCFO_{i,t} \times Volume_{i,t}$	-0.013***	-2.6	-0.016***	-3.03	0.003	0.22	-0.002	-0.15
$CFO_{i,t} \times Volume_{i,t}$	0.033**	1.93	0.042**	2.3	0.045***	4	0.051***	3.87
$Volume_{i,t}$	-0.007**	-2.14	-0.009***	-2.64	-0.007***	-4.77	-0.012***	-6.69
$DCFO_{i,t} \times CFO_{i,t}$	0.391***	8.87	-0.560***	-3.13	-1.092	-1.07	0.018	0.01
$DCFO_{i,t}$	-0.006	-0.8	-0.056*	-1.65	0.005	0.12	-0.179	-1.64
$CFO_{i,t}$	-0.256***	-7.68	0.332**	2.12	-0.525***	-11.33	-0.011	-0.08
Control Variables	NO		YES		NO		YES	
Industry and Year FX	YES		YES		YES		YES	
Observations	12629		12629		12629		12629	
Centered R2	0.0228		0.0548		0.1469		0.2214	
F test (*Prob>F*)	33.70 (0.0000)		25.02 (0.0000)		102.85 (0.0000)		64.92 (0.0000)	

Panel B:Subsample of firms with different investment cycle length

	Firms with Short Investment Cycles				Firms with Long Investment Cycles			
$ACC_{i,t}$	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
$DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$	-0.016	-0.76	-0.047*	-1.9	-0.062***	-2.66	-0.147***	-5.39
$DCFO_{i,t} \times Volume_{i,t}$	-0.002	-0.63	-0.009**	-2.19	-0.016***	-3.13	-0.023***	-3.61
$CFO_{i,t} \times Volume_{i,t}$	0.02	1.43	0.045**	2.49	0.022**	2.37	0.058***	4.42
$Volume_{i,t}$	-0.004**	-2.36	-0.011***	-4.98	-0.003	-1.56	-0.015***	-6.08
$DCFO_{i,t} \times CFO_{i,t}$	0.426***	7.8	-0.286**	-2.53	0.521***	9.65	-0.594***	-4.2
$DCFO_{i,t}$	0.006	0.73	-0.119***	-6.07	-0.022**	-2.15	-0.102***	-3.35
$CFO_{i,t}$	-0.304***	-7.11	0.11	1.23	-0.32***	-10.92	0.205**	2.46
Control Variables	NO		YES		NO		YES	
Industry and Year FX	YES		YES		YES		YES	
Observations	12617		12617		12616		12616	
Centered R2	0.0413		0.1066		0.0597		0.1038	
F test (*Prob>F*)	37.46 (0.0000)		43.98 (0.0000)		56.01 (0.0000)		44.30 (0.0000)	

Table 4: Cross-sectional analyses: firm size, investment cycle length, and asset tangibility

Panel C:Subsample of firms with different level of asset tangibility

	Firms with Low Asset Tangibility				**Firms with High Asset Tangibility**			
$ACC_{i,t}$	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
$DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$	-0.058***	-3.25	-0.108***	-5.24	-0.022	-0.58	-0.072	-1.58
$DCFO_{i,t} \times Volume_{i,t}$	-0.008*	-1.9	-0.015***	-3.07	-0.004	-0.79	-0.017***	-2.83
$CFO_{i,t} \times Volume_{i,t}$	0.03**	2.32	0.063***	4.07	0.027***	2.9	0.05***	3.92
$Volume_{i,t}$	-0.007***	-3.43	-0.017***	-6.49	-0.002	-1.16	-0.01***	-4.84
$DCFO_{i,t} \times CFO_{i,t}$	0.445***	9.18	-0.552***	-4.94	0.659***	7.86	-0.052	-0.25
$DCFO_{i,t}$	-0.006	-0.64	-0.14***	-6.46	0.004	0.37	-0.113***	-3.76
$CFO_{i,t}$	-0.303***	-7.75	0.233**	2.6	-0.39***	-13.54	0.017	0.22
$Control\ Variables$	NO		YES		NO		YES	
Industry and Year FX	YES		YES		YES		YES	
Observations	12577		12577		12580		12580	
Centered R2	0.0161		0.0797		0.1112		0.1728	
F test (Prob>F)	33.91 (0.0000)		37.86 (0.0000)		66.54 (0.0000)		54.52 (0.0000)	

This Table presents the regression results of estimating equation 2 by using 2SLS approach for subsamples of upper and lower terciles based on, size, investment cycle length the level of asset tangibility. Moneyness is employed as the instrument variable. The subsamples period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.

Table 5: EPU and the association between options trading volume and conditional conservatism

	Low Economic Policy Periods				**High Economic Policy Periods**			
$ACC_{i,t}$	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
$DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$	-0.067***	-3.44	-0.136***	-6.06	-0.017	-1.01	-0.055***	-2.96
$DCFO_{i,t} \times Volume_{i,t}$	-0.005	-1.32	-0.009*	-1.95	-0.006*	-1.65	-0.016***	-3.64
$CFO_{i,t} \times Volume_{i,t}$	0.037***	3.66	0.073***	5.45	0.012	1.40	0.033***	3.05
$Volume_{i,t}$	-0.006***	-3.10	-0.015***	-6.01	-0.001	-0.39	-0.010***	-5.42
$DCFO_{i,t} \times CFO_{i,t}$	0.685***	13.35	-0.447***	-3.58	0.406***	9.30	-0.366***	-3.00
$DCFO_{i,t}$	0.005	0.51	-0.085***	-3.85	-0.012	-1.49	-0.158***	-6.04
$CFO_{i,t}$	-0.420***	-14.35	0.149*	1.94	-0.292***	-10.57	0.117	1.38
Control Variables	NO		YES		NO		YES	
Industry and Year FX	YES		YES		YES		YES	
Observations	12623		12623		12487		12487	
Centered R2	0.0823		0.1345		0.0448		0.1215	
F test (Prob>F)	87.85 (0.0000)		73.63 (0.0000)		41.69 (0.0000)		49.15 (0.0000)	

This Table presents the regression results of estimating equation 2 by using 2SLS approach for two subsamples of upper and lower terciles based on EPU. Moneyness is employed as the instrument variable. The subsamples period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.

Table 6: Cross-sectional analyses: financial analyst coverage

	Low Analyst Coverage				**High Analyst Coverage**			
$ACC_{i,t}$	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
$DCFO_{i,t} \times CFO_{i,t} \times Volume_{i,t}$	-0.06**	-2.13	-0.098***	-3.42	-0.082***	-2.78	-0.121***	-3.52
$DCFO_{i,t} \times Volume_{i,t}$	0.004	0.72	-0.003	-0.57	-0.015**	-2.4	-0.021***	-3.13
$CFO_{i,t} \times Volume_{i,t}$	0.074***	5.18	0.1***	5.97	0.032***	2.94	0.053***	4.03
$Volume_{i,t}$	-0.008***	-3.61	-0.014***	-5.11	-0.007***	-3.55	-0.016***	-7.24
$DCFO_{i,t} \times CFO_{i,t}$	0.461***	9.76	-0.399***	-3.47	0.737***	6.19	-0.609***	-2.76
$DCFO_{i,t}$	-0.017**	-2.36	-0.118***	-5.73	0.026	1.2	-0.211***	-5.43
$CFO_{i,t}$	-0.355***	-12.46	0.145	1.6	-0.43***	-9.4	0.134	1.49
Control Variables	NO		YES		NO		YES	
Industry and Year FX	YES		YES		YES		YES	
Observations	12718		12718		12696		12696	
Centered R2	0.0381		0.0861		0.0762		0.1708	
F test (Prob>F)	40.36 (0.0000)		41.20 (0.0000)		57.91 (0.0000)		54.54 (0.0000)	

This Table presents the regression results of estimating equation 2 by using 2SLS approach for two subsamples of upper and lower terciles based on financial analyst coverage. Moneyness is employed as the instrument variable.The subsamples period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.

Table 7: Investment sentiment and the association between options trading volume and conditional conservatism

	Low Sentiment Periods				**High Sentiment Periods**			
$ACC_{i,t}$	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
$DCFO_{i,t}{\times}CFO_{i,t}{\times}Volume_{i,t}$	-0.017	-0.78	-0.066**	-2.18	-0.076***	-3.58	-0.143***	-5.73
$DCFO_{i,t}{\times}Volume_{i,t}$	-0.003	-0.84	-0.01**	-2.04	-0.016***	-3.11	-0.024***	-4.03
$CFO_{i,t}{\times}Volume_{i,t}$	0.025***	2.63	0.055***	4.02	0.035***	3.82	0.072***	5.99
$Volume_{i,t}$	-0.002	-1.57	-0.012***	-5.89	-0.006***	-3.27	-0.015***	-6.2
$DCFO_{i,t}{\times}CFO_{i,t}$	0.387***	7.55	-0.364***	-2.74	0.632***	12.68	-0.515***	-4.25
$DCFO_{i,t}$	-0.013	-1.49	-0.095***	-3.79	0.004	0.36	-0.157***	-6.81
$CFO_{i,t}$	-0.31***	-10.16	0.181**	2.13	-0.411***	-14.73	0.173**	2.21
Control Variables	NO		YES		NO		YES	
Industry and Year FX	YES		YES		YES		YES	
Observations	11558		11558		12648		12648	
Centered R2	0.0396		0.1001		0.0569		0.1161	
F test (*Prob>F*)	40.00 (0.0000)		45.64 (0.0000)		85.18 (0.0000)		73.24 (0.0000)	

This Table presents the regression results of estimating equation 2 by using 2SLS approach for two subsamples of upper and lower terciles based on investor sentiment. Moneyness is employed as the instrument variable. The subsamples period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.

Table 8: The 2SLS regressions of options trading volume and conditional conservatism measured by using Basu's (1997) persistence of earnings changes model

Panel A: The first-stage IV regression estimates with moneyness as the instrument variable

	$Volume_{i,t}$		$D\Delta NI_{i,t}$×$Volume_{i,t}$		$\Delta NI_{i,t}$×$Volume_{i,t}$		$D\Delta NI_{i,t}$×$\Delta NI_{i,t}$×$Volume_{i,t}$	
$Money_{i,t}$	0.442*** (39.62)	0.325*** (33.48)	-0.002** (2.4)	-0.008*** (6.95)	0.002*** (2.62)	0.000 (0.03)	0.000 (-1.18)	0.000 (-1.05)
$D\Delta NI_{i,t}$×$Money_{i,t}$	-0.014 (-1.37)	0.001 (0.09)	0.434*** (41.03)	0.347*** (35.81)	-0.007*** (-3.53)	-0.002 (-1.17)	-0.005*** (-2.69)	-0.002 (-1.12)
$\Delta NI_{i,t}$×$Money_{i,t}$	-0.317*** (-5.65)	-0.247*** (-5.26)	0.007** (1.89)	0.021*** (4.18)	0.350*** (19.34)	0.286*** (18.42)	0.000 (0.5)	0.001** (2.18)
$D\Delta NI_{i,t}$×$\Delta NI_{i,t}$×$Money_{i,t}$	0.52*** (7.29)	0.393*** (6.38)	0.204*** (5.95)	0.157*** (5.01)	-0.032 (-1.09)	-0.021 (-0.78)	0.318*** (13.25)	0.264*** (12.04)
$D\Delta NI_{i,t}$	-0.102*** (-5.08)	0.382*** (5.72)	1.493*** (59.49)	-1.385*** (-20.27)	0.010*** (2.42)	0.092*** (7.71)	0.009*** (2.66)	0.056*** (5.79)
$\Delta NI_{i,t}$	0.069 (0.41)	2.558*** (5.48)	0.013 (0.4)	0.284*** (3.21)	1.618*** (32.51)	-0.911*** (-6.76)	0.003 (1.13	0.014** (2.01)
$D\Delta NI_{i,t}$×$\Delta NI_{i,t}$	-0.126 (-0. 54)	-4.429*** (-6.95)	-0.105 (-0.98)	-1.577*** (-4.84)	0.012 (0.17)	0.318* (1.7)	1.624*** (28.12)	-0.607*** (-4.09)
Observations	32918	32918	32918	32918	32918	32918	32918	32918
Control variables	NO	Y	NO	Y	NO	Y	NO	Y
Industry and Year FX	Y	Y	Y	Y	Y	Y	Y	Y
F test ***(Prob>F)***	713.31 (0.0000)	487.56 (0.0000)	632.62 (0.0000)	451.88 (0.0000)	668.85 (0.0000)	394.00 (0.0000)	602.27 (0.0000)	338.71 (0.0000)
Sanderson Windmeijer multivariate F test (Prob>F)	1775.84 (0.0000)	1330.49 (0.0000)	2308.80 (0.0000)	1736.08 (0.0000)	850.34 (0.0000)	713.01 (0.0000)	1109.21 (0.0000)	877.42 (0.0000)

Table 8: The 2SLS regressions of options trading volume and conditional conservatism measured by using Basu's (1997) persistence of earnings changes model

Panel B: The first-stage IV regression estimates with open interests as the instrument variable

	$Volume_{i,t}$		$D\Delta NI_{i,t} \times Volume_{i,t}$		$\Delta NI_{i,t} \times Volume_{i,t}$		$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Volume_{i,t}$	
$Open_{i,t}$	0.853*** (128.98)	0.760*** (116.28)	0.006*** (6.27)	0.001 (0.44)	0.001 (1.05)	0.000 (-0.6)	0.001*** (-8.35)	-0.001*** (-6.68)
$D\Delta NI_{i,t} \times Open_{i,t}$	-0.013** (-2.12)	-0.013* (-1.91)	0.825*** (120.34)	0.746*** (111.86)	0.001 (0.43)	0.002* (1.84)	0.001 (0.93)	0.002** (2.05)
$\Delta NI_{i,t} \times Open_{i,t}$	0.031 (0.6)	-0.101** (-2.11)	0.004 (0.67)	0.020*** (2.92)	0.832*** (49.57)	0.733*** (46.48)	-0.001 (-0.73)	0.000 (0.28)
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Open_{i,t}$	-0.124* (-1.71)	0.09 (1.29)	-0.094** (-2.21)	-0.007 (-0.16)	0.028 (1.08)	0.018 (0.67)	0.861*** (40.19)	0.751*** (33.68)
$D\Delta NI_{i,t}$	-0.04 (-0.8)	-0.045 (-0.94)	-4.736*** (-87.66)	-5.31*** (-99.17)	-0.006 (-0.55)	-0.008 (-0.79)	-0.008 (-0.83)	-0.004 (-0.44)
$\Delta NI_{i,t}$	-0.617 (-1.47)	-1.47*** (-3.79)	-0.073 (-1.52)	0.036 (0.71)	-4.747*** (-34.95)	-5.637*** (-46.54)	0.012* (1.86)	0.006 (0.92)
$D\Delta NI_{i,t} \times \Delta NI_{i,t}$	1.736*** (2.85)	2.681*** (4.72)	1.085*** (2.98)	1.221*** (3.69)	-0.323 (-1.5)	-0.188 (-0.94)	-5.089*** (-28.18)	-5.831*** (-33.73)
Observations	32918	32918	32918	32918	32918	32918	32918	32918
Control variables	NO	Y	NO	Y	NO	Y	NO	Y
Industry and Year FX	Y	Y	Y	Y	Y	Y	Y	Y
F test (Prob>F)	6493.06 (0.0000)	5360.24 (0.0000)	5298.33 (0.0000)	4195.92 (0.0000)	5046.40 (0.0000)	2385.16 (0.0000)	3420.84 (0.0000)	1307.39 (0.0000)
Sanderson Windmeijer multivariate F test (Prob>F)	19440.76 (0.0000)	16910.33 (0.0000)	22377.85 (0.0000)	21394.81 (0.0000)	7464.17 (0.0000)	4704.28 (0.0000)	9569.14 (0.0000)	6730.11 (0.0000)

Table 8: The 2SLS regressions of options trading volume and conditional conservatism measured by using Basu's (1997) persistence of earnings changes model

Panel C: The second-stage IV regression estimates with moneyness as the instrument variable

$\Delta NI_{i,t+1}$	Coefficient	t-statistic	Coefficient	t-statistic
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Volume_{i,t}$	0.068***	3.9	0.106***	4.64
$D\Delta NI_{i,t} \times Volume_{i,t}$	-0.001	-0.66	-0.002	-1.4
$\Delta NI_{i,t} \times Volume_{i,t}$	-0.028**	-1.99	-0.034*	-1.74
$Volume_{i,t}$	0.002***	2.7	0.001	1.13
$D\Delta NI_{i,t} \times \Delta NI_{i,t}$	-0.142***	-2.94	0.317**	2.56
$D\Delta NI_{i,t}$	-0.003	-0.98	-0.022**	-2.23
$\Delta NI_{i,t}$	-0.08**	-2.2	-0.190**	-1.97
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Size_{i,t}$			-0.088***	-3.54
$D\Delta NI_{i,t} \times Size_{i,t}$			0.003*	1.82
$\Delta NI_{i,t} \times Size_{i,t}$			0.010	0.5
$Size_{i,t}$			0.000	0.18
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Lev_{i,t}$			-0.167***	-3.9
$D\Delta NI_{i,t} \times Lev_{i,t}$			0.002	0.57
$\Delta NI_{i,t} \times Lev_{i,t}$			0.079**	2.12
$Lev_{i,t}$			-0.006***	-3.06
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times MB_{i,t}$			-0.004	-0.58
$D\Delta NI_{i,t} \times MB_{i,t}$			-0.001	-1.36
$\Delta NI_{i,t} \times MB_{i,t}$			0.008	1.5
$MB_{i,t}$			0.002***	5.62
Industry and Year FX	YES		YES	
Observations	32918		32918	
Centered R2	0.0215		0.0424	
F test	29.74***		27.75***	
Kleibergen-Paap rk LM Chi-sq Test	446.51***		619.70***	
Kleibergen-Paap rk Wald F	9596.78***		6507.52***	
Cragg-Donald Wald F statistic	464.32		369.44	
Stock-Yogo weak ID F test critical values:				
5% maximal IV relative bias	16.85		16.85	
10% maximal IV size	24.58		24.58	
Anderson-Rubin Wald test F Test	5.90***		15.22***	
Anderson-Rubin Wald test Chi-sq Test	23.67***		61.10***	
Stock-Wright LM S statistic Chi-sq Test	20.52***		46.99***	
Hansen J statistic	0.0000		0.0000	

This Table presents the regression results of estimating equation 5 by using 2SLS approach. The sample period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.

Table 8: The 2SLS regressions of options trading volume and conditional conservatism measured by using Basu's (1997) persistence of earnings changes model

Panel D: The second-stage IV regression estimates with open interest as the instrument variable

$\Delta NI_{i,t+1}$	Coefficient	t-statistic	Coefficient	t-statistic
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Volume_{i,t}$	0.035**	2.34	0.063***	3.14
$D\Delta NI_{i,t} \times Volume_{i,t}$	-0.001	-1.03	-0.002	-1.58
$\Delta NI_{i,t} \times Volume_{i,t}$	-0.018*	-1.71	-0.019	-1.27
$Volume_{i,t}$	0.001**	2.31	0.000	-0.14
$D\Delta NI_{i,t} \times \Delta NI_{i,t}$	-0.06	-1.42	0.230*	1.9
$D\Delta NI_{i,t}$	-0.002	-1.06	-0.019*	-1.9
$\Delta NI_{i,t}$	-0.103***	-3.41	-0.156*	-1.67
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Size_{i,t}$			-0.056**	-2.38
$D\Delta NI_{i,t} \times Size_{i,t}$			0.003	1.64
$\Delta NI_{i,t} \times Size_{i,t}$			-0.001	-0.04
$Size_{i,t}$			0.001	1.18
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times Lev_{i,t}$			-0.190***	-4.49
$D\Delta NI_{i,t} \times Lev_{i,t}$			0.002	0.74
$\Delta NI_{i,t} \times Lev_{i,t}$			0.088**	2.43
$Lev_{i,t}$			-0.007***	-3.52
$D\Delta NI_{i,t} \times \Delta NI_{i,t} \times MB_{i,t}$			-0.001	-0.14
$D\Delta NI_{i,t} \times MB_{i,t}$			-0.001	-1.44
$\Delta NI_{i,t} \times MB_{i,t}$			0.007	1.34
$MB_{i,t}$			0.002***	6.19
Industry and Year FX	YES		YES	
Observations	32918		32918	
Centered R2	0.0208		0.0417	
F test	28.07***		27.01***	
Kleibergen-Paap rk LM Chi-sq Test	458.20***		433.71***	
Kleibergen-Paap rk Wald F	834.58		499.37	
Cragg-Donald Wald F statistic	21405.80		15685.67	
Stock-Yogo weak ID F test critical values:				
5% maximal IV relative bias	16.85		16.85	
10% maximal IV size	24.58		24.58	
Anderson-Rubin Wald test F Test	2.08*		10.09***	
Anderson-Rubin Wald test Chi-sq Test	8.33*		40.50***	
Stock-Wright LM S statistic Chi-sq Test	8.46*		44.36***	
Hansen J statistic	0.0000		0.0000	

This Table presents the regression results of estimating equation 5 by using 2SLS approach. The sample period for this estimation is from 1997 to 2019. ***,**, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively (two-tailed). We control for industry and year fixed effects. Standard errors are clustered by firm. See Appendix for variable definitions.