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The joint effects of macroeconomic uncertainty and cyclicality on management and analyst earnings forecasts

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ABSTRACT

Prior literature examines the effects of both macroeconomic uncertainty and cyclicality (how strongly a firm's earnings is tied to macroeconomic conditions) on management and analyst earnings forecasts. However, these studies consider macroeconomic uncertainty and cyclicality independently and find conflicting results. This study argues that macroeconomic uncertainty and cyclicality are inextricably linked together, and should be studied jointly. Using a sample of earnings forecasts from 2001 to 2015, we find the following: (1) Kim, Pandit, and Wasley (2016)'s finding that heightened macroeconomic uncertainty decreases management's propensity to issue earnings forecasts is largely driven by firms with low cyclicality and (2) Hutton, Lee, and Shu (2012)'s finding that analysts issue more accurate forecasts than management for firms with high cyclicality only holds when macroeconomic uncertainty is high; increases in macroeconomic uncertainty lead to more accurate analyst forecasts relative to management forecasts only for firms with high cyclicality. These findings are useful to both researchers and investors interested in understanding how macroeconomic factors affect earnings forecasts.

1. Introduction

Macroeconomic uncertainty and cyclicality are examined in recent studies of management and analyst earnings forecasts. Macroeconomic uncertainty captures different states of uncertainty in the macroeconomy,[1] while cyclicality is a firm-specific attribute that reflects how strongly a firm's earnings is tied to macroeconomic conditions. In other words, cyclicality indicates a firm's earnings sensitivity to Gross Domestic Product (GDP), and it is determined by the firm's business model and the industry in which the firm operates. Specifically, macroeconomic uncertainty and cyclicality are both shown to be important determinants of management and analyst forecast characteristics. For example, Kim et al. (2016) find that as macroeconomic uncertainty increases, managers' propensity to issue forecasts decreases; Hutton et al. (2012) show that analysts issue more accurate earnings forecasts than management for firms with high cyclicality. However, the effects of macroeconomic uncertainty and cyclicality are studied independently. In this study, we argue that macroeconomic uncertainty and cyclicality are inextricably linked together, and should be studied jointly.

Prior economics and finance literature shows that firms have different exposures to macroeconomic factors including uncertainty (e.g., Bloom, 2009; Burmeister & Mcelroy, 1988; Chen, Roll, & Ross, 1986; Ferson & Harvey, 1991). For example, Bloom (2009) uses

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[1] There are numerous dimensions and proxies for macroeconomic uncertainty (Jurado, Ludvigson, & Ng, 2015). Consistent with Kim et al. (2016), we focus on the volatility in future GDP growth and in the stock market.

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firm-specific variables to model the impact of macroeconomic uncertainty on firm performance. Bloom (2009) argues that because firms operate under different business models, their performances are differently impacted by the same level of macroeconomic uncertainty. In other words, a firm's cyclicality determines the degree to which its earnings is affected by macroeconomic uncertainty. Thus, cyclicality should be considered when investigating the effect of macroeconomic uncertainty. Meanwhile, the impact of cyclicality on firm performance depends on macroeconomic uncertainty, because the level of macroeconomic uncertainty can enhance or reduce the effect of cyclicality on firm performance. For example, when macroeconomic uncertainty is low, the impact of cyclicality on earnings is attenuated. Therefore, it is important to examine macroeconomic uncertainty and cyclicality jointly to fully understand how they affect management and analyst earnings forecasts.

Studies that examine macroeconomic uncertainty and cyclicality independently find conflicting results. For example, a stream of literature (e.g., Kim et al., 2016; Amiram, Landsman, Owens, & Stubben, 2018; Hope & Kang, 2005) argues that management issues more precise forecasts than analysts when macroeconomic uncertainty is high. In contrast, the findings in Hutton et al. (2012) suggest the opposite. Hutton et al. (2012) show that analysts issue more accurate earnings forecasts than management for firms with high cyclicality. In a review of the management earnings forecasts literature, Hirst, Koonce, & Venkataraman (2008) highlight the importance of examining the joint effects of forecast antecedents or conditioning variables with the following observation: "the typical study focuses on the main effect of one or more forecast antecedents or characteristics on forecast consequences … interaction tests are useful in reconciling conflicting findings in the literature. Including a theoretically motivated conditioning, or moderator, variable often allows the researcher to identify where the effect holds (or where it holds in a different way)."

This study answers the call of Hirst et al. (2008) by explicitly investigating the joint effects of macroeconomic uncertainty and firm cyclicality in two settings. We first extend Kim et al. (2016) by investigating the differential impact of macroeconomic uncertainty on management's propensity to issue earnings forecasts for firms with high cyclicality versus firms with low cyclicality. When macroeconomic uncertainty is high, investors have less precise public information about a firm's value and thus demand more information. Under these conditions, managers can increase the supply of earnings forecasts, thereby building a reputation for timely and relevant disclosure (Graham, Harvey, & Rajgopal, 2005). On the other hand, macroeconomic uncertainty adversely affects the quality of managers' information about future earnings, and potentially imposes costs (such as loss of reputation and stock price declines) on managers if the firm fails to meet managers' forecasts. For example, evidence suggests that a large percent of managers choose to suspend issuing earnings guidance because they cannot make accurate forecasts during periods of heightened economic uncertainty (Morgan, 2009).

We maintain that the benefits and costs of issuing earnings forecasts during periods of increased macroeconomic uncertainty are likely to be different for firms with high cyclicality versus firms with low cyclicality. The differences arise for both demand and supply reasons. Specifically, we posit that the demand for information for firms with high cyclicality will be higher than that for firms with low cyclicality, because firms with high cyclicality are more exposed to macroeconomic uncertainty, and their earnings are less predictable for external parties during periods of high uncertainty. At the same time, managers' reputation costs imposed by macroeconomic uncertainty should be lower for firms with high cyclicality than for firms with low cyclicality, because management forecast inaccuracy for firms with high cyclicality can be attributed to macroeconomic uncertainty, which is largely outside of management's control (Baginski, Hassell, & Kimbrough, 2004). The preceding arguments lead to our prediction that managers of firms with high cyclicality will have higher propensity to issue earnings forecasts than managers of firms with low cyclicality as macroeconomic uncertainty increases.

Second, we examine the relative accuracy of management versus analyst forecasts. As discussed above, prior studies find mixed results on the impact of macroeconomic uncertainty on relative accuracy of management and analyst forecasts, because they fail to consider macroeconomic uncertainty and cyclicality jointly. We argue that the forces shaping the relative accuracy of management and analyst forecasts during periods of increased macroeconomic uncertainty are different for firms with high versus low cyclicality. On the one hand, macroeconomic uncertainty has, by nature, a larger impact on firms with high cyclicality. The large impact leads to more accurate management forecasts, because only managers with more precise earnings-related information issue forecasts in uncertain environments (Kim et al., 2016). Meanwhile, because analysts can better incorporate macroeconomic variables into their earnings forecasts than management (e.g., Jennings & Hassell, 1986; Hann R.N., Ogneva, & Sapriza, 2012; Hutton et al., 2012), the large impact of macroeconomic uncertainty on firms with high cyclicality makes analysts' strength in incorporating macroeconomic variables into earnings more pronounced, resulting in more accurate analyst forecasts. On the other hand, macroeconomic uncertainty has an attenuated impact on firms with low cyclicality. The attenuated impact makes (i) management forecasts less accurate, and (ii) analysts' strength in incorporating macroeconomic variables into earnings less pronounced. Due to the competing forces discussed above, we do not make directional predictions regarding the relative accuracy of management and analyst forecasts. Instead, we argue that as macroeconomic uncertainty increases, the relative accuracy of management and analyst forecasts is different for firms with high versus low cyclicality.

We find the effect of macroeconomic uncertainty on management's propensity to issue forecasts is different for firms with high cyclicality versus firms with low cyclicality. Specifically, for firms with low cyclicality, we find increases in macroeconomic uncertainty decrease manager's propensity to issue earnings forecasts, which is consistent with Kim et al. (2016). Moreover, we find that firms with high cyclicality are more likely to issue earnings forecasts than firms with low cyclicality during periods of high macroeconomic uncertainty. Further, we find some evidence that for firms with high cyclicality, managers are more likely, rather than less likely, to issue earnings forecasts as macroeconomic uncertainty increases.

We also find the impact of macroeconomic uncertainty on the relative accuracy of management and analyst forecasts is different for high cyclicality firms versus low cyclicality firms. For firms with low cyclicality, we do not find significant results, indicating that increases in macroeconomic uncertainty have no impact on the relative accuracy of management and analyst forecasts. However, for

firms with high cyclicality, we find that increases in macroeconomic uncertainty lead to more accurate analyst forecasts relative to management forecasts. This latter finding is consistent with Hutton et al. (2012) who find that analysts have an information advantage at the macroeconomic level, and hence, analysts have a forecasting advantage relative to managers in conditions of heightened macroeconomic uncertainty.

This study makes several contributions to the literature on management and analyst earnings forecasts. First, this study extends prior literature (e.g., Kim et al., 2016; Hutton et al., 2012; Amiram et al., 2018) by investigating the joint effects of macroeconomic uncertainty and firm cyclicality on management and analyst forecasts. Macroeconomic uncertainty and cyclicality are inextricably linked together, and studying their joint effects yields findings that deepen investors' understanding of the impact of macroeconomic uncertainty and cyclicality on management and analyst forecasts, which have been investigated independently in the prior literature. Moreover, this study answers the call of Hirst et al. (2008) to consider the joint effects of forecast antecedents on forecast outcomes, and presents evidence that including a moderator variable can reconcile conflicting findings in the management and analyst forecasts literature.

This study also helps investors better understand management and analyst forecasts during periods of high macroeconomic uncertainty when firm's information environment deteriorates. Specifically, this study reconciles conflicting findings in the management and analyst forecast literature and extends investors' understanding on how macroeconomic uncertainty impacts managers' propensity to issue earnings forecasts and the relative accuracy of those forecasts relative to analyst forecasts. The findings are useful for investors considering that management and analyst forecasts are the two foremost information sources for investors (Beyer, Cohen, Lys, & Walther, 2010). Additionally, this study adds to the recent work that investigates the link between accounting and macroeconomics. There is a growing literature devoted to understanding the relations between firm-specific accounting information and macroeconomic variables (e.g., Bonsall, Bozanic, & Fischer, 2013; Konchitchki & Patatoukas, 2014a, 2014b). Understanding these relations is important, as macroeconomic conditions affect investors' demand for information as well as disclosure characteristics.

The remainder of the paper is organized as follows. In the next section, we discuss relevant literature and develop hypotheses. Section 3 describes the sample and research design. Section 4 provides empirical results, and Section 5 concludes.

2. Literature review and hypothesis development

Prior literature has demonstrated that both macroeconomic uncertainty and cyclicality are important determinants of management and analyst forecasts characteristics. Here macroeconomic uncertainty refers to one's inability to forecast the probability of possible realizations of macroeconomic factors (Knight, 1921), and firm earnings becomes less predictable as macroeconomic uncertainty increases. Cyclicality reflects how strongly a firm's earnings is tied to macroeconomic conditions. In other words, cyclicality determines the degree to which a firm's earnings is affected by macroeconomic conditions. Kim et al. (2016) investigate the impact of macroeconomic uncertainty on management forecasts properties such as frequency, timing, horizon, and precision, i.e., Kim et al. (2016) compare samples in high macroeconomic uncertainty (quadrants A and B in Fig. 1) with samples in low macroeconomic uncertainty (quadrants C and D); Fig. 1 describes a two by two diagram of macroeconomic uncertainty and firm cyclicality. Hutton et al. (2012) study the effect of cyclicality on the relative accuracy of management and analyst forecasts, i.e., they compare samples with low cyclicality (quadrants A and C in Fig. 1) with samples with high cyclicality (quadrants B and D).

However, prior studies that investigate the properties of management and analyst forecasts do not examine macroeconomic uncertainty and cyclicality jointly. In this study, we argue that macroeconomic uncertainty and cyclicality are inextricable and should be considered jointly in studying their impacts on earnings forecasts. As illustrated in Fig. 2, the same level of macroeconomic uncertainty has differential impact on firms with high cyclicality and firms with low cyclicality. In other words, the impact of macroeconomic uncertainty on earnings forecasts depends on firm cyclicality, and vice versa. Specifically, we explore how the joint effects of macroeconomic uncertainty and cyclicality impacts two aspects of management and analyst forecasts: (1) the propensity of management to issue earnings forecasts and (2) the relative accuracy of management and analyst earnings forecasts. Next, we review related literature and propose hypothesis separately for each setting.

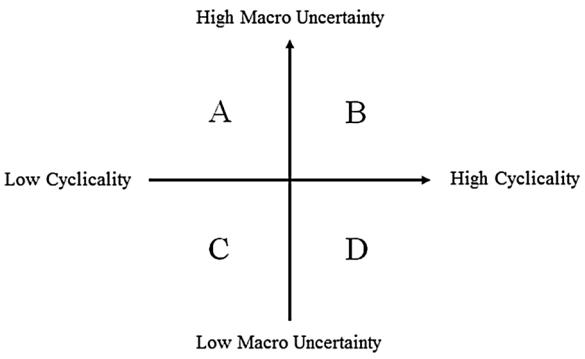

Fig. 1. Macroeconomic uncertainty and cyclicality.

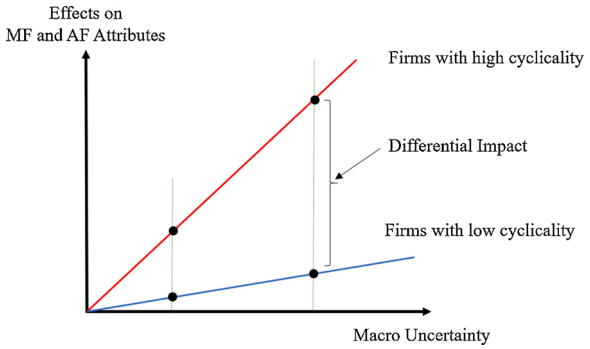

Fig. 2. Differential impact of macroeconomic uncertainty on management and analyst forecast attributes for firms with high cyclicality versus firms with low cyclicality.

2.1. Management forecast issuance

Prior literature has studied reasons why managers issue earning forecasts (see Verrecchia, 2001, Healy & Palepu, 2001; Beyer et al., 2010; Hirst, Koonce, & Venkataraman, 2008 for reviews). Recently, a number of papers have explored the connection between macroeconomy and management forecasts. For example, Anilowski et al. (2007) provide evidence that changes in aggregate proportions of downward or upward management earnings guidance are associated with aggregate earnings news and weakly associated with market returns. Bergman & Roychowdhury (2008) find high investor sentiment on the state of the economy prompts managers to reduce the frequency of long-horizon management forecasts. Bonsall et al. (2013) provide evidence that management forecasts of bellwether firms, which are defined as firms in which macroeconomic news explains the greatest amount of variation in the forecasts, provide timely information to the market about the macroeconomy.

As macroeconomic uncertainty increases, there is greater uncertainty about future earnings, and thus investors are likely to demand more earnings-related information from management who are in a better position to assess how the macroeconomic uncertainty is likely to affect the future earnings prospects of the firm. This provides an opportunity for managers to build a reputation with outside capital suppliers, as managers can benefit from establishing a reputation for providing timely and relevant information about future firm performance during times of heightened uncertainty. For example, Yang (2012) finds the stock price reaction to management forecasts increases with managers' prior forecasting accuracy when information uncertainty is high. However, macroeconomic uncertainty adversely affects the quality of managers' information about future earnings, and thus imposes costs on managers if they fail to meet their forecasts. As highlighted by Graham et al. (2005), "if the firm had previously guided analysts to the EPS target, then missing the target can indicate that a firm is managed poorly in the sense that it cannot accurately predict its own future." When macroeconomic uncertainty is high, a large percent of managers choose to suspend guidance because they cannot make accurate forecasts (Morgan, 2009).

Kim et al. (2016) find that as macroeconomic uncertainty increases, managers' propensity to issue forecasts decreases. However, they do not investigate the effect of cyclicality on management forecast issuance. We argue the costs and benefits of issuing earnings forecasts are different for firms with high cyclicality versus firms with low cyclicality. Specifically, investors' demand for information is likely to be higher for firms with high cyclicality when macroeconomic uncertainty is high, because firms with high cyclicality are more exposed to macroeconomic uncertainty, and their earnings are thus less predictable during periods of high macroeconomic uncertainty. Meanwhile, the reputation costs imposed by macroeconomic uncertainty are likely to be lower for managers of firms with high cyclicality, because macroeconomic uncertainty is largely outside of management's control. In such settings, forecast inaccuracy can be attributed to macroeconomic uncertainty. For example, Baginski et al. (2004) find managers are more likely to provide external attributions, such as economic or governmental issues, for earnings forecasts that are below consensus analyst forecasts. Based on the higher investor demand and lower reputation costs for high cyclicality firms, we make the following prediction:

Hypothesis 1. Firms with high cyclicality are more likely to issue management forecasts than firms with low cyclicality as macroeconomic uncertainty increases.

2.2. Relative accuracy of management and analyst forecasts

We next explore a setting in which researchers examine the relative accuracy of management versus analyst forecasts. Issuing accurate earnings forecasts is important for managers and analysts. For example, Lee et al. (2012) find that that boards of directors use management forecast accuracy as a signal of CEOs' managerial ability and that managers bear a cost for issuing inaccurate forecasts. Specifically, they find the probability of CEO turnover is positively related to the magnitude of absolute management forecast errors. Hui and Matsunaga (2015) find that CEO and CFO compensation is positively related to management forecast accuracy. Hutton and Stocken (2009) find the accuracy of a firm's prior earnings forecasts affects investor response to its subsequent forecasts. Yang (2012) shows the stock price reaction to management forecasts increases with managers' prior forecasting accuracy when information uncertainty is high. In other words, a manager's prior forecasting accuracy allows him to establish a forecasting reputation. Additionally,

Hong, Kubik, & Solomon (2000) find that analysts with less accurate forecasts are more likely to be terminated and less likely to be promoted. Irvine (2004) finds a positive association between analyst forecast accuracy and compensation.

As macroeconomic uncertainty increases, issuing accurate forecasts requires managers and analysts to have access to macroeconomic expertise and to correctly infer the implications of macroeconomic forecasts for a firm and its competitive environment such as customers, suppliers, and competitors. Managers and analysts have different strengths in providing accurate forecasts. For example, managers are insiders who run a firm and make key business decisions, and they have access to inside information (e.g., Altschuler, Chen, & Zhou, 2015; Diamond, 1985). Meanwhile, analysts often cover multiple firms in an industry or along a supply chain, and their broader perspective enables them to piece together the "mosaic" of information (Clement, 1999; Jacob, Lys, & Neale, 1999; and Guan, Wong, & Zhang, 2015).

Prior literature provides mixed results on the impact of macroeconomic uncertainty on relative accuracy of management and analyst forecasts. On the one hand, A stream of literature (e.g., Kim et al., 2016; Amiram, Landsman, Owens, & Stubben, 2018; Hope & Kang, 2005) suggests that as macroeconomic uncertainty increases, management forecasts are more accurate than analyst forecasts. Specifically, Kim et al. (2016) find that managers issue more accurate earnings forecasts as macroeconomic uncertainty increases. Amiram, Landsman, Owens, & Stubben (2018) show that when macroeconomic uncertainty is high, analyst forecasts are less accurate and more optimistically biased. Hope and Kang (2005) find analyst forecast accuracy decreases in the level of macroeconomic uncertainty. On the other hand, Hutton et al. (2012) show that analysts issue more accurate earnings forecasts than management for firms with high cyclicality. [2]

The reason for the conflicting results is that the above-mentioned studies fail to consider the joint impact of macroeconomic uncertainty and cyclicality in their analyses. The stream of literature (e.g., Kim et al., 2016; Amiram, Landsman, Owens, & Stubben, 2018; Hope & Kang, 2005) ignores cyclicality, while Hutton et al. (2012) do not consider macroeconomic uncertainty. As pointed out by Hirst et al. (2018), interaction tests are useful in reconciling conflicting findings in the literature, and using a theoretically motivated conditioning or moderator variable often allows researchers to identify where the effect holds.

We argue that the forces shaping the relative accuracy of management and analyst forecasts during periods of increased macroeconomic uncertainty are different for firms with high versus low cyclicality. On the one hand, macroeconomic uncertainty has, by nature, a larger impact on firms with high cyclicality. The large impact leads to more accurate management forecasts, because only managers with more precise earnings-related information issue forecasts in uncertain environments (Kim et al., 2016). Meanwhile, because analysts can better incorporate macroeconomic variables into their earnings forecasts than management (e.g., Jennings & Hassell, 1986; Hann R.N. et al., 2012; Hutton et al., 2012), the large impact of macroeconomic uncertainty on firms with high cyclicality makes analysts' strength in incorporating macroeconomic variables into earnings more pronounced, resulting in more accurate analyst forecasts. On the other hand, macroeconomic uncertainty has an attenuated impact on firms with low cyclicality. The attenuated impact makes (i) management forecasts less accurate, and (ii) analysts' strength in incorporating macroeconomic variables into earnings less pronounced. Due to the competing forces discussed above, we do not make directional predictions regarding the relative accuracy of management and analyst forecasts. Instead, we argue that as macroeconomic uncertainty increases, the relative accuracy of management and analyst forecasts is different for firms with high versus low cyclicality, which leads to the following hypothesis:

Hypothesis 2. The impact of macroeconomic uncertainty on the relative accuracy of management and analyst forecasts is different for firms with high cyclicality versus firms with low cyclicality.

3. Sample and research design

3.1. Sample selection

We use I/B/E/S Guidance to collect management forecasts issued between January 2001 and December 2015. Consistent with prior studies (e.g., Hutton et al., 2012; Kim et al., 2016), the sample excludes one-sided directional forecasts and qualitative managerial forecasts not specific enough to determine numerical earnings per share (EPS) forecasts. For range forecasts, we use the mid-point as the value for management forecasts. We obtain individual analyst earnings forecasts from I/B/E/S detailed file, and use actual earnings reported in I/B/E/S.

Consistent with Hutton et al. (2012), we limit the management forecast samples to the first annual management earnings forecast issued after the release of the prior year's earnings, because forecasts made late in the fiscal year tend to be confounded by factors such as management's incentives to meet analysts' or their own forecasts (e.g., Matsumoto, 2002). We exclude management forecasts issued in the fourth fiscal quarter for the same reason. For each management forecast, we obtain all analyst earnings forecasts for the same fiscal year made within 30 days prior to and 5 days after the management forecasts to ensure that the analyst forecasts are not stale. If a management forecast is issued within 30 days after the prior year's earnings announcement, we adjust the window for collecting analyst forecasts to start 2 days after the prior year's earnings announcement. We make the adjustment to ensure that analysts have also observed prior year's earnings. Additionally, we delete management forecasts that do not have any corresponding I/B/E/S analyst

[2] Specifically, the steam of literature (e.g., Kim et al., 2016; Amiram et al., 2018; Hope & Kang, 2005) predicts that management forecasts are more accurate than analyst forecasts for samples in quadrants A and B in Fig. 1, while Hutton et al. (2012) document that analyst forecasts are more accurate than management forecasts for samples in quadrants B in Fig. 1.

forecasts made within the 30 day window. We focus on management forecasts of firms that have December 31 fiscal year-ends.

We then merge the sample of management and analyst forecasts obtained from I/B/E/S with Compustat and CRSP, and delete observations with missing data. The sample selection procedure is summarized in Table 1. The final sample consists of 5,116 annual management forecasts made between January 2001 and December 2015.

3.2. Variables definition

Consistent with Kim et al. (2016), we measure macroeconomic uncertainty in two ways. We first estimate macroeconomic uncertainty as the dispersion in the forecasts of Gross Domestic Product (GDP) issued by the Society of Professional Forecasters (released by Federal Reserve Bank of Philadelphia). Specifically, we measure macroeconomic uncertainty, GDPDisp, as the average dispersion measured in quarter $t-1$ for the quarter-over-quarter nominal GDP growth rate forecasts for the following four quarters. We also estimate macroeconomic uncertainty using the Chicago Board Options Exchange Volatility Index (VIX), which is a widely used benchmark for expected market volatility (Whaley, 2009). Prior research has shown that large macroeconomic shocks such as the recent financial crisis results in large and sudden jumps in the VIX. We measure macroeconomic uncertainty, QtrAvgVix, with the average daily VIX levels in quarter $t-1$ for management forecasts issued in quarter t.

Following Hutton et al. (2012), we obtain Cyclicality by measuring the ability of GDP to explain variations in firm-level earnings. Specifically, for each firm-year observation, we regress the firm's quarterly earnings over the prior 12 quarters on the corresponding quarterly GDP.

$$\mathrm{EARN}_{i,t} = \alpha_0 + \alpha_1 \mathrm{GDP}_t + \epsilon_{i,t} \tag{1}$$

where EARN is income before extraordinary items and GDP is the nominal quarterly GDP. Cyclicality is defined as the R-squared (R^2) from the above regression. A higher Cyclicality indicates the variability of a firm's earnings can be better explained by GDP. In other words, a higher Cyclicality implies a firm's earnings are more exposed to fluctuations in GDP. We also create a dummy variable, DummyCyclicality, which equals one if a firm's Cyclicality is larger than the median Cyclicality in the sample and zero otherwise.

We include a set of control variables in testing our hypotheses. Specifically, we control for firm-specific uncertainty using EarnVol. EarnVol is the standard deviation of quarterly revenue over the prior 12 quarters, scaled by the mean revenue over the same time period. We control for FirmRet (average daily firm-level return) and MktRet (average daily value-weighted return), because macroeconomic uncertainty is correlated with firm and market return. Both FirmRet and MktRet are measured over quarter $t-1$, where t indicates the quarter in which management issues a forecast.

To control for firm's information environment, we include firm size (LogAssets, the natural log of total assets), growth (MB, the market-to-book ratio), the change in operating performance (DeltaROA, changes in return on assets) prior to a management forecast, leverage (Lev, total assets divided by book value of equity), the number of analysts following a firm (LogNumAnalyst, natural log of the number of analyst forecasts issued within the 30 days window prior to a management forecast), institutional ownership in quarter $t-1$ (InstOwn), insider trading (InsiderTrading) in quarter t.

We control for a firm's overall operating complexity and forecasting difficulty with the dispersion of analyst forecasts (Dispersion). The higher the analyst forecast dispersion, the more difficulty to forecast earnings for a firm. Dispersion is calculated as the standard deviation of the individual analyst forecasts scaled by the mean consensus analyst forecast, both measured in the 30 day window prior to a management forecast. As the performance of regulated firms tends to depend on macroeconomic variables, we control for regulated industries (Regulated, a dummy variable equals one if a firm's four-digit SIC code is within 4900–4999 (utitlities), 6000–6099, 6100–6199 (banking), or 6200–6299, 6700–6799 (financial institutions), and zero otherwise). We also control for industry concentration. A more concentrated industry indicates the performance of its members is more closely correlated. We estimate industry concentration using the *Herfindahl Index*, which is defined as $\sum_{i=1}^{N} \mathrm{MktShare}_i^2$, where MktShare is market share, measured as the revenue for firm i divided by total revenue for all firms in the industry. Industry classification follows Fama and French (1997).

Following Hutton et al. (2012), we control for revenue synchronicity (RevSyn), which captures how a firm's sales growth is correlated with the underlying industry growth. We use revenue volatility (RevVol) to control for variation in product demand. We use cost structure (CostStru) to control for how a firm's costs vary with its revenue. We define a firm-year as a loss year (Loss) when the management earnings forecast is negative, as management tends to provide more accurate forecasts than analysts in these years. We measure Horizon as the number of days between management forecast and the end of the fiscal year. Finally, we control for the type of management forecasts. Point is a dummy variable that equals one for point forecasts and zero otherwise. The GoodNews dummy variable is one if management forecast is greater than the average of analyst forecasts issued within the 30-day window prior to the

Table 1
Derivation of the sample.

I/B/E/S Guidance data set of annual earnings per share forecasts, January 2001–December 2015.	73,944
Management forecasts excluding one-sided directional forecasts and forecasts for firms whose fiscal year do not end on December 31.	44,674
Management forecasts excluding forecasts issued in the 4th quarter.	33,989
Management forecasts that are the first annual earnings forecast made after last period's earnings announcement.	10,461
Management forecasts for firms that have non-missing I/B/E/S analyst's forecasts 30 days before the management forecast	6,150
Management forecasts for firms with non-missing cyclicality.	5,116
Management forecasts in the final sample	5,116

management forecast, and zero otherwise.

3.3. Research design

To examine whether firms with high cyclicality are more likely to issue management earnings forecasts than firms with low cyclicality as macroeconomic uncertainty increases, we build on Kim et al. (2016) and run the following logit regression:

$$\begin{aligned}\Pr(\text{Issue}_{i,t}=1) = \; & F(\beta_0+\beta_1\text{Cyclicality}_{i,t-1}+\beta_2\text{MacroUnc}_{t-1}+\beta_3 Cyclicality_{i,t-1}*MacroUnc_{t-1}\\ & +\beta_4 EarnVol_{i,t-1}+\beta_5 RevVol_{i,t-1}+\beta_6 FirmRet_{i,t-1}+\beta_7 DeltaROA_{i,t-1}\\ & +\beta_8 LogAssets_{i,t-1}+\beta_9 MktRet_{i,t-1}+\beta_{10} InstOwn_{i,t-1}+\beta_{11} InsiderTrading_{i,t})\end{aligned} \tag{2}$$

where Issue is a dummy variable that is set to one if managers issue at least one annual earnings forecast, and zero otherwise; MacroUnc stands for the two proxies, GDPDisp and QtrAvgVix, for macroeconomic uncertainty. We also run regression (2) by replacing Cyclicality with DummyCyclicality. The coefficients on Cyclicality (β_1) and MacroUnc (β_2) capture the individual impact of cyclicality and macroeconomic uncertainty on management forecast issuance, respectively. More importantly, the coefficient on Cyclicality * MacroUnc (β_3) captures the incremental effect of macroeconomic uncertainty and cyclicality beyond their individual effects on management forecast issuance. H1 predicts the coefficient estimate for Cyclicality * MacroUnc (β_3) is positive and significant, i.e., firms with high cyclicality are more likely to issue management forecasts than firms with low cyclicality as macroeconomic uncertainty increases. Additionally, we predict the coefficient on MacroUnc (β_2) is negative, because Kim et al. (2016) find heightened macroeconomic uncertainty decreases managers' propensity to issue earnings forecasts. We also predict the coefficient on EarnVol is negative, as prior research (Waymire, 1985; Kim et al., 2016; etc.) documents a negative relation between firm-specific uncertainty and management forecast issuance, suggesting it is difficult for firms with highly variable earnings to make earnings forecasts. The coefficient on InstOwn is predicted to be positive, because Ajinkya, Bhojraj, and Sengupta (2005) find firms with greater institutional ownership are more likely to issue a earnings forecast. We predict the coefficient on InsiderTrading is positive due to litigation concerns (Cheng & Lo, 2006).

To test Hypothesis 2, we extend the model employed in Hutton et al. (2012) and run the following logit regression:

$$\begin{aligned}\Pr(\text{MGR}_{i,t}=1) = \; & F(\beta_0+\beta_1\text{Cyclicality}_{i,t-1}+\beta_2\text{MacroUnc}_{t-1}+\beta_3 Cyclicality_{i,t-1}*MacroUnc_{t-1}\\ & +\beta_4\text{RevSyn}_{i,t-1}+\beta_5\text{Regulated}_{i,t}+\beta_6 CostStru_{i,t-1}+\beta_7 RevVol_{i,t-1}\\ & +\beta_8 HighRevVol_{i,t-1}+\beta_9\text{Loss}_{i,t}+\beta_{10} ABI_{i,t-1}+\beta_{11} HighInv_{i,t-1}+\beta_{12} Horizon_{i,t}\\ & +\beta_{13} LogAssets_{i,t-1}+\beta_{14} MB_{i,t-1}+\beta_{15} Lev_{i,t-1}+\beta_{16} LogNumAnalyst_{i,t}\\ & +\beta_{17} Dispersion_{i,t}+\beta_{18} Herfindahl_{i,t}+\beta_{19} Point_{i,t}+\beta_{20} GoodNews_{i,t})\end{aligned} \tag{3}$$

Table 2
Descriptive statistics.

Variable	Mean	Stdev	P25	Median	P75
Cyclicality	0.238	0.261	0.028	0.133	0.372
DummyCyclicality	0.498	0.500	0	0	1
GDPDisp	1.232	0.441	0.876	1.060	1.472
QtrAvgVix	20.049	8.367	13.527	18.204	23.924
EarnVol	0.016	0.025	0.004	0.008	0.016
RevVol	0.181	0.137	0.089	0.142	0.223
FirmRet	0.001	0.005	−0.001	0.001	0.003
DeltaROA	−0.001	0.024	−0.006	0.000	0.004
ROA	0.014	0.019	0.005	0.012	0.022
TotalAssets	12,027	29,653	711	2,558	9,044
MktRet	0.001	0.002	0.000	0.001	0.002
InstOwn	0.736	0.213	0.612	0.768	0.881
InsiderTrading	0.950	0.218	1	1	1
RevSyn	0.222	0.228	0.035	0.143	0.345
Regulated	0.153	0.360	0	0	0
CostStru	0.873	0.560	0.722	0.910	1.028
Loss	0.024	0.153	0	0	0
ABI	−0.036	0.684	−0.369	−0.161	0.099
Horizon	239.926	35.763	240	247	253
MB	3.687	4.435	1.680	2.536	4.103
Lev	3.522	4.038	1.705	2.350	3.523
NumAnalyst	5.053	4.199	2	4	7
Dispersion	0.043	0.088	0.014	0.024	0.045
Herfindahl	0.093	0.074	0.051	0.067	0.109
Point	0.098	0.298	0	0	0
GoodNews	0.417	0.493	0	0	1
PriorMFAccu	0.531	0.264	0.400	0.550	0.682
AnalystOptimism	0.149	1.003	−0.088	−0.016	0.085

Table 2 presents descriptive statistics for the variables used in analysis. All continuous variables are winsorized at the top and bottom 1 percent. See appendix for variable definitions.

where MGR is an indicator variable for the relative accuracy of management forecasts and analyst forecasts. The variable is set to 1 when the absolute value of management forecast error is smaller than the absolute value of analyst forecast error, and is set to 0 otherwise. Specifically, MGR is set to 1 when $|\text{MF} - \text{Realized EPS}| < |\text{Mean AF} - \text{Realized EPS}|$, where Mean AF is the consensus analyst forecasts issued 30 days before the management forecast. H2 predicts the coefficient estimate for Cyclicality $*$ MacroUnc (β_3) is significantly different from zero, i.e., macroeconomic uncertainty has differential impacts on the relative accuracy of management and analyst forecasts for firms with high cyclicality versus firms with low cyclicality. We predict the coefficient estimates for control variables are similar as findings in Hutton et al. (2012). Specifically, the coefficient on HighRevVol is predicted to be positive, because management has an information advantage at the firm level; the coefficient on Loss is expected to be positive, as managers are more accurate when they anticipate a loss; the coefficient on Horizon is predicted to be negative, because management has a forecasting advantage over analysts for shorter horizon forecasts; the coefficient on GoodNews is expected to be positive, as managers issue more accurate forecasts when they raises investor expectations about future earnings.

4. Empirical results

Table 2 describes descriptive statistics for the variables defined in Section 3. Consistent with prior literature, management earnings forecasts tend to be issued by large firms with significant analyst following. The sample firms have an average total asset of $12.03 billion dollars and a median of $2.56 billion dollars; the mean (median) number of analyst following is 5 (4). As we focus on the first annual management forecast after prior year's earnings announcement, the horizon of the management forecast is relative long, with a mean (median) of 240 (247) days. Consistent with existing research, management earnings forecasts tend to be bad news forecasts: 58% of management earnings forecasts in our sample are lower than consensus analyst forecasts. The summary statistics also show 2.4% of management forecasts are negative (Loss), and 9.8% of management forecasts are point estimate. Consistent with Hutton et al. (2012), Cyclicality has a mean (median) of 0.238 (0.133). All continuous variables are winsorized at the top and bottom 1%. For the two proxies for macroeconomic uncertainty, GDPDisp has a mean (median) value of 1.232 (1.06), and QtrAvgVix has a mean (median) value of 20.049 (18.204). Fig. 3 shows the quarterly variation of GDPDisp and QtrAvgVix from 2001 to 2015, which suggests GDPDisp and QtrAvgVix are positively correlated and capture similar aspects of macroeconomic uncertainty. All variables are defined in the appendix.

We first investigate whether firms with high cyclicality are more likely to issue management forecasts than firms with low cyclicality during periods of high macroeconomic uncertainty. Table 3 presents the results from estimating equation (2); it has four columns of results, as there are two variables (GDPDisp and QtrAvgVix) for macroeconomic uncertainty and two variables (Cyclicality and DummyCyclicality) for cyclicality. In column (1), the coefficient estimate for GDPDisp is negative and significant (coefficient $= -0.181$, t-statistic $= -3.313$), suggesting that macroeconomic uncertainty prompts managers to issue fewer management forecasts; this finding is consistent with Kim et al. (2016). However, the coefficient estimate for the interaction Cyclicality $*$ GDPDisp is positive and significant (coefficient $= 0.517$, t-statistic $= 2.985$), indicating firms with high cyclicality are more likely to issue management forecasts than firms with low cyclicality as macroeconomic uncertainty increases. In column (2), we replace Cyclicality with DummyCyclicality, which is a dummy variable that equals one if Cyclicality is above the median Cyclicality in the sample, and zero otherwise. The interaction item DummyCyclicality $*$ GDPDisp offers a direct investigation of the differential impact of macroeconomic uncertainty on management forecast issuance for firms with high cyclicality and firms with low cyclicality. Consistent with the result in column (1), the coefficient estimate for DummyCyclicality $*$ GDPDisp is positive and significant (coefficient $= 0.135$, t-statistic $= 1.708$), suggesting firms with high cyclicality are more likely to issue management forecasts than firms with low cyclicality as

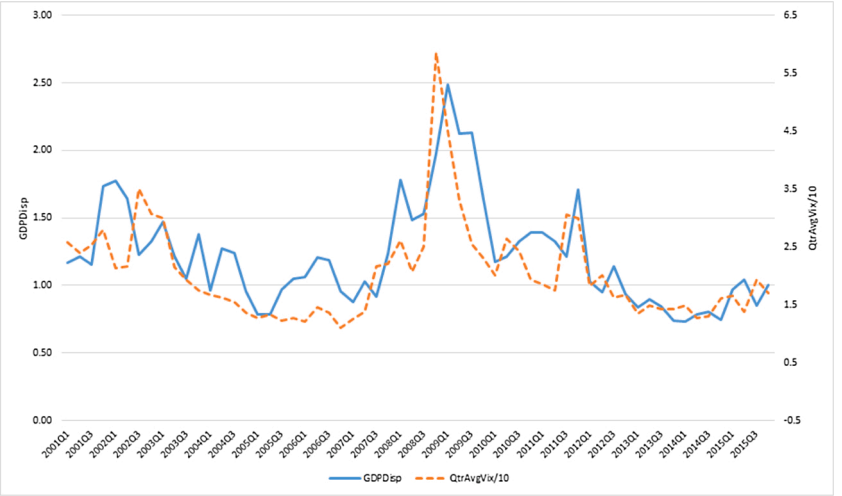

Fig. 3. *GDPDisp* and *QtrAvgVix* (2001–2015).

Table 3
Issuance of management forecasts.

	Dependent variable: Issue			
	(1)	(2)	(3)	(4)
Constant	−0.098	−0.083	−0.141	−0.118
	(0.127)	(0.128)	(0.121)	(0.122)
Cyclicality	−0.478**		−0.268	
	(0.213)		(0.180)	
DummyCyclicality		−0.195*		−0.120
		(0.102)		(0.087)
GDPDisp	−0.181***	−0.144***		
	(0.055)	(0.056)		
Cyclicality*GDPDisp	0.517***			
	(0.173)			
DummyCyclicality*GDPDisp		0.135*		
		(0.079)		
QtrAvgVix			−0.009***	−0.007***
			(0.003)	(0.003)
Cyclicality*QtrAvgVix			0.021**	
			(0.009)	
DummyCyclicality*QtrAvgVix				0.004
				(0.004)
EarnVol	−4.300***	−4.515***	−4.298***	−4.496***
	(0.785)	(0.793)	(0.785)	(0.793)
RevVol	0.010	0.011	0.010	0.011
	(0.016)	(0.017)	(0.016)	(0.017)
FirmRet	−1.315	−1.417	−1.335	−1.458
	(3.334)	(3.345)	(3.328)	(3.337)
DeltaROA	−1.132***	−1.169***	−1.144***	−1.177***
	(0.406)	(0.406)	(0.406)	(0.407)
LogAssets	−0.060***	−0.061***	−0.059***	−0.061***
	(0.010)	(0.010)	(0.010)	(0.010)
MktRet	−6.265	−7.831	−6.978	−8.710
	(10.896)	(10.880)	(10.693)	(10.664)
INSTOWN	0.679***	0.683***	0.676***	0.679***
	(0.074)	(0.074)	(0.074)	(0.074)
InsiderTrading	0.535***	0.539***	0.537***	0.540***
	(0.070)	(0.070)	(0.070)	(0.070)
Observations	14,006	14,006	14,006	14,006

Table 3 shows the logit regression results for equation (2). Standard errors are reported in parentheses. Issue is an indicator variable that equals 1 when management issues at least one annual earnings forecasts, and zero otherwise. All variables are defined in appendix. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

macroeconomic uncertainty increases. The third and fourth columns report results associated with the other proxy for macroeconomic uncertainty (QtrAvgVix). Specifically, the coefficient estimate for QtrAvgVix is negative and significant (coefficient = − 0.009, *t*-statistic = − 3.283), and the coefficient estimate for Cyclicality ∗ QtrAvgVix is positive and significant (coefficient = 0.021, *t*-statistic = 2.337) in column (3); the coefficient estimate for QtrAvgVix is negative and significant (coefficient = − 0.007, *t*-statistic = − 2.591), and the coefficient estimate for DummyCyclicality ∗ QtrAvgVix is positive (coefficient = 0.004, *t*-statistic = 1.080) in column (4). Overall the results in Table 3 show that firms with high cyclicality are more likely to issue management forecasts than firms with low cyclicality during periods of high macroeconomic uncertainty.

The estimated coefficients on control variables are consistent with prior literature. For example, the coefficients on EarnVol and DeltaROA are negative and significant, indicating firms with more volatile operation are less likely to issue management forecasts, which is consistent with prior studies that document a negative relation between firm-specific uncertainty and management forecast issuance (e.g., Dye, 1985; Verrecchia, 1982, 1990; Waymire, 1985; Kim et al., 2016). The coefficient on InstOwn is positive and significant; this result is consistent with Ajinkya et al. (2005) that find firms with greater institutional ownership are more likely to issue a forecast. We also find the the coefficient on InsiderTrading is positive and significant, indicating insider trading is an important incentive for providing management forecast (Cheng & Lo, 2006).

Table 4 presents the results from estimating equation (3), which investigates the impact of macroeconomic uncertainty and cyclicality on the relative accuracy of management and analyst forecasts(MGR). In column (2), the coefficients on DummyCyclicality and GDPDisp reflect the individual effect of cyclicality and macroeconomic uncertainty on MGR respectively, and the coefficient on DummyCyclicality ∗ GDPDisp captures the incremental joint effect of cyclicality and macroeconomic uncertainty. The coefficient on GDPDisp is insignificant (coefficient = 0.097, *t*-statistic = 0.857), which suggests for firms with low cyclicality, macroeconomic uncertainty has no impact on the relative accuracy of management and analyst forecasts. More importantly, the coefficient estimate on Cyclicality ∗ GDPDisp is negative and significant (coefficient = − 0.462, *t*-statistic = − 2.868), which indicates the impact of macroeconomic uncertainty on MGR is different for firms with high cyclicality versus firms with low cyclicality. Specifically, for firms with

Table 4
Relative accuracy of management and analyst forecasts.

	Dependent variable: MGR			
	(1)	(2)	(3)	(4)
Constant	0.439	0.374	0.426	0.376
	(0.342)	(0.343)	(0.333)	(0.333)
Cyclicality	0.652		0.491	
	(0.408)		(0.355)	
DummyCyclicality		0.489**		0.397**
		(0.209)		(0.183)
GDPDisp	0.037	0.097		
	(0.110)	(0.113)		
Cyclicality*GDPDisp	−0.719**			
	(0.328)			
DummyCyclicality*GDPDisp		−0.462***		
		(0.161)		
QtrAvgVix			0.001	0.004
			(0.006)	(0.006)
Cyclicality*QtrAvgVix			−0.036**	
			(0.017)	
DummyCyclicality*QtrAvgVix				−0.024***
				(0.009)
RevSyn	0.286*	0.284*	0.288*	0.288*
	(0.156)	(0.156)	(0.155)	(0.156)
Regulated	0.132	0.133	0.131	0.131
	(0.114)	(0.114)	(0.114)	(0.114)
CostStru	−0.043	−0.045	−0.043	−0.048
	(0.062)	(0.062)	(0.062)	(0.062)
RevVol	−0.421	−0.479	−0.417	−0.471
	(0.374)	(0.372)	(0.374)	(0.372)
HighRevVol	0.613**	0.632**	0.619**	0.641**
	(0.301)	(0.301)	(0.301)	(0.301)
Loss	1.051***	1.063***	1.053***	1.069***
	(0.286)	(0.285)	(0.286)	(0.286)
ABI	−0.006	−0.004	−0.003	−0.002
	(0.068)	(0.068)	(0.068)	(0.068)
HighInv	0.040	0.036	0.039	0.038
	(0.088)	(0.088)	(0.088)	(0.088)
ABI*HighInv	0.087	0.084	0.087	0.082
	(0.099)	(0.098)	(0.099)	(0.099)
Horizon	−0.003***	−0.003***	−0.003***	−0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
LogAssets	−0.026	−0.026	−0.027	−0.027
	(0.027)	(0.027)	(0.027)	(0.027)
MB	−0.005	−0.006	−0.006	−0.006
	(0.009)	(0.009)	(0.009)	(0.009)
Lev	0.009	0.009	0.010	0.010
	(0.010)	(0.010)	(0.010)	(0.010)
LogNumAnalyst	0.073	0.072	0.075	0.073
	(0.049)	(0.049)	(0.049)	(0.049)
Dispersion	1.161**	1.220***	1.166**	1.214**
	(0.466)	(0.469)	(0.468)	(0.472)
Herfindahl	−0.482	−0.464	−0.480	−0.473
	(0.483)	(0.485)	(0.482)	(0.484)
Point	−0.305**	−0.310**	−0.306**	−0.310**
	(0.122)	(0.122)	(0.121)	(0.121)
GoodNews	0.979***	0.976***	0.980***	0.978***
	(0.072)	(0.072)	(0.072)	(0.072)
Observations	3,541	3,541	3,541	3,541

Table 4 presents logit regression results for equation (3). Standard errors are reported in parentheses. MGR is an indicator variable that equals 1 when management issues more accurate forecasts than analysts, and zero otherwise. All variables are defined in appendix. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

high cyclicality, increases in macroeconomic uncertainty leads to lower MGR, i.e., the higher the macroeconomic uncertainty, the more likely analyst forecasts are more accurate than management forecasts. This result is consistent with findings in Hutton et al. (2012). The estimated coefficients on control variables are consistent with prior research. The coefficient estimate for Loss is positive and significant (coefficient = 1.063, *t*-statistic = 3.730), which is consistent with Hwang, Jan, and Basu (1996)'s finding that analysts forecasts are less accurate in loss years. The coefficient on Horizon is negative and significant (coefficient = − 0.003, *t*-statistic = − 3.236). This suggests the shorter the forecast horizon, the more accurate the management forecasts are relative to analyst forecasts;

this result is consistent with Hutton et al. (2012). The coefficient on GoodNews is positive and significant (coefficient = 0.976, *t*-statistic = 13.646), which suggests that when management raises investor expectations about upcoming annual earnings, management forecasts are more accurate relative to analyst forecasts. This is consistent with management's litigation and reputation concerns. In column (4), we replace GDPDisp with QtrAvgVix, and the results are similar as in column (2). For example, the coefficient estimate for QtrAvgVix is insignificant (coefficient = 0.004, *t*-statistic = 0.741); the coefficient on DummyCyclicality * QtrAvgVix is negative and significant (coefficient = − 0.024, *t*-statistic = − 2.803). The results in column (1) and (3) are consistent with estimated coefficients reported in column (2) and (4). Overall, the results in Table 4 show that for firms with high cyclicality, increases in macroeconomic uncertainty prompt analysts to issue more accurate forecasts relative to management; for firms with low cyclicality, macroeconomic uncertainty has no impact on the relative accuracy of management and analyst forecasts.

5. Conclusions

This study investigates the joint effects of macroeconomic uncertainty and cyclicality on management and analyst earnings forecasts. Macroeconomic uncertainty and cyclicality are both shown to be important determinants of earnings forecast characteristics. However, prior literature examines their effects on management and analyst forecasts independently and finds conflicting results. This study demonstrates that macroeconomic uncertainty and cyclicality are inextricably linked together, and should be studied jointly. Specifically, we explore how the joint effects of macroeconomic uncertainty and cyclicality impact two aspects of earnings forecasts: the propensity of management to issue a forecast and the relative accuracy of management and analyst forecasts.

Using a sample of earnings forecasts from 2001 to 2015, we find the following: (1) firms with high cyclicality are more likely to issue earnings forecasts than firms with low cyclicality during periods of high macroeconomic uncertainty, and Kim et al. (2016)'s finding that heightened macroeconomic uncertainty decreases management's propensity to issue earnings forecasts is largely driven by firms with low cyclicality; (2) Hutton et al. (2012)'s finding that analysts issue more accurate forecasts than management for firms with high cyclicality only holds when macroeconomic uncertainty is high; increases in macroeconomic uncertainty lead to more accurate analyst forecasts relative to management forecasts for firms with high cyclicality, but for firms with low cyclicality, macroeconomic uncertainty has no impact on the relative accuracy of management and analyst forecasts. These findings are useful to both researchers and investors interested in understanding how macroeconomic factors affect management earnings forecasts.

This study deepens investors' understanding of earnings forecasts, especially during periods of high macroeconomic uncertainty when firm's information environment deteriorates. Specifically, this study extends investors' understanding on how macroeconomic uncertainty impacts managers' propensity to issue earnings forecasts and the relative accuracy of those forecasts relative to analyst forecasts. The findings are important for researchers and investors considering that management and analyst forecasts are the two most predominant information sources for investors (Beyer et al., 2010). Additionally, this study contributes to the literature that investigates the link between firm-specific accounting information and macroeconomics factors.

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Appendix. Variable Definitions

Issue	Indicator variable for issuance of management earnings forecasts. The variable is set to 1 if management issues at least one annual earnings forecast, and zero otherwise.
MGR	Indicator variable for the relative accuracy of management fore-casts and analyst forecasts. The variable is set to 1 when the absolute value of management forecast error is smaller than the absolute value of analyst forecast error, and is set to 0 otherwise. Management forecast error is calculated as (MF − Realized EPS), i.e., the first management earnings forecasts for year t issued af-ter the announcement of earnings for year t − 1 minus the ac-tual earnings for year t. Analyst forecast error is measured as (Mean AF − Realized EPS), i.e., the consensus analyst forecasts issued 30 days before the first management forecast minus the ac-tual earnings.
Cyclicality	A measure of the ability of Gross Domestic Product (GDP) to explain firm-level earnings. The variable is calculated as the R^2 of the following model over the prior 12 quarters: $EARN_{i,t} = \alpha_0 + \alpha_1 GDP_t + \epsilon_{i,t}$, where EARN is income before extraordinary item (ibq) and GDP is the nominal quarterly GDP.
DummyCyclicality	An indicator variable for Cyclicality. The variable is set to 1 if Cyclicality is larger than the median Cyclicality, and zero other-wise.
GDPDisp	GDP Dispersion, measured as the average dispersion measured in quarter t−1 for the quarter-over-quarter nominal GDP growth rate forecasts for the following four quarters. GDPDisp is a proxy for macroeconomic uncertainty.
QtrAvgVix	Chicago Board Options Exchange Volatility Index (VIX), measured as the average daily VIX levels in quarter t − 1 for management forecasts released in quarter t. QtrAvgVix is another proxy for macroeconomic uncertainty.
RevSyn	Revenue synchronicity, measured as the R_2 of the following model over the prior 12 quarters: $REV_{i,t} = \alpha_0 + \alpha_1 INDREV_t + \epsilon_{i,t}$, where REV is revenue (salesq) divided by lagged four-quarter revenue for firm i, and INDREV is the sum of revenue (saleq) for all firms in the industry

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(*continued*)

	(excluding firm i) divided by lagged four-quarter revenue for all firms (excluding firm i) in the industry. The industry classification follows Fama and French (1997).
Regulated	An indicator variable for firms operating in regulated industries. The variable is set to 1 if a firm operates in a regulated indus-try, and zero otherwise. Regulated industries are defined as hav-ing four-digit SIC codes 4900-4999 (utilities), 6000-6099, 6100-6199 (banking), or 6200-6299, 6700-6799 (financial institutions).
CostStru	Cost structure, measured as the estimated coefficient (β1) from the following model over the prior 12 quarters: $LOG(EXP_t/EXP_{t-1}) = \beta 0 + \beta 1 LOG(REV_t/REV_{t-1}) + \epsilon_{i,t}$, where REV is revenue (saleq) and EXP is revenue (saleq) minus income before extraordinary item (ibq). The model is based on Anderson, Banker, and Janakiraman (2003).
RevVol	Revenue volatility, measured as the standard deviation of revenue (saleq) over the prior 12 quarters, scaled by the mean revenue over the same time period.
HighRevVol	Indicator variable for high revenue volatility. The variable is set to 1 if a firm-year is in the top quintile of RevVol and zero otherwise.
Loss	Indicator variable set to 1 if management forecasts negative earn-ings, and zero otherwise.
Inventory	Inventory (invt), scaled by total assets (at).
HighInv	Indicator variable for high inventory. The variable is set to 1 if a firm-year is in the top quintile of Inventory and zero otherwise.
ABI	Abnormal Inventory, calculated as normalized deviation from the industry days in inventory, (DIit - Industry mean DIt)/Industry standard deviation of DIt, where DI = inventory (invt) * 365/cost of goods sold (cogs). Industry classification follows Fama and French (1997).
Horizon	Number of days between management forecast date and the end of the fiscal year.
LogAssets	Natural logarithm of total assets (at), calculated at the end of the prior fiscal year.
MB	Market to book ratio, calculated as market value of equity (prcc_f * csho) divided by book value of equity (ceq), measured at the end of the prior fiscal year.
Lev	Leverage, calculated as total assets (at) divided by book value of equity (ceq), measured at the end of the prior fiscal year.
LogNumAnalyst	Natural logarithm of the number of analyst forecasts issued 30 days before the management forecast.
Dispersion	Analyst forecast dispersion, calculated as the standard deviation of consensus analyst forecasts scaled by the average analyst forecasts, both measured in the month prior to the management forecast.
Herfindahl	Herfindahl Index is used to measure industry concentration, calcu-lated as $\Sigma_{i=1}^{N} MktShare_i^2$, where MktShare is market share, mea-sured as the revenue for firm i divided by total revenue for all firms in the industry. Industry classification follows Fama and French (1997).
Point	Indicator variable for point management forecast. The variable is set to 1 if management forecast is a point estimate and zero otherwise.
GoodNews	Indicator variable for good news management forecast. The variable is set to 1 if management forecast is greater than consensus analyst forecast and zero otherwise.
PriorMFAccu	Prior management forecast accuracy, defined as the ratio of prior management forecasts that are deemed to be relatively accurate than prevailing consensus analyst forecasts to the total number of management forecasts the firm has issued. A management forecast is deemed to be relatively accurate when abs(MF − Realized EPS) < abs(Median AF − Realized EPS). This mea-sure is based on Hutton and Stocken (2009).
AnalystOptimism	Analyst optimism, calculated as consensus analyst forecasts within 30 days before a management forecast minus actual earnings, scaled by the absolute value of actual earnings.
DeltaROA	The diff ;erence between a firm's quarter t and quarter t−1 industry-adjusted ROA, where ROA is measured as income before extraor-dinary items (ibq) divided by lagged total assets (atq).
InsiderTrading	An indicator variable for insider trading. The variable is set to 1 if a management forecast is issued in quarter t in connection with insider trading, and zero otherwise.
MktRet	The average daily value-weighted market return during month t–1, relative to the MF release month t.
FirmRet	A firm's average daily return in month t – 1, relative to the MF release month t.

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