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Acknowledgements

This work should not be read without first understanding the multitude of individuals that made it possible. First and foremost, I am grateful for the guidance of my faculty advisor Charles F. Manski, whose support and immense pool of knowledge contributed greatly to this finished product. Professors William Rogerson and Robert Porter also offered helpful comments and critiques. Additionally, I greatly appreciate the openness of the industry executives that I interviewed in my research. Lastly, I thank my family, whose forecasts of my success persisted despite any evidence to the contrary.
Abstract

A robust literature exists regarding the external forecasts of corporations, but little analysis has been done of their internal forecasting processes. After reviewing the existing literature, this paper will outline anecdotal evidence of the internal forecasting process of one particular firm. Interviews with industry executives add perspective to this discussion. An analysis of alternate forecasting and disclosure methods in corporate finance and other applications is used to recommend a more sophisticated internal forecasting model that allows for the expression of uncertainty. While acknowledging the shortcomings of such a process, this paper recommends a more nuanced method of projection, in order to allow for the planning of multiple contingencies.
I. Introduction

From time immemorial, human beings have attempted to predict the future. Forecasts have been made in regards to such diverse applications as the budgetary implications of proposed legislation ten years from now, the expected yield of certain crops at the time of the next harvest and the probability that it will rain tomorrow afternoon. If a future outcome is known with complete certainty, forecasting is unnecessary. However, many scenarios exist in which future outcomes of interest are uncertain, and accurate projections can often be extremely beneficial. At the same time, the very uncertainty that makes forecasting valuable also makes it problematic. Any attempts to forecast uncertain events inevitably run the risk of attaching too much faith to flawed predictions. Regardless, the difficulty of forecasting future events under uncertainty has not managed to dissuade its practice.

A cursory glance through most business publications at the end of a fiscal quarter will be met with headlines proclaiming that some companies have underperformed in comparison to their forecasts and others have exceeded expectations. Despite the fact that many unknown factors affect a company’s performance, including macroeconomic and other considerations that are out of executives’ abilities to control, diversions of actual quarterly results from projections are often seen as surprises. These surprises, whether positive or negative, can have drastic implications for the stock price performance of those companies that are publicly traded. Performance that deviates from expectations can also have significant implications in regards to executive bonus pay packages.

Modern portfolio theory contends that the price of an asset is an accurate manifestation of all publicly available information that is relevant to the asset. Insofar as corporate forecasts are intended as signals of the expected future performance of a company, those predictions that are
made public are “priced in” to the company’s stock by investors. Therefore, it should come as no surprise that a positive earnings surprise in which the public forecast is exceeded often results in an increase in stock price. Conversely, falling short of forecasts is likely the cause of many CFO nightmares, since it is often accompanied by plummeting stock prices and uncomfortable press conferences. Either way, as illustrated in Section II below, deviations from forecasts are given heavy weighting in the eyes of investors.

Since executives are rewarded handsomely for beating public forecasts, either via stock price revisions or bonus pay packages, they face the perverse incentive to guide forecasts downward, thereby making them easier to beat. As detailed in Section II below, a game theoretic process in which management teams under-promise and over-deliver on external forecasts has been acknowledged as common practice in the finance world.

In addition to these external forecasts, firms also create forecasts that are used internally. The relationship between these two types of forecast is unclear, and it likely varies among firms. Whereas external forecasts seem to be used to influence the expectations of investors or others about the health of the firm, internal forecasts seem to be more focused on the practical aspects of corporate planning and other firm decisions. Due to the different purposes for these forecast types, they should not be viewed as equivalent. It seems likely that internal forecasts precede external forecasts chronologically, but conclusions should not be drawn too hastily about their relationship to each other.

Although external forecasts generally receive the most attention from researchers, Boards of Directors and even the media, internal forecasts deserve at least equal examination. Firm decisions regarding product pricing, cash flow management, changes in capital structure and a
A variety of others are made according to internally developed forecasts—not those publicly released to investors. Furthermore, the external forecasts of a firm may be derived from the previously-chosen internal forecasts. Therefore, understanding the internal forecasting process could provide insight into external forecasts as well.

There is no internal forecasting framework that is commonly employed by firms; rather, several processes that vary in complexity, the strength of imposed assumptions and accuracy have been used. There are two main methods used to construct firm-wide forecasts. The first, often called the “bottom-up” approach, involves collecting forecasts for each business segment of the company and then conglomerating these smaller projections to build up to a firm-wide prediction. The second, often called the “top-down” approach, begins with a forecast for the entire company and then allows these projections to trickle down to individual segments. For example, firm profits may be expected to have year-over-year growth of three percent, and then these profits are allocated to individual business segments accordingly. Despite their differences in execution, these methods are similar in that they are typically used to produce point predictions. Regardless of the method used in the internal forecasting process, the common theme is that they are typically silent as to the degree of uncertainty with which the forecast is made.

This paper will explore an alternate internal forecasting model that provides the ability to incorporate these inevitable feelings of uncertainty. By the examination of attractive characteristics of projection methods that are used in other applications, options can be identified to improve upon typical corporate forecasting techniques. An analysis of the actual forecasting process undertaken by a specific company will lend anecdotal evidence as to the feasibility and potential accuracy of this new proposed forecasting process. Furthermore, a more fulsome
internal forecasting framework that adequately incorporates uncertainty could ideally be used to inform the external forecasts that are publicly released to equity analysts and investors.

The remainder of this paper proceeds as follows: Section II reviews the various research that has been conducted on the incentives and usefulness of corporate forecasting, Section III examines anecdotal evidence of the internal forecasting process on the single-firm level, Section IV outlines research on firms that release projections beyond point predictions and alternate prediction methods from other disciplines, Section V applies these alternate prediction methods to form a framework of internal forecasting and Section VI concludes.

II. Literature Review

For a variety of reasons, corporate forecasting has been the subject of much academic research for the past few decades. If projections are made public, they are often one of the few sources of information available to investors as to the future earnings potential of a company. Furthermore, as shown below, the ability to consistently meet or beat forecasts is seen on Wall Street as a signal of the competence of a company’s executives and as an indicator of exceptional future firm performance. Although the formation of internal forecasts is potentially an essential component of the external forecasts that are conveyed publically, there is a dearth of analysis on the internal forecasting process. Academic studies on corporate forecasting broadly fall into two categories: analyses of the incentives facing the corporate executives that issue projections and studies of the usefulness of the information conveyed in management forecasts.

II.A. Incentives Facing Managers Issuing Forecasts
It is no secret that members of the management teams of corporations are under immense pressure to meet or beat forecasts – both internally and externally. In fact, research by Skinner and Sloan (2002) suggests that the stock market response to earnings announcements is asymmetric, with the response to negative earnings surprises being much larger in magnitude than positive surprises. The benefits of meeting or beating forecasts have become so extensive that executives often go to great lengths to ensure a “successful” earnings release. For instance, in “Management’s Incentives to Avoid Negative Earnings Surprises,” Matsumoto (2002)catalogues a salient story that followed a presentation by Microsoft executives:

“After a particularly grim presentation by CEO Bill Gates and sales chief Steve Ballmer at an analysts’ meeting two years ago, Goldman Sachs analyst Rick Sherlund ran into the pair outside and said, ‘Congratulations. You guys scared the hell out of people.’ Their response? ‘They gave each other a high five,’ Sherlund recalls” (p. 483).

If publicly issuing intentionally pessimistic predictions in order to negatively influence investor expectations could raise the likelihood of meeting or beating forecasts, executives seem to have little hesitation in doing so. Matsumoto even finds that such behavior has become much more commonplace in recent years, finding a temporal increase in the percentage of firm-quarters that equal or exceed investor expectations from 41.0% in 1985 to 70.1% in 1997 (p. 488).

Matsumoto outlines the two methods by which corporate managers attempt to beat forecasts, known as earnings management and forecast guidance. Through earnings management, executives use dexterous accounting and reporting techniques to inflate their earnings upward. Meanwhile, forecast guidance consists of executives issuing pessimistic predictions, such as in the Microsoft story above, in order to recommend analysts to temper their expectations downward. Bartov, Givoly and Hayn (2002) summarize modern corporations as
“not merely passive observers in the game of meeting or beating analysts’ expectation …
[r]ather, they are active players who try to win the game” (p. 174).

Richardson, Teoh and Wysocki (2004) present an extensive study of this “game” of forecast guidance. They find a pattern of a “walk down” of analyst forecasts over the course of a fiscal quarter, as predictions switch from long-horizon optimism to short-horizon pessimism. The researchers partially attribute this trend to the 1988 Insider Trading and Securities Fraud Enforcement Act, which made it such that the vast majority of insider equity sales occurs in a brief window of time after each earnings announcement (pp. 889-891). Richardson, Teoh and Wysocki logically connect the downward influence of forecast guidance to the magnitude of insider equity sales. The finding of their analysis is that “[t]he probability of forecast pessimism increases from 54 percent for an average firm without net insider selling to 66 percent for an average firm with subsequent net insider selling” (p. 918). Even more, Matsumoto’s research estimates that such forecast pessimism increases the probability of meeting or beating expectations by eight percent (p. 506).

Furthermore, Richardson, Teoh and Wysocki conclude that the actual path of forecast revisions is significantly less important in determining the rewards of exceeding forecasts than the simple fact of whether forecasts are exceeded in the end (p. 894). Equal positive earnings surprises will, on average, result in similar upward price revisions, even if one benchmark has had a significant “walk down” over the course of the quarter. Therefore, many executive managers appear to be veterans at playing the “game” of forecast guidance, and they often use extensive information asymmetries to reap financial rewards through strategic equity sales.
Similarly, executive managers face incentives to meet or beat forecasts due to the structure of bonus pay packages. Analysis by Matsunaga and Park (2001) draws the conclusion that CEO bonuses are negatively impacted when their firms miss more than one benchmark per year (p. 315). Interestingly, their paper finds no such adverse effect on CEO bonuses for reporting losses (p. 326); this suggests that bonus pay packages are reliant upon performance, not in absolute terms, but rather relative to expectations. This research indicates that corporate management confronts bonus incentives, as well as stock price incentives, when undergoing earnings management or forecast guidance.

Matsumoto’s research also analyzes institutional features that may play a part in the public forecasting process. Firms that are generally characterized as high-growth face more pressure to achieve performance in line with their forecasts, and the evidence implies that these firms subsequently engage more frequently in both earnings management and forecast guidance. Similarly, firms with higher levels of institutional ownership, particularly of the transient nature, are found to engage in these techniques at higher levels. Lastly, firms with a history of quarterly losses are found to be less likely to engage in either earnings management or forecast guidance, perhaps due to investor stigmatization or permanently reduced expectations (p. 510). On the whole, it is clear that the incentives to meet or beat forecasts vary by firm depending on corporate variables and history.

The concept of companies issuing “lowball” forecasts that can easily be exceeded is a common assumption on Wall Street. As such, it follows that investors might be expected to discount any pessimistic guidance from management, viewing it as a strategic play rather than the truth. Bartov, Givoly and Hayn suggest this is not the case. Firms classified by these researchers as “habitual beaters” are not found to have positive earnings surprises discounted by
investors; seemingly irrationally, investors appear to attach additional value to these positive surprises (p. 190). Bartov, Givoly and Hayn assert that this is because positive earnings surprises are strongly correlated with exceptional future firm performance. They find that “firms whose quarterly earnings releases constitute a favorable surprise show, in subsequent years, a higher growth in sales and earnings and a higher ROA and ROE than firms with the same earnings performance but with unfavorable earnings surprises” (p. 203). As shown just below, it seems that there is a limit to the extent that this “lowballing” can occur before executives lose credibility. Regardless, the current body of literature suggests that the practice of issuing “lowball” forecasts faces few disincentives.

II.B. Usefulness of Corporate Forecasts

Hassell, Jennings and Lasser (1988) investigate the degree of usefulness of management forecasts to equity analysts. The researchers analyze whether explicit corporate guidance conveys significant inside information to equity analysts or if it is merely a facet of management strategy. As they acknowledge, “[a]nalysts may be less willing to believe good news from management than bad news. Managers possibly have incentives to be optimistic, but it seems unlikely that they would issue bad news unless they are convinced of its validity” (p. 312). However, research seems to imply that equity analysts are rather adeptly able to decipher the pronouncements by management. Hassell, Jennings and Lasser conclude that analysts are able to ascertain when management forecasts are unreasonable and disregard them as the pessimistic maneuvering of executive disclosures. Similarly, analysts appear to be able to interpret when analyst guidance is legitimate and should be trusted (pp. 318-319). In sum, “[t]he average error
of the forecasting sample tends to be lower … and more tightly distributed” than in the firms that do not provide public forecasts (p. 308). This study suggests that the public disclosure of corporate forecasts does provide some useful information to outside analysts and that they are not purely incentive-driven ploys.

II.C. Extensions of Previous Literature

Although a healthy body of research exists on external management forecasts and the “game” that is played between executives and equity analysts, little analysis exists of the internal forecasting process of firms. However, as mentioned above, since the externally communicated forecasts likely have some relationship to internal forecasts, these internal forecasts, and the process by which they are formed, are crucial. As a result, this paper will delve deeper into the nature of the internal forecasting process. What steps do firms take when conducting their internal forecasting process? Are predictions constructed from the bottom upwards or from the top downwards? To what extent do corporate forecasts incorporate macroeconomic trends? How do companies attempt to cope with uncertainty when issuing their projections? Can a more effective internal forecasting process be formulated? If so, what are its uses and implications? This paper will attempt to provide answers to these questions below.

III. Anecdotal Evidence

Although an empirical analysis of the internal forecasting process across a multitude of companies would be extremely valuable, firms are expectedly not very forthcoming with this data. Regardless, anecdotal evidence of the internal forecasting process on the single-firm level provides some interesting insight into this process.
It goes without saying that different companies go about the process of projecting their future performance in different ways. A forecasting procedure that makes sense for a particular company or industry sector could very easily prove to be impossible to conduct or inaccurate for others. Therefore, any forecasting procedures of specific firms should not be carelessly generalized to others. However, an inside look into the process that an actual company uses when making its forecasts helps to ground this analysis in reality.

I conducted a series of interviews with senior executives of a Midwest-based manufacturing company in order to understand their forecasting process and the manifold considerations they take into account when constructing their future projections. The company in question is a privately-held corporation with decades of experience in its industry. Operating with a significant presence in most international markets, it sells and distributes its products in over 100 countries worldwide. The products of the company are sold under several primary brand names. The specific product segment in which the company operates is rather mature, and there are typically trends of seasonality that affect business. As a whole, the nature of the company’s operations seems, at least at a first glance, relatively straightforward. It is a reasonable prediction that the company’s predictions of future performance should be approximately accurate.

The company’s sales operations are divided into a regionally-arranged distribution system. In its North American business, the company has one Sales Manager and several Regional Sales Managers for each brand. Each of these Regional Sales Managers serves between six and fifteen product distributors, who sell the product to the end-customer. In its markets outside of North America, the company has Country Managers and Regional Managers that are
responsible for sales in one or several countries. These Country Managers report to Regional Directors in charge of broad geographic areas, such as Europe and the Middle East and Africa.

The forecasting process undertaken by this company was self-described as a “bottom-up” approach. To begin, certain assumptions on aspects such as industry-wide projections, expected price increases and any potential regulatory changes are conveyed from the CFO to the different groups. The Regional Sales Managers converse with each of their customers to determine how their expected purchases in the upcoming period will compare with historical purchases. Customer purchase projections are aggregated by the Regional Sales Managers for their geographic region and conveyed to the Sales Managers, who aggregate them to determine a projection for each brand of product. The forecasts for all sales channels are assembled by the Vice President of Sales and checked for consistency. Using these projections, the Operations Group forecasts product costs and determines the necessary manufacturing rates of their factories. Together, these numbers are used to compute initial sales and Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) projections.

When describing the construction of these “bottom-up” forecasts, one executive stressed the importance of only worrying about “the big chunks.” In other words, extensive projections are not commonly issued in regards to revenue or expenditure items unless they really “move the needle.” For example, a major expense projection of this particular company is the materials necessary to build their product. Due to the ever-fluctuating price of metals and other raw goods, assumptions must be made carefully and expected inputs must be closely monitored. In addition, forecasted input costs can be compared to previous years for internal consistency. Another “big chunk” that is commonly analyzed in this company’s projection process is planned projects such
as the development of new machinery or factory expansions. Since the timeframe on these expenditures is fairly long-term, they can be projected out with a high degree of certainty.

Since the company-wide projection is derived from the initial forecasts of distributors, these initial forecasts must be closely scrutinized for accuracy. Throughout the process of collecting the projections needed as elements of the “bottom-up” forecast, the sales personnel must be vigilant in analyzing the validity of the forecasts they receive. As described by one executive, “There is a series of reviews and challenges … I sit down with the sales managers and try to make sure that from a macro level it makes sense.” The sales prediction of each distributor is made with uncertainty; therefore, when these predictions are added together to assemble the firm-wide forecast, the uncertainty is amplified.

In the absence of this system of double-checking, the executives I spoke with believed that their forecasts would be unduly optimistic. This optimism was described to me as follows: “They do a forecast and think about all the good things they are doing and that can happen – new products, price increases, new marketing programs. They never spend five seconds thinking about all the bad things that can happen.” Viewing these proposed forecasts in light of past performance can help to rein in this optimistic bias. For instance, “They’ll tell me they’re going to grow market share by ten percent, but they haven’t grown it by more than one percent in the last five years.” Interestingly enough, this optimism of the sales personnel stands in stark contrast to the “lowballing” typically conveyed from management teams to outside analysts. This difference may be due to the fact that these groups face different incentive structures; regardless of the mechanism that drives these differences, they are important to keep in mind for the company as forecasts are developed. As a result, for these executives, a healthy dose of skepticism helps them to avoid accepting overly optimistic forecasts from their sales personnel.
In the next step of the forecasting process, the executive team analyzes these initial projections and makes any “top-down” revisions deemed necessary. Typically, the management team has previously identified target ranges for these predictions. Target ranges are chosen after consulting with the Board of Directors, banks and ratings agencies to determine their sales growth and EBITDA expectations. For example, these target ranges can be found by augmenting sales by between one and two percent from the previous year, thereby expressing some appreciation of uncertainty. Since this particular company is privately-held, their owners can use the experiences they have acquired through working with their other companies to influence forecasts. For example, “The Board could say, based on the economy and everything we’re seeing in North America, we wouldn’t project any growth at all. We think the market’s going to be flat, at best.” However, it is more typical that everyone involved will anticipate modest positive sales and EBITDA growth.

If “top-down” revisions are determined to be needed, management makes realistic tweaks to the forecasts of the sales personnel and operations staff to ensure that their projections are more in line with the target ranges. As described by one executive, the first step in this reconciliation is to “start questioning the assumptions.” For example, price increases for the product can be enacted to make up for lower volume, in order to raise revenue forecasts to the expected level of the Board. In addition, the Board typically has their own expectations of the future movement of interest rates and commodity prices, due to their exposure to other companies and other industries. The projections of the banks and Board are not seen as infallible, but they are described as “an important litmus test.” It may be the case that “they’re all kind of negative and you look at your projections and say, ‘oh man, maybe we were a little aggressive. Are we crazy?’” The most common scenario seems to be that the company’s management will
alter their forecasts as much as possible to align with the expectations of the banks and Board of Directors.

Significantly, executive bonuses for this company are intimately related to the projections that are decided upon. In particular, the maximum bonus amount is paid to top executives when actual EBITDA numbers exceed projected EBITDA by a small percentage. As a result, management is incentivized to produce forecasts that they believe they can easily beat. In fact, it has sometimes occurred that, as one executive described, “I’m sitting there saying, ‘[Expletive], we’re gonna kill that number!’” At the same time, the forecasts must still be believable, skirting the line between maintaining modest year-over-year growth and remaining low enough to easily be exceeded. It is usually the case that “what gets communicated to the Board and to the banks and bondholders is a reasonable outcome that, based on the economy and what everyone else is doing that they’re not going to question it … Deep inside, we’re sitting there saying, ‘We know we can beat that.’”

Furthermore, as mentioned above, the company is incentivized to exceed their forecasts by only a small amount. This level of performance allows the company to reap the many rewards of beating its forecasts, without unnecessarily raising the target range for the next year and making next year’s forecasts more difficult to exceed. The common frame of mind in regard to bonuses by this company was “why generate more sales if there’s no benefit to you?” Rather than significantly exceeding a forecast and running the risk of falling short the next year, this company found it preferable to smooth out their earnings potential across fiscal periods.

If this bonus structure causes companies to purposely limit their performance, it is likely promoting at least some element of inefficiency. For example, if the company has already met or
exceeded their forecast, they are incentivized to delay any additional sales to succeeding periods. An executive described their actions as “moving expenses forward, delaying sales where you can and if you were going to implement a sales increase in the fall you can move it back a couple months.” If their company was running well above forecast near the end of the year, the CEO would often call sales personnel in order to instruct them to bring forward the expenditures they had planned for the first quarter of the next year into the end of the current year. Even more extreme is the degree to which sales are delayed:

“We had probably $25 million worth of sales on the books in December that customers would take any time. We said that we were shipping all we could make and that they would get it in the next year. We even closed the factory down after Christmas and didn’t build product.”

Such revenue and expenditure management in order to only slightly exceed forecasts, thereby maximizing bonus payouts, anecdotally seems to be standard operating procedure for corporations. Rather than seeking to maximize profits in every period, as is typically the case in nearly all economic models, corporations often take into account other considerations beyond firm-wide profit-seeking.

In addition to stymieing performance in the short-term, such behavior likely has a detrimental impact on performance in the long-term. Although maximizing revenue and earnings in any given year could potentially have future negative implications on the management team’s bonus packages, it is hard to argue that it is not the optimal strategy from a firm-wide point of view. One executive I spoke with explained his view very persuasively:

“I don’t like incentivizing a management group or a company to limit their performance. If you’re not reporting what your true capabilities are, then I believe you’re holding back your long-term growth, because you’re not investing in it. If you generate that money, it doesn’t mean you have to put it in your pockets.
Reinvest it in the company and make acquisitions with it, build new products, modernize your facilities, or invest in infrastructure. If you’re holding back your growth today, you’re holding it back long-term too.”

If this belief is true, alternate forecasting models and incentive structures could possibly be beneficial for this company – and likely others as well. A potential option will be proposed below.

**IV. Alternate Prediction Methods**

Despite the fact that the vast majority of corporate forecasts are issued as singular point predictions, there are several alternate prediction methods available. An inherent characteristic of point predictions is that they are not very useful in conveying degrees of uncertainty. It is true that, when expressing its future earnings potential, a company could say, “Although there is significant uncertainty driving this prediction, we believe next quarter’s revenue will be $100 million.” However, statements such as this leave much to be desired. For instance, this type of statement does not adequately express the degree to which the forecast is uncertain. Will revenue approximate $100 million with near certainty? Or is next quarter’s revenue equally likely to be anywhere between $50 and $150 million, and $100 million is just the midpoint of this broad range? The simple act of choosing one number when making a forecast under uncertainty can often be misleading.

Instead, several alternate forecasting methods are available that would allow corporations to more intuitively convey the uncertainty of their projections. Some of these methods have been employed to corporate forecasting already, while others have primarily been only used in other applications. Regardless, techniques that are able to place bounds or probability distributions on
future predictions offer attractive alternatives to mere point predictions. A variety of alternate prediction methods are outlined below.

**IV.A. Analysis of Forecasting Methods in the Corporate Environment**

Each firm must decide for itself on a forecasting policy, including the type of internal forecasting it will conduct and whether to release external forecasts to investors. If it decides to publicly release forecasts, it must choose what form these projections take – point predictions, bounded ranges, or a variety of others. Lastly, a firm must decide how its internal forecasts and external forecasts are related. Companies can either have their external forecasts mirror their internal forecasts exactly or else have them diverge in some way (likely revised downwards).

Pownall, Wasley and Waymire (1993) conducted an empirical examination of the costs and benefits of the range of forecasting methods present in the corporate environment. Unsurprisingly, the authors find that minimum and maximum forecasts are relatively accurate prediction methods. They find that “for all minimums, 21 percent of actual EPS observations fall below the minimum, and for only 9.4 percent of the maximums does actual EPS fall above the maximum” (p. 902). However, given the inherently extreme nature of these projections, it may be surprising that the forecasting errors are even this high. This finding also suggests that especially large surprises – those that would cause a company to miss such extreme forecasts – are disproportionately negative in nature.

Besides minimum and maximum forecasts, Pownall, Wasley and Waymire also analyze the effectiveness of range forecasts and projections that are qualitatively-oriented. To determine these qualitative forecasts, the authors did a search through the Dow Jones News Retrieval
Service for any mentions of the keywords “earnings,” “income” or “profits” by corporate executives. The authors observe that qualitative forecasts are generally made over longer time horizons than other methods. This implies that this more informal prediction method is usually chosen under the scenarios with the highest degrees of uncertainty. Furthermore, range forecasts are found to be rather inaccurate when compared with actual results. The authors note that “[a]ctual earnings per share … fell outside the forecasted bounds in more than 50 percent of our range forecasts” (p. 897). For whatever reason, companies that issue range forecasts appear to issue too narrow of a projection range. Finally, differences in accuracy between point forecasts and other forecasts are concluded to not be statistically significant at any conventional levels (p. 911).

The authors also present several salient issues regarding alternate prediction methods for exploration in further research. For example, is it the case that executive managers are more likely to disclose interim revisions to forecasts when they contain negative news? Knowing the asymmetric response to negative surprises, companies may release negative information early, while saving positive surprises for the earnings release. In addition, Pownall, Wasley and Waymire question whether certain characteristics make a firm more likely to provide forecasts beyond point predictions. They ask, “Do firms that issue relatively more qualitative projections have less stable earnings series or other distinguishing characteristics?” (p. 911) These questions are also relevant when extended from publically issued forecasts to the internal forecasting process.

*IV.B. Additional Prediction Methods*
Another possible method for the formation of projections is that used in the Survey of Professional Forecasters (SPF). Each quarter, SPF respondents are asked to predict annual American GDP, unemployment, inflation and other macroeconomic variables for the current and next years. The panel of forecasters polled by the SPF is composed of university professors and macroeconomists. Uniquely, panel members are not only asked to issue these forecasts as point predictions, but they are also polled to find out their subjective probability distributions for these predicted quantities. For example, the SPF asks respondents to list a point prediction for the GDP of the current and next calendar year. In order to assess individuals’ degrees of uncertainty, the SPF instrument also asks for the probability with which respondents believe inter-period GDP growth will land in ten different intervals, from $(-\infty, -2\%)$ at the low end all the way to $[6\%, \infty)$ at the high end. Figure 1 in the appendix illustrates an example of an SPF forecasting interval.

In a 2009 paper published in the Journal of Business & Economic Statistics, Joseph Engelberg, Charles F. Manski and Jared Williams analyzed the connection between the point predictions and subjective probability distributions of the forecasts in the SPF. Not surprisingly, Engelberg, Manski and Williams find that SPF forecasters have tighter bounds on their predictions in later quarters, as more information about expected annual rates becomes known. After calculating the mean, median and mode of each subjective distribution, the authors also find that the respondents’ reported point predictions typically approximate these measures of central tendency. Among those panelists whose point predictions differ from these measures of central tendency, most report more optimistic point predictions than their subjective probability distributions would suggest (p. 35). Furthermore, the paper reports that “the distance between the point prediction and measures of central tendency are positively correlated with forecaster uncertainty” (p. 38).
Engelberg, Manski and Williams proceed to apply these findings to the accounting literature. As mentioned above in Section II, analyst estimates often are optimistic at the beginning of a fiscal period when predictions face higher uncertainty, and these predictions are found to become more pessimistic as additional certainty is gained throughout the period. Some researchers assert that this phenomenon is due to influence from company executives that are hoping to guide analyst expectations downward in order to release positive earnings surprises.

The analysis of SPF forecasts offers a different account of this phenomenon:

“...It could be that analysts have rational expectations with respect to future earnings but that their point predictions are simply high percentiles of their underlying distributions. Recall ... that the distance between SPF point predictions and subjective medians are positively correlated with forecaster uncertainty. Presumably, analysts become more certain of their forecasts as the earnings announcement date approaches” (p. 39).

Therefore, the downward trend of outside analyst forecasts over the course of a fiscal quarter may be a statistical result of lessening uncertainty rather than the self-interested, pessimistic guidance of corporate executives.

Perhaps most significantly, the conclusions of Engelberg, Manski and Williams suggest a justification for the preference for probabilistic forecasts that account for uncertainty over mere point predictions. From their analysis, the researchers find that the SPF subjective probability intervals could be used to derive the mean, median and modes of the distribution. Further, these measures of central tendency approximated the point predictions that were simultaneously issued by the survey respondents. It follows that interval forecasts of probability can be readily translated into reasonable point predictions. However, the derivation does not work in the opposite direction – point predictions cannot be used to derive a subjective probability distribution along a forecasting interval. In this sense, the issuance of predictions along an
interval should not be seen as an option completely distinct from reporting a point prediction; rather, forecasting intervals can be interpreted as having point predictions nested within a model that also accounts for uncertainty.

There have been no published analyses of whether any firms have utilized a similar forecasting process to that used in the SPF survey. However, many aspects of this prediction method make it an attractive option when evaluating the future earnings potential of corporations as well. The probabilistic interval presents a straightforward way for companies to express the degree of uncertainty with which they are making their forecast. This would vastly reduce the possibility of earnings surprises, since any deviation from the most highly weighted section of the forecasting interval is acknowledged to be unlikely, but still possible. Furthermore, the SPF prediction method may be able to avoid one of the most common criticisms of range forecasts – that clients or the general public do not know how to handle range predictions and need a point prediction in order to understand the forecast. As Engelberg, Manski and Williams show, point predictions can be derived from measures of central tendency of the range forecasts, with only minimal added assumptions. Therefore, the benefits of applying the SPF forecasting method to corporations would not supersede the attractive qualities of the point predictions that are currently used by the majority of companies.

V. Applications of Alternate Predictions Methods to Internal Corporate Forecasting

A version of the forecasting method used in the SPF survey can be tailored to suit the corporate environment, providing a more comprehensive projection method than those currently used. By establishing upper and lower bounds, as well as incorporating both firm-specific and macroeconomic uncertainty, forecasts of corporate performance can be made using a subjective
probability distribution placed along an interval. Additionally, a more nuanced forecasting method could cause changes to the status quo incentive structure, encouraging more optimal behavior by corporations and their managers. The steps of this procedure will now be outlined, with an emphasis on firm-specific elements to which the procedure can be applied.

V.A. Establishing Upper and Lower Bounds

One initial major difference between the SPF projection surveys and a model of corporate forecasts is that companies can often place upper and lower bounds on their projected performance. As a result, there are certain situations in which the forecasting interval in this model may be bounded from above, below or both.

One scenario that could lead to a well-defined lower bound is if a company has legally enforceable sales contracts with portions of its customer base. For example, suppose that a company has five main, long-standing customers. It is sometimes the case that each of these customers will have a contract specifying a minimum amount of product they must purchase per fiscal quarter. As a means of illustration, say that five main customers have summed obligated purchases of $500 million in the next fiscal quarter. If these sales contracts are legally enforceable, then a definite lower bound of $500 million can be forecasted for the subsequent period.

In addition, some firms, especially in the manufacturing sector, have business models that depend upon goods that take a long time to produce. In this case, the receipt of payments may fall in such a way that a certain amount of revenues has already been pledged for products that will be finished in the next fiscal quarter. For example, The Boeing Company’s products, such as
jets and other complex machinery, often take from many months to several years to produce. In some instances, the revenues from the goods that are currently in production can be automatically slotted into future periods. In this case, these expected revenues from long-term products can be used to construct a lower bound of a forecasting interval.

Finally, corporations that sell their products to government entities also often have predetermined sales amounts. Suppose the company under consideration makes heavy-duty transportation vehicles, such as the tanks and other defense-oriented vehicles made by Oshkosh Corporation. Oshkosh has, in the past, been the recipient of large orders of product from the government in the wake of military surges. If the government has placed an $800 million order of product that will be fulfilled over the next year, Oshkosh could reasonably break this up into $200 million worth of sure revenue per quarter. Therefore, Oshkosh’s formulation of a forecasting interval would be able to place this $200 million into its calculation of a lower bound.

Likewise, there are also occasions in which upper bounds can be placed upon a company’s internal forecasting interval. For example, some companies may have their production capacity limited by a variety of factors, such as manpower or machinery performance. In the absence of hiring additional workers or altering the existing capital stock, production at some companies may be constrained from above. In addition, firms that rely upon the purchase of some raw materials, particularly those that are prohibitively expensive or difficult to acquire, can have their performance limited by the acquisition of sufficient inputs. Furthermore, some industries have production restricted by certain aspects of the regulatory environment, such as pollution limits. In any of these cases, various constraints on performance can be meaningfully incorporated into the forecasting process by using them to place an upper
bound on the subjective probability interval of future performance. Figure 2 in the appendix illustrates an example of a forecasting interval with well-defined lower and upper bounds.

Although these explicit lower and upper bounds cannot always be used to constrain forecasts for every firm, a larger set of corporations can use “soft bounds” as the extreme points of their forecasting interval. The most straightforward way to decide on these “soft bounds” is through analysis of historical trends in firm performance. For example, if a company has not grown their revenues more than four percent year-over-year in the last ten years, it seems reasonable to set this upper limit as a “soft bound” on the forecasting interval. Therefore, if last year’s revenue in the upcoming quarter was $100 million, $104 million can feasibly be placed as a “soft upper bound.” Conversely, if the same company has not shrunk revenues more than ten percent year-over-year in the last 15 years, it likewise seems reasonable to set $90 million as a “soft lower bound.” While these “soft bounds” may be more speculative than the well-defined bounds described previously, they can be quite useful in the forecasting process, as long as they are chosen with the requisite care. Figure 3 in the appendix illustrates an example of a forecasting interval with “soft bounds.”

V.B. Incorporating Firm-Specific Uncertainty

Once any potential upper and lower bounds on the forecasting interval have been established, the forecasting interval should be subdivided and then firm-specific variables can be scrutinized to assign likelihood measures to different segments of this interval. Any sources of uncertainty that could possibly affect the firm directly should be used to develop this subjective probability distribution along the interval. Firm-specific uncertainty cannot be elucidated more
generally since, by definition, these elements are unique to each company. However, some illustrative examples are described below.

On the revenue side, uncertainty of performance can be realized in any number of ways. Many companies are constantly releasing new products, the performance of which they are unsure. Rather than attempting to make a point prediction for the outcome of the introduction of new products, companies can present likely results along a range. Instead of projecting an increase in revenue of $200 million on the margin from a certain product, a firm should express uncertainty by issuing this incremental forecast as a subjective probability distribution along an interval from, say, $100 million to $300 million. This incremental projection can then be incorporated into the firm-wide forecasting interval.

Furthermore, a company with large research and development expenditures, such as a pharmaceutical company, confronts this issue even more acutely. Successful conclusions of these R&D expenditures, although extremely uncertain, can lead to significant revenue windfalls. Vast amounts of research could very easily come to naught; at the same time, successful discoveries and patents can be multi-year boons to firm performance. As a result, companies with large research and development budgets can incorporate the possibility of successes into their forecasting intervals.

Conversely, corporations can also use this interval forecasting method to express any uncertain components that may negatively affect performance. These performance shortfalls could be due to reduced revenues, such as those produced by new regulatory systems. If a financial institution could potentially face limits on the derivative products that they are able to offer to customers, which is a prevalent concern in today’s environment, this uncertainty should
be accounted for in the forecasting process. Regulation that, according to popular consensus, has a fifty percent chance of reaching fruition should have its expected subsequent impact used to reduce firm performance by an analogous fifty percent of product revenue. In a similar vein, those corporations that are under the threat of litigation can use a comparable method to modify their forecasts according to the probability that they perceive their chances to be of losing the lawsuit.

Lastly, for companies that rely upon a small subset of main customers for a significant amount of their business, this concentration of business can sometimes be subject to large amounts of uncertainty. For example, when I was speaking with industry executives, one described a scenario in which one of their biggest customers ran into financial troubles and had to forgo a large amount of planned purchases. These circumstances from this lone customer resulted in a $10 million EBITDA shortfall for the executive’s firm. Although this is an extreme example, similar concentration of business among customers presents a large amount of risk due to a lack of diversification. Therefore, firms with a large percentage of their performance that is correlated with the performance of a small group should probabilistically discount their expectations in case of shortfalls among this customer base.

V.C. Incorporating Macroeconomic Uncertainty

Beyond the uncertainty induced from firm-specific variables, the performance levels of most companies are also impacted by a range of unknown factors in the macroeconomy. The degree to which broad macroeconomic trends impact the performance of companies depends centrally on their business models. For example, a luxury retailer such as Mercedes Benz will
likely be much more affected by an economy-wide recession than a producer of consumer staples such as Johnson & Johnson. Regardless, the performance of most corporations is at least somewhat dependent upon macroeconomic elements; therefore, macroeconomic uncertainty should be incorporated into the internal forecasts of these firms whenever possible.

Uncertainty due to macroeconomic factors can arise simply due to the unknown levels of future economic growth or unemployment. As the popular aphorism says, “a rising tide lifts all boats” – broad trends that depress or bolster the economy as a whole also depress or bolster the individual companies from which the economy is composed. For predictions of macroeconomic trends, any number of sources can be used, such as those released by the Federal Reserve or in the Survey of Professional Forecasters. If a company has a long enough track record to analyze, it can determine the relationship between its performance during various business cycles in the macroeconomy; therefore, it can further modify its interval projection using these macroeconomic predictions.

For example, if historical data suggests that a company has seen 1.5 percent growth for every one percent growth in the broader economy, then it can translate future projections of two percent growth in the economy into three percent further growth for itself. If a firm does not have adequate historical data upon which to determine these relationships, it can determine bounds to place upon the impact of macroeconomic factors – firm performance can be supposed to be either perfectly correlated or perfectly uncorrelated with economy-wide trends. Although this incorporation of macroeconomic uncertainty is imperfect since it is necessarily based upon other projections, acknowledgement of the influence of broader economic factors is important when making internal corporate projections.
This macroeconomic uncertainty can also take the form of industry-specific factors that affect all firms in their industry, such as potential changes in the regulatory environment. Although this form of uncertainty may not be relevant for all industries, for those in which it is relevant, this form of uncertainty can have a significant impact on firm performance. After the recent financial crisis, financial firms have come under scrutiny in regards to some of their products, such as various forms of derivatives or trading techniques. Other industries face similar regulatory uncertainties, including many energy, insurance and healthcare companies. Therefore, when conducting their forecasting processes, these firms should analyze the financial impact that would occur if these products were limited by regulation. After this regulatory impact is weighted by its subjective probability of being instituted, it can be layered on top of the rest of the forecasting interval.

V.D. Disadvantages and Advantages

Before the alternate forecasting model outlined above were to be actually adopted by a company, the full range of disadvantages and advantages vis-à-vis the status quo should be carefully examined. A few examples of potential disadvantages and advantages are discussed below.

The chief disadvantage of implementing a more nuanced internal forecasting process is that companies may deem it to be exceedingly onerous to compute. Since this suggested forecasting process is intentionally so firm-dependent, each company must determine how best to apply it. This requires analysis of customer contracts, customer-specific uncertainties and risks, production capabilities, historical performance, macroeconomic correlations, regulatory
environment uncertainties and more. Collecting all of these data and incorporating them into a forecasting model would be a serious undertaking that some corporations may view as unworthy of the hassle. Furthermore, firms may believe that they have few incentives to conduct or release these more complex forecasts. However, as demonstrated below, several important advantages outweigh these disadvantages.

The formulation of an interval forecast has many practical advantages. For each region along the forecasting interval, provisional plans can be developed that would be followed if actual results fell in that region. These plans can concern any number of issues, including the orders of inputs, capital expansion plans, alterations to the workforce or any other items that can be planned ahead of time. By making a large set of contingency plans, corporations can identify plans of action if any of these possibilities become actuality.

Moreover, an internal forecasting model such as this can also be used to reduce some of the perverse incentives of bonus pay packages that were outlined above. Forecasts in the form of point productions are currently coupled with bonuses based on performance in comparison to these point predictions. In addition, current bonus structures, by emphasizing certain target numbers, often lead to a dynamic in which these targets are constantly spiraling upwards from quarter to quarter and year to year. As a result, this “ratchet effect” incentivizes executive managers to direct firm performance to be as close to this kink in the bonus structure as they can; this behavior was seen in Section III above, when the firm intentionally shut down production after Christmas and didn’t produce any more product for the year. However, with an internal forecasting process that places projections along an interval of uncertainty, incentive bonus structures can be integrated into this interval. For instance, forecasting literature on “proper scoring rules” has analyzed how best to structure an incentive system in order to encourage
individuals to honestly express their probabilistic beliefs. As a result, a smoother incentive structure could mitigate the “ratchet effect” of bonuses and ideally promote long-term firm performance over short-term personal rewards.

The most essential advantage to this alternate prediction method is also the most nebulous – it forces corporations to acknowledge and comprehend the inescapable uncertainty of their business operations. As described above, one executive I spoke with asserted that firms typically “do a forecast and think about all the good things they are doing and that can happen. … They never spend five seconds thinking about all the bad things that can happen.” However, this prediction method forces corporations to confront these bad things and also provides an opportunity to create contingency plans in case these unfortunate scenarios come to bear. Inconvenience seems a reasonable price to pay for these advantages of a more sophisticated internal forecasting method.

VI. Conclusion

Accurate projection of future sales and profit by corporations often appears as impracticable as any other of the ubiquitous attempts to predict the future. As effectively summed up by one of the executives I spoke with, “Forecasts are only as good as when you put them together. A month later there’s so many things that change that you have got to do another one.” However, this does not necessarily suggest that the forecasting process should be cast aside as useless. On the contrary, a more robust method of forecasting that permits the expression of uncertainty is preferred, such as the one delineated above. By acknowledging ignorance and the presence of a multitude of unknown factors, the forecasting process formulated above improves the typical corporate forecasting method of issuing point predictions.
Admittedly, there remain many factors of this topic that need to be analyzed further and extended. First off, the internal forecasting processes of additional firms should be examined to see if there are alternate prediction methods currently being used to account for uncertainty. If such models exist, an extensive time-series analysis of its accuracy, such as those that have already been done on typical point predictions, would be tremendously helpful. Further investigation into ways in which corporations attempt to account for uncertainty in their internal forecasting processes could also be used to inform the above model.

Furthermore, additional discussions with executive managers regarding the inadequacies of the current system and the feasibility of proposed alternatives, such as the model above, would be extremely useful. By pinpointing the existing problems and opening a dialogue about ways in which they could potentially be eliminated, a more fulsome and practical model of internal forecasting could surely be developed. Once a reasonable method has been fully formulated, it could be applied by firms to future performance to determine the model’s accuracy. In addition, a new model’s advantages and disadvantages vis-à-vis the status quo process could be more meaningfully analyzed after it has actually been applied. It may be the case that corporations find that an alternative forecasting process is not worth the associated costs, and that, while certainly imperfect, the existing process of internal forecasting is good enough.

The discussion with corporate executives summarized in Section III above indicates that internal corporate forecasting has further downfalls beyond failing to incorporate uncertainty. For example, the executives largely abandon their “bottom-up” forecasts if they differ from the “top-down” projection expectations of the Board of Directors and banks. Further examination could delve into whether there is a preferable alternative to this interaction. In addition, Section III also illustrates how the bonus pay packages of executives provide perverse incentives to the
management team, encouraging them to bypass excessive profits for mild year-over-year profits. These policies very well may cause future performance to be limited; this effect should be more closely examined. Likewise, further analysis should be conducted into whether an alternative corporate incentive structure that provides a smoother bonus structure for executives can be developed to encourage both short- and long-term growth.

Regardless of the extent to which the forecasting method of firms is actually revised based on these suggestions, anything that encourages corporate managers to think more meaningfully about the uncertainty of their business models and to accept the inevitable impact of unknown factors can be of immense value. Just as surely as history is rife with attempts to predict the future, it is rife with evidence of the dangers of insufficient intellectual honesty and inadequate acknowledgement of uncertainty. No one knows everything and no one can predict the future with perfect accuracy – the sooner this unavoidable fact is incorporated into methods of corporate forecasting, the better.
Appendices

**Figure 1:** An example of an SPF forecasting interval (numbers represent percentage growth of GDP).

![Figure 1: An example of an SPF forecasting interval](image)

**Figure 2:** An example of a forecasting interval for a firm with well-defined upper and lower bounds (numbers represent millions in revenue).

![Figure 2: An example of a forecasting interval for a firm with well-defined upper and lower bounds](image)

**Figure 3:** An example of a forecasting interval for a firm with “soft bounds” (numbers represent millions in revenue).

![Figure 3: An example of a forecasting interval for a firm with “soft bounds”](image)
Works Cited


