Chapter 6

Financial Forecasting with Judgment

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SUMMARY

Judgment plays a prominent role in financial forecasting. This chapter reviews previous work on judgmental forecasting of critical financial variables like earnings, exchange rates, stock prices and interest rates. Forecasting accuracy of judgmental point, categorical and probability forecasts are examined with a special focus on the effects of expertise, forecast horizon, task format and contextual information. It is concluded that future research into the needs of both providers and users of judgmental forecasts is crucial for the dissemination of financial knowledge and uncertainty. Within this framework, it is argued that the issues of information utilization, use of heuristics and resultant biases, combining of judgmental forecasts, and investigations of the effects of feedback and different elicitation formats on forecasting accuracy remain important directions for future financial forecasting research.

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6.1 INTRODUCTION

Financial forecasting entails predicting future values of stock and commodity prices, exchange rates, earnings, interest rates, volatilities and other variables critical for making financial decisions. Such forecasts are made and used extensively by security analysts, management and lending institutions, as well as other players in financial markets.

The richness and complexity of financial domains require that the forecasters rely primarily on judgment in making their predictions (Armstrong, 1983; Batchelor & Dua, 1990). Depending on contextual factors, financial forecasts could be based solely on judgment, judgment could be used to adjust the forecasts given by quantitative techniques or, at the very least, judgment could be used in deciding which technique to employ, which model to select, and which information to include. Uncertainties prevailing in financial markets, the resultant widespread use and apparent decision consequences of forecasts make finance an ideal application domain for exploring the use of judgment in forecasting.

Finance theory has initially shown some skepticism as to the forecastability of financial variables, as expressed via the "efficient market hypothesis". This hypothesis suggests that, in an efficient market, a set of information is immediately and fully reflected in market prices (making prices unpredictable given that information set). The particular information set determines the form of efficiency. That is, a market would be weak-form efficient if prices reflected only past prices, and would be semi-strong-form efficient if prices also reflected all publicly available information (e.g. balance sheet, income statement information). In its strong form, this hypothesis regards the changes in asset prices as approximately random because of market efficiency, which means that prices would absorb and reflect all available information (including insider information) rapidly and accurately (Fama, 1970; Granger, 1992). Recent results and research interest in this area appear to signal a fading of this paradigm (De Bondt, 1992, 1993; Mills, 1996) in favor of the recognition of usefulness and indispensability of forecasts in financial domains. In fact, financial forecasts have been attracting research attention since the 1930s. Cowles (1933) reports one of the earliest attempts to evaluate the judgmental forecasts of financial experts. Studying stock recommendations provided by 16 financial services and 24 financial publications for the 1928–1932 period, Cowles (1933) sketches a dim picture of forecasting performance. This profile is reproduced in a follow-up study 10 years later (Cowles, 1944). Since then, a considerable body of research has accumulated on the accuracy of judgmental financial forecasts, with promising findings on forecast quality. Given the unequivocal importance of such empirical accuracy studies for forecasting practice (Fildes & Makridakis, 1995), this chapter aims to review the pertinent work in financial forecasting. In so doing, it attempts to delineate future research directions to explore further the role of judgment in this domain.

Judgmental predictions can assume the form of point forecasts (e.g. value of dollar/mark exchange rate), categorical forecasts (e.g. increase vs. no increase in stock price), or probabilistic forecasts (e.g. probability of an interest rate increase, probability of earnings falling by more than 3%). Judgmental forecasting studies using point/categorical predictions are summarized next, followed by studies requesting probabilistic predictions.

6.2 POINT AND CATEGORICAL FORECASTS

Within financial forecasting research, there has been a strong emphasis on judgmental point forecasts of earnings given by security analysts (see Brown, 1993, for an extensive review). This focus is mainly due to the significance of earnings forecasts in firm-valuation processes (Fried & Givoly, 1982), especially their role in providing information for future cash flows (Finger, 1994). Relatedly, it is suggested that earnings forecasts are immediately incorporated into the stock prices (Elton, Gruber & Gultekin, 1981), and that analysts' earnings forecasts are useful for stock recommendation decisions (Bandyopadhyay, Brown & Richardson, 1995). Guerard & Lawrence (1992) also demonstrate that the security analysts' forecasts "... add value to the portfolio construction process ... by enhancing portfolio returns" (p. 153). We next review the studies focusing on forecasts of earnings.

6.2.1 Earnings Forecasts

An important branch of earnings research involves comparisons of analysts' judgmental forecasts with the predictions given by time-series models. In a remarkably comprehensive study, Brown et al. (1987)

compared the relative accuracy of earnings forecasts reported by security analysts with those given by three univariate Box–Jenkins models for 233 firms over 20 quarters, and for 212 firms over four quarters. Security analyst forecasts proved to be more accurate than each of the time-series models for all forecast horizon and fiscal quarter combinations analyzed. Their findings were also robust to method of handling outliers, definition of forecast error, and the nature of tests (parametric vs. non-parametric) employed. Brown & Rozeff (1978), Fried & Givoly (1982), Armstrong (1983), Collins, Hopwood & McKeown (1984), O'Brien (1988), Hopwood & McKeown (1990) and Branson, Lorek & Pagach (1995) have similarly provided unanimous empirical support for the higher accuracy of security analysts' forecasts as compared with time-series models.

In an interesting extension of this research, Affleck-Graves, Davis & Mendenhall (1990) compared earnings forecasts of analysts with those of students and time-series models. They found that students possessing the same historical information as time-series models performed as accurately as the sophisticated models. Analysts who had access to a broader information set, on the other hand, outperformed both students and time-series models. These results were interpreted as suggesting that while the students could effectively utilize their limited information to render judgmental forecasts with an accuracy comparable to the models, the analysts' superior performance primarily stemmed from their information advantage.

Several studies investigated sources of analyst superiority in detail (Fried & Givoly, 1982; Brown et al., 1987; Brown, Richardson & Schwager, 1987; Kross, Ro & Schroeder, 1990). Brown (1993) summarizes this research and concludes by attributing the analysts' performance edge to their "... private information acquisition activities, which may enable them to better distinguish between permanent, transitory and price-irrelevant earnings shocks" (p. 301). This argument also complements the finding that analysts produce better forecasts of stock prices given their possession of firm-specific private information (Dimson & Marsh, 1984; Elton, Gruber & Grossman, 1986; Brown, Richardson & Trzcinka, 1991). In addition to their information advantage, research shows that analysts also have a timing advantage, i.e. they report their forecasts after model forecasts are issued (Fried & Givoly, 1982; Brown et al., 1987). Taken together, these findings confirm Foster's (1986) predication that higher accuracy of judgmental forecasts stems from analysts' ability to: (a) immediately adjust to structural changes in the forecasting environment; (b) consolidate information from diverse sources; and (c) continuously revise forecasts upon receipt of new information. Importance of these factors in ascertaining the superior accuracy of judgmental forecasts is also pronounced in research focusing on management forecasts of earnings.

Management forecasts differ from analyst forecasts in that they are provided by a limited number of firms and are mostly for one-year-ahead earnings only (Foster, 1986). It has been noted that management provides financial forecasts to rectify the deceptive expectations of analysts and other players in financial markets (Ajinkya & Gift, 1984; Barry & Jennings, 1992) but not all management forecasts are perceived as being equally credible (Jennings, 1987). In a detailed analysis of previous work on earnings forecasts, Armstrong (1983) compared judgmental forecasting performances of managers with analysts, finding a higher accuracy for management forecasts. One possible explanation was provided by management's conceivable impact on performance and potential influence on reported earnings. The other important determinant was believed to be management's access to more (and recent) information, especially internal information. These results again stress the comparative advantage of judgmental forecasts in providing flexibility to continuously accommodate the plethora of incoming information, leading to superior forecasting accuracy in information-rich domains like finance.

Even though the judgmental forecasts of earnings are found to be quite accurate, they naturally are not error-proof. Elton, Gruber & Gultekin (1984) investigated potential causes of analysts' forecast errors. They found that the errors could be attributed to the difficulties in forecasting relative performances of individual industries, in addition to the complexities in forecasting individual company performances (relative to industry averages). That is, the environmental uncertainties were important constituents of forecasting difficulty. In spite of the perceived difficulties, however, analysts' earnings forecasts were found to be overly optimistic (Fried & Givoly, 1982; O'Brien, 1988; Ali, Klein & Rosenfeld, 1992). It is claimed that the independent analysts over-estimate earnings more than the company analysts (Basi, Carey & Twark, 1976) and analysts' forecasts are more optimistic when making negative stock recommendations (Francis & Philbrick, 1993). Interestingly, Brown (1996) argues that the optimism bias observed in previous studies has switched to one of pessimism in recent years. Brown contends that this shift may in turn be mirroring the changing institutional pressures from managers. Overall, these findings corroborate Schipper's (1991) work showing that motivational factors may induce intentional biases in forecasts.

Biases observed in analysts' forecasts may be viewed as signalling a potential for further improvements in performance (Wright, 1980). Combining of judgmental and statistical forecasts provides one such avenue. Conroy & Harris (1987), Guerard (1987), Guerard & Beidleman (1987), Newbold, Zumwalt & Kannan (1987), Lobo & Nair (1990, 1991), Lobo (1991) and Guerard, Stone & Hansen (1992) have developed such "combined" models to predict earnings, demonstrating improved forecasting accuracy as a result of pooling. It is argued that combining mitigates unreasonable assumptions, hence evading large errors (Armstrong, 1986). Forecast errors and biases may also be improved via focused training and feedback. As will be addressed later in the chapter, these issues have not received much research attention in the earnings literature.

In summary, voluminous research on earnings has shown superior accuracy of judgmental forecasts in this field, with potential improvements accruing from combinations with statistical forecasts. Judgmental forecasts of other financial variables have not enjoyed as much of a research exposure. We next turn to the limited number of studies involving point or categorical forecasts of currencies, interest rates and bankruptcies.

6.2.2 Currency, Interest Rate and Bankruptcy Predictions

Judgmental forecasts of currencies, interest rates and bankruptcies received scant research attention. With regard to currencies, the analytic hierarchy process (AHP) attracted interest as a potential judgmental forecasting technique (Wolfe & Flores, 1990; Saaty & Vargas, 1991), in spite of apparent concerns for its use in this context (Salo & Bunn, 1995; Belton & Goodwin, 1996) (for details of the AHP and the role of judgment in this framework, see Saaty, 1990). Blair et al. (1987) reported an example of using the AHP framework to produce forecasts of Japanese Yen/US dollar exchange rates that incorporate expert judgment. Similarly, Ulengin & Ulengin (1994) focused on the US dollar/Deutschmark exchange rate forecasts, finding that the accuracy of AHP forecasts driven by expert judgment are comparable to the forecasting accuracy of powerful statistical models.

Another line of research examined the accuracy of currency forecasts issued by banks (Pollock & Wilkie, 1996; Pollock, Wilkie & Pollock, 1996). Stressing that the issued forecasts are predominated by judgment, this work revealed differing levels of accuracy depending on the particular exchange rate under consideration (Pollock, Wilkie & Pollock, 1996). Discrepancies observed in forecasting accuracy were attributed to the differential volatilities of specific currencies, as well as to the forecasters' selective over-reaction to news events taking place in the relevant period (Pollock & Wilkie, 1996).

Research on interest rates investigated experts' and non-experts' judgmental forecasts. In particular, Kolb & Stekler (1996) analyzed individual analysts' forecasts for short- and long-term interest rates. It was concluded that: (a) although no significant differences were found among analysts for short-term rates, there were performance differences for the long term; (b) there was a general agreement among the analysts concerning the direction of movement of short- and long-term rates; and (c) few analysts' forecasts outperformed the naive no-change forecasts. Alternatively, Angus-Leppan & Fatseas (1986) examined undergraduate students' short-term interest rate forecasts. They noted that, for this group of inexperienced participants, the knowledge of the series did not improve accuracy, and the judgmental forecasts performed little worse than the best-performing statistical model.

More encouraging results concerning forecasting accuracy of experts were obtained with bankruptcy predictions. In particular, Libby (1975) asked bank loan officers to make predictions of failure/non-failure for 60 firms. Given a limited number of accounting ratios, loan officers were requested to (a) predict whether each firm would fail or not, and (b) rate their confidence in their predictions on a three-point scale. Loan officers' predictions were found to be consistent and reliable; with an average of 74% correct predictions exceeding the expected average of 51% correct.

In sum, research on financial forecasting has provided mostly promising results on the accuracy of judgmental forecasts presented in point or categorical form. It is worth noting that, unlike earnings research, studies on judgmental forecasts of other financial variables have been quite limited. Hence, further work explicating diverse financial variables is required to draw firmer conclusions on financial experts' judgmental forecasting performances.

6.3 PROBABILISTIC FORECASTS

In addition to point and categorical predictions, judgmental forecasts can also be expressed via subjective probabilities. Such probabilistic forecasts serve to communicate the forecaster's degrees of belief in the occurrences of relevant future outcomes. Probabilistic judgments are viewed to be more informative than categorical or point forecasts, since they reveal the uncertainty inherent in the forecasting situation (Murphy & Winkler, 1992). Another advantage of judgmental probability forecasts is that they allow the users/decision-makers to make the relevant tradeoffs using their personal values (Raiffa, 1968; Yates et al., 1996). Probabilistic forecasts are also useful for detecting the relative strengths and weaknesses of judgment in forecasting, so that common tendencies like over-reaction, over-forecasting or over-confidence could be discerned (Wilkie & Pollock, 1996).

6.3.1 Forecast Horizon, Task Format and Expertise

Judgmental probability forecasting of financial variables has attracted considerable research attention. In one of the earlier studies, Bartos (1969) asked three security analysts to assess probability distributions for the closing prices of five securities for forecast horizons of 1, 3 and 6 months. Analysts were requested to perform this task once a month for a total of 6 months. Uniform distribution (representing a no-knowledge forecaster who assigns equal probabilities to all possible outcomes) was found to consistently outperform the analysts' distributions.

Stael von Holstein (1972) analyzed multiple-interval probabilistic forecasts given for the closing prices of 12 stocks with a forecast horizon of 2 weeks. A total of 72 participants (10 stock-market experts, 10 bankers, 11 statisticians, 13 business teachers, and 28 management students) provided these forecasts for each of the 10 sessions. Overall, statisticians and stock market experts performed best, followed by business students, business teachers and bankers. Only three participants were found to perform better than the uniform distribution.

Mediocre performance of forecasters (relative to the uniform distribution) found in both Bartos' (1969) and Stael von Holstein's (1972) work was viewed as being an artifact of properties of the tasks employed in these studies. In particular, Winkler (1972, 1973) argued that a precise definition of the variable being forecast (i.e. closing price) was required to avoid multiple interpretations that could lead to confusion on the part of the forecasters as to what they are actually predicting. In a similar vein, Stael von Holstein (1972) attributed the findings to the choice of forecast horizons, arguing that the forecasters could perform better if they made predictions for ecologically valid lead times (i.e. the forecast horizons they regularly use). These assertions were supported by Kabus (1976), who reported a study where seven banking executives made multiple-interval forecasts for interest rates (for their usual forecasting horizon of 3 months) and attached probabilities to their intervals. Executives' probability forecasts were found to be quite accurate, and their forecasted direction of change was always correct. Further support for the importance of forecast horizon in mediating the effects of expertise came from research on stock price predictions in emerging markets. Specifically, it has been found that the performance of experts (professional portfolio managers) deteriorated relative to semi-experts (other banking professionals) for longer forecast horizons less frequently used in emerging markets, even though the experts demonstrated a clear superiority for shorter (more ecologically valid) lead times (Muradoglu & Önkal, 1994).

Studies have also shown that predicting stock prices remains a difficult task, even when probabilities are used to convey the uncertainties confronting forecasters. In an exploratory study, Lichtenstein & Fischhoff (1977) asked students to make directional probabilistic forecasts for the closing prices of 12 stocks. In particular, the subjects were asked (a) to predict whether the stock price of 1 month later would be higher or lower than the current price, and (2) to assess a probability (between 0.5 and 1.0) that the predicted direction would indeed occur. Even though only 47% of predictions turned out to be correct, students were quite over-confident, reporting a mean probability of 0.65 for their fallible forecasts.

Comparable results were reported by Yates, McDaniel & Brown (1991). These authors asked undergraduate and graduate finance students (labeled as "novices" and "semi-experts", respectively) to make multiple-interval probabilistic forecasts for stock prices and earnings. Stock price forecasts were found to be inaccurate in general, with novices performing better than semi-experts. Similar findings were recorded for earnings forecasts, leading researchers to attribute most of the observed difficulties in forecasting to market efficiency. Extending Yates, McDaniel & Brown's (1991) work to an emerging and inefficient stock market setting, Önkal & Muradoglu (1994) analyzed probabilistic forecasts of only stock prices. Confirming previous work, students with previous trading experience (so-called "semi-experts") were found to perform worse than students with no experience in active trading (so-called "novices"). Persistence of such an "inverse-expertise effect" in an emerging market was explained by the over-confidence of semi-experts, as displayed by their recurrent use of extreme probabilities.

There were two principal limitations to Yates, McDaniel & Brown (1991) and Önkal & Muradoglu's (1994) work: (a) both studies used students (either graduate students or students who have previously made investment decisions) as semi-experts; and (b) both studies only employed multiple-interval task formats. Addressing both limitations, Önkal & Muradoglu (1996) investigated the effects of different task formats on the accuracy of probabilistic forecasts given by recognized experts (i.e. portfolio managers), semi-experts (other banking professionals) and novices (students). Results no longer projected a significant inverse-expertise effect on the accuracy of judgmental probability forecasts of stock prices when actual experts were used. Furthermore, findings confirmed Ronis & Yates' (1987) assertion that the choice of task format could have a direct impact on probability judgment accuracy.

6.3.2 Contextual Information

The amount of contextual information provided to the forecasters may constitute another important determinant of probabilistic forecasting performance. For example, it could be argued that limited information may direct attention to only the appropriate cues, hence improving performance. Pursuing this argument in an interesting extension of previous work, Whitecotton (1996) asked financial analysts, MBA and undergraduate students to make probabilistic forecasts for earnings. Historical data from actual firms were used; however, unlike previous research, firm names and actual time frames were not provided. For each of the 16 companies, subjects were given: (a) current period's earnings; (b) financial information (in terms of six ratios) for the previous 2 years; (c) average change in earnings over the previous four periods; and (d) expectations for next period's earnings based on the previous four-period trend. Participants were requested to assess the probability (between 0 and 1.0) that next period's earnings would be more than what is indicated by trend. Subjects in the decision-aid condition also received probabilities of future earnings exceeding trend expectations, with the qualifier that these aid probabilities would be correct for 12 of the 16 cases. Results showed a higher accuracy for analysts and MBA students in comparison to undergraduates, with decision aid improving accuracy for all groups. However, the analysts were found to be more biased than the other two student groups. This was ascribed to analysts' knowledge of "real-world" base rates, which were not depicted in this particular study (which fixed the base rate at 50%).

Whitecotton (1996) attributed the discrepancies between her findings on earnings forecasts and the inverse-expertise results of Yates, McDaniel & Brown (1991) to the differences in accessibility of information. In particular, subjects were constrained to using a "prepackaged" information set in the Whitecotton study, while the participants of the Yates, McDaniel & Brown study could utilize an unconstrained set of information. It was argued that the presentation of selectively screened information precluded the experts from using irrelevant and unpredictive cues that usually lead to poor accuracy and excess scatter in probabilities. Thus, it was maintained that experts could better exhibit their performance superiority if given a constrained information set. In light of our previous discussion on task format effects, it is worth noting that the differences in findings could also be attributed to the diverse task structures employed by researchers. In particular, Whitecotton asked the subjects to assess a probability (between 0 and 1.0) that next period's earnings would be more than what is indicated by trend. Yates, McDaniel & Brown, on the other hand, asked the participants to make forecasts by assigning probabilities to the given intervals specifying potential earnings changes. As discussed earlier, it may be argued that such fundamental differences in elicitation formats could easily yield differential results on accuracies of probability judgments given by participants with differing levels of expertise.

Concern with contextual information effects has also sparked research interest in constructed time series (O'Connor & Lawrence, 1989; Bolger & Harvey, 1993; Webby & O'Connor, 1996). Applications of this research stream to financial forecasting have mainly involved judgmental currency forecasts (Pollock & Wilkie, 1992, 1993; Wilkie & Pollock, 1994; Wilkie, Önkal & Pollock, 1996). Revealing no contextual information (i.e. the particular exchange rates to forecast and the time frame for the given series), this line of work attempted to explore currency professionals' time series extrapolative judgment within a probability forecasting framework. In particular, these studies examined the accuracy of probabilistic directional forecasts obtained by first asking the subjects to indicate whether the exchange rate would go up or not, followed by requesting a probability conveying the participant's degree of belief in the occurrence of the indicated direction. When confronted with this task structure, currency professionals were found to perform better than a random-walk forecaster (i.e. a forecaster who assigns a probability of 0.5 to an arbitrary direction each time), in spite of their over-confidence (Wilkie & Pollock, 1994). An extension of this work showed that experts' probabilistic forecasts were still superior to those of non-experts, even under conditions of equal access to merely time-series information (Wilkie, Önkal & Pollock, 1996).

In summary, research on probabilistic forecasting has primarily examined the effects of task structure, forecast horizon, contextual information and expertise with applications to forecasts of earnings, interest rates, stock prices and exchange rates. This research has also implied that financial forecasts may be heavily influenced by judgmental heuristics and biases, an issue we turn to next.

6.4 HEURISTICS, BIASES AND INFORMATION USE

It may be argued that judgmental heuristics and resultant biases prevail in financial forecasting, as they do in all domains involving judgment under uncertainty (Tversky & Kahneman, 1974). The competitive, time-pressured and stressful nature of financial settings may serve to facilitate the use of judgmental heuristics, leading to biases in forecasts. Furthermore, the high volatilities enabling large gains and losses in financial markets may make judgmental biases especially prevalent in these contexts (Wilkie, Tuohy & Pollock, 1993).

In an exploratory study of these issues, Johnson (1983) asked students taking an advanced accounting course to make probability forecasts for potential bankruptcy facing 12 companies. Subjects were presented with (a) base-rate probabilities giving the frequency of bankruptcies observed for the particular industry under consideration, and (b) a financial profile of each company, including total assets and four financial ratios. Probability forecasts were found to be insensitive to base rates when the financial profile of a company was viewed as being representative of either bankruptcy or no-bankruptcy. When the financial profile was not judged to be directly representative, base rates were not ignored.

However, even in cases where base rates were taken into consideration, company-specific financial data still carried the most weight in final judgments. Emphasizing the importance of base-rate information for evaluating default risks and making loan decisions, Johnson (1983) voiced the need for detailed examinations of experts' (e.g. commercial loan analysts') use of representativeness and other heuristics, along with their financial consequences. Similar concerns were raised by Affleck-Graves, Davis & Mendenhall (1990), who attributed biases in analysts' earnings forecasts to their use of judgmental heuristics.

Among judgmental biases, the hindsight bias (i.e. individuals' tendency to exaggerate what could have been expected in foresight) has received a special attention in financial forecasting. Fischhoff (1982) has maintained that even when all the forecasts and the actual outcomes are undeniably present, financial forecasters still may display a tendency to provide causal interpretations for the outcomes: "... market analysts have an explanation for every change in price, whether purposeful or not. Some explanations ... are inconsistent; others seem to deny the possibility of any random component ... One of my favorite contrasts is that when the market rises following good economic news, it is said to be responding to the news; if it falls, that is explained by saying that the good news had already been discounted" (p. 345). Persistence of hindsight bias in earnings forecasts is also demonstrated by Camerer, Loewenstein & Weber (1989), who found this bias to persevere even in the face of high monetary incentives.

As a potential remedy to the biases discussed above, Silverman (1992) suggested a critiquing system that aims to aid a forecaster in recognizing judgmental biases in addition to signalling errors due to missing knowledge. Listing reasons that support or contradict the reported forecasts is also proposed as a method for detecting biases. In particular, Moser (1989) asked investors to make judgmental forecasts for Apple Computer Inc.'s earnings increasing by at least 5% (or not increasing by at least 5%) over a 1-year forecast horizon. Investors were asked to report their probability forecasts after listing supporting or contradicting reasons, and it was found that the order made a difference. In particular, investors generating supporting reasons first assigned higher probabilities, while those generating contradicting reasons first assigned lower probabilities. Investors' forecasts were claimed to be influenced by "output interference", i.e. investors' initial thoughts inhibited later thoughts (Hoch, 1984). Results were similar for those investors, who were only given the company name, vs. the remaining investors, who were given financial statement information in addition to the company name. It was concluded that the difficult and uncertain nature of forecasting in investment settings may lead forecasters to rely heavily on available (albeit questionable) information and arguments. These findings may have significant implications for investment decision-making and financial markets. As argued by Moser (1989), if the only available information (or majority of information) is coming from disproportionate media exposure or sensational and exaggerated news items, then a critical potential for over-reaction may be conjectured to exist. Similarly, De Bondt & Thaler (1985, 1987, 1989, 1990) suggested that stock prices may be influenced by non-expert investors' over-reaction to unexpected news items. Rooted in the heuristics and biases literature, this "over-reaction hypothesis" emphasized decision makers' misperceptions of future prices.

Other researchers argued that the market reaction to many types of financial information (e.g. equity offerings, share repurchases, earnings announcements, mergers, etc.) can be characterized by under-reaction (Abarbanell & Bernard, 1992; Ikenberry, Lakonishok & Vermaelen, 1995; Maines & Hand, 1996). A potential explanation reconciling the suggested over- and under-reaction effects is provided via saliency of information. In particular, Andreassen (1990) suggested that new information like news reports affects judgmental forecasts via its relative salience, implying that perceptions and use of news items could account for the anomalies observed in financial markets.

Studying financial analysts' information utilization is imperative for enhancing our understanding of judgmental forecasting in this domain (Slovic, 1969, 1972). Accordingly, several studies investigated forecasters' use of information in bankruptcy prediction and credit evaluation tasks within the context of linear modeling (Shepanski, 1983; Whitred & Zimmer, 1985), yielding preliminary support for experts' identification and use of extra-model information (Chalos, 1985; Casey & Selling, 1986). This finding receives full confirmation from earnings research, which argues that security analysts outperform statistical models since their forecasts contain non-time series information such as management forecasts (Brown, et al., 1987), other firms' earnings reports (Foster, 1981), ongoing strikes (Brown & Zmijewski, 1987), and other analysts' forecasts (Brown, Richardson & Schwager, 1987). An important consideration affecting the information utilization of analysts may involve perceived pressures of accuracy. In particular, Foster (1986) reports that security analysts: (a) use other analysts' forecast revisions as valuable information in constructing their judgmental forecasts; and (b) attach high penalties to deviating from consensus. Perceived pressures to conform to consensus forecasts may be triggering motivational biases that could lead to distorted (but "harmonized") forecasts. Combining forecasts may serve to relieve these pressures, enabling a more representative forecasting performance.

6.5 COMBINING FORECASTS

Combining of judgmental forecasts remains an important research arena (Mentzer & Cox, 1984; Dalrymple, 1987; Armstrong, 1989; Clemen, 1989; Stickel, 1993; Maines, 1996), its exigency accentuated by the prevalent use of combined forecasts as inputs to business planning models (Menezes & Bunn, 1993). The appeal of combining forecasts comes from the notion of basing forecasts on broadened information sets (Granger, 1989; Lobo & Nair, 1990), so that the combined forecasts offer better surrogates for market expectations of financial variables such as earnings, stock prices and interest rates. In fact, Lobo & Nair (1990) defend combined models by making an analogy to portfolio theory: "The method of combining forecasts to form a composite is efficient in the same way that combining securities in a portfolio to diversify unsystematic risk is efficient" (p. 447).

Several studies investigated comparative forecasting accuracy of combined judgmental forecasts. In earnings research, Jacquillat & Grandin (1994) analyzed analysts' forecasts for 150 French companies from 1986 to 1994. They found better performance with combined forecasts and suggested that future work needs to analyze the long-term performance of combined earnings forecasts in different markets with varying volatilities. Working with exchange rate forecasts, MacDonald & Marsh (1994) concluded that combining removes systematic biases in forecasts and should be studied over extended horizons. In a related study, Fan, Lau & Leung (1996) proposed methods for combining ordinal forecasts of stock market movement (i.e. bullish, bearish or sluggish states of the market). Using the highly volatile Hong Kong stock market, the authors showed that the combined forecasts of weekly market movement outperformed the individual forecasts. Relative accuracy of combined forecasts reported by previous work has led McNees (1992) to suggest that forecasters and users need to focus on the differences between individual forecasts and the combined forecast, so that they can learn from the reasons behind the observed discrepancies.

Combining probabilistic forecasts presents an important yet neglected research problem (see Genest & Zidek, 1986; Clemen, Murphy & Winkler, 1995). In a distinctive application to judgmental financial forecasting, Stael von Holstein (1972) demonstrated that combined probability forecasts via aggregation rules assigning higher weights to good performers worked better in forecasting stock prices.

Revising statistical forecasts with judgment constitutes an extension of research on combining forecasts that has also been mostly overlooked. In a notable exception, Wolfe & Flores (1990) showed that judgmental adjustments to statistical forecasts of earnings lead to improved accuracy. It may be argued that judgmental revisions are essential, given the frequent need to accommodate structural changes and adjust for the omitted variables (Bunn & Salo, 1996). Further research on this issue is clearly warranted, especially considering Fildes & Hastings' (1994) report on 84% of the interviewed forecasters stressing the importance of modifying forecasts with judgment.

6.6 CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

Volatile characteristics of financial markets tailor a critical role for judgment in financial forecasting. In fact, Brown (1996) maintains that the investment community over-emphasizes forecasts by time-series models at the expense of analysts' forecasts, whereas it could construct refined trading rules by focusing on how the judgmental forecasts are formulated. Clearly, experience in balancing data and judgment is a fundamental asset in financial markets, and the primary advantage of using judgmental forecasts lies in the incorporation of such experience (McHugh & Sparkes, 1993; Bunn, 1994; Winklhofer, Diamantopoulos & Witt, 1996).

Studies reviewed in this chapter have addressed different aspects of judgmental forecasting research within the realm of financial applications. While the variations in findings may be reflective of the different characteristics of financial variables being predicted and the particular task structures utilized, it can be deduced that firmer conclusions necessitate more comparative studies and detailed investigations of judgmental forecasting performance under varying market conditions (e.g. bull vs. bear markets) and in different (emerging vs. developed) financial markets. To be effective, such research would have to involve studying professional experts in their customary financial settings (Bolger & Wright, 1993, 1994; Wright et al., 1994).

Gaining an in-depth understanding of the cognitive processes that experts use in judgmental forecasting is essential for designing effective forecast support systems for financial decision-makers (Goodwin & Wright, 1993; Zmijewski, 1993). Relatedly, studying the cues used in judgmental financial forecasting constitutes a fertile area for future work. In constructing their forecasts, financial analysts typically utilize a wide range of qualitative and quantitative information sources (such as reports, discussions, macro-economic forecasts, etc.), with implicit or explicit weights assigned to these sources varying on the basis of changing situational factors (Firth, 1975; Foster, 1986). Capturing financial experts' skills in recognizing and flexibly using significant information constitutes a research goal vital to the development of support systems in this domain (Goodwin & Wright, 1991).

In an insightful study, De Bondt (1993) notes that, while most individuals appear to predict prices by extrapolating from past trends, forecasts of experts (assumed to portray rational investors) are radically different. He maintains that potential differences in knowledge structures or beliefs of investors stemming mainly from experience could account for the observed forecasting differences. Probabilistic forecasts provide a means for exploring this issue further. In particular, it is argued that the construction of a judgmental probability forecast requires the formation of a belief (i.e. belief-assessment phase), followed by the assessment of a probability qualifying the belief (i.e. probability-assessment phase) (Smith, Benson & Curley, 1991; Curley & Benson, 1994; Benson, Curley & Smith, 1995; Curley et al., 1995). It follows that the "goodness" of forecasts is a consequence of forecaster's performance in both stages. Within this framework, efforts to improve judgmental probability forecasts in the financial domain would necessarily involve further research into the belief-assessment phase, in addition to research on procedures for improving the final probability assessments. Such research would enhance our understanding of the processes used by financial experts in constructing forecasts, as well as the prevailing roles of reasoning and judgment in these processes.

Another promising research agenda involves studying the effects of feedback on financial forecasting performance. Feedback is critical for ensuring learnability and enhancing expertise in any domain (Bolger &

Wright, 1994), its impact highlighted especially in domains as inherently difficult as financial forecasting. Focusing on stock prices, Önkal & Muradoglu (1995) show that feedback is effective in improving probabilistic forecasts, with performance feedback leading to better accuracy than outcome (knowledge-of-results) feedback. Relatedly, Benson & Önkal (1992) argue that performance feedback affects the probability usage of forecasters, reflecting improved assessment of uncertainties embedded in the forecasting environment. Feedback representation and effectiveness of different types of feedback still remain important topics (Goodwin & Wright, 1994; Ganzach, 1994; Harvey & Bolger, 1996; Webby & O'Connor, 1996) that need to be addressed in the direction of specific factors like the judgment domain (Rowe & Wright, 1996). In particular, financial markets present dynamic forecasting environments where the forecast may influence the behavior of the market, and where the importance of cues may vary with time. Studying the impact of feedback in such volatile environments may prove especially vital for enhancing forecast support (Goodwin & Wright, 1993).

Communication between the providers and the users of financial forecasts remains a critical topic deserving research attention (Fischhoff, 1994). The investment community relies on experts' forecasts (Brown et al., 1987), making their communication a strategic issue. Users' understanding of the forecasts (as intended vs. not intended to be understood by the providers) has significant decision consequences. As noted by Bunn & Wright (1991), communicability of forecasts may in fact be more consequential than accuracy, due to its implications. The communication issue also implies that the needs of users should be considered when preparing and presenting forecasts. For example, users may find probabilistic forecasts more informative and more useful than simple point forecasts, since probabilities are viewed as reflecting indications of forecaster's confidence and uncertainty (Murphy & Winkler, 1992; Önkal & Dirimtekin, 1996). That is, the probabilities may aid the users in their interpretation of issued forecasts. As argued by Fischhoff (1994), "unless forecasters say how confident they are in forecasts, recipients are left to guess" (p. 393). Accordingly, there is a specific need for future research on the communication of judgmental probability forecasts to users/decision-makers (Abramson & Clemen, 1995).

It is also interesting that, when judgmental forecasts are given in probabilistic form, users' focus in evaluating these forecasts may be quite different from the accuracy dimensions emphasized by researchers (Yates et al., 1996). To have practical value, forecasts must adhere to users' expectations and evaluation criteria. Relatedly, Batchelor & Dua (1992) suggest that the consensus-seeking vs. variety-seeking behavior of forecasters (i.e. their tendency to give forecasts close to vs. far away from other analysts' forecasts) may be affected by users' expectations or preferences. For example, users may ignore forecasts that deviate too much from the consensus, but at the same time, dismiss forecasts too close to the consensus for not being informative. In a similar vein, McNees (1992) argues that the users employ the dispersion of individual point forecasts as an index of market uncertainty, so that the pressures to converge towards consensus could have significant implications for the use (and credibility) of these forecasts.

Use of interval forecasts may be effective in overcoming such perceived pressures, since they do not require commitment to one specific value (i.e. point forecast). It is interesting to note that interval forecasts have largely been ignored in financial forecasting research. Given that financial managers are found to prefer interval forecasts to point predictions for explicitly communicating uncertainty (Baginski, Conrad & Hassell, 1993; Pownall, Wasley & Waymire, 1993), use of interval predictions presents an intriguing research dimension waiting to be explored.

Scenario planning could also provide a promising alternative in communicating uncertainties about future values of financial variables. Scenario-based procedures for decomposing judgmental probability forecasts have already been proposed (Salo & Bunn, 1995). Further research is required to determine whether scenario planning could play an important role in judgmental forecasting of financial futures (Jungermann & Thuring, 1987; van der Heijden, 1994; Wright, 1996).

In conclusion, it is clear that apparently conflicting or ambiguous signals will continue to dominate financial markets (Renshaw, 1993), accentuating the role of judgment in these domains. It is also inevitable that financial players' expectations and judgmental forecasts will influence the platforms underlying futures, options and other crucial financial markets. Future research into the specific needs of financial agents (as both providers and users of judgmental forecasts) remains critical for disseminating financial knowledge and uncertainty, hence contributing towards effective decision making in these settings.

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