Forecasting ability of the investor sentiment endurance index: The case of oil service stock returns and crude oil prices

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ABSTRACT

Using a binomial probability distribution model this paper creates an endurance index of oil service investor sentiment. The index reflects the probability of the high or low stock price being the close price for the PHLX Oil Service Sector Index. Results of this study reveal the substantial forecasting ability of the sentiment endurance index. Monthly and quarterly rolling forecasts of returns of oil service stocks have an overall accuracy as high as 52% to 57%. In addition, the index shows decent forecasting ability on changes in crude oil prices, especially, WTI prices. The accuracy of 6-quarter rolling forecasts is 55%. The sentiment endurance index, along with the procedure of true forecasting and accuracy ratio, applied in this study provides investors and analysts of oil service sector stocks and crude oil prices as well as energy policy-makers with effective analytical tools.

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"But how do we know when irrational exuberance has unduly escalated asset values, which then become subject to unexpected and prolonged contractions as they have in Japan over the past decade?"—Alan Greenspan, from a speech entitled "The Challenge of Central Banking in a Democratic Society," delivered at the Annual Dinner and Francis Boyer Lecture of The American Enterprise Institute for Public Policy Research, Washington, D.C.—December 5, 1996

1. Introduction

The presence of numerous market anomalies and asset pricing inconsistencies leads most modern finance theorists to concede that investors behaving irrationally can and do temporarily impact asset prices. In fact, much of the relatively new field of behavioral finance attempts to model those behaviors and predict their impact on asset prices. One such behavior that is widely believed to impact markets is investor sentiment. From a logical perspective it seems clear that optimistic investors are more likely to buy assets and drive prices higher while pessimistic investors are more likely to sell assets and drive prices

lower. However, at some point this optimism or pessimism can push values far higher or lower than traditional valuation models predict. In other words, a seemingly rational behavior crosses over into irrationality at some point.

Former Federal Reserve Chairman Alan Greenspan's famous 1996 quote from a speech made at The American Institute for Public Policy Research refers to this condition of extreme optimism as "irrational exuberance." As Greenspan clearly states asset prices are impacted by investor sentiment. However, problems exist in measuring and forecasting investor sentiment with enough consistency to forecast asset prices and make profitable trades based on those forecasts. Numerous studies including Barberis et al. (1998), Baker and Wurgler (2006) and Sayim et al. (2013), attempt to identify realistic proxies for investor sentiment and use those proxies in asset pricing models. Each study has varying degrees of success.

One problematic issue for researchers is the fact that not all investors react to the same exogenous environmental variables in the same manner. Some investors may be pessimistic with respect to current conditions while other investors may be optimistic to those same conditions. That fact, coupled with the continuous flow of information that must be reviewed and digested by each investor to form ever-changing valuation opinions, makes investor sentiment a moving target that can also rapidly switch directions. Therefore the net effect of those

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opposing time-varying sentiments will impact asset prices and most measures of investor sentiment fail to capture these dynamics.

However, one model of investor sentiment, developed by He (2012), assumes those often conflicting sentiments are captured in the closing stock prices. This method uses readily available information to construct a sentiment endurance index (SE) that is not dependent on the type of news or the ability to predict whether that news will be considered positive or negative by investors. The net effect of the investor sentiment is instead embedded in the closing stock price. In this paper we provide additional evidence that this method can be used to forecast asset prices. To test the model's reliability in volatile markets with available data we use the model to forecast the price of crude oil and various oil service stocks using the Philadelphia Stock Exchange Oil Service Sector Index (OSX) as a proxy.

2. Literature review

Investors acting in efficient markets constantly react to new information and adjust their asset positions accordingly. New information, by definition, has not been available to investors prior to its release to be factored into their buy and sell decisions. Upon release the net effect of relevant information is to move asset prices higher or lower. Some information impacts all stocks and their returns as modeled by Fama and French in several studies (1993, 1996, 1997). Still other information is more firm-specific and impacts the returns of select stocks or funds (Daniel and Titman, 1997). In addition to the vast amount of stock specific information and macroeconomic information investor sentiment can also be impacted by non-economic factors such as the weather. For example Kamstra et al. (2003) find that market returns are lower during the fall and winter when the weather is gloomy. They attribute this finding to a specific behavioral disorder associated with declining daylight hours. Given the complexity of human behavior there is no consensus of the type of information that will impact asset prices. Investors, in their quest for excess returns, respond to all information and can respond in different directions to the same set of information.

A seminal paper by Delong (DeLong et al., 1990) develops the underpinnings for this line of research. The DSSW paper maintains that investors are subject to sentiment which is defined as a belief about a firm's future cash flows and level of risk that is not supported by current facts. In addition these sentiment beliefs can persist for extended periods of time resulting in asset prices that differ from their intrinsic value. The asset prices can be higher, which is a result of investor overreaction, or lower due to investor underreaction (Barberis et al., 1998). In any case investor sentiment is considered to be one driver of observed asset pricing irregularities.

Given that investor sentiment has been identified as a driver of asset mispricing there are a significant number of researchers that focus on ways to measure investor sentiment. This effort is justified since a consistent model that predicts investor sentiment could generate excess returns for investors. A study by Fisher and Statman (2000) is based on the premise that investor sophistication dictates investor sentiment. They divide investors into three groups based on portfolio size and utilize different sentiment proxies for each group. Each sentiment proxy uses survey based data that is currently collected and published. Their findings are interesting since they determine the three investors groups do not move in unison. The sentiment of large investors had almost no correlation with the sentiment of the other two groups. This finding highlights the problem of determining the net impact of investor sentiment on asset prices at any given time.

Brown and Cliff (2004) conduct a comprehensive study of measures of investor sentiment and their impact on future stock returns. While they find that aggregate measures of sentiment levels are highly correlated with contemporaneous market returns their model is incapable of consistently forecasting future stock returns. However, their research does support that institutional sentiment is strongly related to large stock returns which further supports that different groups or classes of

investors can engage in trading activities that cancel their respective impacts.

Other examples of investor sentiment are identified by Swaminathan (1996) and Neal and Wheatley (1998) that both find that closed-end fund discounts can be a useful proxy for investor sentiment. Neal and Wheatley (1998) also determine that net mutual fund redemptions can aid in forecasting the size of the mispricing. Baker and Wurgler (2007) provide a laundry list of proxies for investor sentiment. These proxies include the aggregate forecasts of newsletter writers identified by Brown and Cliff (2005), changes in consumer confidence (Lemmon and Portniaguina, 2006), and trading volume (Scheinkman and Xiong, 2003). In addition they list other proxies such as mutual fund flows, dividend premium, opinion implied volatility, IPO first-day returns, IPO volume, equity issues over total new issues, and insider trading. All of these investor sentiment indexes and their lagged terms are used as predictors for stock market returns or portfolio returns (Baker and Wurgler, 2006).

A few studies have identified industry-specific differences that are useful to review for the purpose of this paper. For example Sayim et al. (2013) find that investor sentiment does indeed positively impact stock returns in several industries including the oil industry. The impact is near term and rapidly disappears as one would expect. Their paper uses fundamental market data to generate a forecast of investor sentiment and finds that about one-third of investor sentiment can be linked to market factors. The market factors include such data as U.S. business conditions and short-term interest rates.

Two other studies look at futures markets for various commodities. Spyrou (2006) finds that investors in the IBE Crude Oil Futures are more likely to overreact to positive price shocks in the oil market. He concludes it is possible for a trader to generate significant abnormal profits by exploiting these price inefficiencies. Wang (2001) finds similar inefficiencies in six agricultural commodity futures markets. This sparse list of studies shows the need for additional research on the impact of investor sentiment on oil prices and oil stocks given the importance of this market.

Also, as you can see there is no clear measure of investor sentiment found in the finance literature. Few of these proxies perform well when used to forecast future returns. Part of this poor performance is likely due to the fact that investor sentiment is adaptive and continuously reacts to the release of new relevant information. For this reason surveys and other discrete proxies of investor sentiment cannot reflect this new information that investors receive and react to every minute. Given the unpredictability of the release of new information, and the uncertainty surrounding investor reactions to this information, an effective model must rapidly adapt to be useful in forecasting asset prices. Fortunately one data point does incorporate this information and it is the asset's price. An asset's closing price has all of this often-conflicting information and conflicting investor reaction embedded within. While some investors respond positively and other negatively throughout the day the closing price will still be the net effect of the day's transmission of new information and investor sentiment.

Although many prices between the high and low prices are going to cancel out each other during a trading day, some of them can form a lasting force that drives stock prices and the overall market. This dynamic process reveals not only investor sentiment, but also resilience or endurance of sentiment. It is only long-lasting resilient sentiment that can be built into the closing price. It means that the only feasible way to use investor sentiment contained in stock prices to forecast future stock prices is to detach resilient investor sentiment from stock prices and construct an index of endurance of investor sentiment.

In order to improve forecasting quality, this study uses a comprehensive measure of investor reactions to all sorts of relevant information, macro or firm-specific, to predict changes in oil prices and the Philadelphia Stock Exchange Oil Service Sector Index (OSX). The premise of this paper is that the overall impact of investor sentiment